2
DOE/ET/10205--T1-Vol.4

**A minerals and materials contract report
MARCH 1985**

DOE/ET/10205--T1-Vol.4

DE86 010831

FIXED-BED GASIFICATION RESEARCH USING U.S. COALS, VOLUME 4 GASIFICATION OF LEUCITE HILLS SUBBITUMINOUS COAL

Contract H0222001

Black, Sivalls, and Bryson, Incorporated

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

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

DISCLAIMER NOTICE

The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies or recommendations of the Interior Department's Bureau of Mines or the United States Government.

Reference to specific brands, equipment, or trade names in this report is made to facilitate understanding and does not imply endorsement by the Bureau of Mines.

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

REPORT DOCUMENTATION PAGE	1. REPORT NO.	2.	3. Recipient's Accession No.
4. Title and Subtitle Fixed-Bed Gasification Research Using U.S. Coals, Volume 4, Gasification of Leucite Hills Subbituminous Coal		5. Report Date March 31, 1985	
7. Author(s) David Thimsen, Rolf E. Maurer, Albert R. Pooler, David Pui, Ben Liu, David Kittelson		8. Performing Organization Rept. No. BSB-ES-8503	
9. Performing Organization Name and Address Black, Sivalls & Bryson, Incorporated BS&B Energy Systems 7324 Southwest Freeway Houston, TX 77074		10. Project/Task/Work Unit No.	
12. Sponsoring Organization Name and Address U.S. Department of the Interior Bureau of Mines P. O. Box 1660 Twin Cities, MN 55111		11. Contract(C) or Grant(G) No. (C) H0222001 (G)	
13. Type of Report & Period Covered Contract Report		14.	
15. Supplementary Notes This research was partially funded by U.S. DOE under Interagency Agreement No. DE-A121-7ET10205.			
16. 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 fourth volume in a series of reports describing the atmospheric pressure, fixed-bed gasification of U.S. coals. This specific report describes the gasification of Leucite Hills subbituminous coal from Sweetwater County, Wyoming. The period of the gasification test was April 11-30, 1983.			
17. Document Analysis a. Descriptors Fixed-bed coal gasification, alternate fuels, coal gasification, Wellman-Galusha, Leucite Hills subbituminous coal. b. Identifiers/Open-Ended Terms MIFGa, Wellman-Galusha c. COSATI Field/Group			
18. Availability Statement Unlimited		19. Security Class (This Report) Unclassified	21. No. of Pages 259
		20. Security Class (This Page) Unclassified	22. Price

FOREWORD

This report was prepared by Black, Sivalis, and Bryson, Inc., Houston, Texas under USBM contract number H0222001. 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 1982 to May 1984. This final report was submitted by the authors on March 31, 1985.

Funding for this contract was through USBM/USDOE Interagency Agreement DE-A121-7ET10205.

The University of Minnesota, Particle Technology Laboratory, Minneapolis, Minnesota, a subcontractor to Black, Sivalis, and Bryson, Inc., participated in preparation of this report.

The Leucite Hills subbituminous coal gasified during the operations described here was donated by Rocky Mountain Energy.

TABLE OF CONTENTS

	Tables.....	6
	Figures.....	7
	Introduction.....	8
Section 1	Test Summary.....	9
Section 2	Test Objectives	
2.1	Selection of Coal to be Tested.....	11
2.2	Test Objectives.....	11
2.3	Test Plan.....	11
Section 3	Description of Fuel to be Tested.....	13
Section 4	Facility Description	
4.1	Test Facility.....	18
4.2	Gas Sampling and Conditioning System....	18
4.3	Gas Analysis Equipment.....	21
Section 5	Test Procedures	
5.1	Test Teams.....	23
5.2	Gasifier Sampling and Data Acquisition Procedures.....	24
Section 6	Conduct of Test.....	26
Section 7	Test Results	
7.1	Data Summary	
7.1.1	Continuous Output Transducer Data.....	31
7.1.2	Coal, Ash, and Cyclone Dust...	31
7.1.3	Gas Analysis Data.....	45
7.1.4	Tar and Water Yields and Analysis.....	47
7.2	Material Balance and Thermal Efficiency Calculations.....	53
7.3	Grate Performance Model.....	54
7.4	Combustion Monitoring.....	54
7.5	Tar/oil Yield Correlations.....	76
Section 8	Conclusions and Recommendations.....	79
	References.....	81
	Appendices.....	83

TABLES

- 1-1 Design Point Performance of Leucite Hills
Subbituminous Coal

- 3-1 Average Analysis of Leucite Hills Coal
- 3-2 Characteristics of Leucite Hills Coal with Regard to the
Coal Test Objective Matrix

- 4-1 Principal Features of the HP 5880A Gas Chromatograph

- 7-1 Summary of Coal, Ash, and Cyclone Dust Analyses
- 7-2 Comparison of Coal Size Distribution Before and After
Screening to that Found in the Feed Bin
- 7-3 Physical and Chemical Properties of Coal and Cyclone Dust
- 7-4 Chemical Analyses of Moisture-free Ash
- 7-5 USEPA Resource Conservation and Recovery Act Hazardous
Waste Test Results
- 7-6 Condensed Material Analyses
- 7-7 Material Balance and Thermal Efficiency Calculation
0.65 tn/hr, 145 F, +3/4 inch
- 7-8 Material Balance and Thermal Efficiency Calculation
0.73 tn/hr, 142 F, +3/4 inch
- 7-9 Material Balance and Thermal Efficiency Calculation
1.22 tn/hr, 149 F, +3/4 inch
- 7-10 Material Balance and Thermal Efficiency Calculation
1.19 tn/hr, 145 F, +3/4 inch
- 7-11 Material Balance and Thermal Efficiency Calculation
1.16 tn/hr, 142 F, +3/4 inch
- 7-12 Material Balance and Thermal Efficiency Calculation
1.67 tn/hr, 149 F, +3/4 inch
- 7-13 Material Balance and Thermal Efficiency Calculation
1.67 tn/hr, 146 F, +3/4 inch
- 7-14 Material Balance and Thermal Efficiency Calculation
1.96 tn/hr, 149 F, +3/4 inch
- 7-15 Material Balance and Thermal Efficiency Calculation
0.68 tn/hr, 149 F, +1/4 inch
- 7-16 Material Balance and Thermal Efficiency Calculation
0.96 tn/hr, 149 F, +1/4 inch
- 7-17 Material Balance and Thermal Efficiency Calculation
0.94 tn/hr, 142 F, +1/4 inch
- 7-18 Material Balance and Thermal Efficiency Calculation
2.10 tn/hr, 153 F, +1/4 inch
- 7-19 Material Balance and Thermal Efficiency Calculation
0.68 tn/hr, 145 F, +3/4+1/4 inch
- 7-20 Material Balance and Thermal Efficiency Calculation
1.13 tn/hr, 146 F, -3/4+1/4
- 7-21 Material Balance and Thermal Efficiency Calculation
1.44 tn/hr, 138 F, -3/4+1/4
- 7-22 Material Balance and Thermal Efficiency Calculation
Leucite Hills Overall Average
- 7-23 Gas combustor Operating Conditions 1000 to 1500 hrs.
4/21/83.

FIGURES

- 2-1 Test Plan BOM/FGT-003
- 3-1 Location of Leucite Hills Mine
- 3-2 Leucite Hills Coal Sizing History
- 4-1 Coal Gasifier Process Flow Schematic, U.S. Bureau of Mines,
Twin Cities Research Center.
- 4-2 Schematic Diagram of the Gas Sampling and Conditioning
System
- 6-1 Test History, BOM/FGT-003
- 7-1 Physical Characteristics of the Gasifier Operation.
- 7-2 Feed Coal Size Distribution Analysis
- 7-3 Geometrical Mean Coal Particle Size
- 7-4 Average Particle Size Distribution of Feed Coal
- 7-5 Ash Size Distribution Analysis
- 7-6 Geometrical Mean Ash Particle Size
- 7-7 Ash Characteristics and Operating Conditions
- 7-8 Major Gas Species Measured by the Gas Chromatograph.
- 7-9 Minor Gas Species Measured by the Gas chromatograph.
- 7-10 Dry gas HHV, Major Gas Species and Gasifier Operational
Parameters.
- 7-11 Tar/Oil Yield and Water Yield with Operating Conditions
- 7-12 Comparison of the Geometrical Grate Performance Model
with Daily Average Ash Removal Rates.
- 7-13 Combustor Centerline Gas Composition
- 7-14 Combustor Horizontal Center Plane Composition Profile I
- 7-15 Combustor Horizontal Center Plane Composition Profile II
- 7-16 Tar/oil Yield - Volatile Matter-Oxygen Correlation
- 7-17 Tar/oil Yield - Volatile BTU Correlation

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 (BS&B) 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 (UMPTL) is subcontractor to BS&B to monitor process parameters, and provide analysis for material inputs and outputs.

This report is the fourth volume in a series of reports describing the fixed-bed gasification of U.S. coals at the Bureau of Mines, Twin Cities Research Center. This report covers the test period identified as BOM/FGT-003, gasification of Leucite Hills subbituminous coal. The time period covered is April 11 - 30, 1983.

Section 1 gives a brief summary of test. 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

The Leucite Hills subbituminous coal gasified during BOM/FGT-003 is a friable western coal whose testing in a fixed-bed gasifier expands the data base for gasification of western United States coals.

The Leucite Hills coal is a subbituminous A coal, surface mined in Sweetwater County, Wyoming. It is a medium moisture, medium ash, non-swelling coal. Oxidizing ash fusion temperatures are high (+2700 F). The coal is very friable and care must be exercised in handling to avoid size degradation.

The Leucite Hills coal was gasified in a 6.5 foot I.D. Wellman-Galusha single-stage, atmospheric pressure, air-blown, fixed-bed gas producer. The hot, raw gas was partially cleaned of dust in a cyclone and incinerated in a cylindrical combustion chamber. The products of combustion were quenched and cleaned of particles and sulfur dioxide in a wet caustic scrubber.

The coal gasified well. High coal throughputs were achieved (2.1 tons/hour) under stable conditions. Ash clinkering responded predictably to changes in blast saturation temperature and is easily avoided. Gasification of 2 1/2 x 1/4 inch coal allowed slightly higher throughputs than gasification of 2 1/2 x 3/4 inch coal but maximum throughput was limited by capacity of the gas combustion system. Gasification of 3/4 x 1/4 inch coal was successful at medium throughput. No attempt was made to gasify this size range at high throughput. The gasifier was banked on coal for a 27-hour period due to a power failure, and was brought back to load successfully.

Dry gas higher heating value ranged from 170 to 185 Btu/scf and throughputs of near 2 tons per hour were achieved for 50 hours of operation. Tar/oil yields averaged 7.1 lb/100 lb coal. Table 1-1 gives a design point performance of this coal based on the results of this test. The design throughput of 1.6 tons per hour (96.4 lb/hr/sq ft grate) allows a 25% over design capacity based on maximum throughputs achieved during this test.

Gas combustor emissions measurements were performed while gasifying 2 1/2 x 1/4 inch coal at high throughput (and before flue gas scrubbing). The particulate emission factor ranged from 0.26 to 3.7 lb/million Btu. The sulfur dioxide emission factor was 0.97 lb/million Btu.

It may be desirable to further test the 3/4 x 1/4 inch coal sizing to establish maximum throughput.

This coal is recommended as a fixed-bed gasifier fuel in the coal size ranges tested (2 1/2 x 1/4 inch). High throughputs are achievable, gas quality is steady, and operating labor requirements are modest.

Table 1-1

Design Point Characteristics for Gasification of
Leucite Hills Coal.

Coal Throughput - 1.60 tons/hour (96.4 lb/hr/sqft grate)

Air/coal Ratio	1.78	lb/lb
Steam/coal Ratio	.332	lb/lb
Blast Saturation Temperature	146	deg F
Gas Offtake Temperature	565	deg F
Wet Gas/coal	49.4	scf/lb
Gas Dew Point	128	deg F

Tar Yield	6.6	lb/100 lb coal
-----------	-----	----------------

Tar Analysis:

HHV (dry)	15,430	BTU/lb
Pour Point	90	deg F
Viscosity (210 F)	73	SUS
Specific Gravity (60/60 F)	1.075	

Dry Gas Composition:

Hydrogen	19.4	mol %
Carbon Monoxide	28.8	mol %
Methane	1.67	mol %
Ethylene	.051	mol %
Ethane	.152	mol %
Propylene	.038	mol %
Propane	.037	mol %
Carbon Dioxide	5.96	mol %
Nitrogen	43.2	mol %

Water	7.73	lb/1000 scf dry gas
-------	------	---------------------

HHV (dry gas)	178	BTU/scf
LHV (dry gas)	166	BTU/scf

Thermal Efficiencies:

Hot, raw	93	%
Cold, with tar	85	%
Cold, without tar	75	%

SECTION 2

TEST OBJECTIVES

2.1 Selection of Coal to be Tested

Preliminary analyses of Leucite Hills coal indicated that it is a subbituminous B coal. This would fit nicely into the program test objective matrix. Analyses performed as part of this test classify the coal as a subbituminous A coal, but its gasification is still of interest to the program.

The coal is typical of high quality western subbituminous coals. Past tests have not produced the breadth of experience to conclusively distinguish between those western subbituminous coals that can be gasified well in a fixed-bed producer (i.e. Grassy Creek coal- GKP-37) and those that do not maintain physical integrity in the retort and hence gasify with limited success (i.e. Rosebud- BOM/FGT-002). This coal would expand the data base and experience with regard to western subbituminous coals.

The coal was donated to the project by Rocky Mountain Energy, a member of the Mining and Industrial Fuel Gas Group (MIFGa).

2.2 Test Objectives

- a. Determine gasifier performance (including conversion efficiency) with a western subbituminous coal at various loads and blast steam/air ratios.
- b. Evaluation of maximum throughput and gas quality as a function of coal size distribution.
- c. Characterize the combustion of hot, raw low-BTU gas from a low sulfur coal.
- d. Characterize low-BTU gas quality and composition with coal throughput, blast saturation temperature, and coal sizing.
- e. Identify operational requirements for stable operation of a fixed-bed gasifier fueled with this coal.

2.3 Test Plan

Figure 2-1 shows the projected load levels and blast saturation temperatures for BOM/FGT-003. Operation with agitator and establishment of maximum load were left to the facility manager's judgment based on performance of the coal during the test. Ash depth was to be maintained at 12 inches plus or minus 3 inches.

The spacings between grate levels were unchanged from BOM/FGT-002, gasification of Rosebud subbituminous coal and were 6 inches plus or minus 1/8 inch for both grate spacings.

Test Plan BOM/EGT-003

Figure 2-1

SECTION 3

DESCRIPTION OF FUEL TESTED

The Leucite Hills coal tested during BOM/FGT 003 is a non-swelling, medium-moisture subbituminous A coal mined by Rocky Mountain Energy Company in Sweetwater County, Wyoming. Figure 3-1 shows the location of the Leucite Hills coal mine, approximately 25 miles northeast of Rock Springs, Wyoming. The coal is surface mined from three separate seams averaging 5 feet in thickness. Average stripping ratio is 5:1. Reserves within the current mining area are estimated at 5 million tons with annual production capacity of 500,000 tons.

The mine is located 6 miles from the Prospect Point Coal company loadout facility. Coal is transported by truck from the mine to the loadout, where it is stockpiled, crushed, and finally loaded onto rail cars. Prospect Point is served by the Union Pacific Railroad.

Prospect Point has no production screening facilities. For this test only, a portable screening plant was used to double screen the coal to 2 1/2" X 3/4" at the loadout. Typical run of mine size distribution shows 30 - 40 % less than 1/4 inch.

The coal gasified during BOM/FGT-003 was loaded onto 10 rail cars at Prospect Point, Wyoming on March 14, 1983. The cars arrived in the Twin Cities on April 4, 1983 and were unloaded April 6, 1983. The coal remained in uncovered storage at the rail unloading site and was loaded onto trucks and transported 15 miles to the test site, as needed, between April 8 and April 21. As delivered, the coal contained noticeable lumps of white clay.

Approximately 808 tons were delivered to the test site. Approximately 550 tons were moved through the weigh bin during BOM/FGT 003. Approximately 250 tons of -3/4 inch coal were stockpiled on site for possible future testing.

A complete analysis of the coal is given in Table 3-1. The results shown are averages of 3 samples submitted to Interpoll, Inc., Circle Pines, Minnesota. Table 3-2 shows how the coal fits into the coal test objective matrix.

Figure 3-2 shows the size distribution history of the coal through the loading system. These data and qualitative observations of the coal indicate that it is very friable. Significant size degradation occurred in getting coal to the gasifier.

The contact for this coal is :

Rocky Mountain Energy (303) 469-8844
10 Longs Peak Drive
Broomfield, Colorado 80020

Figure 3-1
Location of Leucite Hills Mine

Table 3-1

Average Analysis of Leucite Hills Coal

Proximate Analysis:

Moisture	16.75	%
Volatile Matter	29.63	%
Ash	8.07	%
Fixed Carbon	45.55	%

Ultimate Analysis:

Hydrogen	3.85	%
Carbon	58.73	%
Nitrogen	1.36	%
Sulfur	0.55	%
Oxygen	10.69	%
Ash	8.07	%
Moisture	16.75	%

Higher Heating Value 10209 BTU/lb

Ash Fusion Temperatures:	Reducing		Oxidizing	
Initial Deformation	2660	F	2700	F
Softening	2760	F	+2800	F
Hemispherical	+2800	F	+2800	F
Fluid	+2800	F	+2800	F

Free Swelling Index: 0

Table 3-2

Characteristics of Leucite Hills Coal 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	BRIQUETTES
			A	B	C				
ASH CONTENT	H + 20%								
	M 10 - 20%								
	L - 10%		003						
ASH FUSION	H + 2700 F		003						
	M 2300-2700 F								
	L - 2300 F								
FREE SWELLING INDEX	H 3 +								
	M 1 - 3								
	L 0 - 1		003						
MOISTURE CONTENT	H + 15%		003						
	M 5 - 15%								
	L - 5 %								
FRIABILITY (GRINDABILITY)	H		003						
	M								
	L								

Figure 3-2
Leucite Hills Coal Sizing History

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 foot ID 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 and controlled 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 MM BTU/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. The sampling port is thermally insulated to prevent condensation. The hot producer gas is quenched rapidly upon

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

entering the surface 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 every 23 minutes with a Hewlett-Packard model 5880A gas chromatograph. The principal features of this chromatograph are listed in Table 4-1.

Table 4-1

Principle Features of the
HP 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. 23 minute analysis time

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, Sivals & 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 all activities. 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 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

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, subcontractor to the University of Minnesota, had a two man team on site on April 26, 1983. They sampled for exhaust emissions from the gas combustor.

5.1.4 Gas Combustion Monitoring

American Natural Resources, Incorporated, a MIFGa member, contributed a three-man team who were brought on site on April 21, 1983. Their objectives were to sample combustion gas concentrations and temperature profiles in the combustion chamber.

5.2 Gasifier Sampling and Data Acquisition Procedures

5.2.1 Continuous Data

An Analog Devices, Incorporated MACSYM 2 data acquisition system was used for this test. Process signals are sampled once a minute. Ten-minute signal averages are recorded on magnetic tape. Thirty-minute signal averages are printed by line printer. The operations team also logs these signals hourly along with some twenty parameters not sampled by the data acquisition system.

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.

5.2.3 Tar and Oil Data

The condensed tar, oil, and water are removed from the accumulation reservoirs twice 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.

5.2.4 Coal Data

Coal samples are taken from each of the two weigh bin legs by the operations team during coal addition to the lock hopper four times each shift. These four samples are stored in a sealed bucket and submitted as a composite shift sample for each weigh bin leg. 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 to the USBM Twin Cities Research Center Laboratories. The ash samples on which detailed analyses are performed by the USBM Twin Cities Research Center are composited over the same time periods used for compositing the coal samples.

5.2.6 Dust Data

Samples of cyclone dust are grabbed from the dust accumulation bin. Samples of duct dust are removed from an access port near a right angle turn in the main gas duct where the dust accumulates.

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 Gas Combustion Monitoring

Gas samples are withdrawn from the side ports of the cylindrical combustion chamber and a small sight port at the combustion chamber discharge. Gas samples are removed through a 1/4" stainless steel tube (uncooled) and filtered before being sent to the analyzer. Combustibles and oxygen are measured with a Davis Model 11-3400-A Combustion analyzer. Carbon monoxide, carbon dioxide, nitrogen oxides, hydrogen sulfide and sulfur dioxide determinations are made by drawing fixed volume samples through "Draeger" tubes and observing the extent of color changes.

5.2.9 Retort Temperature and Pressure Profiles

Retort temperature and pressure profiles are taken at the end of relatively stable operating periods just prior to changes in blast air flow or blast saturation temperature.

SECTION 6

CONDUCT OF TEST

6.1 Test History

BOM/FGT 003, gasification of Leucite Hills subbituminous coal, began at 8:00 AM on April 11, 1983. The light off procedure described in Reference 1 was used. The retort was filled with coke. A total of 4.9 tons of coke were added to the retort and lower bin prior to introduction of the Leucite Hills coal. The Leucite Hills coal entered the retort at approximately 10:00 AM and fully occupied the retort by about 4:00 PM.

Figure 6-1 shows the time history of the three parameter variations: size distribution, blast saturation temperature (steam/air ratio), and saturation air flow (load). An orderly variation of these parameters was possible since this coal performs very well as a fixed-bed gasifier fuel.

The first phase of the test was gasification of 2 1/2 inches x 3/4 inch coal. The delivered coal was passed over a 3/4 inch screen. Approximately 35% of the coal went through the screen. These screenings were retained for the third phase of the test.

The saturation air flow was maintained at 600 cfm for 40 hours. Saturation temperatures of 149 F (65 C), 145 F (62.5 C) and 141 F (61 C) were maintained for about 12 hours each. Coal consumption was about 0.64 tons per hour at this air flow. Operation was stable during this period. Slight clinkering was detected at the very low blast saturation temperatures.

On April 13 the saturation air flow was raised to 1000 cfm over a 4-hour period. An air flow of 1000 cfm and a blast saturation temperature of 149 F (64.5 C) were maintained for 16 hours before a series of power blinks culminated in a loss of power due to a blizzard the morning of April 14. The gasifier was banked.

After 27 hours of banking, power returned on April 15 and the saturation air flow was brought up to 1000 cfm over a six-hour period. No adverse effects due to banking were noted. This air flow resulted in a coal consumption of about 1.18 tons per hour. Three saturation temperatures of 149 F (64.5 C), 146 F (62.5 C), and 141 F (61 C) were maintained for 16-24 hours each. Again some minor crusting and clinkering of ash was detected at the low blast saturation temperatures.

On April 18 the saturation air flow was increased to 1500 cfm over a 4-hour period. This air flow was held for two days and resulted in a coal consumption of about 1.71 tons per hour. Saturation temperatures of 149 F (64.5 C) and 146 F (62.5 C) were maintained for one day each. No ash clinkering was

Figure 6-1

Test History, BOM/FGT-003

observed.

On April 20 the saturation air flow was increased to 1750 cfm over a 6-hour period at 149 F (64.5 C) blast saturation temperature. The top of the retort began to glow and some burning through at the sides of the retort was detected. During this period there were no spikes in the offtake temperature, so the burning through was not severe. Coal consumption averaged 1.96 tons per hour. These conditions were maintained for 30 hours. During this time period, minor crusting of ash was detected, and occasionally a fire test indicated multiple zones. Otherwise, operation was stable and the ash bed "behaved" very well.

The second phase of the test began with replacement of the 3/4 inch screen by a 1/2 inch screen to evaluate the influence of bottom size on operation. The coal passed over the 1/2 inch screen entered the retort at 10:00 PM on April 21. Saturation air flow was reduced to 1000 cfm at 149 F (64.5 C) blast saturation temperature. The saturation air flow was increased to 1500 cfm, at which point, some burning through was detected. Coal was raked to the area of burning through. Further burning through required reduction in saturation air flow to 1400 cfm and then 1300 cfm early in the morning of April 23. Poking and raking were used to control this. Maximum coal consumption during this period was about 1.6 tons per hour. No crusting or clinkering was detected during this period.

The 1/2 inch screen was replaced with a 1/4 inch screen. Coal passed over the 1/4 inch screen reached the retort at 2:30 PM on April 23. Saturation air flow was reduced to 600 cfm at 149 F (64.5 C) blast saturation temperature. Coal consumption was 0.68 tons per hour. These conditions were maintained for 16 hours. The fire zone was very cool towards the end of this period.

The saturation air flow was increased to 800 cfm at a blast saturation temperatures of 149 F (64.5 C) and 141 F (61 C). As there were no noticeable problems in operation, saturation air flow was gradually increased to 1950 cfm over a 36-hour period. This top air flow rate was held for 15 hours until the delivered coal was consumed. This resulted in a coal consumption rate of 2.10 tons per hour. As the load was being increased, minor crusting and clinkering of the ash was detected twice. To mitigate this problem, the blast saturation temperature was increased from 146 F (62.5 C) to 150 F (65 C) and then to 153 F (66 C). These steps were successful in reducing the ash fusion to manageable levels.

The third phase of the test was gasification of screenings from the first phase. The -3/4 inch screenings from phase one were passed over the 1/4 inch screen. This coal entered the retort at 9:00 AM on April 27. Initial saturation air flow was 600 cfm and the blast saturation temperature was 146 F (62.5 C). This

produced a coal consumption rate of 0.68 tons per hour. These conditions were held for 18 hours. Towards the end of this period, glowing on top of the retort occurred. The agitator was swept once to distribute the coal over the glowing spots.

Saturation temperature was raised to 152 F (66 C) to cool the bed. Saturation air flow was raised to 1000 cfm resulting in a coal consumption of 1.13 tons per hour. When glowing was detected, the agitator was swept once. This continued to solve the problem for a short period of time. The agitator was then turned on permanently at 5.0 sweeps per hour (2.5 rev/hr). It appears that operation of the agitator has minimal effect on size degradation of this small sized coal.

Operation of the grate during this period was sluggish. Very high grate speeds were necessary to remove a modest amount of ash. The ash was sticky during fire tests. This indicated over saturation of the blast. The blast saturation temperature was reduced to 138 C (59 C). This change was successful and resulted in a need to reduce the grate speed, even under a saturation air flow increase to 1300 cfm. This increase created a coal consumption of 1.44 tons per hour.

The test was terminated at 8:00 AM on April 30, which was the start of BOM/FGT-004. All original objectives were met.

The ash discharged from the gasified Leucite Hills coal was generally white. Often ash pieces were observed to have a white chalky outer layer 1/2 to 1 inch thick with a black, partially unreacted core 1/2 inch thick. The outer layer appeared not to be fused. It simply had not flaked away.

On several occasions, finely divided ash collected in the undergrate area and was flushed with water sprays, installed specifically in anticipation of this problem. These sprays undoubtedly saved a gasifier shutdown to manually clean the undergrate area of caked ash.

Initially there was very little particulate collected in the cyclone or downcomer trap. About 4 days into the test, particulate did appear in the cyclone. There were two types of cyclone discharge: silty char and agglomerated chunks (1-4 inches) of tar and char. The fine dust often had a silvery or whitish luster. At no time was an excessive quantity of dust removed.

Tars and oils did condense at a downcomer trap, and occasionally collected in the throat of the gas burner. The condensed material in the trap was extremely viscous and exhibited plastic behavior. Four to eight pounds of this material were removed daily by chiseling and scraping. Tar/oil in the burner throat was easily pushed into the combustion chamber with a rod.

Retort temperature and pressure profiles were taken under five

different load and blast saturation temperature conditions as indicated in Figure 6-1. These data are presented in Appendix K.

SECTION 7

TEST RESULTS

7.1 Data Summary

7.1.1 Continuous Output Transducer Data

The data acquisition system operated continuously with minor outages of less than 1 hour duration. Ten-minute averages of continuously logged signals are available for essentially all of the test period.

Figure 7-1 gives the offtake temperature, fire loss pressure, dry gas higher heating value along with operating parameters. Offtake temperature is not strongly affected by blast saturation temperature, but does show a transient response to saturation air flow changes. An increase in air flow is accompanied by a decrease in offtake temperature. This transient response of offtake temperature disappears in 8-12 hours.

Fire loss pressure was variable, but not erratic. As a rule, fire loss pressure increases with increasing saturation air flow and blast saturation temperature. Both of these trends are consistent with an increased volume flow through the coal bed. These trends are not rigidly adhered to, however. (Note the decrease in fire loss pressure on the evenings of April 20, 25 & 26).

Dry gas higher heating value was relatively stable in the range of 170-185 BTU/SCF. The only discernable trend in dry gas heating value is that it increases substantially upon a rapid decrease in saturation air flow. This is consistent with only a slight change in coal devolatilization rate for a short period (6 hours) after the step change in air flow rate. The devolatilization products are added to the gasification products without nitrogen dilution, thus increasing the heating value of the dry gas until the devolatilization rates decline to match the new coal feed rates. This increase in higher heating value is due almost entirely to increased concentrations of hydrocarbons (see Section 7.1.3).

7.1.2 Coal, Ash & Dust Data

A complete list of the tests performed on the bulk coal, ash and cyclone dust samples collected during BOM/FGT-003, together with the number of samples analyzed, is presented in Table 7-1. A total of 99 coal, 174 ash, and 5 cyclone dust samples were collected and analyzed.

7.1.2.1 Coal Data

Figure 7-2 shows the feed coal size distribution analysis, and

Figure 7-1

Physical Characteristics of the Gasifier Operation.

Table 7-1

Coal, Ash and Cyclone Dust Analysis

Material	Type of Analysis	Number of Samples Collected	Number of Composite Samples Analyzed
Coal	Particle size distribution	99	-
	Proximate analysis	-	3
	Ultimate analysis	-	3
	Heating value	-	3
	Ash fusion temperature	-	3
	Free swelling Index	-	3
Ash	Particle size distribution	174	-
	Bulk density	174	-
	Moisture content	174	-
	Carbon content	174	3
	Sulfur content	174	3
	Chemical analysis	-	3
Cyclone dust	Proximate analysis	5	1
	Ultimate analysis	5	1

Figure 7-2

Feed Coal Size Distribution Analysis

Figure 7-3 gives the geometrical mean particle size. Prior to the use of the 1/2" and 1/4" screens, the geometrical mean coal size decreased indicating possible deterioration in storage.

The average size distributions of the feed coal during four different time periods are presented in Figure 7-4. The time periods used for averaging the coal samples were selected on the basis of the particle size of the feed coal. The fine particulate matter was selectively removed from the coal by passing the coal over 3/4 inch, 1/2 inch or 1/4 inch mesh size screens. The three averaging times correspond to use of each of these screens. The fourth average, labeled "-3/4 +1/4", consists of the material originally passed through the 3/4 inch screen and then passed over the 1/4 inch screen. The mean particle sizes were 1.02, 0.80, 0.73 and 0.50 inch for the period of time when the 3/4, 1/2, 1/4 and "-3/4 +1/4" inch screens were in use.

The coal size distributions in Figure 7-4 show that a significant fraction of the feed coal was less than 3/4 inch and 1/2 inch mesh sizes during the times when the 3/4 inch or 1/2 inch mesh screens were being used in the coal feed system. The fraction of material fed to the gasifier less than 3/4 inch was 20.0% during the period when the 3/4 inch mesh screen was in use and 16.1% less than 1/2 inch when the 1/2 inch mesh was being used.

During the course of the test, selective coal samples were obtained to determine the source of the fine coal particles in the coal as fed to the gasifier. In addition to the standard coal samples collected each shift from the lock hopper, 21 coal samples were collected before the coal was screened and 21 samples were collected after the screen, but before the coal was transported up the bucket elevator. By comparing the coal size distribution before screening and transport to that obtained for the coal in the lock hopper, it is possible to determine the fraction of fine particles resulting from carryover from the screen and the fraction resulting from coal breakage during transport to the lock hopper. These average size distribution data are presented in Table 7-2 for the special samples together with the data obtained from the standard coal samples collected from the storage bin discharge. The data show that typically 50 to 80% of the material less than the process screen size results from particle breakage during transport from the screen, the remainder being particle carryover from the screen. Furthermore, there is a marked decrease in the fraction of particles greater than 1 inch and 1 1/2 inch which again indicates breakage of particles between the screen and the lockhopper.

The results of the chemical and physical analyses of the composited coal samples are presented in Table 7-3. These data were obtained for composite coal samples. Three composite samples were made from the coal samples collected during each

Figure 7-3

Geometrical Mean Coal Particle Size

Figure 7-4

Average Particle Size Distribution of Feed Coal

Table 7-2

Comparison of Coal Size Distribution Before and After
Screening To That Found in the Feed Bin

Screen mesh size, inch	Sample Location	Cumulative Mass Fraction, %, less than stated mesh size, inch				
		1/4	1/2	3/4	1	1 1/2
+3/4	Before Screen	8.2	23.1	44.2	63.9	88.7
	After Screen	0.6	0.8	9.1	41.9	81.1
	Feed Bin	1.9	5.0	19.8	49.9	87.2
+1/2	Before Screen	6.0	17.7	35.0	55.9	84.0
	After Screen	0.7	8.8	28.8	50.7	81.4
	Feed Bin	3.5	16.1	44.6	70.6	94.7
+1/4	Before Screen	8.0	19.3	35.6	54.1	83.9
	After Screen	1.1	14.5	32.2	50.9	81.7
	Feed Bin	4.1	25.1	52.6	74.3	93.5
-3/4, +1/4	Before Screen	20.3	57.3	97.9	99.8	100.0
	After Screen	2.2	51.0	97.6	99.6	100.0
	Feed Bin	6.4	49.9	96.1	99.3	99.8

Table 7-3

Physical and Chemical Properties of Coal and Cyclone Dust

Material	Coal			Cyclone Dust	
Screen Mesh Size, Inch	+3/4	+1/2,+1/4	-3/4+1/4	Average	(dry basis)
<u>Type of Analysis</u> ¹					
Proximate Analysis, wt %:					
Moisture	17.36	16.20	16.69	16.75	---
Volatile Matter	28.75	29.89	30.26	29.63	15.49
Ash	9.03	8.46	6.71	8.07	30.22
Fixed Carbon ²	44.86	45.45	46.34	45.55	54.29
Sulfur	0.45	0.66	0.53	0.55	0.67
Ultimate Analysis, wt %:					
Hydrogen	3.68	3.88	4.00	3.85	1.49
Carbon	57.52	58.97	59.69	58.73	57.25
Nitrogen	1.37	1.33	1.39	1.36	0.96
Sulfur	0.45	0.66	0.53	0.55	0.67
Oxygen ²	10.59	10.50	10.99	10.69	9.41
Ash	9.03	8.46	6.71	8.07	30.22
Moisture	17.36	16.20	16.69	16.75	---
Heating Value, btu/lb.:					
As Received	10,016	10,242	10,370	10,209	---
Moisture Free	12,120	12,223	12,448	12,264	8,759
Ash Fusion Temp., deg F:					
(Oxidizing Atmosphere)					
Initial Dif., IT	2,565	2,790	2,745	2,700	-
Softening, ST	2,695	+2,800	+2,800	+2,800	-
Softening, HT	2,750	-	-	+2,800	-
Fluid, FT	2,775	-	-	+2,800	-
(Reducing Atmosphere)					
Initial Def., IT	2,620	2,700	2,655	2,658	-
Softening, ST	2,725	2,790	2,770	2,762	-
Softening, HT	2,745	+2,800	2,785	+2,800	-
Fluid, FT	2,785	-	+2,800	+2,800	-
Free Swelling Index	0	0	0	0	

¹ All values "as received" unless otherwise noted.

² By difference.

shift. The time periods used for compositing the coal samples were selected on the basis of the screen size over which the feed coal was passed. The first composite sample corresponds to use of the 3/4 inch screen. The second is a composite for the time periods when the 1/2 inch and 1/4 inch screens were used. The third composite consists of the material originally passed through the 3/4 inch screen and then passed over the 1/4 inch screen. The primary differences among these three samples is in the ash concentration. The ash concentration decreased from 9.03 to 6.71% as the particle size distribution decreased from +3/4 inch to "-3/4 + 1/4" inch.

7.1.2.2 Ash Data

The mass fraction of ash less than each of five indicated mesh sizes and the mean ash particle size are presented in Figures 7-5 and 7-6. These data show significant variations in the size distribution with time. These variations will be discussed below.

The bulk density, carbon, sulfur, and mean particle size of the ash for the entire test period are presented in Figure 7-7 along with the operational parameters. As has been noted in previous tests, the short term increases in carbon concentration correspond to changes in load conditions. No such relationship between a decrease in load and short term decrease in ash carbon content can be established. The carbon concentration typically varied from 15 to 25%. These concentrations correspond to only about 2% of the carbon found in the feed coal. Gasification of the -3/4 + 1/4 inch coal resulted in an average of 5.3 % carbon in the ash. This corresponds to less than 1% of the carbon in the feed coal.

In general as carbon content in the ash increases so does sulfur content in the ash. Ash bulk density follows the same trend, but the correlation is weaker. None of these parameters are particularly sensitive to blast saturation temperature. The mean ash particle size is not strongly related to operational parameters.

(When comparing the ash dump data to the continuous output data associated with the gasifier operation conditions, one must consider the fact that the ash data are presented as a function of time of ash dump. Since several ash dumps are required to transport material from the upper portions of the retort to the ash pit, any step function changes in the gasifier operating conditions which affect the ash will not be reflected in the reported ash data until several ash dumps later. This time typically was about six to eight hours.)

The data from the elemental analysis of the moisture-free ash are presented in Table 7-4. The average mass fraction for each element is presented.

Figure 7-5
Ash Size Distribution Analysis

Figure 7-6

Geometrical Mean Ash Particle Size

Figure 7-7

Ash Characteristics and Operating Conditions

BOM/FGT-003

Table 7-4

Summary of Chemical Analysis of Moisture-Free Ash

Mass Fraction, %, for Composited Samples

Element	006-101	106-148	153-171	Average
Fe	3.1	3.6	3.3	3.4
Fe2+	1.0	1.5	1.0	1.2
Si	23.1	22.7	25.5	23.8
Al	12.2	11.9	14.2	12.8
C	19.8	20.2	6.5	1.5
Ca	1.7	1.9	2.4	2.0
Mg	0.67	0.69	0.71	0.69
K	0.32	0.31	0.15	0.26
P	<0.01	<0.01	<0.01	<0.01
Na	0.12	0.11	0.12	0.12
S	0.20	0.14	0.089	0.143
Ti	0.6	0.5	0.6	0.6

Rocky Mountain Energy, suppliers of the Leucite Hills Coal, commissioned USEPA Resource Conservation and Recovery Act (RCRA) hazardous waste tests to be performed on three grab samples of ash. The results of these tests are given in Table 7-5. A preliminary comparison to regulatory criteria indicates that the ash is a non-hazardous waste.

7.1.2.3 Cyclone Dust Data

The proximate and ultimate analyses of the composite cyclone dust sample are given in Table 7-3. The moisture content of the cyclone dust is a fictitious number as the dust passes through a water seal as it leaves the gas stream. The samples are dried prior to submission for analysis. The moisture free volatile matter of the dust is 15.5% compared to 35.6% for the feed coal. The moisture free ash content and fixed carbon are 29.9% and 53.7% for dust and 9.7% and 54.7% for coal respectively. The volatile matter of the dust decreases consistent with partial devolatilization at offtake temperatures. This devolatilization does not adequately explain the large increase in ash content, however. This can only be explained by dilution of the coal dust with some high ash material. This is consistent with visual observations of the cyclone dust as having a "silvery" or "whitish" luster (see section 6). Apparently high ash portions of the feed coal were carried over to the cyclone.

Three grab samples of cyclone dust were submitted for the RCRA hazardous waste tests described in section 7.1.2.2. The results of the analysis are also given in Table 7-5, and confirm the preliminary assessment that this material is a non-hazardous waste.

7.1.3 Gas Analysis Data

The NDIR carbon monoxide and paramagnetic oxygen analyzers operated well during the test period. The NDIR carbon dioxide analyzer malfunctioned during the first part of the test. It was placed into service April 21 and operated well for the remainder of the test. The SIGMA continuous flow gas calorimeter was operated during the test, but data recorded from this analyzer is questionable as there was a substantial calibration drift (10-15%/day). All heating values given are calculated from the gas chromatograph output.

Gas chromatograms were obtained every 23 minutes throughout the test. There are no significant gaps in GC data.

During most of the test the oxygen concentration in the gas was indistinguishable from zero. When the steam sealed retort access ports were opened during fire tests and freeboard measurements, however, oxygen concentrations were greater than zero. These devices, while sealing against gas leaks out of the retort, apparently aspirate some air into the product gas. All

oxygen concentrations reported to be greater than zero result from this ingestion of air into the freeboard of the gasifier. Otherwise the oxygen analyzer served as a very sensitive leak detector.

Figures 7-8 and 7-9 present the concentrations of species measured by the gas chromatograph. As noted in Section 7.1.1 large reductions in saturation air flow on the evening of 4/21 and 4/27 resulted in temporary increases of most of the minor species which also increases the dry gas heating value. After 6-8 hours the concentrations of these species returned to their previous level.

Figure 7-10 shows the major active species and the gasifier operating conditions. Gas composition is not a strong function of saturation airflow. It is, however, very dependent on blast saturation temperature. A decrease in blast saturation temperature (steam-air ratio) results in a decrease in carbon dioxide and hydrogen concentrations and an increase in carbon monoxide concentration. The inverse is also true. This is consistent with the shift reaction:

playing a major part in determining offgas composition. The shift reaction does not substantially affect the higher heating value of the dry gas as hydrogen and carbon monoxide have nearly the same volumetric higher heating value. The lower heating value of the dry gas declines with higher blast saturation temperatures as hydrogen has a lower low heating value than does carbon monoxide.

7.1.4 Tar and Water Yield Data

The gas sampling and conditioning system performed well during this test. The only brief shut-down was caused by high voltage breakdown of the electrostatic precipitator HV insulator which required replacement. The condensed material drain interval was 12 hours during the initial test period and was later changed to 24 hours.

Three sets of tar samples were analyzed. They were obtained during the following time periods:

Sample No.	Tar Collection Period
1	4/11 21:15 - 4/12 20:15
2	4/16 06:00 - 4/17 14:00
3	4/18 00:21 - 4/21 07:20

The analysis results are included in Table 7-6.

The tar and water yields for the entire test period have been measured and are shown in Figure 7-11 along with gasifier operational parameters. For this test water in the tar/oil

Figure 7-8

Major Gas Species Measured by the Gas Chromatograph.

Figure 7-9

Minor Gas Species Measured by the Gas Chromatograph.

Figure 7-10

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

Table 7-6
Condensed Material Analyses

	#1 4/11-4/12	#2 4/16-4/17	#3 4/18-4/21
Water			
Total Organics	1.24	1.52	---
Tar (as received) (*)			
Heating Value, Btu/lb	12648 (14132)	15067 (16543)	13883 (15426)
Flash Point, deg F	232	213	203
Water by distillation, %	10.5	8.92	10.0
Specific Gravity, 60/60 F	1.0692	1.0750	1.0770
Pour point, deg F	95	90	65
Cold (solid) Point, deg F	90	85	60
Viscosity:			
122 F Saybolt Furol, s	25.6	68.6	156.5
122 F Kinematic, cstokes	48.94	144.5	331.4
210 F Saybolt Furol, s	63.7	73.0	108.1
210 F Kinematic, cstokes	11.26	13.73	22.4
Ultimate Analysis, wt% (*)			
Hydrogen	7.48 (8.36)	7.40 (8.12)	7.79 (8.66)
Carbon	74.09 (82.78)	74.35 (81.63)	67.67 (75.19)
Nitrogen	1.15 (1.28)	1.13 (1.24)	.98 (1.09)
Oxygen (by difference)	6.29 (7.03)	8.30 (9.11)	13.16 (14.26)
Sulfur	0.40 (.45)	0.41 (.45)	0.28 (.31)
Moisture, total	10.5	8.29	10.0
Ash	0.09 (.10)	0.11 (.12)	0.12 (.13)

(*) Dry basis values in parentheses

Figure 7-11

Tar/Oil Yield and Water Yield with Operating Conditions

samples was determined by distillation of each tar sample. Significant differences in water content exist from sample to sample, but the dry tar loading indicated in Figure 7-11 is very constant at about 1.5 lb/1000 dry scf. The total water yield in the gas averaged 7.5 lb/1000 dry scf. No correlation with operational parameters is possible within the resolution of the tar/oil and water yield data.

7.2 Material and Energy Balances

The material and energy balance calculation procedures are described in Volume 1 of this series (Thimsen, Maurer et al, 1984). A brief description follows.

The measured data used to calculate material and energy balances around the gasifier include process temperatures, pressures, and flows, tar/water yields, material ultimate analyses and gas compositions. The calculations for this test also include the following assumptions:

- A. Dust carryover is estimated to be 2% of the coal feed rate based on operator observations.
- B. Coal bound sulfur not reporting to the tar or ash is reported as hydrogen sulfide in the gas. No measurements of gas phase sulfur or dust bound sulfur were taken during this test.
- C. Coal gas flow and blast air flow are calculated assuming a simultaneous nitrogen and carbon balance around the gasifier. The coal gas flow meter gave a reproducible but inaccurate signal. The air flow signal was also reproducible but inaccurate due to a misapplied flow element.
- D. The total gas analysis is normalized to 99.9 %.
- E. Ash discharge is calculated to be the ash associated with the measured coal consumption plus the carbon and sulfur analyzed for each ash sample.

The continuous process variables of interest are the saturation air flow, blast saturation temperature, offtake temperature, ambient temperature, cooling water inlet and outlet temperatures, cooling water flow and saturation steam imported. Ten-minute averages are available for all of these parameters except the cooling water flow and saturation steam imported. Hourly totals and flow rates logged by the operators are used for these parameters.

Condensable yields in the gas stream were obtained from the gas sampling and conditioning system.

Ultimate analyses and heating values of the coal and moisture-free tar samples were used for the carbon-nitrogen balance calculations as well as the dry gas compositions from the gas chromatograph.

Since relatively stable operation was achieved during the whole test reliable data was collected for a variety of operating conditions. Each material balance and thermal efficiency calculation made shown in Tables 7-7 to 7-21 is characterized by three operational parameters: coal rate, saturation temperature, and coal sizing. Table 7-22 shows the mass weighted average performance over the whole test period.

7.3 Grate Performance Model

A simple grate performance model has been developed to calculate the ash removal rate from the gasifier. The model is based entirely on geometrical considerations. The model is described more fully in Volume 1 of this series (Thimsen, Maurer et al, 1984). Figure 7-12 shows the results of this model compared to daily average ash discharge rates. For the most part the data agree with the model. The scattered data points can be identified with large changes in grate speed, and uneven rejection of ash from the ashpit to the ash cone as described in Section 6.

7.4 Combustor Performance and Emissions Monitoring

7.4.1 Flame Characteristics

Table 7-23 gives the combustor operating conditions during the period of sampling. Figure 7-13 gives combustor centerline gas compositions. Figures 7-14 and 7-15 show oxygen and combustibles profiles at the horizontal center plane of the combustion chamber. The baffle burner gives a long flame at this high load.

7.4.2 Combustion Emissions Monitoring

Combustion chamber exhaust emissions were measured on April 26, 1983 from 0900 to 1400 hrs. The gasifier was operating on high load gasifying 2 1/2 x 1/4 inch coal. The exhaust gas was monitored for particulates, sulfur dioxide and nitrogen oxides. The emissions monitoring report is contained in Appendix J. The results presented here are abstracted from that report.

Particulate concentrations ranged from .016 to .24 gr/ACF corresponding mass rate from 9.5 to 151 lb/hr. The particulate emissions factor, the parameter used by most pollution control agencies to regulate emissions from combustors and boilers, ranged from 0.26 to 3.7 lb/million BTU. It is difficult to interpret these data as the variation is so great.

Table 7-7

Material Balance and Thermal Efficiency Calculation
 =3/4 inch, 0.59 tn/hr, 145 F

 Input Data

Time period: 4/12/83 8:30 - 4/12/83 20:00 (11.5 hours)

Gasifier Operation:

Coal feed, Ton/hour = 0.59
 Blast air flow (dry) , Scfm = 600.
 Saturated air temperature, F = 145.
 Steam/Air Ratio (lb./lb.) = 0.18
 Ambient air temperature, F = 42.
 Off-take temperature, F = 480.

Coal Data:

Type = Leucite Hills (+3/4)
 Mass Fraction Carbon % = 57.5
 Mass Fraction Fixed Carbon = 44.86
 Mass Fraction Moisture % = 17.36
 Mass Fraction nitrogen % = 1.37
 Mass Percent sulfur = 0.45
 Heating value, Btu/lb = 10016

Tar and Water Yield (dry basis):

Water yield, lb./1000 SCF = 7.93
 Tar yield, lb./1000 SCF = 1.41
 Carbon in Tar (percent) = 82.8
 Sulfur in Tar (percent) = 0.45
 Tar HHV, thou. Btu/lb = 14.13

Ash and Dust Data:(dry basis)

Ash discharge ,lb/hour = 117.
 Ash carbon ,percent = 5.1
 Ash sulfur ,percent = 0.22
 Ash moisture (wet),percent = 17.7
 Cyclone dust,lb/hour(est.) = 23.

Gas Composition (Dry): (normalized to 99.90)

H2 % = 19.5	CH4 % = 1.62	H2S (est ppm) = 1078
CO % = 29.8	C2H4 % = 0.040	
CO2 % = 5.65	C2H6 % = 0.122	
N2 % = 42.5	C3H6 % = 0.030	
O2 % = 0.00	C3H8 % = 0.035	HHV, Btu/SCF = 180
Molec. Weight= 23.53	Argon(est. %)= 0.504	LHV, Btu/SCF = 168

 Calculation Results (based on nitrogen and carbon balance)

Material Balance (Percent unaccounted for: -2.49)

Input,	lb/hr	% Total	Output,	lb/hr	% Total
Coal	= 1172.	32.4	Dry gas	= 3113.	83.9
Steam (total)	= 380.	10.5	Water in gas	= 398.	10.7
Air(calc,dry)	= 2067.	57.1	Oil and tar	= 71.	1.9
			Ash(calc,dry)	= 104.	2.8
			Dust	= 23.	0.6
Total	= 3619.		Total	= 3709.	

Energy Balance (Percent unaccounted for: 2.33)

Input,	MM BTU/hr	Output,	MM Btu/hr	% Total
Coal	= 11.7	Dry coal gas	= 9.0	77.5
Air	= -0.009	Oil and tar	= 1.00	8.6
Steam(import)	= 0.306	Sensible	= 0.48	4.1
Cooling water	= -0.090	Latent	= 0.428	3.7
		Ash	= 0.078	0.7
		Dust	= 0.205	1.8
		Cooling water	= 0.432	3.7
Total	= 11.9	Total	= 11.7	

Performance Data

Cold gas efficiency, percent = 75.7
 Cold gas with tar efficiency, percent = 84.1
 Hot gas without tar efficiency percent = 83.0
 Hot gas with tar efficiency, percent = 91.6
 Air/Coal (lb./lb.) = 1.764
 Steam/Coal (lb./lb.) = 0.324
 Air/Fixed Carbon (lb./lb.) = 3.931
 Coal/Gasifier Area (lb./hr./sqft) = 35.3
 Fixed Carbon/Area (lb./hr./sqft) = 15.8
 Producer Gas/Coal (SCF/lb.) = 50.0
 Producer Gas/Fixed Carbon (SCF/lb.) = 111.6
 Tar Yield (lb./lb. coal) = 0.060

Table 7-8

Material Balance and Thermal Efficiency Calculation
+3/4 inch, 0.69 tn/hr, 140 F

Input Data

Time period: 4/12/83 20:00 - 4/13/83 08:00 (12.0 hours)

Gasifier Operation:

Coal feed, Ton/hour = 0.69
Blast air flow (dry) , Scfm = 731.
Saturated air temperature, F= 140.
Steam/Air Ratio (lb./lb.) = 0.16
Ambient air temperature, F = 40.
Off-take temperature, F = 442.

Coal Data:

Type = Leucite Hills (+3/4)
Mass Fraction Carbon % = 57.5
Mass Fraction Fixed Carbon = 44.86
Mass Fraction Moisture % = 17.36
Mass Fraction nitrogen % = 1.37
Mass Percent sulfur = 0.45
Heating value, Btu/lb = 10016

Tar and Water Yield (dry basis):

Water yield, lb./1000 SCF = 8.21
Tar yield, lb/1000 SCF = 1.49
Carbon in Tar (percent) = 82.8
Sulfur in Tar (percent) = 0.45
Tar HHV, thou. Btu/lb = 14.13

Ash and Dust Data:(dry basis)

Ash discharge ,lb/hour = 422.
Ash carbon ,percent = 4.2
Ash sulfur ,percent = 0.13
Ash moisture (wet),percent = 17.2
Cyclone dust,lb/hour(est.) = 28.

Gas Composition (Dry): (normalized to 99.90)

H2 % = 18.2	CH4 % = 2.01	H2S (est ppm)= 1144
CO % = 29.9	C2H4 % = 0.062	
CO2 % = 6.41	C2H6 % = 0.175	
N2 % = 42.4	C3H6 % = 0.041	
O2 % = 0.00	C3H8 % = 0.051	HHV, Btu/SCF = 132
Molec. Weight= 23.95	Argon(est. %) = 0.503	LHV, Btu/SCF = 171

Calculation Results (based on nitrogen and carbon balance)

Material Balance (Percent unaccounted for: -4.81)

Input,	lb/hr	% Total	Output,	lb/hr	% Total
Coal	= 1387.	33.8	Dry gas	= 3604.	83.7
Steam (total)	= 377.	9.2	Water in gas	= 469.	10.9
Air(calc,dry)	= 2345.	57.1	Oil and tar	= 85.	2.0
			Ash(calc,dry)	= 122.	2.8
			Dust	= 28.	0.6
Total	= 4109.		Total	= 4307.	

Energy Balance (Percent unaccounted for: 5.21)

Input,	MM Btu/hr	Output,	MM Btu/hr	% Total
Coal	= 13.9	Dry coal gas	= 10.4	78.0
Air	= -0.011	Oil and tar	= 1.20	9.0
Steam(import)	= 0.287	Sensible	= 0.50	3.7
Cooling water	= -0.091	Latent	= 0.504	3.8
		Ash	= 0.075	0.6
		Dust	= 0.243	1.8
		Cooling water	= 0.404	3.0
Total	= 14.1	Total	= 13.3	

Performance Data

Cold gas efficiency,	percent = 74.0
Cold gas with tar efficiency,	percent = 82.5
Hot gas without tar efficiency	percent = 80.8
Hot gas with tar efficiency,	percent = 89.6
Air/Coal	(lb./lb.) = 1.690
Steam/Coal	(lb./lb.) = 0.272
Air/Fixed Carbon	(lb./lb.) = 3.768
Coal/Gasifier Area	(lb./hr./sqft) = 41.8
Fixed Carbon/Area	(lb./hr./sqft) = 18.8
Producer Gas/Coal	(SCF/lb.) = 48.3
Producer Gas/Fixed Carbon	(SCF/lb.) = 107.7
Tar Yield	(lb./lb. coal) = 0.061

Table 7-9

Material Balance and Thermal Efficiency Calculation
+3/4 inch, 1.22 tn/hr, 149 F

Input Data

Time period: 4/15/83 16:00 - 4/16/83 08:00 (16.0 hours)

Gasifier Operation:

Coal feed, Ton/hour = 1.22
Blast air flow (dry) , Scfm = 1053.
Saturated air temperature, F = 149.
Steam/Air Ratio (lb./lb.) = 0.21
Ambient air temperature, F = 37.
Off-take temperature, F = 475.

Coal Data:

Type = Leucite Hills (+3/4)
Mass Fraction Carbon % = 57.5
Mass Fraction Fixed Carbon = 44.86
Mass Fraction Moisture % = 17.36
Mass Fraction nitrogen % = 1.37
Mass Percent sulfur = 0.45
Heating value, Btu/lb = 10016

Tar and Water Yield (dry basis):

Water yield, lb./1000 SCF = 9.47
Tar yield, lb/1000 SCF = 1.51
Carbon in Tar (percent) = 81.0
Sulfur in Tar (percent) = 0.45
Tar HHV, thou. Btu/lb = 16.43

Ash and Dust Data:(dry basis)

Ash discharge ,lb/hour = 255.
Ash carbon ,percent = 21.9
Ash sulfur ,percent = 0.22
Ash moisture (wet),percent = 21.1
Cyclone dust,lb/hour(est.) = 49.

Gas Composition (Dry): (normalized to 99.90)

H2 % = 20.0	CH4 % = 1.75	H2S (est ppm) = 1093
CO % = 28.4	C2H4 % = 0.051	
CO2 % = 6.32	C2H6 % = 0.142	
N2 % = 42.5	C3H6 % = 0.030	
O2 % = 0.00	C3H8 % = 0.041	HHV, Btu/SCF = 130
Molec. Weight= 23.48	Argon(est. %) = 0.504	LHV, Btu/SCF = 167

Calculation Results (based on nitrogen and carbon balance)

Material Balance (Percent unaccounted for: -3.05)

Input,	lb/hr	% Total	Output,	lb/hr	% Total
Coal	= 2449.	32.6	Dry gas	= 6315.	81.5
Steam (total)	= 871.	11.6	water in gas	= 966.	12.5
Air(calc,dry)	= 4201.	55.9	Oil and tar	= 154.	2.0
			Ash(calc,dry)	= 265.	3.4
			Dust	= 49.	0.6
Total	= 7520.		Total	= 7749.	

Energy Balance (Percent unaccounted for: 1.26)

Input,	MM BTU/hr	Output,	MM Btu/hr	% Total
Coal	= 24.5	Dry coal gas	= 18.3	74.8
Air	= -0.022	Oil and tar	= 2.53	10.3
Steam(import)	= 0.389	Sensible	= 0.99	4.0
Cooling water	= -0.074	Latent	= 1.037	4.2
		Ash	= 0.824	3.4
		Dust	= 0.429	1.8
		Cooling water	= 0.351	1.4
Total	= 24.8	Total	= 24.5	

Performance Data

Cold gas efficiency, percent = 73.9
Cold gas with tar efficiency, percent = 84.1
Hot gas without tar efficiency percent = 81.7
Hot gas with tar efficiency, percent = 92.2
Air/Coal (lb./lb.) = 1.715
Steam/Coal (lb./lb.) = 0.356
Air/Fixed Carbon (lb./lb.) = 3.824
Coal/Gasifier Area (lb./hr./sqft) = 73.8
Fixed Carbon/Area (lb./hr./sqft) = 33.1
Producer Gas/Coal (SCF/lb.) = 50.1
Producer Gas/Fixed Carbon (SCF/lb.) = 111.6
Tar Yield (lb./lb. coal) = 0.063

Table 7-10

Material Balance and Thermal Efficiency Calculation
 +3/4 inch, 1.19 tn/hr, 145 F

 Input Data

Time period: 4/16/83 08:00 - 4/17/83 08:00 (24.0 hours)

Gasifier Operation:

Coal feed, Ton/hour = 1.19
 Blast air flow (dry) , Scfm = 821.
 Saturated air temperature, F = 145.
 Steam/Air Ratio (lb./lb.) = 0.18
 Ambient air temperature, F = 35.
 Off-take temperature, F = 479.

Coal Data:

Type = Leucite Hills (+3/4)
 Mass Fraction Carbon % = 57.5
 Mass Fraction Fixed Carbon = 44.86
 Mass Fraction Moisture % = 17.36
 Mass Fraction nitrogen % = 1.37
 Mass Percent sulfur = 0.45
 Heating value, Btu/lb = 10016

Tar and Water Yield (dry basis):

Water yield, lb./1000 SCF = 8.30
 Tar yield, lb/1000 SCF = 1.40
 Carbon in Tar (percent) = 81.0
 Sulfur in Tar (percent) = 0.45
 Tar HHV, thou. Btu/lb = 16.43

Ash and Dust Data:(dry basis)

Ash discharge ,lb/hour = 281.
 Ash carbon ,percent = 22.1
 Ash sulfur ,percent = 0.25
 Ash moisture (wet),percent = 16.4
 Cyclone dust,lb/hour(est.) = 48.

Gas Composition (Dry): (normalized to 99.90)

H2	%	= 19.4	CH4	%	= 1.72	H2S	(est ppm)	= 1078
CO	%	= 29.0	C2H4	%	= 0.051			
CO2	%	= 5.66	C2H6	%	= 0.142			
N2	%	= 43.2	C3H6	%	= 0.031			
C2	%	= 0.00	C3H8	%	= 0.041	HHV,	Btu/SCF	= 179
Molec. Weight=		23.54	Argon(est. %)=		0.513	LHV,	Btu/SCF	= 167

 Calculation Results (based on nitrogen and carbon balance)

Material Balance (Percent unaccounted for: -1.88)

Input,	lb/hr	% Total	Output,	lb/hr	% Total
Coal	= 2380.	32.4	Dry gas	= 6209.	82.9
Steam (total)	= 775.	10.6	Water in gas	= 331.	11.1
Air(calc,dry)	= 4192.	57.1	Oil and tar	= 141.	1.9
			Ash(calc,dry)	= 258.	3.4
			Dust	= 48.	0.6
Total	= 7348.		Total	= 7486.	

Energy Balance (Percent unaccounted for: 1.63)

Input,	MM BTU/hr	Output,	MM Btu/hr	% Total
Coal	= 23.8	Dry coal gas	= 17.9	75.7
Air	= -0.023	Oil and tar	= 2.31	9.8
Steam(import)	= 0.339	Sensible	= 0.96	4.0
Cooling water	= -0.073	Latent	= 0.892	3.8
		Ash	= 0.810	3.4
		Dust	= 0.417	1.8
		Cooling water	= 0.367	1.6
Total	= 24.1	Total	= 23.7	

Performance Data

Cold gas efficiency, percent = 74.4
 Cold gas with tar efficiency, percent = 84.0
 Hot gas without tar efficiency percent = 91.8
 Hot gas with tar efficiency, percent = 91.6
 Air/Coal (lb./lb.) = 1.762
 Steam/Coal (lb./lb.) = 0.326
 Air/Fixed Carbon (lb./lb.) = 3.927
 Coal/Gasifier Area (lb./hr./sqft) = 71.7
 Fixed Carbon/Area (lb./hr./sqft) = 32.2
 Producer Gas/Coal (SCF/lb.) = 49.5
 Producer Gas/Fixed Carbon (SCF/lb.) = 110.3
 Tar Yield (lb./lb. coal) = 0.059

Table 7-11

Material Balance and Thermal Efficiency Calculation
+3/4 inch, 1.16 tn/hr, 142 F

Input Data

Time period: 4/17/83 08:00 - 4/18/83 06:00 (22.0 hours)

Gasifier Operation:

Coal feed, Ton/hour = 1.16
Blast air flow (dry) , Scfm = 797.
Saturated air temperature, F = 142.
Steam/Air Ratio (lb./lb.) = 0.17
Ambient air temperature, F = 35.
Off-take temperature, F = 520.

Coal Data:

Type = Leucite Hills (+3/4)
Mass Fraction Carbon % = 57.5
Mass Fraction Fixed Carbon = 44.86
Mass Fraction Moisture % = 17.36
Mass Fraction nitrogen % = 1.37
Mass Percent sulfur = 0.45
Heating value, Btu/lb = 10016

Tar and Water Yield (dry basis):

Water yield, lb./1000 SCF = 7.20
Tar yield, lb/1000 SCF = 1.20
Carbon in Tar (percent) = 75.2
Sulfur in Tar (percent) = 0.31
Tar HHV, thou. Btu/lb = 15.43

Ash and Dust Data:(dry basis)

Ash discharge ,lb/hour = 239.
Ash carbon ,percent = 20.5
Ash sulfur ,percent = 0.20
Ash moisture (wet),percent = 21.2
Cyclone dust,lb/hour(est.) = 46.

Gas Composition (Dry): (normalized to 99.90)

H2	%	= 18.2	CH4	%	= 1.63	H2S	(est ppm)= 1110
CO	%	= 30.3	C2H4	%	= 0.061		
CO2	%	= 4.90	C2H6	%	= 0.137		
N2	%	= 44.0	C3H6	%	= 0.031		
O2	%	= 0.00	C3H8	%	= 0.031	HHV,	Btu/SCF = 178
Molec. Weight= 23.74			Argon(est. %)= 0.522		LHV,	Btu/SCF = 167	

Calculation Results (based on nitrogen and carbon balance)

Material Balance (Percent unaccounted for: -0.96)

Input,	lb/hr	% Total	Output,	lb/hr	% Total
Coal	= 2324.	32.1	Dry gas	= 6194.	84.6
Steam (total)	= 701.	9.7	Water in gas	= 713.	9.7
Air(calc,dry)	= 4225.	58.3	Oil and tar	= 119.	1.6
			Ash(calc,dry)	= 247.	3.4
			Dust	= 46.	0.6
Total	= 7250.		Total	= 7319.	

Energy Balance (Percent unaccounted for: 2.87)

Input,	MM BTU/hr	Output,	MM Btu/hr	% Total
Coal	= 23.3	Dry coal gas	= 17.6	77.5
Air	= -0.024	Oil and tar	= 1.83	8.0
Steam(import)	= 0.235	Sensible	= 1.01	4.4
Cooling water	= -0.073	Latent	= 0.766	3.4
		Ash	= 0.719	3.2
		Dust	= 0.407	1.8
		Cooling water	= 0.367	1.6
Total	= 23.4	Total	= 22.7	

Performance Data

Cold gas efficiency, percent = 75.3
Cold gas with tar efficiency, percent = 83.1
Hot gas without tar efficiency percent = 82.6
Hot gas with tar efficiency, percent = 90.6
Air/Coal (lb./lb.) = 1.818
Steam/Coal (lb./lb.) = 0.302
Air/Fixed Carbon (lb./lb.) = 4.053
Coal/Gasifier Area (lb./hr./sqft) = 70.0
Fixed Carbon/Area (lb./hr./sqft) = 31.4
Producer Gas/Coal (SCF/lb.) = 49.1
Producer Gas/Fixed Carbon (SCF/lb.) = 109.5
Tar Yield (lb./lb. coal) = 0.051

Table 7-12

Material Balance and Thermal Efficiency Calculation
+3/4 inch, 1.77 tn/hr, 149 F

Input Data

Time period: 4/18/83 12:00 - 4/19/83 08:00 (20.0 hours)

Gasifier Operation:

Coal feed, Ton/hour = 1.77
Blast air flow (dry) , Scfm =1211.
Saturated air temperature, F= 149.
Steam/Air Ratio (lb./lb.) = 0.21
Ambient air temperature, F = 39.
Off-take temperature, F = 576.

Coal Data:

Type = Leucite Hills (+3/4)
Mass Fraction Carbon % = 57.5
Mass Fraction Fixed Carbon = 44.86
Mass Fraction Moisture % = 17.36
Mass Fraction nitrogen % = 1.37
Mass Percent sulfur = 0.45
Heating value, Btu/lb = 10016

Tar and Water Yield (dry basis):

Water yield, lb./1000 SCF = 8.13
Tar yield, lb/1000 SCF = 1.58
Carbon in Tar (percent) = 75.2
Sulfur in Tar (percent) = 0.31
Tar HHV, thou. Btu/lb = 15.43

Ash and Dust Data:(dry basis)

Ash discharge ,lb/hour = 499.
Ash carbon ,percent = 20.2
Ash sulfur ,percent = 0.21
Ash moisture (wet),percent = 17.4
Cyclone dust,lb/hour(est.) = 71.

Gas Composition (Dry): (normalized to 99.90)

H2	%	= 19.9	CH4	%	= 1.69	H2S	(est ppm)= 1105
CO	%	= 28.2	C2H4	%	= 0.065		
CO2	%	= 6.38	C2H6	%	= 0.155		
N2	%	= 42.9	C3H6	%	= 0.044		
O2	%	= 0.00	C3H8	%	= 0.041	HHV,	Btu/SCF = 178
Molec. Weight= 23.53			Argon(est. %)= 0.508		LHV,	Btu/SCF = 166	

Calculation Results (based on nitrogen and carbon balance)

Material Balance (Percent unaccounted for: -1.18)

Input,	lb/hr	% Total	Output,	lb/hr	% Total
Coal	= 3543.	32.1	Dry gas	= 9264.	83.0
Steam (total)	= 1284.	11.6	Water in gas	= 1215.	10.9
Air(calc,dry)	= 6202.	56.2	Oil and tar	= 236.	2.1
			Ash(calc,dry)	= 375.	3.4
			Dust	= 71.	0.6
Total	= 11030.		Total	= 11160.	

Energy Balance (Percent unaccounted for: 1.26)

Input,	MM BTU/hr	Output,	MM Btu/hr	% Total
Coal	= 35.5	Dry coal gas	= 26.7	75.3
Air	= -0.030	Oil and tar	= 3.64	10.3
Steam(import)	= 0.490	Sensible	= 1.78	5.0
Cooling water	= -0.072	Latent	= 1.307	3.7
		Ash	= 1.077	3.0
		Dust	= 0.621	1.8
		Cooling water	= 0.315	0.9
Total	= 35.9	Total	= 35.4	

Performance Data

Cold gas efficiency, percent = 74.3
Cold gas with tar efficiency, percent = 84.5
Hot gas without tar efficiency percent = 82.6
Hot gas with tar efficiency, percent = 93.0
Air/Coal (lb./lb.) = 1.751
Steam/Coal (lb./lb.) = 0.362
Air/Fixed Carbon (lb./lb.) = 3.902
Coal/Gasifier Area (lb./hr./sqft) = 106.8
Fixed Carbon/Area (lb./hr./sqft) = 47.9
Producer Gas/Coal (SCF/lb.) = 49.5
Producer Gas/Fixed Carbon (SCF/lb.) = 110.3
Tar Yield (lb./lb. coal) = 0.067

Table 7-13

Material Balance and Thermal Efficiency Calculation
+3/4 inch, 1.67 tn/hr, 146 F

Input Data

Time period: 4/19/83 08:00 - 4/20/83 08:00 (24.0 hours)

Gasifier Operation:		Coal Data:	
Coal feed, Ton/hour	= 1.67	Type = Leucite Hills (+3/4)	
Blast air flow (dry) , Scfm	= 1421.	Mass Fraction Carbon %	= 57.5
Saturated air temperature, F	= 146.	Mass Fraction Fixed Carbon	= 44.86
Steam/Air Ratio (lb./lb.)	= 0.19	Mass Fraction Moisture %	= 17.36
Ambient air temperature, F	= 43.	Mass Fraction nitrogen %	= 1.37
Off-take temperature, F	= 565.	Mass Percent sulfur	= 0.45
		Heating value, Btu/lb	= 10016

Tar and Water Yield (dry basis):		Ash and Dust Data:(dry basis)	
Water yield, lb./1000 SCF	= 7.73	Ash discharge ,lb/hour	= 367.
Tar yield, lb/1000 SCF	= 1.55	Ash carbon ,percent	= 15.9
Carbon in Tar (percent)	= 75.2	Ash sulfur ,percent	= 0.15
Sulfur in Tar (percent)	= 0.31	Ash moisture (wet),percent	= 20.6
Tar HHV, thou. Btu/lb	= 15.43	Cyclone dust,lb/hour(est.)	= 67.

Gas Composition (Dry): (normalized to 99.90)

H2 %	= 19.4	CH4 %	= 1.67	H2S (est ppm)	= 1118
CO %	= 28.8	C2H4 %	= 0.051		
CO2 %	= 5.96	C2H6 %	= 0.152		
N2 %	= 43.2	C3H6 %	= 0.038		
O2 %	= 0.00	C3H8 %	= 0.037	HHV, Btu/SCF	= 178
Molec. Weight	= 23.61	Argon(est. %)	= 0.512	LHV, Btu/SCF	= 166

Calculation Results (based on nitrogen and carbon balance)

Material Balance (Percent unaccounted for: -1.51)

Input,	lb/hr	% Total	Output,	lb/hr	% Total
Coal	= 3342.	32.2	Dry gas	= 8826.	83.7
Steam (total)	= 1111.	10.7	Water in gas	= 1096.	10.4
Air(calc,dry)	= 5935.	57.1	Oil and tar	= 220.	2.1
			Ash(calc,dry)	= 335.	3.2
			Dust	= 67.	0.6
Total	= 10387.		Total	= 10544.	

Energy Balance (Percent unaccounted for: 1.69)

Input,	MM BTU/hr	Output,	MM Btu/hr	% Total
Coal	= 33.5	Dry coal gas	= 25.3	76.2
Air	= -0.022	Oil and tar	= 3.40	10.2
Steam(import)	= 0.383	Sensible	= 1.64	4.9
Cooling water	= -0.074	Latent	= 1.180	3.6
		Ash	= 0.759	2.3
		Dust	= 0.585	1.8
		Cooling water	= 0.331	1.0
Total	= 33.7	Total	= 33.2	

Performance Data

Cold gas efficiency,	percent	= 74.9
Cold gas with tar efficiency,	percent	= 85.0
Hot gas without tar efficiency	percent	= 82.8
Hot gas with tar efficiency,	percent	= 93.2
Air/Coal	(lb./lb.)	= 1.776
Steam/Coal	(lb./lb.)	= 0.332
Air/Fixed Carbon	(lb./lb.)	= 3.959
Coal/Gasifier Area	(lb./hr./sqft)	= 100.7
Fixed Carbon/Area	(lb./hr./sqft)	= 45.2
Producer Gas/Coal	(SCF/lb.)	= 49.4
Producer Gas/Fixed Carbon	(SCF/lb.)	= 110.2
Tar Yield	(lb./lb. coal)	= 0.066

Table 7-14

Material Balance and Thermal Efficiency Calculation
+3/4 inch, 1.95 tn/hr, 149 F

Input Data

Time period: 4/20/83 16:00 - 4/21/83 22:00 (30.0 hours)

Gasifier Operation:

Coal feed, Ton/hour = 1.95
Blast air flow (dry) , Scfm =1581.
Saturated air temperature, F= 149.
Steam/Air Ratio (lb./lb.) = 0.21
Ambient air temperature, F = 53.
Off-take temperature, F = 585.

Coal Data:

Type = Leucite Hills (+3/4)
Mass Fraction Carbon % = 57.5
Mass Fraction Fixed Carbon = 44.86
Mass Fraction Moisture % = 17.36
Mass Fraction nitrogen % = 1.37
Mass Percent sulfur = 0.45
Heating value, Btu/lb = 10016

Tar and Water Yield (dry basis):

Water yield, lb./1000 SCF = 8.37
Tar yield, lb/1000 SCF = 1.58
Carbon in Tar (percent) = 75.2
Sulfur in Tar (percent) = 0.31
Tar HHV, thou. Btu/lb = 15.43

Ash and Dust Data: (dry basis)

Ash discharge ,lb/hour = 447.
Ash carbon ,percent = 15.3
Ash sulfur ,percent = 0.19
Ash moisture (wet), percent = 19.1
Cyclone dust, lb/hour (est.) = 78.

Gas Composition (Dry): (normalized to 99.90)

H2 % = 19.7	CH4 % = 1.65	H2S (est ppm) = 1095
CO % = 27.7	C2H4 % = 0.055	
CO2 % = 6.67	C2H6 % = 0.140	
N2 % = 43.2	C3H6 % = 0.041	
O2 % = 0.00	C3H8 % = 0.041	
Molec. Weight= 23.63	Argon (est. %) = 0.512	HHV, Btu/SCF = 176
		LHV, Btu/SCF = 164

Calculation Results (based on nitrogen and carbon balance)

Material Balance (Percent unaccounted for: -1.45)

Input,	lb/hr	% Total	Output,	lb/hr	% Total
Coal	= 3901.	31.5	Dry gas	= 10413.	33.0
Steam (total)	= 1458.	11.8	Water in gas	= 1399.	11.2
Air (calc, dry)	= 7005.	56.7	Oil and tar	= 265.	2.1
			Ash (calc, dry)	= 388.	3.1
			Dust	= 78.	0.6
Total	= 12364.		Total	= 12543.	

Energy Balance (Percent unaccounted for: 1.65)

Input,	MM BTU/hr	Output,	MM Btu/hr	% Total
Coal	= 39.1	Dry coal gas	= 29.4	75.9
Air	= -0.011	Oil and tar	= 4.09	10.6
Steam (import)	= 0.359	Sensible	= 2.04	5.3
Cooling water	= -0.056	Latent	= 1.505	3.9
		Ash	= 0.848	2.2
		Dust	= 0.683	1.8
		Cooling water	= 0.169	0.4
Total	= 39.4	Total	= 38.7	

Performance Data

Cold gas efficiency, percent = 74.6
Cold gas with tar efficiency, percent = 85.0
Hot gas without tar efficiency percent = 83.2
Hot gas with tar efficiency, percent = 93.9
Air/Coal (lb./lb.) = 1.796
Steam/Coal (lb./lb.) = 0.374
Air/Fixed Carbon (lb./lb.) = 4.003
Coal/Gasifier Area (lb./hr./sqft) = 117.6
Fixed Carbon/Area (lb./hr./sqft) = 52.7
Producer Gas/Coal (SCF/lb.) = 50.5
Producer Gas/Fixed Carbon (SCF/lb.) = 112.6
Tar Yield (lb./lb. coal) = 0.068

Table 7-15

Material Balance and Thermal Efficiency Calculation
+1/2 inch, 0.68 tn/hr, 148 F

Input Data

Time period: 4/23/83 16:00 - 4/24/83 8:00 (16.0 hours)

Gasifier Operation:

Coal feed, Ton/hour = 0.68
Blast air flow (dry) , Scfm = 733.
Saturated air temperature, F = 148.
Steam/Air Ratio (lb./lb.) = 0.20
Ambient air temperature, F = 49.
Off-take temperature, F = 491.

Coal Data:

Type = Leucite Hills (+1/2)
Mass Fraction Carbon % = 59.0
Mass Fraction Fixed Carbon = 45.45
Mass Fraction Moisture % = 16.20
Mass Fraction nitrogen % = 1.33
Mass Percent sulfur = 0.66
Heating value, Btu/lb = 10242

Tar and Water Yield (dry basis):

Water yield, lb./1000 SCF = 7.43
Tar yield, lb./1000 SCF = 1.64
Carbon in Tar (percent) = 75.2
Sulfur in Tar (percent) = 0.31
Tar HHV, thou. Btu/lb = 15.43

Ash and Dust Data:(dry basis)

Ash discharge ,lb/hour = 91.
Ash carbon ,percent = 15.3
Ash sulfur ,percent = 0.16
Ash moisture (wet),percent = 19.3
Cyclone dust,lb/hour(est.) = 27.

Gas Composition (Dry): (normalized to 99.90)

H2	%	= 20.0	CH4	%	= 1.85	H2S	(est ppm)	= 1616
CO	%	= 26.9	C2H4	%	= 0.041			
CO2	%	= 6.69	C2H6	%	= 0.152			
N2	%	= 43.5	C3H6	%	= 0.036			
O2	%	= 0.00	C3H8	%	= 0.042	HHV,	Btu/SCF	= 176
Molec. Weight=		23.53	Argon(est. %)	=	0.516	LHV,	Btu/SCF	= 164

Calculation Results (based on nitrogen and carbon balance)

Material Balance (Percent unaccounted for: -0.56)

Input,	lb/hr	% Total	Output,	lb/hr	% Total
Coal	= 1354.	30.6	Dry gas	= 3747.	84.2
Steam (total)	= 521.	11.8	Water in gas	= 449.	10.1
Air (calc,dry)	= 2548.	57.6	Oil and tar	= 99.	2.2
			Ash(calc,dry)	= 126.	2.8
			Dust	= 27.	0.6
Total	= 4423.		Total	= 4448.	

Energy Balance (Percent unaccounted for: -0.89)

Input,	MM BTU/hr	Output,	MM Btu/hr	% Total
Coal	= 13.9	Dry coal gas	= 10.6	75.2
Air	= -0.007	Oil and tar	= 1.53	10.8
Steam(import)	= 0.238	Sensible	= 0.59	4.2
Cooling water	= -0.073	Latent	= 0.484	3.4
		Ash	= 0.274	1.9
		Dust	= 0.237	1.7
		Cooling water	= 0.382	2.7
Total	= 14.0	Total	= 14.1	

Performance Data

Cold gas efficiency, percent = 75.9
Cold gas with tar efficiency, percent = 86.8
Hot gas without tar efficiency percent = 83.2
Hot gas with tar efficiency, percent = 94.4
Air/Coal (lb./lb.) = 1.881
Steam/Coal (lb./lb.) = 0.385
Air/Fixed Carbon (lb./lb.) = 4.140
Coal/Gasifier Area (lb./hr./sqft) = 40.8
Fixed Carbon/Area (lb./hr./sqft) = 18.6
Producer Gas/Coal (SCF/lb.) = 51.7
Producer Gas/Fixed Carbon (SCF/lb.) = 113.7
Tar Yield (lb./lb. coal) = 0.073

Table 7-16

Material Balance and Thermal Efficiency Calculation
 +1/4 inch, 0.96 tn/hr, 148 F

 Input Data

Time period: 4/24/83 10:00 - 4/24/83 20:00 (10.0 hours)

Gasifier Operation:

Coal feed, Ton/hour = 0.96
 Blast air flow (dry) , Scfm = 856.
 Saturated air temperature, F= 148.
 Steam/Air Ratio (lb./lb.) = 0.22
 Ambient air temperature, F = 67.
 Off-take temperature, F = 528.

Coal Data:

Type = Leucite Hills (+1/4)
 Mass Fraction Carbon % = 59.0
 Mass Fraction Fixed Carbon = 45.45
 Mass Fraction Moisture % = 16.20
 Mass Fraction nitrogen % = 1.33
 Mass Percent sulfur = 0.66
 Heating value, Btu/lb = 10242

Tar and Water Yield (dry basis):

Water yield, lb./1000 SCF = 7.94
 Tar yield, lb/1000 SCF = 1.53
 Carbon in Tar (percent) = 75.2
 Sulfur in Tar (percent) = 0.31
 Tar HHV, thou. Btu/lb = 15.43

Ash and Dust Data:(dry basis)

Ash discharge ,lb/hour = 160.
 Ash carbon ,percent = 0.2
 Ash sulfur ,percent = 0.01
 Ash moisture (wet),percent = 17.7
 Cyclone dust,lb/hour(est.) = 38.

Gas Composition (Dry): (normalized to 99.90)

H2 % = 19.3	CH4 % = 1.71	H2S (est ppm) = 1633
CO % = 27.7	C2H4 % = 0.051	
CO2 % = 6.67	C2H6 % = 0.142	
N2 % = 43.5	C3H6 % = 0.036	
O2 % = 0.00	C3H8 % = 0.038	
Molec. Weight= 23.74	Argon(est. %)= 0.517	HHV, Btu/SCF = 175
		LHV, Btu/SCF = 163

 Calculation Results (based on nitrogen and carbon balance)

Material Balance (Percent unaccounted for: -1.01)

Input,	lb/hr	% Total	Output,	lb/hr	% Total
Coal	= 1918.	30.1	Dry gas	= 5430.	84.3
Steam (total)	= 793.	12.4	Water in gas	= 689.	10.7
Air(calc,dry)	= 3665.	57.5	Oil and tar	= 133.	2.1
			Ash(calc,dry)	= 151.	2.3
			Dust	= 38.	0.6
Total	= 6376.		Total	= 6441.	

Energy Balance (Percent unaccounted for: 1.51)

Input,	MM BTU/hr	Output,	MM Btu/hr	% Total
Coal	= 19.6	Dry coal gas	= 15.2	77.4
Air	= 0.006	Oil and tar	= 2.05	10.4
Steam(import)	= 0.331	Sensible	= 0.93	4.7
Cooling water	= -0.070	Latent	= 0.741	3.8
		Ash	= 0.008	0.0
		Dust	= 0.336	1.7
		Cooling water	= 0.360	1.8
Total	= 19.9	Total	= 19.6	

Performance Data

Cold gas efficiency, percent = 76.2
 Cold gas with tar efficiency, percent = 36.5
 Hot gas without tar efficiency percent = 84.3
 Hot gas with tar efficiency, percent = 94.8
 Air/Coal (lb./lb.) = 1.911
 Steam/Coal (lb./lb.) = 0.413
 Air/Fixed Carbon (lb./lb.) = 4.205
 Coal/Gasifier Area (lb./hr./sqft) = 57.8
 Fixed Carbon/Area (lb./hr./sqft) = 26.3
 Producer Gas/Coal (SCF/lb.) = 52.9
 Producer Gas/Fixed Carbon (SCF/lb.) = 116.4
 Tar Yield (lb./lb. coal) = 0.069

Table 7-17

Material Balance and Thermal Efficiency Calculation
+1/4 inch, 0.94 tn/hr, 142 F

Input Data

Time period: 4/24/83 20:00 - 4/25/83 05:00 (9.0 hours)

Gasifier Operation:

Coal feed, Ton/hour = 0.94
Blast air flow (dry) , Scfm = 882.
Saturated air temperature, F= 142.
Steam/Air Ratio (lb./lb.) = 0.17
Ambient air temperature, F = 54.
Off-take temperature, F = 467.

Coal Data:

Type = Leucite Hills (+1/4)
Mass Fraction Carbon % = 59.0
Mass Fraction Fixed Carbon = 45.45
Mass Fraction Moisture % = 16.20
Mass Fraction nitrogen % = 1.33
Mass Percent sulfur = 0.66
Heating value, Btu/lb = 10242

Tar and Water Yield (dry basis):

Water yield, lb./1000 SCF = 7.74
Tar yield, lb/1000 SCF = 1.50
Carbon in Tar (percent) = 75.2
Sulfur in Tar (percent) = 0.31
Tar HHV, thou. Btu/lb = 15.43

Ash and Dust Data:(dry basis)

Ash discharge ,lb/hour = 246.
Ash carbon ,percent = 22.4
Ash sulfur ,percent = 0.18
Ash moisture (wet),percent = 21.4
Cyclone dust,lb/hour(est.) = 38.

Gas Composition (Dry): (normalized to 99.90)

H2 % = 18.4	CH4 % = 1.70	H2S (est ppm)= 1639
CO % = 29.7	C2H4 % = 0.041	
CO2 % = 4.41	C2H6 % = 0.146	
N2 % = 44.7	C3H6 % = 0.035	
O2 % = 0.00	C3H8 % = 0.041	HHV, Btu/SCF = 178
Molec. Weight= 23.61	Argon(est. %)= 0.531	LHV, Btu/SCF = 167

Calculation Results (based on nitrogen and carbon balance)

Material Balance (Percent unaccounted for: -1.15)

Input,	lb/hr	% Total	Output,	lb/hr	% Total
Coal	= 1887.	31.0	Dry gas	= 5153.	83.8
Steam (total)	= 598.	9.8	Water in gas	= 641.	10.4
Air(calc,dry)	= 3593.	59.1	Oil and tar	= 124.	2.0
			Ash(calc,dry)	= 191.	3.1
			Dust	= 38.	0.6
Total	= 6077.		Total	= 6147.	

Energy Balance (Percent unaccounted for: 0.05)

Input,	MM BTU/hr	Output,	MM Btu/hr	% Total
Coal	= 19.3	Dry coal gas	= 14.8	75.9
Air	= -0.005	Oil and tar	= 1.92	9.9
Steam(import)	= 0.205	Sensible	= 0.76	3.9
Cooling water	= -0.068	Latent	= 0.690	3.5
		Ash	= 0.609	3.1
		Dust	= 0.331	1.7
		Cooling water	= 0.378	1.9
Total	= 19.5	Total	= 19.4	

Performance Data

Cold gas efficiency,	percent = 75.9
Cold gas with tar efficiency,	percent = 85.7
Hot gas without tar efficiency	percent = 83.0
Hot gas with tar efficiency,	percent = 93.1
Air/Coal	(lb./lb.) = 1.904
Steam/Coal	(lb./lb.) = 0.317
Air/Fixed Carbon	(lb./lb.) = 4.190
Coal/Gasifier Area	(lb./hr./sqft) = 56.9
Fixed Carbon/Area	(lb./hr./sqft) = 25.8
Producer Gas/Coal	(SCF/lb.) = 51.1
Producer Gas/Fixed Carbon	(SCF/lb.) = 112.5
Tar Yield	(lb./lb. coal) = 0.066 .

Table 7-18

Material Balance and Thermal Efficiency Calculation
+1/4 inch, 2.10 tn/hr, 153 F

Input Data

Time period: 4/26/83 14:00 - 4/27/83 08:00 (18.0 hours)

Gasifier Operation:

Coal feed, Ton/hour = 2.10
Blast air flow (dry) , Scfm = 1697.
Saturated air temperature, F= 153.
Steam/Air Ratio (lb./lb.) = 0.24
Ambient air temperature, F = 60.
Off-take temperature, F = 615.

Coal Data:

Type = Leucite Hills (+1/4)
Mass Fraction Carbon % = 59.0
Mass Fraction Fixed Carbon = 45.45
Mass Fraction Moisture % = 16.20
Mass Fraction nitrogen % = 1.33
Mass Percent sulfur = 0.66
Heating value, Btu/lb = 10242

Tar and Water Yield (dry basis):

Water yield, lb./1000 SCF = 8.53
Tar yield, lb/1000 SCF = 1.67
Carbon in Tar (percent) = 75.2
Sulfur in Tar (percent) = 0.31
Tar HHV, thou. Btu/lb = 15.43

Ash and Dust Data:(dry basis)

Ash discharge ,lb/hour = 455.
Ash carbon ,percent = 17.3
Ash sulfur ,percent = 0.15
Ash moisture (wet),percent = 27.0
Cyclone dust,lb/hour(est.) = 84.

Gas Composition (Dry): (normalized to 99.90)

H2 % = 21.0	CH4 % = 1.62	H2S (est ppm) = 1598
CO % = 25.8	C2H4 % = 0.061	
CO2 % = 7.34	C2H6 % = 0.142	
N2 % = 43.2	C3H6 % = 0.043	
O2 % = 0.00	C3H8 % = 0.034	HHV, Btu/SCF = 173
Molec. Weight= 23.42	Argon(est. %) = 0.513	LHV, Btu/SCF = 161

Calculation Results (based on nitrogen and carbon balance)

Material Balance (Percent unaccounted for: -0.27)

Input,	lb/hr	% Total	Output,	lb/hr	% Total
Coal	= 4209.	29.8	Dry gas	= 11719.	82.9
Steam (total)	= 1931.	13.7	Water in gas	= 1619.	11.5
Air(calc,dry)	= 7961.	56.5	Oil and tar	= 318.	2.2
			Ash(calc,dry)	= 400.	2.8
			Dust	= 84.	0.6
Total	= 14102.		Total	= 14140.	

Energy Balance (Percent unaccounted for: -1.12)

Input,	MM BTU/hr	Output,	MM Btu/hr	% Total
Coal	= 43.1	Dry coal gas	= 32.9	74.8
Air	= 0.000	Oil and tar	= 4.90	11.1
Steam(import)=	0.499	Sensible	= 2.48	5.6
Cooling water =	-0.064	Latent	= 1.743	4.0
		Ash	= 0.987	2.2
		Dust	= 0.737	1.7
		Cooling water	= 0.254	0.6
Total	= 43.5	Total	= 44.0	

Performance Data

Cold gas efficiency, percent = 75.6
Cold gas with tar efficiency, percent = 86.8
Hot gas without tar efficiency percent = 84.8
Hot gas with tar efficiency, percent = 96.5
Air/Coal (lb./lb.) = 1.891
Steam/Coal (lb./lb.) = 0.459
Air/Fixed Carbon (lb./lb.) = 4.161
Coal/Gasifier Area (lb./hr./sqft) = 126.9
Fixed Carbon/Area (lb./hr./sqft) = 57.7
Producer Gas/Coal (SCF/lb.) = 53.3
Producer Gas/Fixed Carbon (SCF/lb.) = 117.3
Tar Yield (lb./lb. coal) = 0.075

Table 7-19

Material Balance and Thermal Efficiency Calculation
+3/4, -1/4 inch, 0.68 tn/hr, 145 F

Input Data

Time period: 4/27/83 12:00 - 4/28/83 05:00 (17.0 hours)

Gasifier Operation:

Coal feed, Ton/hour = 0.68
Blast air flow (dry) , Scfm = 722.
Saturated air temperature, F = 145.
Steam/Air Ratio (lb./lb.) = 0.19
Ambient air temperature, F = 59.
Off-take temperature, F = 522.

Coal Data:

Type = Leucite Hills (-3/4,+1/4)
Mass Fraction Carbon % = 59.7
Mass Fraction Fixed Carbon = 46.34
Mass Fraction Moisture % = 16.69
Mass Fraction nitrogen % = 1.39
Mass Percent sulfur = 0.53
Heating value, Btu/lb = 10370

Tar and Water Yield (dry basis):

Water yield, lb./1000 SCF = 8.56
Tar yield, lb/1000 SCF = 1.84
Carbon in Tar (percent) = 75.2
Sulfur in Tar (percent) = 0.31
Tar HHV, thou. Btu/lb = 15.43

Ash and Dust Data:(dry basis)

Ash discharge ,lb/hour = 91.
Ash carbon ,percent = 5.2
Ash sulfur ,percent = 0.08
Ash moisture (wet),percent = 22.5
Cyclone dust,lb/hour(est.) = 27.

Gas Composition (Dry): (normalized to 99.90)

H2	%	= 19.1	CH4	%	= 1.65	H2S	(est ppm)	= 1271
CO	%	= 29.0	C2H4	%	= 0.041			
CO2	%	= 5.11	C2H6	%	= 0.134			
N2	%	= 44.2	C3H6	%	= 0.030			
O2	%	= 0.00	C3H8	%	= 0.041	HHV,	Btu/SCF	= 177
Molec. Weight=		23.54	Argon(est. %)=		0.524	LHV,	Btu/SCF	= 165

Calculation Results (based on nitrogen and carbon balance)

Material Balance (Percent unaccounted for: -1.88)

Input,	lb/hr	% Total	Output,	lb/hr	% Total
Coal	= 1354.	30.3	Dry gas	= 3800.	83.5
Steam (total)	= 488.	10.9	Water in gas	= 524.	11.5
Air(calc,dry)	= 2624.	58.7	Oil and tar	= 113.	2.5
			Ash(calc,dry)	= 87.	1.9
			Dust	= 27.	0.6
Total	= 4467.		Total	= 4551.	

Energy Balance (Percent unaccounted for: -1.88)

Input,	MM BTU/hr	Output,	MM Btu/hr	% Total
Coal	= 14.0	Dry coal gas	= 10.8	74.6
Air	= -0.001	Oil and tar	= 1.74	12.0
Steam(import)	= 0.293	Sensible	= 0.66	4.5
Cooling water	= -0.073	Latent	= 0.565	3.9
		Ash	= 0.066	0.5
		Dust	= 0.237	1.6
		Cooling water	= 0.416	2.9
Total	= 14.3	Total	= 14.5	

Performance Data

Cold gas efficiency, percent = 76.0
Cold gas with tar efficiency, percent = 88.2
Hot gas without tar efficiency percent = 84.2
Hot gas with tar efficiency, percent = 96.7
Air/Coal (lb./lb.) = 1.938
Steam/Coal (lb./lb.) = 0.361
Air/Fixed Carbon (lb./lb.) = 4.182
Coal/Gasifier Area (lb./hr./sqft) = 40.8
Fixed Carbon/Area (lb./hr./sqft) = 18.9
Producer Gas/Coal (SCF/lb.) = 53.5
Producer Gas/Fixed Carbon (SCF/lb.) = 115.4
Tar Yield (lb./lb. coal) = 0.083

Table 7-20

Material Balance and Thermal Efficiency Calculation
+3/4, -1/4 inch, 1.13 tn/hr, 146 F

Input Data

Time period: 4/28/83 14:00 - 4/29/83 05:00 (15.0 hours)

Gasifier Operation:		Coal Data:	
Coal feed, Ton/hour	= 1.13	Type = Leucite Hills (-3/4,+1/4)	
Blast air flow (dry) , Scfm	=1041.	Mass Fraction Carbon %	= 59.7
Saturated air temperature, F	= 146.	Mass Fraction Fixed Carbon	= 46.34
Steam/Air Ratio (lb./lb.)	= 0.19	Mass Fraction Moisture %	= 16.69
Ambient air temperature, F	= 51.	Mass Fraction nitrogen %	= 1.39
Off-take temperature, F	= 550.	Mass Percent sulfur	= 0.53
		Heating value, Btu/lb	= 10370

Tar and Water Yield (dry basis):		Ash and Dust Data:(dry basis)	
Water yield, lb./1000 SCF	= 8.56	Ash discharge ,lb/hour	= 176.
Tar yield, lb/1000 SCF	= 1.80	Ash carbon ,percent	= 3.4
Carbon in Tar (percent)	= 75.2	Ash sulfur ,percent	= 0.08
Sulfur in Tar (percent)	= 0.31	Ash moisture (wet),percent	= 25.1
Tar HHV, thou. Btu/lb	= 15.43	Cyclone dust,lb/hour(est.)	= 45.

Gas Composition (Dry): (normalized to 99.90)			
H2 %	= 18.9	CH4 %	= 1.55
CO %	= 29.9	C2H4 %	= 0.051
CO2 %	= 4.59	C2H6 %	= 0.135
N2 %	= 44.0	C3H6 %	= 0.041
O2 %	= 0.00	C3H8 %	= 0.030
Molec. Weight= 23.51	Argon(est. %)= 0.523	HHV, Btu/SCF	= 179
		LHV, Btu/SCF	= 167
		H2S (est ppm)=	1276

Calculation Results (based on nitrogen and carbon balance)

Material Balance (Percent unaccounted for: -1.68)

Input,	lb/hr	% Total	Output,	lb/hr	% Total
Coal	= 2264.	30.4	Dry gas	= 6327.	83.5
Steam (total)	= 322.	11.0	Water in gas	= 374.	11.5
Air(calc,dry)	= 4362.	58.6	Oil and tar	= 184.	2.4
			Ash(calc,dry)	= 143.	1.9
			Dust	= 45.	0.6
Total	= 7448.		Total	= 7573.	

Energy Balance (Percent unaccounted for: -0.70)

Input,	MM BTU/hr	Output,	MM Btu/hr	% Total
Coal	= 23.5	Dry coal gas	= 13.2	76.2
Air	= -0.009	Oil and tar	= 2.83	11.8
Steam(import)	= 0.369	Sensible	= 1.17	4.9
Cooling water	= -0.054	Latent	= 0.942	3.9
		Ash	= 0.072	0.3
		Dust	= 0.397	1.7
		Cooling water	= 0.288	1.2
Total	= 23.8	Total	= 23.9	

Performance Data

Cold gas efficiency,	percent	= 76.7
Cold gas with tar efficiency,	percent	= 88.6
Hot gas without tar efficiency	percent	= 85.1
Hot gas with tar efficiency,	percent	= 97.4
Air/Coal	(lb./lb.)	= 1.927
Steam/Coal	(lb./lb.)	= 0.363
Air/Fixed Carbon	(lb./lb.)	= 4.157
Coal/Gasifier Area	(lb./hr./sqft)	= 68.2
Fixed Carbon/Area	(lb./hr./sqft)	= 31.6
Producer Gas/Coal	(SCF/lb.)	= 53.3
Producer Gas/Fixed Carbon	(SCF/lb.)	= 115.1
Tar Yield	(lb./lb. coal)	= 0.081

Table 7-21

Material Balance and Thermal Efficiency Calculation
+3/4, -1/4 inch, 1.47 tn/hr, 138 F

Input Data

Time period: 4/29/83 14:00 - 4/30/83 08:00 (18.0 hours)

Gasifier Operation:

Coal feed, Ton/hour = 1.47
Blast air flow (dry) , Scfm =1273.
Saturated air temperature, F= 138.
Steam/Air Ratio (lb./lb.) = 0.15
Ambient air temperature, F = 52.
Off-take temperature, F = 520.

Coal Data:

Type = Leucite Hills (-3/4,+1/4)
Mass Fraction Carbon % = 59.7
Mass Fraction Fixed Carbon = 46.34
Mass Fraction Moisture % = 16.69
Mass Fraction nitrogen % = 1.39
Mass Percent sulfur = 0.53
Heating value, Btu/lb = 10370

Tar and Water Yield (dry basis):

Water yield, lb./1000 SCF = 9.19
Tar yield, lb/1000 SCF = 1.67
Carbon in Tar (percent) = 75.2
Sulfur in Tar (percent) = 0.31
Tar HHV, thou. Btu/lb = 15.43

Ash and Dust Data:(dry basis)

Ash discharge ,lb/hour = 160.
Ash carbon ,percent = 7.4
Ash sulfur ,percent = 0.07
Ash moisture (wet),percent = 24.0
Cyclone dust,lb/hour(est.) = 59.

Gas Composition (Dry): (normalized to 99.90)

H2 % = 17.8	CH4 % = 1.53	H2S (est ppm)= 1288
CO % = 31.3	C2H4 % = 0.051	
CO2 % = 3.44	C2H6 % = 0.137	
N2 % = 44.9	C3H6 % = 0.041	
O2 % = 0.00	C3H8 % = 0.030	
Molec. Weight= 23.63	Argon(est. %)= 0.533	HHV, Btu/SCF = 179
		LHV, Btu/SCF = 169

Calculation Results (based on nitrogen and carbon balance)

Material Balance (Percent unaccounted for: -3.79)

Input,	lb/hr	% Total	Output,	lb/hr	% Total
Coal	= 2937.	30.8	Dry gas	= 8212.	83.0
Steam (total)	= 853.	9.0	Water in gas	= 1211.	12.2
Air(calc,dry)	= 5743.	60.2	Oil and tar	= 221.	2.2
			Ash(calc,dry)	= 193.	1.9
			Dust	= 59.	0.6
Total	= 9533.		Total	= 9895.	

Energy Balance (Percent unaccounted for: -1.18)

Input,	MM BTU/hr	Output,	MM Btu/hr	% Total
Coal	= 30.5	Dry coal gas	= 23.7	76.6
Air	= -0.010	Oil and tar	= 3.40	11.0
Steam(import)	= 0.145	Sensible	= 1.42	4.6
Cooling water	= -0.058	Latent	= 1.302	4.2
		Ash	= 0.205	0.7
		Dust	= 0.514	1.7
		Cooling water	= 0.381	1.2
Total	= 30.5	Total	= 30.9	

Performance Data

Cold gas efficiency,	percent = 77.5
Cold gas with tar efficiency,	percent = 88.6
Hot gas without tar efficiency	percent = 86.0
Hot gas with tar efficiency,	percent = 97.5
Air/Coal	(lb./lb.) = 1.956
Steam/Coal	(lb./lb.) = 0.291
Air/Fixed Carbon	(lb./lb.) = 4.220
Coal/Gasifier Area	(lb./hr./sqft) = 88.5
Fixed Carbon/Area	(lb./hr./sqft) = 41.0
Producer Gas/Coal	(SCF/lb.) = 53.7
Producer Gas/Fixed Carbon	(SCF/lb.) = 115.9
Tar Yield	(lb./lb. coal) = 0.075

Table 7-22

Material Balance and Thermal Efficiency Calculation
Leucite Hills Overall Average

Input Data

Time period: Overall Average (262.5 hours)

Gasifier Operation:

Coal feed, Ton/hour = 1.31
Blast air flow (dry) , Scfm = 1086.
Saturated air temperature, F = 146.
Steam/Air Ratio (lb./lb.) = 0.19
Ambient air temperature, F = 48.
Off-take temperature, F = 542.

Coal Data:

Type = Leucite Hills
Mass Fraction Carbon % = 58.1
Mass Fraction Fixed Carbon = 45.21
Mass Fraction Moisture % = 17.03
Mass Fraction nitrogen % = 1.37
Mass Percent sulfur = 0.50
Heating value, Btu/lb = 10116

Tar and Water Yield (dry basis):

Water yield, lb./1000 SCF = 8.28
Tar yield, lb/1000 SCF = 1.57
Carbon in Tar (percent) = 75.3
Sulfur in Tar (percent) = 0.31
Tar HHV, thou. Btu/lb = 15.43

Ash and Dust Data:(dry basis)

Ash discharge ,lb/hour = 286.
Ash carbon ,percent = 15.6
Ash sulfur ,percent = 0.17
Ash moisture (wet),percent = 20.5
Cyclone dust,lb/hour(est.) = 53.

Gas Composition (Dry): (normalized to 99.90)

H2 % = 19.4	CH4 % = 1.67	H2S (est ppm) = 1236
CO % = 28.6	C2H4 % = 0.053	
CO2 % = 5.90	C2H6 % = 0.144	
N2 % = 43.4	C3H6 % = 0.038	
O2 % = 0.00	C3H8 % = 0.038	HHV, Btu/SCF = 177
Molec. Weight = 23.58	Argon(est. %) = 0.515	LHV, Btu/SCF = 166

Calculation Results (based on nitrogen and carbon balance)

Material Balance (Percent unaccounted for: -1.80)

Input,	lb/hr	% Total	Output,	lb/hr	% Total
Coal	= 2625.	31.5	Dry gas	= 7072.	83.3
Steam (total)	= 926.	11.1	Water in gas	= 942.	11.1
Air(calc,dry)	= 4791.	57.4	Oil and tar	= 179.	2.1
			Ash(calc,dry)	= 247.	2.9
			Dust	= 53.	0.6
Total	= 8342.		Total	= 8492.	

Energy Balance (Percent unaccounted for: 0.81)

Input,	MM BTU/hr	Output,	MM Btu/hr	% Total
Coal	= 26.6	Dry coal gas	= 20.2	76.0
Air	= -0.013	Oil and tar	= 2.76	10.4
Steam(import)	= 0.333	Sensible	= 1.26	4.8
Cooling water	= -0.070	Latent	= 1.013	3.8
		Ash	= 0.549	2.1
		Dust	= 0.460	1.7
		Cooling water	= 0.337	1.3
Total	= 26.8	Total	= 26.6	

Performance Data

Cold gas efficiency, percent = 75.3
Cold gas with tar efficiency, percent = 85.6
Hot gas without tar efficiency percent = 83.5
Hot gas with tar efficiency, percent = 94.0
Air/Coal (lb./lb.) = 1.825
Steam/Coal (lb./lb.) = 0.353
Air/Fixed Carbon (lb./lb.) = 4.037
Coal/Gasifier Area (lb./hr./sqft) = 79.1
Fixed Carbon/Area (lb./hr./sqft) = 35.8
Producer Gas/Coal (SCF/lb.) = 51.0
Producer Gas/Fixed Carbon (SCF/lb.) = 112.8
Tar Yield (lb./lb. coal) = 0.068

Figure 7-12

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

Table 7-23

Gas combustor Operating Conditions
1000 to 1500 hrs. 4/21/83.

Dry Gas Composition:

Hydrogen	19.7	%
Carbon monoxide	27.7	%
Methane	1.65	%
Ethane	.140	%
Ethylene	.055	%
Propane	.041	%
Propylene	.041	%
Carbon dioxide	6.66	%
Nitrogen	43.2	%
Dry Gas Molecular Weight	23.6	lb/lb mol
Dry Gas HHV	176	BTU/scf
Dry Gas LHV	164	BTU/scf
Tar HHV	15425	BTU/lb
Tar Content	1.58	lb/1000 scf dry gas
Water Content	8.37	lb/1000 scf dry gas
Gas Temperature	585	deg F
Raw Coal Gas Flow	180	lb/min
Primary air flow	4500	cfm
Secondary air flow	8300	cfm
Ambient temperature	53	deg F

Figure 7-13
Figure 7-13

Computer Horizontal Center Plane Composition Profile
Combustor Centerline Gas Composition

Sample Point:	0	1	2	3	4	5	6	7	8	9	10
Oxygen, %	-	-	-	-	13.0	10.3	8.0	14.0	15.6	10.0	9.7
Combustibles, %	-	-	-	-	15+	15+	15+	15+	11.6	4.7	0
CO ₂ , %	2.6*	-	-	-	1.4	3.0	3.8	1.3	0.6	3.6	6.5
CO	23.7*	-	-	-	-	-	-	-	-	-	0
HClH ₂ O, ppm	-	-	-	-	-	-	-	-	-	-	-
NO _x , ppm	-	-	-	-	-	-	-	-	-	-	300 ppm
NH ₃ , ppm	930 ppm*	-	-	-	-	-	-	-	-	-	-
HCN, ppm	-	-	-	-	-	-	-	-	-	-	-
SO ₂ , ppm	-	-	-	-	-	-	-	-	-	-	500 ppm
H ₂ S, ppm	1075 ppm*	-	-	-	-	-	-	-	-	-	-

Test Date: 4/21/83 10:00-15:00 hrs.

* Concentrations given on wet basis

Figure 7-14

Combustor Horizontal Center Plane Composition Profile I

Test Date: 4/21/83 10:00-15:00 hrs.

Figure 7-15

Combustor Horizontal Center Plane Composition Profile II

The heat input to the combustion chamber was estimated to be 37-40 million BTU/HR using the F factor calculated from the low-BTU gas composition together with the particulate emission factor and the particulate mass rates. This heat input rate was verified by the sulfur dioxide emission factors and rates and gasifier energy balance calculations.

Sulfur dioxide concentrations in the exhaust has ranged from 197 to 252 ppm. The sulfur dioxide emission rate was approximately 39 lb/hr and the emission factor 0.97 lb/million BTU. Using the emission factor, the coal heating value and 93.5% hot gas efficiency the calculated sulfur content of the coal is 0.46%. This compares with the ultimate analysis of the coal composited for this coal size distribution which gives sulfur content of .66%. Ash analyses for this period show approximately 1 lb/hr sulfur being discharged through the grate. This amounts to only 2.5% of the sulfur leaving the gasifier.

Nitrogen oxide concentrations ranged from 148-180 ppm (dry gas basis).

7.5 Tar/Oil Yield Correlations

The overall average tar yield measured during this test was 6.8 lb/100 lb coal. This tar yield can be compared with tar + oil yields reported for Fischer-Schrader Assays of similar coals (Selvig and Ode, 1957). There is no Fischer-Schrader assay available for this coal.

Figures 7-16 and 7-17 show the tar yield observed during fixed-bed gasification of this coal plotted against parameters that correlate well with Fischer-Schrader assay tar + oil yields (Ode and Selvig, 1944, Gomez et al, 1958). As can be seen in these figures, the overall average tar yield observed during this test is somewhat lower than that predicted the Ode and Selvig (1944) correlation, but very close to that predicted by the Gomez et al correlation.

Figure 7-16

Tar/oil Yield - Volatile Matter-Oxygen Correlation

(Ode and Selvig, 1944)

Figure 7-17

Tar/oil Yield - Volatile BTU Correlation

(Gomez et al, 1958)

SECTION 8

CONCLUSIONS AND RECOMMENDATIONS

1. A throughput of 1.6 tons per hour is recommended as a design point. (See Volume 1 of this series (Thimsen, Maurer et al, 1984) for maximum throughput decision making criteria.) Based on this throughput and a blast saturation temperature of 146 F (63 C) the following material and energy flows can be expected:

Material Input	Energy Input (MMBTU/Hr)
-----	-----
lb air/lb coal - 1.78	Coal 32.1
lb steam/lb coal - .332	Steam (IMPORT) .37
Material Output	Energy Output (MMBTU/Hr)
-----	-----
lb dry gas/lb coal - 2.64	Dry Coal Gas 24.2
lb tar-oil/lb coal - 0.066	Tar and Oil 3.3
lb dust/lb coal (est) 0.020	Sensible and
lb ash/lb coal - 0.100	Latent heat 2.7
lb water/lb coal - 0.328	Cooling Water .32
	Dust .56
	Ash .73
	Unaccounted for .66

Hot, Raw Gas Energy Conversion Efficiency - 93%

2. Coal throughputs near 2 tons/hour (120 lb/hr/sqft grate) were achieved for a total of 50 hours gasifying 2 1/2 x 3/4 inch coal and 2 1/2 x 1/4 inch coal. These throughputs were limited by blowing through along the walls of the retort, and limited capacity in the gas combustion train. Maximum throughput gasifying 3/4 x 1/4 inch coal was not obtained during these tests. Further testing of this coal should seek to obtain maximum throughput gasifying 3/4 x 1/4 inch coal.
3. Blast Saturation temperatures in the range of 144-149 F (62-64 C) were used successfully gasifying 2 1/2 x 3/4 inch coal. A blast saturation temperature of 153 F (66 C) was necessary to avoid clinkering of ash at very high loads gasifying 2 1/2 x 1/4 inch coal. The 3/4 x 1/4 inch coal required lower blast saturation temperatures 136-140 F (58-60 C) to avoid oversaturating the ash layer.
4. The mass weighted average tar/oil production was 6.8 lb tar/100 lb coal over the entire test period. This represents 11% of the energy in the coal. The tar/oil yield is approximately predicted by correlations based on Fischer-Schraeder assays of similar coals.
5. The ash removal rate of the rotating grate is generally

predicted by a geometrical grate model.

6. No significant differences were noted in operations when 2 1/2 x 1/4 inch coal replaced 2 1/2 x 3/4 inch coal despite the fact that this is a 9:1 range in coal size. In fact, a 7% greater throughput was achievable with the lower bottom size coal. The 3/4 x 1/4 inch coal gasified well at 1.44 ton/hr, but maximum throughput was not tested.
7. Stack emissions measurements made while gasifying 2 x 1/4 inch coal at high load indicated particle concentrations of 0.016 to 0.24 gr/ACF; sulfur dioxide concentrations of 197 to 252 ppm and nitrogen oxide concentrations of 148-150 ppm (dry gas basis). Corresponding emission factors for particulate and sulfur dioxide were 0.26 to 3.7 lb/million BTU and 0.97 lb/million BTU respectively.
8. The agitator was not used for the 2 1/2 x 3/4 and 2 1/2 x 1/4 inch coal sizings to minimize size degradation of the coal. The agitator was used as a spreader during gasification of 3/4 x 1/4 inch coal to move coal to the retort wall. No size degradation of this small coal sizing was detected.
9. The gasifier can be banked for time periods of at least a day and brought back to load successfully. Banking over longer periods was not attempted.
10. The Leucite Hills subbituminous coal is recommended as a fixed-bed gasifier feedstock based on this test due to high throughputs achievable and high gas quality.

REFERENCES

- Gomez, M., Goodman, J.B., Parry, V.F.; "General Properties of Low Temperature Tar"; USBM Bulletin 569; 1958
- Ode, W.H., Selvig, W.A.; "Low Temperature Distillation Yields of Primary Tar and Light Oil from Coals of Various Ranks and Types"; USBM R.I. 3748; March 1944
- Selvig, W. A., Ode, W. H.; "Low Temperature Carbonization Assays of North American Coals"; USBM Bulletin 571; 1957
- Thimsen, D., R. E. Maurer, A. R. Pooler, D. Y. H. Pui, B. Y. H. Liu, D. B. Kittelson. Fixed-Bed Gasification Research Using U. S. Coals, Volume 1 - Program and Facility Description. BuMines Contract HO222001 Final Report. October 1984

OTHER PUBLICATIONS UNDER BUMINES CONTRACT HO222001

- Thimsen, D., R. E. Maurer, A. R. Pooler, D. Y. H. Pui, B. Y. H. Liu, D. B. Kittelson. Fixed-Bed Gasification Research Using U. S. Coals, Volume 2 - Gasification of Jetson Bituminous Coal. BuMines Contract HO222001 Final Report. March 1985
- Thimsen, D., R. E. Maurer, A. R. Pooler, D. Y. H. Pui, B. Y. H. Liu, D. B. Kittelson. Fixed-Bed Gasification Research Using U. S. Coals, Volume 3 - Gasification of Rosebud Subbituminous Coal. BuMines Contract HO222001 Final Report. March 1985
- Thimsen, D., R. E. Maurer, A. R. Pooler, D. Y. H. Pui, B. Y. H. Liu, D. B. Kittelson. Fixed-Bed Gasification Research Using U. S. Coals, Volume 4 - Gasification of Leucite Hills Subbituminous Coal. BuMines Contract HO222001 Final Report. March 1985
- Thimsen, D., R. E. Maurer, A. R. Pooler, D. Y. H. Pui, B. Y. H. Liu, D. B. Kittelson. Fixed-Bed Gasification Research Using U. S. Coals, Volume 5 - Gasification of Stahlman Stoker Bituminous Coal. BuMines Contract HO222001 Final Report. March 1985
- Thimsen, D., R. E. Maurer, A. R. Pooler, D. Y. H. Pui, B. Y. H. Liu, D. B. Kittelson. Fixed-Bed Gasification Research Using U. S. Coals, Volume 6 - Gasification of Delayed Petroleum Coke. BuMines Contract HO222001 Final Report. May 1985
- Thimsen, D., R. E. Maurer, A. R. Pooler, D. Y. H. Pui, B. Y. H. Liu, D. B. Kittelson. Fixed-Bed Gasification Research Using U. S. Coals, Volume 7 - Gasification of Piney Tipple Bituminous Coal. BuMines Contract HO222001 Final Report. May 1985
- Thimsen, D., R. E. Maurer, A. R. Pooler, D. Y. H. Pui, B. Y. H. Liu, D. B. Kittelson. Fixed-Bed Gasification Research Using U. S. Coals, Volume 8 - Gasification of River King Illinois #6 Bituminous Coal. BuMines Contract HO222001 Final Report. May 1985

Thimsen, D., R. E. Maurer, A. R. Pooler, D. Y. H. Pui, B. Y. H. Liu, D. B. Kittelson. Fixed-Bed Gasification Research Using U. S. Coals, Volume 9 - Gasification of Elkhorn Bituminous Coal. BuMines Contract HO222001 Final Report. May 1985

Thimsen, D., R. E. Maurer, A. R. Pooler, D. Y. H. Pui, B. Y. H. Liu, D. B. Kittelson. Fixed-Bed Gasification Research Using U. S. Coals, Volume 10 - Gasification of Benton Lignite. BuMines Contract HO222001 Final Report. May 1985

Thimsen, D., R. E. Maurer, A. R. Pooler, D. Y. H. Pui, B. Y. H. Liu, D. B. Kittelson. Fixed-Bed Gasification Research Using U. S. Coals, Volume 11 - Gasification Minnesota Peat. BuMines Contract HO222001 Final Report. May 1985

Thimsen, D., R. E. Maurer, A. R. Pooler, D. Y. H. Pui, B. Y. H. Liu, D. B. Kittelson. Fixed-Bed Gasification Research Using U. S. Coals, Volume 12 - Gasification Absaloka Subbituminous Coal. BuMines Contract HO222001 Final Report. May 1985

Thimsen, D., R. E. Maurer, A. R. Pooler, D. Y. H. Pui, B. Y. H. Liu, D. B. Kittelson. Fixed-Bed Gasification Research Using U. S. Coals, Volume 13 - Gasification Blind Canyon Bituminous Coal. BuMines Contract HO222001 Final Report. May 1985

Thimsen, D., R. E. Maurer, A. R. Pooler, D. Y. H. Pui, B. Y. H. Liu, D. B. Kittelson. Fixed-Bed Gasification Research Using U. S. Coals, Volume 14 - Gasification Kemmerer Subbituminous Coal. BuMines Contract HO222001 Final Report. May 1985

APPENDICES

A. Gasifier Operator's Log.....	A-1
B. Weather Data for Testing Days.....	B-1
C. Coal Analysis Data.....	C-1
D. Coal Addition Log.....	D-1
E. Ash Analysis Data.....	E-1
F. Ash Removal Log.....	F-1
G. Operator Logged Data.....	G-1
H. Gas Chromatograph Data.....	H-1
I. Continuous Output Transducer Data.....	I-1
J. Stack Sampling Report.....	J-1
K. Retort Temperature and Pressure Probe Data.....	K-1

APPENDIX A

Gasifier Operator's Log

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

BOM/FGT 003

3/29/83

Loaded 70 bags of ash totaling 3,842 pounds.

4/8/83

Installed 3,842 pounds of ash, 720 pounds of charcoal and set the pipes for fuel.

4/9/83

Loaded the coal weigh bin to 4.91 tons with screened coke.

4/11/83

0630 Filled retort and pipes with coke.

0700 Started coaling up-Leucite Hills coal-upper bin.
Conveyor belt needed adjustment.

0834 Light gasifier

0945 Lit vent flare

1008 Attempts to start boiler are unsuccessful. Will call Bureau of Mines. Water limit valve stuck.

1010 Boiler started-Limit stuck.

1030 Elbow cracked on number 1 poke hole.

1035 Started primary and secondary combustor air fans-10% open.

1039 Induced draft fan started. Vane valve-10%

1040 Purging pilot flame in the combustor.

1043 Scrubber pumps on.

1047 combustor pilot on. Safety valve is open.

1100 combustor lit.

1110 Saturation air flow-600cfm. Cyclone dipleg valve is wide open.

1120 BST steam controller set to 64oC.

1130 First fire test and freeboard. (15 & 40)

1200 pH is low-attempting adjustment.

1220 Two one inch lines are open-need caps. Gas leak below University of Minnesota platform.

1410 2nd shift will fix poke hole leak at face of cyclone feed tube.

1420 Grate drive on first time-4 teeth, .85 Power supply kicks out at higher speeds (1E2). Trouble shooting-faulty current, limit board from agitator power supply was installed-now working.

1530 Coal up-.52 tons

1545 Repaired gas leak in offtake pipe.

1600 Fire test-Ash Average-17.4 Bed felt good. Bars slipped in easily.

1630 Dumped the cyclone-removed a fair amount of particulate.

1640 Dump ash-400 pounds. (did not remove any ash-only water.

1700 Freeboard-49.5

1735 Grate speed control quit working. We lost control voltage to the motor start. Bob Boots wired the motor on the grate drive direct and hot wired the coil on the motor start. Reset the grate drive to one tooth.

1800 Fire test-Ash average 14.3 inches-Ash weight 432

1830 Coal up-.68 tons. Still have not found out where the control voltage is in the control console.

1900 Freeboard-49.0 inches

1930 Coal up-.63 tons

2000 Fire test. Found loose wire on the grate drive on the control board

2030 Coal up-.80 tons

2100 Start loading coal.

2130 Coal up-.61 tons
2200 Fire test-Ash average 15.0
2230 Coal up-.60 tons Dump ash.
2345 Dumped cyclone-very little particulate
2350 pH-5.1 (paper reading 6.0)
2400 Ash depth-14 inches (rod went in good)

04/12/83

0030 Main bearing oiler is filled with #10 oil.
0045 Shut down #2 scrubber pump. Water was overflowing.
Gas leak on the downcomer valve-tightened bolts and
clamped valve closed.
0100 pH 6.0
0200 Ash depth 15.8 inches. Bars going in well.
0215 pH 6.0 Induced draft fan-90 amps
0330 pH 9.0 Increased the caustic pump to 30 position
0400 Ash depth-11.5 average
0430pH 9.0 Changed the caustic pump to .05 position.
Started coaling up. Weight-6.41
0515 Coal bin weight-11.95
0530 pH 6.0 Cleaned combustion burner
0600 Ash depth 14.1 average. Bar going in well. #4 bar
is dirty
0615 Dump ash-Weight 1032
0645 pH 6.0
0730 Dumped cyclone-little particulate. Screen torn
loose. #2 scrubber pump-continued off
0800 pH stays at 6.0
0830 Dumped the cyclone-little particulate. Changed
saturation air temperature to 620C from 640C. Fire
bed was in good shape with no clinkers. We will
keep the saturation temperature at 620C for half
the remaining time on the 600cfm load which will be

approximately 12 hours. If no problems occur at 620C, the saturation temperature will be lowered to 600C.

0845 Removed the grate drive speed control box and wired it direct. Diagram is shown on the loose page insert. Rotated the agitator so it is under the saturation pipes.

0900 pH 6.0 Dumped the ash. 486 LBWT

0905 Rodded the combustion chamber-some small chunks.

0930 Cyclone dump-still no particulate. Lowered the water level to refit the screen

1000 Fire test-13" average. pH paper 6.0 motor 7.6

1145 Downcomer trap dumped; combination of black and yellow granular material fell out.(wet approximately 2 pounds. Used 1 1/4 and 1 1/8 wrenches.)

1215 Dump ash I.D. weight 482

1245 Coaling up from 6.9 tons to 12.09

1300 pH continues 6.0 on paper.

1420 Saturation air flow is constantly showing less than 600 cfm. It is averaging 585. The controller is set at 640-increased it to 650 to see if the panel meter can be brought closer to 600 cfm.

1425 Note: The controller was accidentally on manual. This was the problem. Switch to automatic brought the panel meter up to 600 cfm average with the controller set at 640. Same situation with the saturation steam controller. When we switched it to automatic TT2-703 was at 61.30C, it then rose to 620C.

1455 The offtake temperature went from 2300C to 3000C about 1420. It held at 3000C. We checked the holes for fire. Hole number 6 glowed slightly. Will instruct the evening shift to watch for burning through. Fire loss pressure has been steadily increasing to 5.6 in WC, but has been varying plus or minus 0.2 in WC over the last half hour. Hard to say what is happening because the last fire test was good; no dirty bars or high holes.

1530 Dump ash

1600 Good fire test-the bed felt good (no clinkering) Number 5 hole was high with a wide incandescent

zone. Nuber 3 & 4 were colder

1800 The fire test was very good. The bed was free of clinkers. Number 3 hole was low (9 inches). The ash average was 15.8, down from the last fire test of 2 inches

1830 Dumped the cyclone-very small amount removed. (not much floating material.)

2000 Dropped the saturation temperature from 62oC to 60oC per the schedule. The fire test went well with no clinkering. Number 3 was hot. The ash average was 16.8 inches. Dumped ash-501 pounds.

2010 Started loading coal.

2045 Called Dick because the fire loss pressure has been increasing steadily to 7.5 inWC since we dropped the saturation temperature to 60oC. Dick had me open the gas control valve to 50%, dropping the back presure to 1 in WC. This dropped the ash pit pressure from 9.0 to 7.8 in WC, also dropping the fire loss from 7.5 to 6.8 in WC.

2100 Finished loading the coal.

2200 Fire test: The bars went in very easily with no clinkering. High ash on #2 hole-33 inches. The ash average is 21.4 inches. I am increasing the grate speed to 2 teeth. Number 6 had a dirty bar and poked number 6.

2400 Fire test-The bars went in easily. The ash average is 14.1 inches.

04/13/83

0030 Checked the scrubber pump, combustion burner, and the induced draft fan-all seem o.k.

0045 Dumped ash-663 pounds.

0100 Main bearing oil is dropping 3 drops per minute, we changed it to 8 drops.

0200 Fire test-16.0 inches average. Number 2 was 38 inches. Poked the fire bed-#2 bar went in easily.

0245 Checked the scrubber pump and cleaned the combustion burner. The motor and bearings sound quiet.

0040 Fire test-20.8 inch average. Number 2 was 43 inches and number 5 was 39 inches. The bars are going in well and no burning through is evident.

Increased the grate from 2 to 4 teeth to lower the ash depth average.

- 0430 Started coaling up-weight 7.27 Dumped ash-weight 680 pounds
- 0500 Checked the number 2-40 inches, 3-12 inches and 5-22 inches. Coal bin weight-11.44
- 0600 Fire test-Average ash depth is 16.4 inches. Number 2 and number 3 are forming clinkers. Had to force the bar in number 2, three feet from the grate and number 3 twelve inches from the grate.
- 0630 Dumped the ash-weight 530 pounds.
- 0700 Checked numbers 2 and 3 holes. The bars went in well. Number 2 was 32 inches and number 3 was 11 inches.
- 0730 Grate speed at 4 teeth. pH is at 4.
- 0750 Increased the saturation temperature to 640C in preparation for the higher load. We will begin to increase the saturation air flow up to 1000 cfm at 50 cfm increments at 0800.
- 0810 Increased the saturation air flow 50 cfm from 600 to 650. Will increase every 20 minutes to a half hour. FC-820 drops 1200 cfm. Increase to set point.
- 0830 Saturation air flow was increased from 650 to 700 cfm. Little particulate. pH 5.5
- 0850 Saturation air flow is up to 750 from 700 cfm.
- 0900 Ash dump and sample: Weight-504 pounds (net dry weight. Primary air flow again drops to 3500.
- 0920 Saturation air flow is up to 800 from 750 cfm
- 0930 Steady increase in useage as the saturation air flow increased.
- 0940 Increased the saturation air flow another 50 cfm to 850 cfm
- 1000 Saturation airflow is up to 900 from 850. Cut jacket waterflow back to 7 from 8.5. Increased the grate to 6 teeth as ash level was up to 17.7 on the 1000 fire test.
- 1030 Saturation air flow is up to 950 from 900.
- 1045 Reinstalled grate drive speed control, (zero at

zero, 2 at 6 setting, 3.44 at full setting). Adjusted it to read 3.4 at 10 setting. Final adjustment is 4.70 at full setting (24 rpm).

- 1050 Increased the saturation air flow to 1000 cfm.
- 1100 Dumped the ash-Net dry weight 430 pounds.
- 1110 Variable frequency power supply for the grate drive was replaced and tested. The grate was off for about 20 minutes. High fire loss pressure resulted. Operator console panel now reads in grate revolutions per day per tooth engaged on the drive gear. This meter was recalibrated with the grate drive output. The grate drive was set at a maximum to reduce fire loss pressure. (maximum = 4.75 revolutions/day/tooth). Six teeth were engaging.
- 1125 pH down to 3-cleaned out the tube. Pumping rate returns. pH is again at 6.0. The caustic drum is to be changed later this shift.
- 1200 Fire test and freeboard is at 1000 cfm with the grate set at 6/4.75. Ash level dropped two inches. The fire test went well-clean.
- 1215 Check out the thermocouple probe.
- 1230 Primary combustor air flow tops out at +5000 cfm, readjusted it down to 4300 cfm.
- 1240 Downcomer trap opened. No particulate, only a little tar.
- 1245 Caustic barrel changed as the pH is at 4.0 and the tube is plugged. After the change the pH is back to 6.0.
- 1300 Dump ash-weight 519 pounds. Started coaling up at 5.04 tons/at finish 8.20 tons (1330)
- 1330 Resumed loading - 6.8 tons
- 1400 Fire test is very good-all average around 14.3 inches. Leaving the grate at 6/4.75
- 1425 Dump ash-weight 548 pounds. The pH is 3.0, readjusted again
- 1440 Stopped coaling up at 10.58 tons
- 1525 Replaced lead wire for T-705
- 1600 Fire test: The bed is a little tight, no clinkering, ash has dropped. The bars are going in well.

The ash level is at 12.1

- 1700 We flushed out the upper ash pit with the three nozzles we installed. This removed 1600 pounds of ash, saving us from a shut down. We were not removing any ash at the time we flushed the ash pit.
- 1800 The fire test went well. Slowed the grate due to a low ash average.
- 1830 Dumped ash-1000 pounds. We flushed the upper ash pit and removed another load of 1000 pounds of ash that was built up.
- 2000 The boiler went down due to a blockage in the chemical feed tank on water make up. The float valve float blocked the pump for the boiler causing the boiler to go out on low water. The float valve was removed, the float level repositioned, and the valve reinstalled. This will raise the level in the makeup tank to its proper level, thus the float cannot block the pump. Recommendation: installation of a manual feed water line on the boiler per ASME code for such problems.

The CO was leaking out of the poke holes during the fire test. This was due to loss of steam.

- 2045 Start loading coal. The previously mentioned water problem caused the pump to over heat and lock up, burning up the rubber coupling. After being allowed to cool, the pump was freed up and duct taped back together to get water to the boiler.
- 2215 We finally have steam.

04/14/83

- 0015 Fire test-the bars went in well. Ash average-7.4" Slowed the grate drive down to 1.0 from 2.1. changed the gearbox output to 6 rpm from 11 rpm
- 0045 Checked the scrubber pump, combustion burner, fans and boiler. Everything is running o.k. The transition pipe from the induced draft fan is leaking badly.
- 0100 Checked number 2 & 4 holes at 2400 (#2 had 5 inches of ash and #4 had 3 inches of ash) These have now been brought up to 10 inches and 9 inches respectively. The bars went in well.
- 0130 CO₂ alarm by the coal bin is going off when coaling up.

0145 Checked the pump and combustion burner as well as the fans and boiler.

0200 Fire test- Ash depth average is 13.2. The bars went in well. Increased the grate drive - 1.43

0215 Dumped the ash-weight 630 pounds. Adjusted the retort steam orifice 1-7

0230 Flushed the ash cone with the three nozzles. Very little ash came out.

0305 Boiler is down-low water. The coupling between the motor and the pump is sliding.

0330 Trouble with the grate drive stoping. Lights just blink and down she goes.

0345 Saturation instrument is not working on automatic-fine tuning appears to be off.

0400 Fire test-ash depth average 10.5. Bars going in well.

0415 Ran the hose to the boiler to fill the boiler through the blow down valve when the pump goes down because of low water. Retaped the pump with nylon tape.

0450 Started coaling up-weight 603. Snowing heavily outside and blowing.

0500 POWER FAILURE opened the vent valve and flooded the cyclone. Restarted the system.

0530 200 cfm

0535 Boiler is down-low water. Retaped the pump together

0545 250 cfm

0555 POWER FAILURE opened the vent valve and flooded the cyclone. Restarted the combustion burner and saturation fan. Drained the cyclone.

0610 POWER FAILURE again opened the vent valve and flooded the cyclone. Secondary fan would not start. Called A.R. Pooler. Went out to check the fan and could smell the induced draft fan smoking, so the induced draft fan was shut down. Called A.R. Pooler who advised he would come in. Checked the power to the fan-it was single phased. Called Irv Meyer-He advised the power lines were down and the motors were all single phasing. All motors are down and venting out the roof.

0730 So far 6 inches of wet snow and winds 30-40 mph. We are continuing in shut down mode. Full power is still down.

0800 Opened the vent disc to facilitate banking draft. Dismantled shaft coupling from pump motor-searching for replacement. Shut off the water to the boiler and opened the valve draining the cylinder on the pump tank.

1130 Power is still down. Poked # 2 & 5 and they were red after 3 minutes.

1330 We now have 13 inches of snow with 3 more expected.

1440 Cleaned the downcomer trap. About 1 liter of tar fell out. Inspected the downcomer and found it to be clean. Inspected the cross duct and it was also clean. The gas safety valve was seen to be closed and little build up was evident.

1515 Power still out.

1540 Water bleeds to scrubber-opened the pumps and drained as much as possible. Blowdown of scrubber tanks set at maximum.

1600 Started clearing snow away from the building, parking area and coal storage area (without pushing the snow into the coal).

2200 From 1600 to 2200 moving snow with the loader and the shovel. Periodically checking traps and power. Still down. Ash dump bay door will not open.

2330 Power is still down. Water flow is still steady on traps and water bleeds to the scrubber. Tomorrow is another day...GOOD LUCK

04/15/82

0730 TAX DUE DAY! POWER IS STILL DOWN! Swing shift did a super job of snow removal and now the sun is out!

0750 Fire test-Numbers 1, 3, and 6 are over 15 inches with long incandescent zones. Will close air entry a little to reduce incandescent zone.

0830 NSP has restored power. We will begin to check out all equipment. The grate drive is on maximum (6/4.70)

0905 Saturation air blower is on. All other electrical equipment has checked out o.k. Pilot flame is on

and the vent valve is open. F-701 to 100 cfm. T-703 is at 64°C.

0909 F-701 to 200 cfm

0920 Coal up 4.81 tons. Will sweep agitator around once to make sure the coal is well distributed in the retort.

0940 Grate is slowed down to 6/2.33 Fire test-8.3 inches.

0950 Increased the saturation air flow to 400 cfm while emptying the cyclone water seal.

0956 Combustor lit.

1005 Grate drive is set to 6/0.98 to slow ash removal.

1030 Readjusting the conveyor. It must have been moved in last night's snow removal. pH is between 10 and 12. We are readjusting caustic rate to 35 from 50.

1100 Fire test-found the ash level to be low (6"). Cut rate back to 6 teeth/0.28.

1120 Grate drive speed control malfunctions at all settings. Reverse polarization leads. Grate starts running. Decided to decrease teeth to 3/1.50 and not to run drive at settings below 1.00.

1130 Increase saturation air flow to 450 cfm from 400 cfm. Started coaling up at 3.2 tons. Hopefully the conveyor will take it. Repositioned as close as possible but it is still rubbing lower right edge.

1145 Recalibrated grate speed control to read approximately 1.05 at zero. Now running 4 teeth/1.05/zero setting.

1200 Increased saturation air flow to 500 cfm from 450 cfm.

1230 Increased saturation air flow to 550 cfm from 500 cfm. pH has leveled off at 6.5 (paper reading). Readjusted speed to 10 and stroke at 50.

1300 Ash level still low-6.4 inches average. Number 2 is very low. Change to 2 teeth at low speed. Increased the saturation air flow to 600 cfm from 550 cfm. pH level is still not right, readjusted it once more.

1315 Increased the saturation air flow to 650 cfm from 600 cfm. Will continue increasing it until 1000 cfm

around 1530 with the saturation temperature remaining at 640C. Finally got the pH level at 6.0

1325 Offtake temperature keeps going up. Checked all six bars and found no channeling or burning on top is evident.

1330 Made on sweep of the agitator at this time to level the coal. Trying to bring offtake temperature down.

1340 Raised the saturation air flow to 700 cfm from 650 cfm.

1345 Opened the gas throttling valve to reduce the offtake pressure from 4.3 to 2.3 in WC.

1400 Cycled the agitator arm 1800 to bring the offtake down from 2900C.

1405 Saturation air flow is at 750 cfm.

1415 Ash level is up to 9.7 inches average. Leaving it at 2 teeth and low speed.

1420 Saturation air flow is up to 800 cfm from 750 cfm. pH is staying level at 6.0

1440 Saturation air flow is up to 850 cfm from 800 cfm.

1455 Saturation air flow is up to 900 cfm from 850 cfm.

1515 Saturation air flow is up to 950 cfm from 900 cfm. Gas offtake pressure is up to 5.0. Opened the valve. Took down about 2 1/2".

1530 Raised the saturation air flow to 1000 cfm.

1540 Raised the saturation water flow to 7 gallons per minute and found the outlet flow hotter than desired.

1600 Fire test- Ash average is 17.6. Increased the grate speed to 4/3.14 from 2/1.07

1700 Made a slight adjustment to the saturation temperature.

1730 Dump ash- 530 pounds.

1800 Fire test: The bed felt good with no clinkering. Ash average is 13 minutes.

1900 Dump ash 500 pounds

2000 Fire test: bar went in well with no clinkering or uneven bars. Ash average is 12.7.

2015 Started loading coal

2115 Finished loading coal-12.56 tons.

2200 Fire test: Bed is very even and feels good with no clinkering. #1 hole was dirty so poked it.

2300 Dumped ash-500 pounds.

04/16/83

0000 Fire test: Ash average is 12.4. Looked good.

0040 Cyclone valve is sticking-rapped on the slide.

0045 Dumped ash-weight 595. Flushed the cone with spray nozzles.

0105 Made the rounds outside and everything is operating well.

0200 Fire test: Ash average 15.1. The bars are going in well. Number 7 is a cold bar. Increased the grate drive 4/3.50. Started snowing outside again.

0330 Dumped ash-weight 675 pounds. The cyclone valve is sticking both open and closed.

0345 Made the rounds outside and everything is operating well. The scrubber tank is running the water through overflow. The spray nozzles are on.

0400 Fire test: Average is 13.4 inches. Bars are going in well and the bed seems loose. The ashpit pressure seems to be increasing throughout the shift from 9.8 to 11.5

0440 Started coaling up-weight 2.56 Adjusted the conveyor belt.

0445 Opened the gas control valve from 60% to 70 %. The ashpit pressure dropped from 11.4 to 9.2. Fire loss 9.5 to 8.6. The offtake pressure dropped from 1.9 to 0.9.

0525 Finished coaling up-weight 11.26

0600 Fire test: Ash average is 13.2 inches. The bed felt even through all seven holes.

0610 Cyclone valve is still sticking, but we freed it up some.

0630 Dumped ash-600 pounds

0730 1000 cfm at 640C. Gas offtake has leveled off at +2450C. The grate is at 4 teeth at 3.50. Dumped the cyclone and the drain valve functions fine.

0800 Fire test: average is 12.0 ash depth. Reduced the saturation air flow to 620C at 1000 cfm. We will hold at this saturation temperature for 24 hours at this 1000 cfm load per the test plan.

0810 Dumped ash-571 pounds.

0915 Loosened up the packing nuts around the cyclone drain slide.

1000 Fire test-ash average is 11.7. The bed felt a little hotter with the 620C saturation temperature. Bars are going in well and the bed appears pretty even. No clinkers...yet!

1030 Cyclone particulate is a little more evident now. Checked the downcomer-got tar and some black particulate as well as some watery liquid.

1100 Dump ash-885 pounds. Will do it every two hours regardless of total.

1200 Fire test: 13.4 inches average. Rods are going in easily and it appears a little hotter. Increased the grate drive to 6 teeth at the same rate of 3.50. Started coaling up at 2.5 tons.

1300 Dump ash: 712 pounds

1315 Finished coaling up at 10.6 tons.

1320 Ash dump: clinkered-lots of large pieces.

1330 Closed the gas throttling valve to bring the offtake pressure up to 2.6 in WC from 0.8 in WC.

1400 Fire test: 12.4 inches average. The bed is in good shape with no clinkers and the rods go in easily. Leaving the grate at 6/3.50.

1500 Dumped ash: 873 pounds (large clinkers) Took a trip around outside and everything appears to be functioning well.

1430-1530 Took pressure and temperature profiles in the retort

1600 Fire test: Ash average is 10.1 inches. Slowed the

grate to 6/7.69 from 6/3.50. Fire test looked good and the bed is not sticky. The bars went in well with no clinkering.

1615 Dump ash: 583 pounds. Ash is mainly 2" in diameter. A few larger clinkers seem to have a fair amount of carbon.

1800 Fire test: Ash average is 9.2 inches. Number 7 bar was 0. Slowing the grate to 6/1.76 from 6/2.69

1810 Dump ash: 567 pounds

2000 Fire test: Ash average is 10.1 inches. Number 7 was 4 inches. The bars went in well. Have been watching the offtake temperature. Since this last test, it has gone from 2550C to 2740C over the last two hours, and then dropped back to 2590C. This has been a gradual move, not spiking. The CO has been staying at 29 to 30% showing very little change. No burning through or clinkering is apparent. The saturation temperature is staying at 620C.

2030 Dumped ash: 539 pounds. Started loading coal.

2200 Fire test went good. Still no clinkering. The offtake is still wandering all over from a low of 2480C to a high of 2820C.

2210 Dumped ash: 516 pounds

04/17/83

0000 Fire test: Ash average is 10.8 inches. The bars went in well. Number 7 was a cold bar.

0015 Checked outside and everything was o.k.

0045 Dumped ash: 650 pounds

0200 Fire test: Ash average is 10.5 inches. The bed seems even and the bars are going in easily.

0240 Dump ash: 600 pounds. Flushed the cone with spray nozzles for 30 seconds.

0400 Fire test: Ash average is 11.4 inches with the bars going in well. The bed feels even through all holes. Number 7 is a cold bar.

0415 Checked everything outside and all seems o.k. The ash pit pressure has increased steadily through out the shift.

0440 Started coaling up-weight 4.43

0520 Finished coaling up-weight 12.57

0540 Dumped ash-weight 800 pounds.

0600 Fire test: Ash average is 11.4. The bar is going in well. Ash bed is even.

0610 Made the rounds outside and everything is functioning well. No new noises!

0730 1000 cfm at 620C.

0800 Fire test: Ash averages 12.0 inches. No clinkers and the bars are going in well.

0815 Per A.R.Pooler, taking the saturation temperature down to 600C and leaving the saturation air flow at 1000 cfm.

0900 Dump ash: 836 pounds

0915 Rodded the combustion chamber. It looked clean.

0950 Noticed the top ash dump valve which had been left closed was open.

1000 Fire test: Ash averages-11.8 inches The bed seemed even all around and the bars went in easily. The incandescent zone is a little hotter as we are leaving the bars in approximately 3 minutes.

1015 Checked the downcomer and noticed the tar was a little thicker than yesterday.

1100 Dumped the ash even though it was only 487 pounds as at the 090 dump. Forgot to open upper valve for 45 minutes. Flushed the ash cone with the spray nozzles from above to make sure it was well cleaned out. Noticed a lot of fine ash, so it is just as well we dumped even though it was light.

1115 Cleaned up the general area in and around the boiler building.

1200 Fire test: The bed is still good with no clinkers. Ash average is 11.9 inches.

1240 Jog close the gas throttle valve, down to 45% to bring gas offtake from 1.6 in WC to 2.5 in WC. Both F-705 and P-706 are at or around 2.5 in WC.

1300 Dumped ash: 500 pounds. The chunks are a little larger. Started coaling up at 3.3 tons.

1400 Fire test: 10.8 inches ash average. Numbers 2,5 &7 have a slight crust. No channeling evident. Leaving the grate at 6/1.75 per A.R. Pooler. Finished coal-ing up at 12 tons.

1500 Dump ash: 550 pounds

1600 Fire test: Ash average is 14.1. The bars went in easily. The bed had no crust or clinkering.

1700 Dump ash: 509 pounds

1800 The fire test went very well. No clinkering. No crust. No high bars. Ash average is 14.0 inches.

1900 Dump ash: 560 pounds. Dumped the trash and removed the fines.

2000 Fire test: ash average 14.0 inches. The bars went in well. Number 5 hole was high (20 inches). No clinkering.

2030 Dump ash-481 pounds. Start loading coal.

2130 Finish loading coal.

2200 Fire test ash average 14 inches. Very even bed with the bars going in easily. No high holes.

2230 Dump ash: 580 pounds

04/18/83

0000 Fire test: Ash average 13.8. Bars number 1,2,4,6 & 7 went in easily. Numbers 3 & 5 felt like hitting clinkers. Increased the grate drive to 6/2.25 from 6/1.75

0015 University of Minnesota fixed the CO instrument.

0045 Made the rounds outside-everything seems normal-no unusual noises.

0100 Dump ash: weight 600 pounds

0115 Changed the caustic barrel

0200 Fire test: Ash average is 14.5. The bars are going in easily. Increased the grate drive to 6/2.75

0245 Dump ash: weight 600 pounds. Flushed the ash with the new spray nozzles.

0400 Fire test: Ash average is 13.4. The bars are going in well. Numbers 3 & 5 are high holes. (19 and 20

inches of ash.)

- 0435 Started coaling up-weight 4.46
- 0525 Finished coaling up-weight 12.96
- 0535 Dump ash-weight 834
- 0600 Fire check: ash average 12.7. The bed is even and feels good.
- 0610 Increased saturation temperature from 60°C to 64°C
- 0700 Increased the saturation air flow to 1050 cfm.
- 0730 Increased the saturation air flow to 1100 cfm at 64°C.
- 0750 Dumped ash: weight 660 pounds
- 0800 Fire test: average ash weight is 12.8 inches. The bed feels good. Increased the saturation air flow to 1150 cfm. The pH is still at 4.0-Increased the dial rate to 10 from 6.
- 0830 Increased the saturation air flow to 1200 cfm
- 0845 Fire loss pressure is coming down slightly
- 0900 Increased the saturation air flow to 1250 cfm. Dump ash-570 pounds (thick and heavy) Used the upper nozzles to flush the grate underside. pH levels out at 6.0
- 0930 Increased the saturation air flow to 1300 cfm. Opened the gas valve from 20% to 60% (bringing the off take, fire loss, ash pit pressures in line.) Increased the combustion air flow. Both valves are at 100% open
- 0950 The gas offtake temperature pushes through to 300°C
- 1000 Fire test: Ash average is 13.7 inches. No hot zones. The rods are going in easy all around. Increase the saturation air flow to 1350 cfm. The offtake temperature is at 325°C.
- 1010 Checked the downcomer-tar, water and particulate are more solidified due to sludge.
- 1030 Increased the saturation air flow to 1400 cfm. Gas offtake temperature is now at 340°C.
- 1050 Gas offtake pushes through 350°C

- 1100 Increased the saturation air flow to 1450. Dumped ash: weight 514 pounds. Flushed with the upper nozzles and it came out better this time.
- 1130 Increased the saturation air flow to 1500 cfm at 64°C. The offtake temperature is 380°C
- 1133 Blast plate opened to let air flow increase to 1500 cfm. Overshot a little. Cyclone residue includes 1 inch floating ash dust. The bottom particulate is getting heavier. Will possibly have to shovel it out tomorrow.
- 1200 Fire test: Ash average is 17.8 inches. Increased the grate speed to 4.00. No channeling and the bed is even.
- 1230 Start coaling up at 2 tons. Offtake temperature and all others have backed down to more stable levels one hour after going to 1500 cfm. CO is at 28%. Large cyclone particulate chunks floating. (Turn to powder form-see pail)
- 1300 Dump ash: 698 pounds
- 1330 Finished coaling up at 11.98 tons. Opened the gas valve to 70%, dropping the offtake from 4.0 to 2.5 in WC. P-703 and F-704 are now under 20.0 in WC
- 1400 Fire test: Ash average 19.0 inches. The bed looks good. Increased the stroke to 8 teeth at the same speed (4.00)
- 1445 Slight adjustment to the saturation temperature - had been slightly under 64°C (63.5)
- 1500 Dump ash: 1050 pounds
- 1600 Fire test went well with no clinkering. Number 5 hole was high at 20 inches. Bars slipped in easily. Dumped ash: 602 pounds
- 1710 Dumped ash: 683 pounds
- 1800 Fire test: ash average is 12.0 inches. The bars went in easily and the bed appears to be even. Slowed the grate to 8/3.00 from 8/4.00.
- 1830 Dumped ash: 833 pounds
- 2000 Fire test: Ash average is 13.1 inches. Bars went in easily. No clinkering. Number 5 bar had a wide incandescent zone. The bed is still fairly even with no crust.

2015 Dump ash: Weight 887 pounds

2200 Fire test: Ash average 13.7 inches. The bars were a little sticky going in. No clinkering was observed and the bed appeared even.

2230 Dump ash: Weight 894 pounds

04/19/83

0000 Fire test: Ash average 14.1 inches. The bars went in easily Numbers 3 & 5 were extra hot.

0010 Dump ash: Weight 900 pounds

0035 Adjusted the saturation temperature slightly from 63.5°C to 64°C. The University of Minnesota is working on the CO₂ instrument.

0145 Made the rounds outside and everything seems in good shape.

0150 Dump ash: Weight 670 pounds

0200 Fire test: Ash average is 16.5 inches. The bars are going in well. Increased the grate drive to 8/4.00

0300 Dump ash: Weight 755 pounds Flushed with spray nozzles.

0305 Dumped the cyclone-lots of particulate

0400 Fire test: Ash average 14.5 inches. Number 2 is high (22 inches) Bars are going in well.

0430 Dump ash: Weight 725 pounds. Coal was hung up in the upper bin in the south leg.

0435 Started coaling up: weight .79

0500 Increased the saturation temperature to 64.75°C on the Automatic to get 64°C on the chart.

0520 Finished coaling up: Weight 12.22 Put 1.75 in the gasifier and coaled up again to 12.26.

0600 Fire test: Ash average 13.8 inches. Number 2 was 20 inches and number 5 was 22 inches. The bed feels good.

0615 Replace the bolts in the shaker motor adjustment bracket.

0620 Dump ash: Weight 1002

- 0625 Dumped the cyclone-particulate is increasing steadily during the shift.
- 0730 Saturation air flow is at 1500 cfm and 640C with the grate at 8/4.00. The ash is below 50 pounds.
- 0800 Fire test: Ash average 13.1 inches. The bed felt good with the bars going in easily with no hot zones.
- 0815 Dump ash: 1150 pounds and flushed with upper nozzles. Chunky. Largest is 10 to 12 inches in diameter. Had to use two hoppers, one for the wet and one for the dry. Truck running on the lower level sets off the CO alarm. Both propane tanks on the lift truck were empty.
- 0830 Per plan, dropped the saturation temperature from 640C to 620C at 1500 cfm. Cyclone particulate is heavier with large chunks and much floating debris.
- 0930 Cyclone valve sticks shut. No response to panel. Pressure on cylinder line opens the valve.
- 0945 Started to coal up-4.75 tons. Slight adjustment was made on the saturation temperature to maintain 620C on the charts.
- 1000 Fire test: Ash average is 12.6 inches. Leaving the grate at 8/4.00 until 1200 test and see. Found crust on numbers 2, 3, 4 & 7. Numbers 1 & 2 were colder. No multiple zones.
- 1030 Stop coaling up at 12 tons. Dumped ash at 1190 pounds. Many 3 to 4 inch diameter chunks. The ash seemed drier. Cyclone particulate: much floating ash and tar particles.
- 1100 Pressures P-703, 704, 705 & 706 steadily at the lower parameter 12.2, 9.9, 1.8 & 1.7. Jog closed the gas control valve to 60%, bringing back to par 2.5 in WC for P-705 etc. The offtake temperature is steady at 2700C for some time. CO is 29 to 30%.
- 1120 Check the downcomer trap and found three inches of solids and thick tar liquid on top.
- 1200 Fire test: Ash average is 11.6 inches. Drop of one inch overall. Reduced the grate speed to 8/2.75 or 30% and see. There is a slight crust on number 5, but the other bars seemed to go in easily.
- 1230 Feed coal hangs up in one leg. Recycled feed valves and it dropped normally.

1300 Dumped ash: 1040 pounds. CO alarm went off again on the 4th level.

1315 Start coaling up for the second time at 6.58 tons and finish at 12.4 tons at 0155.

1330 Cyclone dump particulate has turned from clumps to a fine silt, floating and settling on the bottom.

1400 Fire test: Ash average 12.1 inches. The bed has freed up. Poked number 7 twice and got only one inch on both bars. leaving the grate at 8/2.75.

1505 Dump ash: 860 pounds

1600 Fire test: Ash average is 8.5 inches. The incandescent zone seems wider with lower saturation temperature. Number 7 hole was 0. Bars went in well with no clinkers. Slowed the grate to 8/2.00 from 8/2.75.

1638 The steam saturation temperature control stuck and the saturation temperature started rising. (cycled it back and forth by hand) It seems to be working o.k. now.

1700 Dump ash: 8.38

1800 Fire test: Ash average is 9.8 inches. No clinkering.

1900 Dump ash: 840 pounds. Ash was loose with very few clinkers.

2000 Fire test: Ash average is 10.2 inches. The bed felt a little sticky. No clinkers. Number 7 was 2 inches.

2030 Dump ash-640 pounds. Started loading coal.

2145 Finished loading coal. Dump ash: 840 pounds.

2200 Fire test: Ash average is 10.2 inches. The bed is fairly even with no clinkering.

2230 Dump ash

04/20/83

0000 Fire test: Ash average is 12.5 inches. The bars are going in well. Number 7 was 0. Bar glows orange to tip.

0010 Cyclone dump: very little particulate, that which is visible is fine and floating on the top.

0015 Dump ash: 755

0020 Made a slight adjustment on the steam saturation on manual control.

0045 Made the rounds outside and everything looks and sounds quiet.

0100 Checked the number 7 hole-one inch of ash. Dumped ash: 440 pounds

0200 Fire test: Ash average is 9.8 inches. The bars are going in well. The ash appears to be very uneven (ranging from 0 to 23 inches)(#5-23" #6-1" #7-0") Slowed the grate down to 7/1.50 from 8/2.00.

0220 Dumped the cyclone and found mostly small pieces of particulate floating and on the bottom.

0300 Dump ash: Weight 710 pounds-Used the last ash bucket. Fire test : #3-14", #5-12" and dirty bar-crust on the bottom, #6-14", #7-2". Poke bar #5 went in well after poking the fire zone 5 times.

0335 Made a manual change on the steam saturation valve position.

0345 Made the rounds outside-everything appears to be running normally.

0350 Offtake temperature dropped 120C in the last two hours. P-704 Fire loss pressure has dropped also and leveled off.

0400 Fire test: Ash average is 12.4. The bed is still very uneven. Number 5 bar was a little stiff going in for the last 12 inches.

0440 Started coaling up with a weight of 1.80 tons

0445 Dumped the cyclone-particulate is fine with some on top of the water, but most has settled in the bottom of the tank. Raked the tank seven times. Dumped ash: Weight 540 pounds. The ash came out the size of softballs, but is not really hard. Flushed upper gasifier cone for 45 seconds and got lots of ash flushed down.

0500 Offtake temperature started going up from 3200C to 3500C. Checked the holes and number 3 was glowing about 12 inches around. Poked and raked the hot spot. The temperature dropped to 3150C in five minutes.

0515 Fire test: #2 is 10 inches (bar was hot 10 inches

from the bottom and glows for four inches). Number 7 has 6 inches of ash.

- 0530 Closed the steam saturation valve on manual 5%. Checked the number 3 hole and found it was starting to glow again. Poke the fire-the bed seems spongy so raked the coal again. Coal weight 10.30. Put 1.58 in the gasifier and coaled up again to 12.81.
- 0540 Offtake temperature: 306°C
- 0600 Fire test: Ash Average is 14.7 inches. The ash bed is getting a little more even. Increased the grate drive to 7/2.00 hoping to improve #3.
- 0635 Opened the gas control valve from 60% to 70%. This dropped the gas supply pressure to 2.4 in WC from 3.1 in WC
- 0640 Offtake temperature: 340 °C. Number 2 hole is glowing. Poked and raked. Ash bed felt crusty. Temperature 309°C. Dump ash: 400 pounds
- 0700 Offtake temperature: 345°C. Glowing between 2 & 3. Poked and raked.
- 0730 Saturation temperature 62°C at 1500 cfm. Checked for glowing and saw none.
- 0745 Increased the saturation temperature from 62°C to 64°C at 1500 cfm.
- 0800 Fire test: Ash average is 16.8 (Numbers 4 & 5 are 20 inches). Increased the stroke to 8/2.00. There are no noticeable hot spots and the bed poked easily.
- 0900 Dumped ash: 800 pounds. NO large chunks but the ash was wetter. Tightened the bolts on the shaker motor-larger bolts are needed.
- 0905 Increased the saturation air flow to 1550 cfm and upped the grate speed to 8/2.50. Will increase saturation air flow 50 cfm every half hour per plan.
- 0930 Increased the saturation air flow to 1600 cfm. Fire loss pressure is at 18.0 in WC
- 0950 The induced draft fan belt is slipping and making noise. Adjusted it.
- 1000 Fire test: Ash average is 18.4 inches. Bar number 4 was a little hard going in. Increased the grate speed to 8/4.50. Increased the saturation air flow to 1650 cfm. Opened the throttle on the gas valve

- to 75% reducing the offtake pressure to 2.5 in WC
- 1015 Fire loss pressure is still at 20 to 21 in WC.
- 1020 Fire loss pressure started coming down to 18.0 in WC
- 1030 Increased the saturation air flow to 1700 cfm.
- 1045 Fire loss pressure rapidly increased after increasing the saturation air flow (23.0" in WC). The ash pit pressure is at 25.8 in WC.
- 1100 Holding the load at 1700 cfm until the 1200 fire test. Reduced the secondary air flow to 900 cfm bringing the ashpit and fire loss pressures down. Dump ash: 1048 pounds.
- 1130 Dump cyclone: noticed more fine silt. No chunks to speak of as the load increases.
- 1200 Fire test: Ash average is 19.8 inches. (However, number 2 is 45 inches). Numbers 2, 5 & 6 are red on top. No channeling when checked the holes after the fire test. The bars went in easily. Leaving the load and grate speed at 1700 cfm and 8/4.50. Strip chart spike time noted when number 2 hole pulled. See fire loss and off take spikes. Started coaling up: 2.54 tons.
- 1220 Recheck all holes for channeling (numbers 2 & 3 are glowing. Will not poke and rake as do not want to disturb the bed.
- 1300 Dump ash: 1075 pounds. Chunks are noticeably larger and the ash appears drier. Rechecked all holes and noticed no glowing.
- 1315 Cannot maintain 640C, tends toward 630C at 100% open. Stop coaling up at 11.91 tons - will top off after 1430 feed.
- 1330 Using 1.95 to 1.97 tons per hour since things have been steady at 1700 cfm and 640C.
- 1345 Made a change in the water jacket from 8 gallons to 5 gallons. The steam valve is still at 100% after 10 minutes.
- 1400 Fire test: Ash average is 18.7 inches. (number 2-29 inches and 4-27 inches) No burning through this time.
- 1410 Increase the saturation air flow to 1750 at 640C

1415 Increase grate stroke to 9 teeth at 4.50

1430 Coaling up at 8.05 tons. Jogged the gas control valve to 85% to bring down the offtake pressure to 2.5 in WC. from 3.3 in WC

1440 Notice burning through in #5 & #6 holes.

1445 Number 5 and 6 holes are now glowing. The offtake pressure is coming down.

1450 Finished coaling up at 11.72 tons.

1500 Rechecked numbers 5 & 6 and the glowing had stopped. Dump ash: 1150 pounds. Chunks of coal not being consumed: about 1" in diameter.

1510 Checked numbers 5 & 6 again. They are glowing once more, but the offtake temperature is not unusually high (3800C) Watching for it to top 4000C.

1540 Trim the saturation air flow so it peaks at 1750 cfm

1550 Turned the electronic damping on F-701 transmitter to maximum.

1600 Fire test: 15.6 inches. Numbers 4 & 6 are glowing. Bars are going in easily. Numbers 3 & 5 are over 20 inches.

1630 Coal up 2.14 tons

1700 Dump ash: 1214 pounds

1730 Cyclone dump valve would not close. After flushing the cyclone, we released a large amount of floating particulate. Had to loosen the packing nuts to get it closed. We have a small CO leak there.

1800 Fire test: Ash average 11 inches. Slowing the grate to 9/4.00 from 9/4.52

1900 Dump ash: 1240 pounds

2000 Fire test: Ash average is 12 inches. Good fire test with no clinkering and the bed is even.

2130 Dump ash: 1465 Had trouble closing the cyclone again. Found a lot of particulate.

2200 Fire test: Bed is very even with no clinkering or burning through. The bars went in well. The ash average is 12.4 inches.

2230 Dump ash: 1170 pounds

2335 Dumped the cyclone - large amount of fine particulate both floating and on the bottom. The valve is sticking going both ways. Dumped the cyclone hopper

2340 Dump ash: weight 840 pounds. Large amount of ash the size of softballs, but not hard. Ash is white in color.

2345 CO₂ on chart R-3 been going up scale from the start of the shift.

04/21/83

0000 Fire test: Ash average 8.2 inches. Starting to get clinkers. Had to pound number 7 bar in the last 24 inches. Number 6 felt spongy. Straightened all the bars. Slowed the grate to 9/2.50

0025 Made a manual change in the steam saturation (closed the valve 2% and put it back on automatic).

0035 Offtake temperature: 2950C

0100 Dump cyclone-particulate fine. The valve is sticking. Dump ash: 700 pounds. Flushed the upper cone. There were some large chunks of ash, but more fine this time.

0110 Offtake temperature rose to 3250C at 0055, but is down to 2950C now. Checked numbers 2, 3 & 5 and found no glowing.

0130 Made the rounds outside-the belts are squealing on the induced draft fan.

0200 Fire test: Ash average is 11 inches. The bars went in well. Left them in for 2 minutes. Number 7 was a cold bar.

0205 Saturation is starting to oscillate, but on manual control.

0235 Coaling up: weight 3.80 tons.

0315 Coal weight 12.15 tons

0320 Dump ash: weight 891 pounds.

0325 Put steam saturation back on automatic. Dumped the cyclone, found lots of particulate.

0400 Fire test: ash average 9.2 inches. The bed feels

- good and even. Slowed the grate to 9/2.00
- 0415 Made the rounds outside and everything sounds in good shape. Noticed the cleanout hole for the combustor has a positive pressure-blowing gas out.
- 0450 Dumped the cyclone.
- 0525 Coal up: weight 12.93 tons
- 0530 Dump ash: weight 876 pounds. The ash came out in chunks one to three inches in diameter. Flushed the upper cone.
- 0545 Coal up : weight 13.60 tons
- 0600 Fire test: ash average is 11.0 inches. The bed feels good and the ash depth is fairly even.
- 0630 Dumped the cyclone-the valve opened and closed satisfactorily. There is a large amount of fine particulate.
- 0645 Dump ash: weight 500 pounds
- 0730 Saturation air flow is 1750 cfm at 640C with the grate at 9/2.00. Dumped the cyclone, found hardly anything on the bottom.
- 0800 Fire test: Ash average is 13.5 inches. The bars are going down easily, but number 5 comes up dirty. There are multiple fire zones at 6 and 15 inches. Number 2 is high at 25 inches. Increase the grate speed to 9/2.50
- 0900 Dump ash: 970 pounds. Flushed with the upper nozzles 10 gallons each. The particulate is light colored, with some 3-4 inches in diameter.
- 0930 Close gas control valve slightly 85 to 78% bringing offtake pressure to 2.5 in WC. Thermocouple T-703A was replaced, see temperature change from 260C to 530C on jacket air exhaust. Previous readings from test start were in error as a type K thermocouple was being read as a type T thermocouple.
- 0945 Checked the downcomer trap. Noticed 3" of powdery tar with a half pint of liquid above the crust.
- 1000 Fire test: Ash average is 11.4 inches. No multiple zones. Bars number 1, 2 & 5 are hitting crust 9 to 10 inches from the bottom. Number 6 is low at 4 inches. The bars were white at 2.5 minutes. Will be changing from the 3/4 inch to the 1/2 inch screen at 1230. Replaced the bolts on the shaker motor

mount.

- 1030 Cyclone particulate continues to be silty with a few chunks.
- 1100 Dump ash: 764 pounds. It looks about the same as before, but the centers of the chunks are dark with the outer edges being charred and white.
- 1140 Made the rounds outside and found no unusual noises. Al seems to be running smoothly.
- 1145 Dump the cyclone
- 1200 Fire test: 13.7 inches ash average. Number 5 had a slight crust, and number 1 is hot. No multiple zones since 0800. Leaving the grate alone. Number 2 was over 20 inches again.
- 1230 Took 800 pounds less coal this feed. Cycled the valves twice. Both chutes to the retort are choked full. The upper bin is empty. Cyclone dump: The floating debris is silver in color instead of black silt.
- 1255 Start coaling up at .69 tons.
- 1300 Dump ash at 920 pounds. Flushed with the upper nozzles.
- 1330 Stopped coaling up at 5.11 tons. Feed coal hit 2.10 tons. Averaging out last two feeds at 1.8 tons. Start coaling back up at 3.01 tons.
- 1400 Fire test: Ash average is 13.0 inches. Number 3 was a dirty bar; not with a distinct double zone. Number 5 was crusty 10 inches from the bottom. Number 2 is high again at 26 inches. All but number 5 went in easily. No change was necessary on the grate speed.
- 1420 Stopped coaling up at 12.19 tons on the 3/4 inch screen. Start the screen change over from 3/4 inch to 1/2 inch screen.
- 1430 Start feed on last 12 tons of coal at 3/4 inch. Dump the cyclone: same type of particulate.
- 1500 Dump ash: 1064 pounds. Some large (8 inch in diameter) chunks.
- 1600 Fire test: Ash average is 14.8 inches. There is a little crust on number 1.
- 1700 Dump ash: There was a small amount of clinkers.

- 1800 Fire test: The bars went in easily with no clinkering. The ash average is 14.2. The bed appears to be fairly even with no crust.
- 1900 Dump ash.
- 2000 Fire test: Ash average is 16.8 inches. The bars went in well with no clinkering. Bar number 4 was high at 30 inches.
- 2030 Finish loading 3/4 inch coal into the lower bin. Start loading 1/2 inch coal into the upper bin.
- 2130 Scrubber pump stopped pumping to the upper spray nozzles. The scrubber exhaust temperature was 179°C. Turned on the manual spray and switched the pumps. Now getting 7.5 pounds pressure to the spray nozzles. The first pump was still running but not pumping.
- 2140 Scrubber exhaust is 83°C and is running stable.
- 2145 Loaded 3.45 tons of 1/2 inch coal into the lower bin. The north leg was empty. The offtake is starting to climb.
- 2150 Dropped the load to 1000 cfm. The saturation temperature is 64°C.
- 2200 Fire test: The bars went in well with no burning through.
- 2335 Closed the gas control valve 20% to maintain 2.4 in WC. It was reading 0.2 in WC.
- 2345 Dump ash: weight 950 pounds. Ash is mostly 1 inch size with a few 2-3 inches. Some raw coal is coming through. Dumped the cyclone-the valve is working o.k. Very small amount of fine particulate. Dumped hopper. CO₂ indicator is jumping around on chart R-3.

04/22/83

- 0005 Fire test: Ash average is 7.7. Bars went in well. Number 3 is a cold bar and ash was hot on the tip of Number 7. Slowed the grate drive to 8/2.00
- 0010 CO₂ Indicator on chart R-3 seems to be working alright.
- 0035 Trouble with the sample buckets-both ash numbers and coal shift buckets.

- 0110 Made the rounds outside to check the scrubber pumps. Noticed all the pumps were running, closed the valve on number 1 pump and it stopped. Went back up to the control room to check the number 1 pump relay. It was energized. Checked the voltatge across it and it blew up. The meter was on proper voltage and range. It blew the main breaker in the transformer cage. We had to flood the cyclone and vent out the roof. The burner on the roof would not light. It must be on the same circuit as the scrubber pumps, combustor fans, saturation fan, and grate drive. Went down to reset the breaker in the transformer pannel-had trouble finding which breaker. After resesting the breaker, the roof vent burner lit and the cyclone dumped. Reflooded the cyclone, started the saturation fan at 150 cfm. Started combustor fans and combustion burner.
- 0130 Drained the cyclone and closed the vent valve. Gas is going downstream to the combustor. Saturation air flow is 150 cfm. Slowed the grate drive to 8/1.50
- 0140 Saturation air flow is 200 cfm
- 0200 Saturation air flow is 300 cfm
- 0210 Saturation air flow is 400 cfm
- 0220 Saturation air flow is 600 cfm
- 0230 Saturation air flow is 800 cfm
- 0240 Saturation air flow is back up to 1000 cfm
- 0300 Dump ash: 769 pounds. Ash came out in various sized chunks (from fine to 6 inches in diameter). Flushed the upper cone.
- 0345 Dumped the cyclone: very little particulate.
- 0350 Closed the gas control valve to increasee the gas supply pressure from 1.7 to 2.4 in WC.
- 0400 Fire test: Ash average is 8.2 inches. The bars are going in well. Number 7 is a cold bar. Ash average is not increasing, changed the grate drive to 7/1.50 from 8/1.50
- 0435 Started coaling up: weight 2.39 tons. Coalup weight is 13.15 tons.
- 0500 Fire test: Ash is not increasing on numbers 3 & 6. (3-8" & 6-6") Slowed the grate to 6/1.50

0515 Dumped ash:482 pounds.

0535 Put the steam saturation control on manual-the valve was occilating 63-65.

0600 Fire test: Ash average is 6.4 inches. The bars went in well. Number 7 was a cold bar. The bed is fairly even, but the ash average is going down. Slowed the grate to 5/1.50.

0610 Saturation control is on automatic with the jacket at 7 gpm up from 5 gpm at 640C.

0615 Slowed the grate drive to 4/1.50 in order to build up ash.

0635 Dumped the cyclone: very little particulate. The valve is working well.

0645 Dump ash-weight is 356 pounds. Ash is mostly fines and liquid. Having the Bureau of Mines look at the Hyster-trouble with forward and reverse lever on the steering column.

0730 Saturation air flow is 1000 cfm at 640C with the grate drive at 4/1.50. Remove the number 1 scrubber pump and motor for overhaul. Cyclone dump: very little particulate (top or bottom).

0800 Fire test: Ash average is 10.1 inches. The bed appears very even and the bars are going in easily. Leaving the grate at 4/1.50.

0805 Increased the saturation air flow to 1050 cfm but staying at 640C. Will increase in 50 cfm increments every 1/2 hour until we reach 1400 cfm, per plan.

0830 Increase the saturation air flow to 1100 cfm.

0900 Increase the saturation air flow to 1150 cfm. Ash is at 364 pounds. Will dump and sample at 1100.

0930 Increased the saturation air flow to 1200 cfm.

0940 Opened the gas control valve to 60% to bring down P-705 gas offtake pressure 3.5 to 2.5 in WC

1000 Up load to 1250 cfm. Fire test: Ash average is 12.1" The bars are going down easily and the bed is level all around. # 7 is more accurate this time as it hits the top of the cone. Numbers 1 & 6 were cold bars.

1020 Check and sample the downcomer. Two inches of rock hard carbon, two inches of thick tar and then

liquid tar and moisture.

- 1030 Increase the load by 50 cfm to 1300 cfm. Tightened the hystor linkage brace. Mid point adjusted-works fine now.
- 1100 Increased load 50 cfm to 1350 cfm. Rodded combustion burner. It semed clean. Dump and sample ash: 630 pounds. Used the upper nozzles to flush the cone. The particulate is much smaller. The ash is quite wet.
- 1130 Increased the saturation air flow to 1400 cfm. The CO monitor was on for 7 minutes after the 1130 coal feed. Vent fan is working, but the ducts are vibrating apart-retaped the seams.
- 1140 Made the rounds outside and found all to be well.
- 1200 Hold at 1400 cfm. Fire test: Ash average is 15.4 inches. Bars number 1 & 6 are still cold after 3-4 minutes. Crust is evident 6-8 inches from the bottom on numbers 2 & 4. The others poked easily. Increased the grate to 6/1.00. Fire loss continues to rise steadily. Reposition gas control to 60% to bring the offtake pressure to 2.5 in WC.
- 1230 Dumped the cyclone. Nothing on the bottom but much more floating dust.
- 1300 Increase the saturation air flow to 1450 cfm.
- 1320 Start coaling up: 5.8 tons. Noticed a large hole on the top of the induced draft fan pipe near the scrubber. It is on the suction side of the induced draft fan.
- 1330 Increase the saturation air flow to 1500 cfm (from 1450) at 640C. Trying to reach a maximum load for 1/2 inch screen. Dumped the cyclone and noticed small white particles floating.
- 1350 Opened gas control valve to 87% to bring the offtake to 2.5 in WC. Stopped coaling up at 11.9 tons. The pH is at 3.5 - changed the barrel of caustic.
- 1400 Fire test: Ash average is 21.2. The bars are going in easily with no clinkers. Increase the grate to 6/3.38. Stroke limiter bent back.
- 1430 Working on the grate to increase the teeth to 8 -it stopped and started twice.
- 1431 Dumped the cyclone: silvery stuff floating - no

chunks.

1450 Grate is now set at 8/3.38.

1455 Dumped the ash: 950 pounds. One clinker about 6 inches around, but most of the ash is of uniform size (1-1 1/2"). Used the upper nozzles and got much fine ash. (texture was that of powdered cement.)

1500 Caustic rate from 2- to 25. pH is at 5.0

1525 Dropped the load to 1475 cfm.

1600 Fire test: The bars went in well with no crust. The number 3 bar was high at 26 inches.

1700 Dump ash: 988 pounds.

1800 Fire test: Ash average is 14.8 inches. We had a spike before the fire test and it started to burn through. We raked it. This stopped the channeling on #6. The bed was loose and the bars went in easily. Number 2 hole was high.

2000 Fire test ash average is 17.8 inches. Increased the grate to 8/3.75. Holes 1, 2 & 5 were over 20 inches.

2200 Fire test: Ash average is 15.7. The bed is very even. Number 4 was the high bar at 19 inches. The bars went in easily with no clinkering.

2330 Dumped the cyclone: Mostly fine particles with just a few chunks floating. Raked the tank twice to clean the bottom, very little on top.

04/23/83

0010 Fire test: 19.1 Ash average. The bars are going in loosely. Holes number 2, 3 & 6 show coal glowing on top. Number 2 has 31 inches of ash and number 4 has 25 inches of ash. Increased the grate speed to 8/4.25. The motor and gear box are really humming.

0035 Increased the saturation air flow to 1475 slightly. Dumped the cyclone and found the particulate to be the same as the last dump.

0100 Dumped ash: No clinkers, but it looks like half the ash is unburned coal. Ash is mostly black in color. Holes number 5 & 6 are glowing. Number 6 was a dirty bar.

0115 Made the rounds outside. The induced draft fan belt squeels. Checked the amps (107). Opened number 1

tank and bled the valve. Noticed soft tar in 24 inch inlet to the combustion burner. It appeared to be about 8 inches thick on the bottom.

- 0120 Checked number 3 (14 inches of ash) and number 1 (17 inches of ash).
- 0145 Decreased the saturation air flow to 1400 cfm. Burning through on numbers 5 & 6. CO₂ increasing on chart R-3. Poked and raked numbers 5 & 6. The offtake temperature is 420°C.
- 0200 Fire test: Ash average is 19.7 inches. Burning through on numbers 5 & 6. Number 3 showed 35 inches of ash. Number 4 had 24 inches. The bars are loose. Changed the grate speed to 10/3.50. Adjustor got bent while changing from 8 to 10 teeth.
- 0245 Burning through on number 6. Poked and raked. Number 2 was glowing. Straightened the skip plate on the grate drive.
- 0300 Dump ash: 675 pounds. Some clinkers approximately 3 inches in diameter. There appears to be a large amount of 1" diameter coal in the ash.
- 0315 Burning through against the sidewall in the #6 hole. Number 2 has a glow and is also getting close to the sidewall. The offtake temperature is 348°C.
- 0400 Fire test: Ash average is 18.5 inches. The bars are going in loosely. Channeling in number 6 and glowing in numbers 2 & 5. Number 2 is 28 inches and number 3 is 29 inches. Number 6 was a dirty bar. Increased the grate speed to 10/4.00. The offtake temperature is 335-345°C.
- 0410 Made the rounds outside. Conveyor carriage roller shaft broke - need new shaft and spacer.
- 0435 Dumped the cyclone. Particulate is mostly gray in color and about 2 inches thick floating on top of the water.
- 0440 Number 6 is channeling through slightly. Number 3 is glowing. The offtake temperature is 325°C.
- 0445 Dump ash: small clinkers 1-3 inches in diameter. Flushed the upper cone and large amounts of fine ash came out.
- 0500 Number 6 is channeling through. Lowered the saturation air flow to 1300. The offtake temperature is 442°C. Poked and raked number 6.

0510 Coal bin weight 11.45 tons. The offtake temperature is 2730C.

0545 Number 3 is burning through. Poked and raked number 6. It looks good.

0600 Fire test: Ash average is 14.1 inches. Number two shows evidence of crust 24 inches from the bottom. The bed is fairly even. Number 2 has 23 inches of ash. Slowed the grate to 10/3.50 with ash at 14 inches and saturation air flow at 1300 cfm.

0605 Put the saturation steam on manual and closed the valve 10%, then put it back on automatic.

0620 Closed the gas control valve to increase the gas supply pressure from 1.7 to 2.2 in WC (20% closed).

0630 Dumped the cyclone: Particulate is fine and gray in color. The particulate floating on top of the water about 2 inches thick. Number 6 is starting to channel through next to the sidewall. Number 2 is glowing.

0640 Closed the saturation steam valve on manual 10%, and then returned it to automatic.

0645 Dump ash: 960 pounds

0730 Saturation air flow is at 1300 cfm at 640C with the grate at 10/3.50.

0745 Start the changeover from 1/2" to 1/4" shaker screen.

0800 Fire test: Ash average is 12.4". No channeling. Number 2 is still high at 24 inches. The bars went in easily. Flashing on number 3 bar.

0820 Dumped ash: 1030 pounds. Many small chunks that appear not to have burned at all.

0830 Coal up: 1.59 tons with the saturation temperature at 640C and the saturation air flow at 1300 cfm.

0930 Cyclone dump: Again much fine, silty material-light in color.

0945 Having electrical problems with the conveyor plug in. Replaced the entire wire.

1000 Fire test: 12.0 inch ash average. The bed is evening out all around. Bars are going in smoothly. No hot bars but number 1 is still cold at 3 minutes. Leaving the grate as is (10/3.50). Number 7

shows 21 inches.

- 1020 Checked the downcomer trap and finished troubleshooting the conveyor wire. The downcomer had 6 inches of packed tar on the bottom. It took 15 minutes to chisel it clean. Suggest this be done twice a day so there is not much build up on the walls. Too much time in gas if the wind is blowing right.
- 1030 Dump ash: 1075 pounds. Lots of fine ash and charred 2 inch chunks. Dumped the cyclone: noticed a lot of floating particulate. Some of the lumps are harder than usual. Took a sample off the bottom. (Silvery in color and heavy)
- 1120 Turned the grate drive off to check the new stroke limiter.
- 1130 Feed the last of the 1/2" fraction from the upper bin. Drops 1.33 tons from 1.65 tons leaving .32 tons tare weight. Turned the grate drive back on, but am leaving it at 10/3.50 until we start feeding 1/4" coal. The offtake temperature is 257°C.
- 1200 Fire test: 10.8 inch ash average. Noted that numbers 5 & 6 bent 300 at the fire zone. Bars are sticky going in. The bed is very even. Slowed the grate to 1.50
- 1210 Start coaling up with 1/4" at .32 tons.
- 1232 Offtake is rising from 240°C
- 1245 Finished coaling up: 12.8 tons of 1/4". The legs are still full. The offtake temperature is 265°C. Cycling the lower bin valves to empty them out.
- 1300 Dump ash: 1050 pounds
- 1307 The offtake temperature is up to 300°C. There is still much 1/2 inch fraction in the lower bin.
- 1330 There is still 1/2 inch fraction in the bin.
- 1400 Fire test: No problems. The bars went in easily.
- 1415 Continued cycling from the lower bin into the gasifier.
- 1430 The offtake temperature is 326°C The north leg is emptying out. Loading the first of the 1/4" X 2 1/2" coal into the lower bin (5 tons). Dropped the saturation air flow to 600 cfm at 64°C. Set the grate at 4/3.00

1450 Closed the gas control valve to about 50% bring the gas pressure back to 2.5 in WC.

1500 Dump ash: 585 pounds.

1600 Fire test: Ash average is 7.9 inches. Dropped the grate speed to 4/2.00. The bars are going in easily, with no clinkering or crust.

1700 Dump ash: 669 pounds

1800 Fire test: Ash average is 7.5 inches. The number 7 bar was 0. Slowed the grate to 4/1.05

1900 Dump ash: 817 pounds

2000 Fire test: Ash average is 9.5 inches. It is starting to come up. The bars went in easily.

2200 Fire test: Ash average is 9.7 inches. Slowing the grate to 2 teeth.

2330 Dumped the cyclone: Found very little particulate.

04/24/83

0000 Fire test: 72 inch ash average. The bed feels loose. Slowed the grate to 1/1.05

0035 Closed the gas control valve 5% to maintain 2.4 in WC gas supply pressure.

0200 Fire test: 9.4 inches. Leaving the bars in for 4 minutes. The bed seems loose, and the ash even.

0345 Slowed the caustic pump to 10-25

0400 Fire test: Ash average is 11.0 inches. Numbers 4 & 6 are cold bars. The bed feels loose. Number 2 is 20 inches ash.

0430 Dumped the cyclone: very little ash.

0500 Grate speed up to 1/1.50

0535 Started coaling up: 8.5 tons

0550 Coal weight: 12.39

0600 Fire test: Ash average is 12.7 inches. Number 2 is high at 23 inches. Number 3 is spongy. Increased the grate to 1/2.00

0630 Dumped the cyclone: Very little particulate. Have

not dumped ash yet this shift. Induced draft fan is showing 110 amps

0730 Saturation air flow is at 600 cfm at 640C with the grate being maintained at 1/2.00. Feeding 0.6 tons of coal. Dumped the cyclone: hardly any particulate. Only slight surface scum resembling gold dust.

0800 Fire test: Ash average is 13.4 inches. Number 1 is still cold after 4 minutes. At 600 cfm, decided to leave bars in a good 5 minutes to get a decent incandescent range. The bed is even and the bars are going in easily. Change the grate to 2/2.25. Increased the saturation air flow to 650 cfm at 640C. Will increase the saturation air flow by 50 cfm every half hour until it reaches 800 cfm.

0830 Dumped the cyclone: the surface particulate is the same. There are some small chunks on the bottom. Increased the saturation air flow to 700 cfm.

0850 Checked the downcomer: It was easier to clean out this time (only three inches of packed tar). Lower the load hoping to create less condensation and build up. It took only 5 minutes compared to 15 minutes last time at the higher load level.

0900 Increased the load to 750 cfm. Dump ash: 515 pounds. Found chunks 4-5 inches in diameter. Used the upper nozzles to flush. There appear to be lots not burned through.

0930 Increased the saturation air flow to 800 cfm. Opened the gas control valve to 47%. The offtake pressure is down to 2.5 in WC

1000 Fire test: Ash average is 18.5 inches. The bed was very loose. Numbers 1 & 2 were still cold after 4-4 1/2 minutes. Increase the grate to 6/2.50

1130 Dump the cyclone: Hardly any particulate. Start welding thermocouples to coal legs above the gasifier.

1200 Fire test: 15.1 inches ash average. The bed is crusting up on numbers 2 & 5. Still not getting a hot zone until 4-5 minutes on numbers 1 & 6. Numbers 2 & 5 were over 20 inches. Leaving the grate at 6/2.75

1230 Feed coal is approaching 1 ton at 800 cfm.

1300 Start coaling up at 6.33 tons. Dumped ash: 670 pounds.

1320 Stopped coaling up at 12.92 tons.

1400 Fire test: Ash average is 14.1 inches. The bed is getting loose again. There is a minor crust on number 5. Number 2 is still high. Increase the grate speed to 6/3.25

1600 Fire test: Ash average is 12.2 inches. No clinkering and the bars went in easily in this loose bed.

1700 Dump ash: 1232 pounds.

1800 Fire test: Ash average is 14.1 inches. The bars went in easily with no clinkering.

2000 Dropped the saturation air temperature to 600C. Fire test: Ash average is 13.2 inches. There was a little crust on number 3. The bed was even with no high bars.

2015 Start loading coal.

2045 Finish loading coal

2100 Dump ash: 864 poundsd

2115 It took 10 buckets full to fill load 8.04 tons of coal. We had 2.5 buckets full of fines.

2200 Fire test: Ash average is 12.5 inches. The bars went in well with no crust. No clinkering or high bars.

2245 Dump ash: weight is 640 pounds. Mostly fine particulate with a few clinkers. Flushed the upper cone. 400 pounds of ash came out (fine in texture).

2300 Made the rounds outside - everything is running normally

04/25/83

0000 Fire test: Bars are going in easily and the bed seems even. Slowed the grate down to 6/2.75.

0130 Dumped the cyclone: very little particulate (brown in color and floating on top.

0200 Fire test: Ash average is 10.8. The bars went in loose, the eash is even. Slowed the grate to 6/2.00 to bring the ash average up to 13 inches.

0300 Dumped ash: 745 pounds. Mostly fine ash with some clinkers from 1-3 inches in diameter.

0400 Fire test: Ash average is 10.7 inches. The bars went in loose and number 7 was 0. Slowed the grate to

6/1.50.

0440 Started coaling up: 5.63 tons

0515 Increased the saturation temperature to 620C in preparation for increasing the load.

0520 Finished coaling up: 13.17 tons

0530 Increased the saturation air flow to 850 cfm.

0535 Dumped ash: 438 pounds. Flushed the upper cone.

0600 Fire test: 13.4 Ash average. Number 7 was 6 inches and a cold bar. The bars are going in easily. The bed is loose and even. Increased the grate to 6/2.50.

0630 Increased the saturation air flow to 900 cfm. The saturation temperature is still at 620C. Will continue to increase the saturation air flow until it reaches 1000 cfm. Dump the cyclone: very little particulate found. Some surface sludge-black and gold in color.

0640 Made the rounds outside. Everything is o.k. The hole in the induced draft fan pipe is now about 18 inches in diameter.

0730 Increased the saturation air flow to 950 cfm. The coal feed is nearing one ton at 950 cfm. Opened the gas control valve 10% to 55% to keep the gas offtake pressure at 2.5 in WC

0800 Fire test: Ash average is 13.1 inches. The bars are going in smoothly. They are hot at 3.5 minutes. Number 7 is low-only the tip is black. Number 5 is 20 inches. Leaving the grate as is at 6/2.50

0815 Can now read T-714. The coal leg temperature is at 310C.

0830 Increase the saturation air flow to 1000 cfm at 620C. Hold at this level per plan. Now using coal at a rate of 1.05 tons. The coal indicator wire is loose. Tonnage fluctuates .3 ton. Reset connections. Tonnage is suspect at the 0830 coal feed. Dump cyclone: particulate is about the same. Small chunks and light surface silt.

0900 Dump ash: 544 pounds. Noticed the ash is much finer with no big chunks. Used the upper nozzles 10 gallons each.

0915 Check and sample the downcomer trap. Found 3-4 inches of packed tar, chunks and distillate.

0930 Increase the saturation air flow to 1050 cfm. Open

the gas control valve to maintain the gas offtake pressure at 2.5 in WC. It is now 48% open.

1000 Fire test: Ash average is 13.3 inches. The bed is even and loose. Number 5 is still at 21 inches. Increase the grate speed to 6/2.75.

1140 The grate drive quit. It was down for approximately 10 minutes. (Reverse input wires) Set grate at 6/3.50 to kick out build up.

1200 Fire test: 17.3 inches ash average. Rods went in easily. No hot spots. Some crust on the number 1 hole. Leaving the grate at 6/3.50. Number 7 shows very high at 19 inches, but only one fire zone.

1310 Begin coaling up at 5.05 tons. Dump ash at 685 pounds, packed tightly in cone. Flushed with the upper nozzles. Noticed larger chunks and fine upper ash.

1330 Increased the saturation air flow to 1150 cfm. Maintaining for one hour.

1340 Finish coaling up at 12.11 tons. Fed coal and added one more scoop for top off at 11.60.

1400 Fire test: Ash average is 19.3 inches. The bed is fairly even. Number 1 hits small clinker. Number 7 is still high. There are 3 holes over 20 inches. Increase the grate to 9/4.00

1445 Increased the load to 1200 cfm.

1505 The crank arm broke on the grate drive assembly. The unit is being welded and realigned. If this is accomplished with in a half hour, we may not have to reduce the load.

1535 We are back on line.

1600 Fire test: Ash average is 21 inches. The bed felt spongy.

1800 Fire test: Ash average is 20.0 inches with no clinkering. Increased the grate speed to 9/4.50

1818 Increased the load to 1250 cfm

1900 Dump ash: 1202 pounds

1930 Increased the load to 1300 cfm

2000 Fire test: Ash average is 21.2 inches. The bars went in easily with no clinkerinig.

2130 Decreased the load to 1275 cfm as we are burning through.

2300 Dumped the cyclone: the particulate is charcoal in color. It is 2 inches thick floating on top of the water and 2-3 inches on the bottom.

2310 Dumped ash: weight 860 pounds. There were a few clinkers 3-4 inches in diameter. Flushed the upper cone with 30 gallons of water. Got 1026 pounds of fine ash and water.

04/26/83

0000 Fire test: Ash average is 11.5 inches. Number 2 is high with 23 inches. The bars are going in easily. Leaving them in 3 minutes. Slowed the grate to 9/3.75 to build up ash.

0035 Opened the gas control valve 5% to lower the gas supply pressure from 2.9 to 2.4 in WC. Dumped the cyclone: About 4 rakes full of particulate. Have not been burning through for the last 1 1/2 hour. Cyclone particulate has gone down.

0100 Dump ash: weight 970 pounds. Ash is 0-2 inches in size and light gray in color.

0110 Started coaling up: 6.73 tons.

0135 Saturation air flow is 1375 cfm . The control was on manual, but now is back on automatic at 1300 cfm.

0145 Made the rounds outside and everything seems to be running smoothly. Induced draft fan is at 112 amps.

0200 Fire test: Ash average is 7.8 inches. Number 7 is a cold bar. The bed feels loose. Slowed the grate down to 9/1.25

0300 Dump ash: weight 840 pounds. Dumped the cyclone and found a small amount of particulate.

0400 Fire test: Ash average is 10.7 inches. Number 4 is a dirty bar with 6 inches of ash. The bed is loose and fairly even. Increase the grate to 9/1.50

0430 Coal up: 7.46 tons to start

0500 Glowing between holes number 3 & 4. Nothing is indicated on the instruments. Dump ash: weight 495 pounds. Some clinkers 1-3 inches in size.

0600 Fire test: Ash average is 9.8 inches. Number 7 is a cold bar. Number 4 encountered crust. Slowed the grate

to 9/1.25

0630 Increase the saturation temperature to 640C and bump the saturation air flow up to 1350 cfm. Dump the cyclone and found much more particulate at higher loads on top than yesterday.

0650 Open the gas control valve to maintain offtake pressure at 2.5 in WC. The valve is at 72% open.

0700 Increase the load to 1400 cfm and maintain at 640C per plan. The offtake temperature is up to 3270C. Dump ash: 585 pounds. Flushed with the upper nozzles.

0800 Fire test: Ash average is 13.1 inches. Hit clinkers on numbers 4, 5 & 6. No multiple fire zones. Increased the grate speed to 9/1.75. Increase the saturation air flow to 1450 and hold.

0815 Offtake temperature 3360C. Open the gas control valve to 80% to maintain gas pressure.

0840 Cut back on the secondary air flow by 1000 cfm to allow the induced draft fan to maintain pressure. Noticed back pressure from the combustor.

0850 Check and sample the downcomer

0900 Increase the saturation air flow by 50 cfm to 1500 cfm at 640C. The offtake temperature is at 3240C. CO continues at 28%.

0915 Dump ash: 565 pounds.

0930 Feed coal hits 1.5 ton at the present load. Cyclone dump shows similar particulate. Just more of everything.

1000 Fire test: 14.6 inches. Number 4 - clinkers. Hitting the crust all the way around. Came up with a dirty bar on number 2. Increase the grate to 9/2.50. If stable at 1030 we will increase the load.

1030 Increase the saturation air flow to 1550 cfm. Noticed the saturation air flow has begun to flop around again after steadying for 3 hours.

1100 Increase the saturation air flow to 1600 cfm. The offtake temperature is at 3250C. Open the gas control valve 100% reducing the gas supply pressure to 2.5 in WC. Going to wait until after the 1200 fire test to increase the load again.

1105 Dump ash: 610 pounds. Noticed quite a few large clinkers (8-10 inches across)

1130 Hit 1.7 tons at 1600 cfm and 640C.

1140 Start coaling up at 2.8 tons.

1200 Fire test: 15.1 inches. Hit crust on numbers 2, 3, 4 & 5 about 8 inches up. No multiple zones this time. Number 2 was high at 28 inches. Waiting 2-3 minutes with the bars. Increase the grate to 9/4.20. Increased the saturation air flow to 1650 cfm. The offtake temperature is at 307°C.

1215 Finished coaling up at 13 tons.

1220 Fire loss is up - 19 inches. The offtake temperature is down to 289°C No break through yet. We will bump the load again at 1300 if things stay stable.

1300 Dump ash: 1056 pounds. More large clinkers.

1315 T-703 (saturation temp.) is jumping all over. Still no breakthrough.

1330 Increased the load to 1750 cfm. Drop coal.(just shy of 2 tons.)

1345 T-703 is still haywire. The strip charts are holding steady. The offtake temperature bottomed out at 280°C, and is now up over 300°C. The ash is already at 500 pounds.

1400 Fire test: 11.6 inches. Crust on numbers 2, 4 & 5. The bars are white at 2.5 minutes. There are no double zones. Slowing the grate to 9/3.50. Increasing the load to 1800 cfm. Increased the saturation temperature to 660C.

1410 The furnace pressure is low. Decreased the secondary air flow by 3000 cfm to 5000 cfm.

1435 Dump ash: 996 pounds.

1510 Increased the saturation air flow to 1850 cfm.

1545 We removed a large amount of particulate from the cyclone this dump.

1610 Slowed the grate speed to 9/3.00. The ash average is 8.8 inches on this fire test. The bars went in easily with no clinkering.

1615 Increased the saturation air flow to 1900 cfm.

1630 Dump ash: 1168 pounds.

1730 Increased the saturation air flow to 1950 cfm. Loaded coal.

1800 Fire test: 10.5 inches ash average. The bars went in easily with no clinkering.

1900 Dump ash: 1234 pounds.

2000 Fire test: wide incandescent zone. The bars went in easily.

2100 Dump ash: 1270 pounds.

2200 Fire test: Ash average is 11.8 inches. No clinkers or crust. The bars went in easily.

2230 Dump the cyclone: lots of particulate (2 inches floating and about 2 inches on the bottom-black in color)

2300 Dump ash: 938 pounds. Lots of clinkers 1-6 inches in size. Flushed the upper cone and got 760 pounds.

2110 Using 2.21 tons of coal per hour. The steam valve is 100% open. The saturation is dropping from 66 to 65.

04/27/83

0000 Fire test: Ash average is 14.8 inches. Left the bar in 2.5 minutes and they are plenty hot. The bed felt loose. Number 7 is a cold bar (8 inches). Number 2 has 27 inches of ash. Increased the grate speed 9/3.50. CO₂ monitor alarm has been going on after each coal up and stays on for 1 1/2 minutes

0030 Started coaling up: weight 4.42 tons. Stop at 13.67 tons.

0110 Inlet to the scrubber is glowing on top - turned the fresh water spray on half. Fire in the combustion burner coming all the way through to the peephole.

0115 Dump ash: weight 1106 pounds. A few small clinkers and fine ash. There appears to be some unburned coal in the ash.

0210 Fire test: 12.2 inches. Numbers 2 & 3 have a crust 18 inches from the bottom. The ash bed is even. The grate is at 10/3.25

0235 Made the rounds outside and everything sounds o.k. The induced draft fan is at 110 Amp.

0250 Dump ash: weight 1264 pounds. The clinkers are about 7 inches in diameter. Coaling up using the last of

the coal. Start weight is 9.45 tons and the finish is 10.13 tons.

0405 Dump ash: weight 1045 pounds. Flushed the upper cone.

0410 Fire test: Ash average is 12.2 inches. Number 7 reads 0. The ash bed appears even. Light crust before the fire zones. The grate is at 10/3.00.

0530 Dump ash: weight 960 pounds. Some clinkers are about 3-4 inches in diameter, but mostly 1 inch in diameter. Dumped the cyclone: The particulate is black and about 2 inches on the bottom and another 2 inches floating.

0600 Fire test: Ash average is 10.2 inches. There is a light crust. The bed is loose. Slowed the grate down to 10/2.50

0630 Cyclone dump: The slide valve won't close. There are large chunks of particulate hung up in the drain. It will close no more than one inch. Leaving the water on and the drain open. Will rake the top particulate every 20 minutes. Perhaps it will clean itself out as we drop to lower loads later on in the day.

0700 Dump ash: 1210 pounds. The cone had approximately 600 pounds of water and only half a hopper of ash. Did not have to pound the cone at all to loosen the ash.

0730 Dropped the last of the 2 1/2 x 1/4 inch fraction into the lower bin. Started coaling up with the fines (1/4" x 3/4") at 0.31 tons and stopped at 8.1 tons.

0800 Fire test: 12.7 inch average. Hit clinkers on numbers 2 & 6. The bars are hot at two minutes. No double zones showing.

0830 Cycle the lower bin. Slow the grate to 10/2.25

0850 South leg is emptying out. The offtake temperature is up to 355°C. Coal leg thermocouple shows 27°C to 28°C.

0855 T-714 is 29°C

0900 Drop the 1/4" x 3/4" fines (4.39 tons) Cycled the valves twice. Both legs emptied out before drop. T-714 hit 30°C. Dropped the saturation air flow to 600 cfm, and the saturation temperature to 62°C. Manually close to 18% open. Closed the gas control valve from 100% to 70% open to maintain 2.5 in WC offtake pressure. Increase the secondary combustion air from 5000 cfm to 9000 cfm. The furnace pressure is back to normal. The

induced draft fan can take over. Decreased the grate to 4/2.25.

0920 Close the gas control valve to 55% to bring gas supply pressure to 2.5 in WC.

0925 Make a slight adjustment to the saturation temperature as it had been above and below 620C after 25 minutes. Saturation temperature hit 700C for a short while. Had to increase the water jacket flow to 9 gpm. Saturation temperature finally evens out at 620C.

0930 Check and sample the downcomer. Found it to be caked 8 inches thick. Suggest taking the torch to it in the future rather than chipping at it for 15 minutes.

0950 Have a new strip chart pen for the saturation air flow. Now using the green pen as normal indicator was stuck at 1900 cfm. The green reads 60 cfm below set point.

1000 Fire test: The bed is very even (9-15 inches) The Ash average is 11.4 inches. Slowing the grate to 4/1.80. Numbers 4 & 6 were cold at 4 minutes. Started receiving 100 tons of Stahlman Stoker.

1030 Cyclone valve still will not close. We will continue to leave the water on and rake periodically. (Every 20-30 minutes)

1040 pH is running 8-9. Change the stroke from 45+ to 35.

1130 Cyclone valve still will not cycle. Hardly any floating particulate, but the bottom is getting thick. Start coaling up at 1.44 tons.

1200 Fire Test: 8.3 inch ash average. Two low bars (#2-2" and #7-0). Saw a strange fire zone on number 2. Would not quite call it a dirty bar, but it had two zones with a cooler spot in between-it was still red hot however. Adjusted the grate to 2/1.50.

1205 Finish coaling up at 12.28 tons.

1230 Cyclone still will not close more than one inch.

1300 Dump ash: 713 pounds. It is still very wet and it comes out very easily.

1330 Exercise the cyclone. Still sticky. Will not close. It appears to be a build up of tar. Will try to heat the cyclone collar tomorrow if it is still hung up.

1345 Put a plastic tarp over the fines pile in case of

rain. Conveyor belt grips are starting to loosen up on one side.

1400 Fire test: 12.0 inches Number 6 was still cold after 5 minutes. The bed is loose. Leaving the grate at 4/1.50

1600 Fire test: Ash average is 11.2 inches. The bars went in very easily. No clinkering. Bars number 5, 7 & 2 were cold.

1800 Fire test: Ash average is 11.0 inches. The bed is very even. We left the bars in for 3 minutes. Still bars 4, 6 & 7 were cold.

1900 Dump ash: 620 pounds

2000 Fire test: Ash average is 15.2 inches. Number 5 hole was high at 23 inches. The bars went in very easily with no clinkering.

2030 Started loading coal.

2200 Fire test: Ash average is 13.1 inches. The bars went in easily with no clinkering. Number 7 had a wide incandescent zone.

2230 Dumped the cyclone: The valve is stuck open. Very little particulate was evident. (One rake full on the bottom) Primed the caustic pump. no pH tape.

4/28/83

0000 Fire test: Ash average is 16.2 inches. Number 7 was a cold bar. The bed feels loose. Increased the grate to 2/2.75

0100 Dump ash: 546 pounds clinkers range from 1 to 3 inches in size and amount to about 30% of the ash.

0200 Fire test: Ash average is 11.5 inches. The bars are going in easily and the bed feels loose. Leaving the bars in for 4 minutes. The bed is even.

0335 Dumped the cyclone: small amount of particulate, mostly in the bottom of the tank.

0345 Coal up: 8.44 tons

0400 Finished coaling up: 13.44 tons

0450 Dump ash: 516 pounds. There were a few clinkers 6-8 inches in size. Flushed the upper cone.

0500 There is fire in holes 2, 3, 5 & 6. The offtake

temperature is starting to rise.

0520 Raised the saturation temperature to 64 C

0540 Started the agitator up for one sweep. (Count 005)

0545 Increased the saturation air flow to 650 cfm. The fire has stopped burning in all four holes.

0600 Fire test: Ash average is 11.2 inches. The bed feels loose and even.

0615 Increase the saturation air flow to 700 cfm. Rotate the agitator half a revolution as holes 2, 3, 5 & 6 were burning through.

0645 Increase the saturation air flow to 750 cfm. Raising the saturation air temperature to 66°C.

0700 Still burning through on numbers 2, 3, 5 & 6. Offtake temperature hits 330°C.

0715 Increase the load to 800 cfm.

0730 Checked the cyclone slide valve. It still will not close more than 1 1/2". Cycled the valve at high speed many times with no success. Flushed it with water and got little or no particulate.

0745 Raise the saturation air flow to 850 CFM. The offtake continues to climb and it is now 341°C.

0750 Number 2 continues to burn through somewhat and still see glowing on numbers 3, 5 & slightly on 6.

0800 Fire test: 14.3" average. Numbers 1 & 2 are quite high. Increase the grate speed to 2/2.80. Numbers 2 & 3 are still burning through.

0815 Increase the load to 900 cfm.

0820 Open the gas control valve to 25% to maintain offtake pressure at 2.5 inches.

0825 Using the torch to heat the tar build up in the cyclone valve in attempt to get it working properly.

0845 Increased the saturation air flow to 950 cfm at 66°C. The offtake is up to 362°C

0900 Changed the grate to 4/2.80

0910 Success in troubleshooting the cyclone valve after 45 minutes of applying heat and continued cycling of the valve. Noticed at least four inches of floating black

silt.

0915 Saturation air flow is now at 1000 cfm. The offtake temperature is up to 381°C. Started the agitator moving slowly at 5.0 sweeps/hour to bring the offtake temperature down.

0915 Dump ash: 442 pounds. Noticed many larger clumps.

0925 Having trouble maintaining 66°C. The steam valve is 100% open. Cut the water flow from 9 gpm to 7gpm through the water jacket.

0930 Cut the water flow to the jacket down to 6" as the saturation temperature is still no more than 65°C. The offtake temperature is down to 361°C.

0945 Check the poke holes. Number 2 is still burning through and numbers 3 & 6 are glowing. The agitator continues to run slowly at 5.0 sweeps/hour.

We are attempting to increase the load on this 1/4" X 3/4" sized coal. At the low load of 600 cfm, there was some burning on top of the bed (2, 3, 5 & 6). To allow a greater throughput, several things will be tried. The saturation temperature has been increased from 62°C to 66°C. With the fines fraction increased, the operation of the agitator may not be significant to producing bed deterioration as it would with the larger fraction coal. The attempt will be made to run either intermittently or at a very slow continuous speed.

1000 Fire test: 16.4" average. Number 3 is hot. Numbers 1 & 5 are cold. Channeling on number 7 from 12" to 24" fire zones. Agitator running. Increase the grate to 6/4.00. Numbers 2 & 3 still are burning through. Have some crust on numbers 4 & 6.

1020 Changed the agitator depth to 36" in an attempt to push more coal toward the outer edges, thus ending the channeling.

1030 Coal feed hits 1.08 tons. The cyclone is operating properly again. Dump ash: Some floating particulate and bottom buildup. Rechecked the holes. Number 2 has less burn through, but still has a bright glow through numbers 3 & 5. one on number 6.

1045 Check the downcomer. It is much less dense. Not as compact or as built up with tar. Saturation temperature is heading toward 67°C. Closed the steam valve from 94% to 60% leaving the water jacket flow at 6".

1100 Freeboard on all six outer holes shows 38.5" average. Burnthrough has ceased on all holes. The CO is

at 28% on the charts. The offtake temperature is at 320°C.

1200 Fire test: 18.8" average, but number 7 hole is suspect at 2". Possibly a dirty bar, but cold. Numbers 2 & 3 were still high and started burning through again. Number 4 was a dirty bar with two distinct fire zones at 16" & 22". Increase the grate to 8/4.75 in an attempt to lower ash. With 7 " on number 7 hole, the ash average should be two inches lower at 16.8". Freeboard on numbers 1-6 is at 38.6".

1230 Took another fire test on number 7 and it still shows 21 inches, with no double fire zone.

1240 Slowed the grate to 8/2.50 for 3 minutes to allow installation of the grate drive guard.

1243 Resume the grate speed at 8/4.80.

1300 Dump ash at 714 pounds. Flush with the upper nozzles. Hopefully this will loosen any clogging under the grate and reduce the overall ash average. Increase the gratae to 10/3.84 which will produce the same results as 8/4.80. Should save wear on the drive with the lower ratio.

1305 Start coaling up: 5.49 tons

1330 Stop coaling up at 12.85 tons. Conveyor puts up 700 pounds per minute.

1340 Notice no burn through on numbers 2 & 3. There is still a slight glow on number 5 and no glow on number 6.

1400 Fire test: 19.6 inches ash average. Number 3-dirty bar. There is a crust on number 1 about a foot up. Numbers 1, 2, 3 & 7 are very high. The grate is at 10/3.84.

1410 Lowered the saturation temperature to 64°C

1530 Dropped the saturation temperature to 62°C.

1555 The ash dump at 1300 appeared to be very wet and sticky. The sticky ash in combination with the high grate speed for this load indicates over saturation. A drop in saturation temperature should allow easier ash discharge through the grate and lower bed pressure drop. As expected, CO₂ dropped and CO rose on the reduction of saturation temperature.

1600 Fire test: Ash average: 19.5" average. The bars went in easily, but the bed felt a little sticky. Number 3 bar was high (33")

1612 Increased the grate speed to 10/4.00

1700 Dump ash: 682 pounds

1800 Fire test: Ash average 27.1 inches. The bars went in easily with no clinkering. Number 3 bar had a wide incandescent zone and was high at 34 inches. Number 6 was high at 39 inches. Number 7 was 26 inches.

1845 Flushed the upper grate to see if this would help the grate remove the ash better.

1945 Saw a stranger walking around the duck pond. He appeared to have a white Volkswagen bus. Federal protection was called to investigate.

2000 Fire test: Ash average is 22.4 inches. Number 1 had a dual zone. We poked it. Number 6 bar was high at 39 inches. Number 3 started to burn through so it was raked after the test was completed.

2030 The south coal leg open slide switch stopped working. Had to energize it by hand to open the slide.

2130 Dump ash: 656 pounds

2200 Fire test: Ash average is 24.4 inches. Number 1 bar is dirty. Number 3 bar is high at 40 inches. The bars went in easily with no clinkering.

2330 Number 3 hole is burning through. The slide gate is working alright now. T-703 (saturation air) is giving erratic readings.

04/29/83

0000 Fire test: Ash average is 17.5 inches. The bars are loose and the ash bed even. Numbers 2 & 3 are burning through. We poked and raked them to help alleviate this problem. Number 2 has a dirty bar. Increased the grate to 10/4.50

0015 Dump ash: 416 pounds. Flushed the upper cone. (fine ash and no clinkers)

0035 Dumped the cyclone and found a small amount of particulate.

0100 Number 3 is burning through. We poked and raked it.

0200 Fire test: ash average is 22.9 inches. Bed feels loose and even. Increased the grate to 10/5.00. Burning through on number 3. Sparklers going up about 12".

0240 Flushed the upper cone. 40 gallons of water was used. Ash weight was not gaining.

0245 Tightened the wire on the T-703 transmitter.

0300 Dump the cyclone: fair amount of particulate (floating-1 inch) (3 rake fulls on the bottom) Dump ash weight: 943 pounds. Ash is like fine cement powder.

0335 Started coaling up at 4.82 tons. Stopped coaling up at 13.52 tons

0345 Made the rounds outside and everything is o.k.

0350 Flushed the upper cone.

0400 Fire test: Ash average is 22.4 inches. Number 2 is high at 44 inches. Poked and raked number 2

0500 Number 2 had 30 inches of ash. Again we poked and raked it.

0515 Flushed the upper cone with 40 gallons of water. Lowered the saturation temperature to 60°C

0535 Lowered the saturation temperature to 58°C

0540 Dumped the cyclone: Large chunks of particulate and a large amount of fines. Flushed the upper cone twice and saturated the ash with water.

0600 Fire test: Ash average is 18.1 inches. The bed feels loose and even. Number 2 is down to 23 inches from 44 inches.

0630 Shut down the agitator to install height adjustment arm for BOM/FGT-004.

0730 Dump cyclone: Found 4 inches of dry silt and flat particulate from the cone walls 3" X 2". Dump ash: 633 pounds. No big chunks. Flushed with the upper nozzles and received much fine material. The grate underside is plugged up with a sticky substance.

0745 Rodded the combustor. Found solids and not liquid build up. Bearings on all pumps are cool. Cleaned the downcomer and found much less build up. Lit off gas to melt the tar.

0750 Shut down the agitator again to move the drive wheel peg to the outer circumference hole in order to drive 3 teeth. Replaced the #5 corner plate screws. Opened the blow down on the scrubber-now bleeding out both tanks.

0800 Fire test: 21.6 inches ash average. Number 3 was a dirty bar at 16 inches and 24 inches. Number 5 was extremely high at 40 inches. Grate running near maximum at 10/5.00. Poked numbers 2, 3, 4 & 5. The offtake temperature hits 300°C

0830 Upon request of Bob Zahl, cut primary air flow to the combustor from 4800 cfm to 4000-3500 cfm. then 3500-3250 cfm for photographic purposes.

0840 Return to 4800 cfm.

0900 Number 3 hole is burning through again. (Poked Number 3) Start agitator again, attempting to adjust the high limiter. The agitator is set at 5.75 sweeps per hour. Dump ash: 500 pounds. Noticed that the ash in the cone was very loose. Saw many large chunks this time 6-7" in diameter.

0915 On backstroke, pushing three teeth, the drive bar hits the measuring post. Reposition the peg to push 2 teeth and start the agitator on 5.7 sweeps per hour.

0930 Shut down the agitator once more for more adjustment to the height limiter.

0945 Restart the agitator and run at 10.0/min.

1000 Fire test: 16.4 inches ash average. No dirty bars. The bed has evened out with the exception of number 5. No burn throughs, so we are poking through on holes number 2, 3, 4 & 5. Must have helped. Leaving the grate at 10/5.00 until 1200 fire test. The offtake temperature is down to 203°C indicating increased ash being discharged.

1010 Reduce the agitator to 5.7 sweeps per hour, with the limiter set at 33 inches to 37 inches.

1105 Lost one of the springs on grate drive

1110 Restart the grate drive. Return to 10/5.00 speed. Increase the saturation air flow to 1050 cfm. Leave the saturation temperature at 58°C.

1120 Dump ash at 810 pounds. Flushed the upper cone and more large chunks followed by fine ash from the underside of the grate.

1130 Cyclone dump. Very little discharge is found. Noticed more large flat chunks.

1140 Increase the saturation air flow to 1100 cfm.

1150 Discovered the grate had only been pushing 8 teeth

at 5.0 since before this shift. Reset to 10/5.00

1200 Fire test: 14.7 inches ash average. All have evened out, but number 5 is still high at 27 inches. Number 3 had a 42 inch fire zone. Leaving the grate at 10/5.00 for one more hour.

1210 Increased the saturation air flow to 1150 cfm.

1240 Saturation air flow is increased to 1200 cfm and hold. Advised to keep increasing by 50 cfm until 1300 cfm is acheived.

1245 Start coaling up at 2.56 tons.

1310 Stop coaling up at 12.28 tons. Increase the saturation air flow to 1250 cfm.

1330 Coal feed hits 1.5 tons. Dump ash: 890 pounds. We have a full hopper of dry ash.

1340 Increase the saturation air flow to 1300 cfm at 580C

1345 Open the gas control valve to maintain the offtake pressure at 2.5 inches.

1400 Fire test: 9.7 inches ash average. Slow the grate to 10/2.50. The bed is finally straightened out. Numbers 7 & 3 were hot bars. No multiple zones. Instructed to maintain 1300 cfm at 580C until the end of the test.

1445 Reduce the secondary combustion air flow from 9500 to 7000 cfm to bring the induced draft fan away from 100% open to 75% open.

1500 Dumped ash: finely divided and found very few chunks.

1530 Saturation steam valve was closed. Increase the jacket water from 6-8 gpm to cool blast so steam valve can take over.

1650 Cyclone dump: not much came out.

1700 Ash dump: result was more granular with some large clinkers of softball size.

1750 Change the caustic drum

1800 Dropped the speed of the agitator to 10/2.00. Fire test: ash average is 7.8 inches. The bars went in easily with no clinkers.

1830 Dump ash: 770 pounds.

1945 Smelled burning rubber in the control room. We found that the Univeresity of Minnesota fan belt was slipping and the motor had kicked out on internal overload.

2000 Fire test: Ash average is 9.5 inches. The bars went in easily with no clinkering.

2015 Started loading coal.

2150 Stopped loading coal.

2200 Fire test: ash average is 10.5 inches. The bars are going in easily with no clinkering.

2230 Changed the screen from 1/4 inch to 1/2 inch for next test. The coal weight is 1.56 tons.

2320 Dump ash: 575 pounds. Ash is dry with some clinklers 3" in size. (mostly 1 inch an smaller)

2325 Dumped the cyclone: Large amount of particulate and it is black in color. Closed the gas control valve 15% to increase the outlet pressure.

2345 Made the rounds outside - everything looks and sounds normal.

04/30/83

0000 Fire test: Ash average 4.4 inches. Numbers 3 & 2 are zero and number 2 was a dirty bar. Number 7 is a cold bar and the bed is looses. Slowed the grate down (3/1.50) to build up ash . Poked number 2.

0100 Fire test #2 seven inches of ash. Number 3 is 6 inches. Will leave the grate at 3/1.50 to build up ash.

0130 Dumped cyclone: 1 inch of black particulate on the water. The offtake temperature is 309°C (was 233°C at 2400) Slowed the grate down earlier and that must have increased the temperature. Checked numbers 2, 3, 4 & 5 - the fire is not burning through.

0200 Fire test: ash average is 9.4 inches. #2 crust is about 14 inches from the grate. Number 7 was 0. Will leave the grate speed as is to build up ash.

0230 Opened the gas control valve 15% to lower the gas supply pressure to 2.4 inches (P-706)

0300 Fire test: Number 2-7 inches, Number 3-10 inches, and number 5-14 inches. Number 5 was also a dirty bar four feet up. Poked number 5. Dumped ash: 59 pounds. Some

clinkers 4" in size, but mostly smaller from fine to one inch.

0400 Fire test: Ash average is 10.4 inches. Number 2 has signs of crust 14 inches from the bottom. Increased the grate to 4/1.75. Number 5 was a cold bar with 7 inches of ash.

0410 Made the rounds outside-There seems to be a large amount of gas escaping from the burner inspection port. Lowered the secondary fan output (it had been stuck on closed) opened it manually. Increased the induced draft fan 80 and lowered the primary fan 15%. Amount of gas escaping has reduced, however a small amount is still coming out.

0430 Dumped the cyclone: found a large amount of black particulate both floating and in the bottom of the tank.

0530 Dumped the cyclone: small amount of black particulate is found floating on the water.

0600 Fire test: Ash average is 12.1 inches. Number 3 is a dirty bar. Number 5 shows signs of forming clinkers next to the grate. The ash bed appears fairly even.

0630 Dropped the last of the 1/4" X 3/4" fines. The weigh bin is at 0.12 tons. Starting preparations to coal up for BOM/FGT 004 Stahlman Stoker coal on the 1/2" screen.

0700 Started coaling up with the Stahlman Stoker. Dumped ash: 525 pounds. Used the upper nozzles and found the cone loosely packed. The material came out easily. Found much finely divided particles with a few small chunks.

0715 The coal leg thermocouple readout is up 1°C to 25°C. Banged on both pipes and found them to still be choked.

0730 Dumped the cyclone: noticed some top silt, but many sidewall flat chunks 3-4" long in the bottom.

0745 Hammered the coal legs. Both are still full. Readout continues to show 25°C. The offtake temperature is 336°C.

0750 T-714 up to 26°C.

0800 Termination of BOM/FGT-003 and beginning of BOM/FGT-004, Stahlman Stoker.

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

HOUR TEMP RELATIVE BAROMET RAIN
HUMIDITY PRESS SNOW

DATE: APRIL 11

1	37	85	29.89
2	35	89	29.01
3	33	92	29.02
4	33	92	29.03
5	35	89	29.04
6	32	92	29.01
7	37	89	29.08
8	41	76	29.09
9	45	71	29.10
10	49	54	29.10
11	51	48	29.09
12	53	45	29.09
13	54	41	29.07
14	55	37	29.05
15	56	37	29.04
16	56	37	29.03
17	56	42	29.03
18	54	38	29.05
19	49	50	29.06
20	49	52	29.07
21	48	56	29.08
22	45	68	29.09
23	42	73	29.10
24	41	76	29.11

General Conditions: Clear
sunrise and cloudy sunset.
731 minutes of sunshine(92%).
Maximum wind speed-17mph.

HOUR TEMP RELATIVE BAROMET RAIN
HUMIDITY PRESS SNOW

DATE: APRIL 12

1	39	79	29.10	
2	37	82	29.11	
3	37	79	29.07	
4	36	79	29.06	
5	37	79	29.07	
6	37	82	29.08	
7	38	82	29.06	
8	39	79	29.05	
9	41	73	29.05	
10	42	76	29.03	
11	42	76	29.01	
12	42	76	29.00	
13	43	76	29.00	
14	42	82	28.95	.02
15	39	89	28.93	.10
16	38	92	28.88	.03
17	38	92	28.86	.01
18	39	89	28.89	.02
19	39	89	28.87	.07
20	37	96	28.85	.08
21	36	88	28.84	.09
22	36	96	28.81	.12
23	36	100	28.78	.11
24	38	92	28.75	.02

General Conditions: Cloudy sunrise
and cloudy sunset. 40 minutes of
sunshine(5%). Maximum wind speed-
25mph.

HOUR TEMP RELATIVE BAROMET RAIN
HUMIDITY PRESS SNOW

DATE: APRIL 13

1	38	92	28.71	T
2	39	96	28.70	T
3	39	96	28.61	T
4	40	100	28.63	
5	41	100	28.61	.01
6	42	100	28.60	.01
7	40	100	28.61	.19
8	40	100	28.60	.12
9	40	100	28.53	.03
10	40	100	28.60	T
11	40	96	28.62	T
12	40	96	28.62	T
13	40q	100	28.64	T
14	40	96	28.66	.01
15	40	100	28.67	.01
16	40	92	28.69	T
17	39	89	28.71	
18	38	92	28.72	T
19	38	96	28.72	T
20	38	92	28.73	T
21	37	100	28.73	
22	37	89	28.70	T
23	37	89	28.69	T
24	37	82	28.67	

General Conditions: Cloudy
sunrise and cloudy sunset.
3 minutes of sunshine(0%).
Maximum wind speed-23mph.

HOUR TEMP RELATIVE BAROMET RAIN
HUMIDITY PRESS SNOW

DATE: APRIL 14

1	35	88	28.64	.04
2	35	86	28.61	.03
3	33	88	28.55	.11
4	33	100	28.53	.07
5	33	100	28.50	.15
6	31	100	28.48	.15
7	31	100	28.50	.16
8	30	96	28.53	.16
9	29	100	28.57	.15
10	28	96	28.58	.13
11	28	100	28.62	.17
12	28	100	28.64	.11
13	28	100	28.67	.06
14	29	96	28.70	.03
15	30	100	28.75	.02
16	30	100	28.75	.02
17	29	100	28.75	T
18	30	96	28.77	T
19	29	100	28.81	T
20	29	96	28.85	T
21	29	100	28.89	T
22	29	96	28.89	T
23	29	82	28.90	
24	28	72	28.92	

General Conditions: Cloudy sunrise
and cloudy sunset. 0 minutes of
sunshine(0%). Maximum wind speed-35

HOUR	TEMP	RELATIVE HUMIDITY	BAROMET PRESS	RAIN SNOW
------	------	-------------------	---------------	-----------

DATE: APRIL 15

1	28	75	28.93	
2	28	72	28.95	
3	26	81	28.96	
4	26	78	28.97	
5	25	74	28.99	
6	24	73	29.02	
7	25	71	29.05	
8	26	78	29.06	
9	29	75	29.08	
10	30	81	29.10	
11	33	75	29.10	
12	34	69	29.11	
13	35	69	29.11	
14	37	67	29.11	
15	40	57	29.11	
16	41	57	29.11	
17	41	53	29.12	
18	38	48	29.12	
19	40	48	29.12	
20	37	59	29.13	
21	35	67	29.13	
22	34	69	29.13	
23	33	72	29.12	
24	33	75	29.12	

General Conditions: Cloudy sunrise and clear sunrise. 792 minutes of sunshine(98%). Maximum wind speed-20mph.

HOUR	TEMP	RELATIVE HUMIDITY	BAROMET PRESS	RAIN SNOW
------	------	-------------------	---------------	-----------

DATE: APRIL 16

1	34	75	29.12	
2	34	82	29.01	T
3	33	92	29.09	T
4	32	100	29.09	.02
5	32	100	29.10	.01
6	31	96	29.12	T
7	32	89	29.13	
8	33	85	29.13	
9	34	54	29.16	
10	35	54	29.18	
11	37	52	29.19	
12	37	46	29.20	
13	37	52	29.21	
14	38	46	29.22	
15	37	48	29.23	
16	36	50	29.28	
17	36	52	29.23	
18	36	54	29.23	
19	35	52	29.24	
20	35	52	29.25	
21	32	61	29.25	
22	30	66	29.25	
23	29	66	29.25	
24	28	68	29.25	

General Conditions: Cloudy sunrise and cloudy sunset. 610 minutes of sunshine(76%). Maximum wind speed-17 mph.

HOUR TEMP RELATIVE BAROMET RAIN
 HUMIDITY PRESS SNOW

DATE: APRIL 17

1	25	78	29.250
2	26	74	29.235
3	23	77	29.235
4	23	81	29.240
5	23	81	29.235
6	22	84	29.240
7	23	77	29.240
8	26	68	29.245
9	28	66	29.240
10	30	60	29.235
11	32	61	29.240
12	33	56	29.235
13	34	54	29.220
14	35	54	29.220
15	36	52	29.210
16	36	52	29.200
17	36	48	29.200
18	35	50	29.200
19	34	49	29.210
20	32	58	29.220
21	31	61	29.230
22	30	63	29.220
23	31	58	29.210
24	29	66	29.220

General Conditions: Clear
 sunrise and cloudy sunset.
 734 minutes of sunshine (90%).
 Maximum wind speed-12mph.

HOUR TEMP RELATIVE BAROMET RAIN
 HUMIDITY PRESS SNOW

DATE: APRIL 18

1	26	81	29.220
2	26	81	29.215
3	26	74	29.225
4	25	68	29.225
5	24	71	29.225
6	23	74	29.230
7	24	81	29.240
8	29	75	29.245
9	31	63	29.230
10	34	54	29.240
11	36	44	29.230
12	37	40	29.220
13	38	37	29.200
14	38	40	29.170
15	39	40	29.140
16	39	42	29.125
17	38	44	29.115
18	37	50	29.105
19	36	50	29.105
20	33	54	29.105
21	31	58	29.105
22	32	53	29.105
23	30	58	29.105
24	29	60	29.115

General Conditions: Clear sunrise
 and clear sunset. 805 minutes of
 sunshine. Maximum wind speed-12
 mph.

HOUR TEMP RELATIVE BAROMET RAIN
 HUMIDITY PRESS SNOW

DATE: APRIL 19

1	31	58	29.11
2	29	75	29.10
3	26	81	29.10
4	27	78	29.10
5	27	74	29.11
6	27	78	29.12
7	30	85	29.14
8	33	85	29.14
9	37	59	29.14
10	40	50	29.14
11	42	49	29.14
12	42	45	29.13
13	43	39	29.12
14	44	40	29.11
15	44	38	29.11
16	44	38	29.10
17	43	39	29.11
18	43	45	29.11
19	40	44	29.11
20	38	48	29.11
21	36	59	29.13
22	36	59	29.13
23	36	64	29.12
24	34	78	29.12

General conditions: Cloudy
 sunrise and sunset. 658
 minutes of sunshine (80%)
 Maximum wind speed-12 mph.

HOUR TEMP RELATIVE BAROMET RAIN
 HUMIDITY PRESS SNOW

DATE: APRIL 20

1	31	78	29.12
2	34	69	29.12
3	32	81	29.13
4	31	85	29.13
5	31	81	29.13
6	30	88	29.14
7	34	85	29.15
8	39	67	29.15
9	42	57	29.15
10	45	53	29.15
11	46	53	29.15
12	48	49	29.14
13	50	48	29.13
14	51	48	29.12
15	52	50	29.11
16	52	52	29.09
17	52	50	29.09
18	51	54	29.07
19	45	68	29.07
20	45	63	29.08
21	42	73	29.09
22	43	70	29.11
23	42	70	29.10
24	41	73	29.10

General conditions: Clear sun-
 rise and sunset. 814 minutes
 of sunshine (99%). Maximum
 wind speed-12 mph.

HOUR TEMP RELATIVE BAROMET RAIN
HUMIDITY PRESS SNOW

DATE: APRIL 21

1	38	85	29.10
2	36	82	29.09
3	37	82	29.09
4	35	92	29.09
5	34	100	29.10
6	34	96	29.09
7	38	89	29.10
8	45	82	29.10
9	50	66	29.10
10	53	48	29.10
11	56	45	29.09
12	57	40	29.08
13	59	39	29.06
14	60	34	29.06
15	59	36	29.04
16	60	34	29.03
17	59	36	29.03
18	59	36	29.03
19	55	45	29.03
20	51	48	29.04
21	51	48	29.05
22	50	50	29.05
23	49	51	29.05
24	47	71	29.05

General Conditions: Clear sun-
rise and sunset. 826 minutes
of sunshine (100%). Maximum
wind speed- 14 mph

HOUR TEMP RELATIVE BAROMET RAIN
HUMIDITY PRESS SNOW

DATE: APRIL 22

1	44	68	29.05
2	43	70	29.04
3	44	73	29.05
4	44	82	29.06
5	42	89	29.05
6	44	86	29.07
7	44	89	29.08
8	50	74	29.08
9	56	61	29.08
10	59	55	29.07
11	62	50	29.07
12	64	45	29.06
13	63	43	29.05
14	63	40	29.04
15	63	38	29.04
16	63	38	29.04
17	62	43	29.04
18	62	41	29.04
19	59	39	29.05
20	57	47	29.07
21	54	48	29.07
22	54	45	29.09
23	50	54	29.10
24	49	54	29.11

T
T

General Conditions: Cloudy sun-
rise and sunset. 512 minutes of
sunshine (62%). Maximum wind
speed - 15 mph.

HOUR TEMP RELATIVE BAROMET RAIN
 HUMIDITY PRESS SNOW

DATE: APRIL 23

1	49	52	29.10
2	48	54	29.10
3	44	70	29.11
4	42	67	29.12
5	41	67	29.13
6	40	76	29.15
7	45	63	29.18
8	49	50	29.20
9	49	52	29.21
10	53	46	29.21
11	56	37	29.20
12	57	37	29.20
13	59	30	29.18
14	60	28	29.16
15	60	28	29.15
16	59	27	29.14
17	59	29	29.14
18	58	32	29.14
19	55	35	29.16
20	52	37	29.18
21	51	39	29.19
22	49	44	29.20
23	42	57	29.20
24	43	60	29.20

General Conditions: Clear sun-
 rise and sunset. 831 minutes
 of sunshine (100%). Maximum
 wind speed - 23 mph.

HOUR TEMP RELATIVE BAROMET RAIN
 HUMIDITY PRESS SNOW

DATE: APRIL 24

1	40	73	29.20
2	41	70	29.19
3	39	76	29.19
4	34	89	29.19
5	31	96	29.19
6	36	85	29.20
7	40	86	29.20
9	55	50	29.21
9	55	50	29.21
10	60	30	29.20
11	62	27	29.18
12	64	29	29.16
13	66	27	29.13
14	67	27	29.11
15	68	27	29.08
16	68	28	29.06
17	67	28	29.04
18	66	28	29.03
19	63	32	29.03
20	60	37	29.01
21	53	50	29.01
22	55	47	29.01
23	50	56	29.00
24	49	58	29.00

General Conditions: Clear sun-
 rise and sunset. 836 minutes of
 sunshine (100%). Maximum wind
 speed - 13 mph.

HOUR TEMP RELATIVE BAROMET RAIN
HUMIDITY PRESS SNOW

DATE: APRIL 25

1	47	63	28.99
2	46	63	28.98
3	46	65	28.97
4	45	68	28.96
5	44	68	28.95
6	43	70	28.95
7	50	63	28.95
8	56	53	28.94
9	63	36	28.93
10	66	26	28.92
11	67	28	28.90
12	68	28	28.88
13	69	31	28.86
14	70	29	28.83
15	72	27	28.79
16	71	28	28.76
17	70	30	28.75
18	70	30	28.74
19	67	32	28.74
20	63	40	28.74
21	61	44	28.74
22	60	47	28.73
23	59	51	28.73
24	58	53	28.73

General Conditions: Clear sunrise cloudy sunset. 784 minutes of sunshine (93%). Maximum wind speed - 23 mph.

HOUR TEMP RELATIVE BAROMET RAIN
HUMIDITY PRESS SNOW

DATE APRIL 26

1	58	53	28.72
2	58	55	28.69
3	58	53	28.68
4	59	51	28.66
5	56	57	28.66
6	55	64	28.66
7	56	64	28.66
8	60	55	28.63
9	66	47	28.63
10	69	49	28.63
11	70	49	28.62
12	71	47	28.62
13	72	48	28.62
14	69	53	28.63
15	68	56	29.64
16	68	57	28.67
17	67	59	28.69
18	68	55	28.70
19	67	42	28.73
20	64	43	28.75
21	62	41	28.79
22	58	45	28.83
23	56	47	28.87
24	53	50	28.90

T

General Conditions: Cloudy sunrise and clear sunset. 644 minutes of sunshine (77%). Maximum wind speed - 24 mph.

HOUR	TEMP	RELATIVE HUMIDITY	BAROMET PRESS	RAIN SNOW
------	------	-------------------	---------------	-----------

DATE: APRIL 27

1	50	56	28.92	
2	48	66	28.94	
3	46	63	28.96	
4	46	58	28.97	
5	44	58	28.99	
6	44	60	29.02	
7	47	49	29.04	
8	49	50	29.06	
9	52	46	29.07	
10	54	41	29.07	
11	56	40	29.07	
12	58	37	29.04	
13	61	31	29.01	
14	62	32	29.04	
15	63	31	29.04	
16	62	32	29.03	
17	62	32	29.02	
18	60	33	29.02	
19	56	38	29.02	
20	56	38	29.04	
21	55	40	29.06	
22	52	46	29.05	
23	50	54	29.04	
24	49	58	29.03	

General Conditions: Clear sunrise and cloudy sunset. 797 minutes sunshine (94%). Maximum wind speed - 23 mph.

HOUR	TEMP	RELATIVE HUMIDITY	BAROMET PRESS	RAIN SNOW
------	------	-------------------	---------------	-----------

DATE: APRIL 28

1	48	63	29.03	
2	50	61	29.04	
3	52	56	29.05	T
4	52	61	29.03	T
5	52	68	29.03	T
6	52	68	29.03	.01
7	52	74	29.04	T
8	52	66	29.04	T
9	54	59	29.04	T
10	55	52	29.03	
11	56	47	29.02	
12	59	40	29.01	
13	60	49	28.99	
14	62	48	28.98	
15	62	48	28.97	
16	58	62	28.98	.03
17	50	93	29.00	.09
18	50	96	29.01	.17
19	50	100	29.00	T
20	50	100	29.02	
21	50	96	29.04	
22	47	93	29.08	
23	46	93	29.09	
24	43	92	29.10	

General Conditions: Cloudy sunrise and sunset. 334 minutes of sunshine (39%). Maximum wind speed - 13 mph.

HOUR	TEMP	RELATIVE HUMIDITY	BAROMET PRESS	RAIN SNOW
------	------	-------------------	---------------	-----------

DATE: APRIL 29

1	42	96	29.10	
2	40	100	29.09	
3	38	100	29.10	
4	37	96	29.11	
5	37	85	29.12	
6	38	82	29.13	
7	41	76	29.13	
8	44	60	29.14	
9	45	60	29.14	
10	47	53	29.14	
11	49	52	29.14	
12	50	50	29.13	
13	52	48	29.12	
14	52	48	29.11	
15	53	46	29.08	
16	54	47	29.08	
17	53	46	29.08	
18	52	48	29.08	
19	51	48	29.09	
20	51	48	29.09	
21	51	46	29.09	
22	51	44	29.07	
23	49	56	29.06	T
24	48	58	29.05	T

General Conditions: Clear sunrise and cloudy sunset. 701 minutes of sunshine (82%). Maximum wind speed - 16 mph.

HOUR	TEMP	RELATIVE HUMIDITY	BAROMET PRESS	RAIN SNOW
------	------	-------------------	---------------	-----------

DATE: APRIL 30

1	47	65	29.10	.01
2	46	71	29.10	T
3	45	73	29.11	T
4	45	76	29.08	
5	45	76	29.10	
6	45	82	29.11	
7	46	73	29.12	
8	49	71	29.13	

General Conditions: Cloudy sunrise. Maximum wind speed - 12 mph.

APPENDIX C

Coal Analysis Data

- C-1 Gasifier Feed Coal Sizing Data
- C-2 Screen Feed Coal Sizing Data
- C-3 After Screen Coal Sizing Data

Feed Coal Size Distribution for BOM/FGT-003

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
20	4/11/83	8: 0	+3/4	1.8	4.2	13.0	34.5	75.8
21	4/11/83	16: 0	+3/4	1.0	3.4	11.5	39.5	82.1
22	4/12/83	0: 0	+3/4	2.2	5.8	16.8	47.9	86.6
23	4/12/83	8: 0	+3/4	0.6	2.4	8.6	31.5	75.1
24	4/12/83	16: 0	+3/4	1.1	3.9	13.9	42.4	83.2
25	4/13/83	0: 0	+3/4	1.1	3.1	10.9	39.9	77.6
26	4/13/83	8: 0	+3/4	0.7	2.0	8.8	36.1	72.4
27	4/13/83	16: 0	+3/4	1.1	3.2	12.1	48.8	89.4
28	4/14/83	0: 0	+3/4	2.3	5.3	16.7	51.6	87.1
32	4/15/83	8: 0	+3/4	0.5	1.9	14.3	48.8	86.3
33	4/15/83	16: 0	+3/4	2.3	6.2	32.8	84.5	89.5
34	4/16/83	0: 0	+3/4	1.1	3.3	17.7	53.2	91.7
35	4/16/83	8: 0	+3/4	0.5	1.7	12.6	39.4	83.5
36	4/16/83	16: 0	+3/4	2.4	6.9	19.3	48.2	85.5
37	4/17/83	0: 0	+3/4	2.0	5.7	19.9	59.8	88.7
38	4/17/83	8: 0	+3/4	1.1	3.5	16.4	48.6	82.1
39	4/17/83	16: 0	+3/4	1.9	6.1	20.6	55.1	89.7
40	4/18/83	0: 0	+3/4	2.7	6.4	24.8	58.2	91.6
41	4/18/83	8: 0	+3/4	1.1	4.5	21.6	52.3	87.3
42	4/18/83	16: 0	+3/4	2.9	7.7	26.7	56.7	89.4
43	4/19/83	0: 0	+3/4	6.8	1.9	30.8	63.9	91.2
44	4/19/83	8: 0	+3/4	1.1	3.8	14.6	45.2	88.1
45	4/19/83	16: 0	+3/4	2.2	5.5	21.7	56.4	97.7
46	4/20/83	0: 0	+3/4	2.8	6.8	23.2	57.7	98.7
47	4/20/83	8: 0	+3/4	1.1	3.6	20.2	54.4	97.2
48	4/20/83	16: 0	+3/4	2.4	7.6	24.3	57.6	92.7
49	4/21/83	0: 0	+3/4	2.1	6.5	22.9	58.7	95.8
50	4/21/83	8: 0	+3/4	1.1	4.3	17.7	51.2	83.3
51	4/21/83	16: 0	+3/4	1.8	6.4	25.1	57.2	91.3
52	4/22/83	0: 0	+1/2	3.7	12.3	37.5	61.4	89.7
53	4/22/83	8: 0	+1/2	1.2	5.1	21.1	40.2	77.2
54	4/22/83	16: 0	+1/2	2.6	9.3	31.8	55.8	87.3
55	4/23/83	0: 0	+1/2	3.9	13.9	42.9	68.3	93.1
56	4/23/83	8: 0	+1/2	3.7	13.4	40.2	68.6	94.6
57	4/23/83	16: 0	+1/4	2.9	20.9	50.7	75.0	96.5
59	4/24/83	0: 0	+1/4	4.1	23.6	53.8	77.9	94.7
59	4/24/83	8: 0	+1/4	2.7	22.4	48.6	71.3	92.6
60	4/24/83	16: 0	+1/4	2.2	17.5	43.9	72.5	97.6
61	4/25/83	0: 0	+1/4	4.2	24.9	53.5	78.4	96.0
62	4/25/83	8: 0	+1/4	3.5	26.4	53.3	75.3	93.7
63	4/25/83	16: 0	+1/4	7.7	38.6	66.9	85.9	97.7
64	4/26/83	0: 0	+1/4	5.0	24.2	50.0	70.4	90.4
65	4/26/83	8: 0	+1/4	3.0	20.9	46.4	70.5	89.5
66	4/26/83	16: 0	+1/4	3.1	15.6	38.7	63.6	93.8
67	4/27/83	0: 0	+1/4	4.3	22.7	49.4	67.4	89.9
68	4/27/83	8: 0	-3/4, +1/4	5.3	38.9	74.4	83.8	93.0

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
69	4/27/83	16: 0	-3/4,+1/4	5.4	45.4	91.4	96.6	99.3
70	4/28/83	0: 0	-3/4,+1/4	6.3	50.5	97.9	100.0	100.0
71	4/28/83	8: 0	-3/4,+1/4	6.1	53.6	96.6	98.8	99.0
72	4/28/83	16: 0	-3/4,+1/4	5.1	57.2	98.8	100.0	100.0
73	4/29/83	0: 0	-3/4,+1/4	8.3	45.1	97.3	99.1	100.0
74	4/29/83	8: 0	-3/4,+1/4	6.8	50.2	97.7	100.0	100.0
75	4/29/83	16: 0	-3/4,+1/4	6.5	40.9	91.5	99.8	100.0
76	4/30/83	0: 0	-3/4,+1/4	6.9	56.5	97.3	100.0	100.0
<hr/>								
Averages			+ 3/4	1.9	5.0	19.8	49.9	87.2
			+ 1/2	3.5	16.1	44.6	70.6	94.7
			+ 1/4	4.1	25.1	52.6	74.3	93.5
			- 3/4,+ 1/4	6.4	49.9	96.1	99.3	99.8

Table C-2

Coal Size Distribution as Fed to Screen

Sample Number	Date	Screen Mesh Size inch	Cumulative Mass Fraction, % <u>less than stated mesh size, inch</u>					
			1/4	1/2	3/4	1	1 1/2	
1	4/11/83	+3/4	7.7	25.5	45.7	64.5	88.3	
2	4/11/83	+3/4	1.6	8.1	22.5	42.6	76.9	
3	4/11/83	+3/4	8.9	24.7	45.0	65.3	90.9	
4	4/13/83	+3/4	9.0	20.9	37.6	53.7	92.5	
5	4/13/83	+3/4	1.5	1.7	9.1	42.5	91.0	
6	4/13/83	+3/4	12.5	37.6	59.6	76.3	92.7	
7	4/15/83	+3/4	19.7	49.8	69.8	81.8	92.8	
8	4/16/83	+3/4	12.9	35.7	58.0	75.8	90.2	
9	4/12/83	+3/4	3.5	11.9	28.2	47.3	75.5	
10	4/12/83	+3/4	8.0	20.0	34.5	50.2	79.7	
11	4/17/83	+3/4	2.2	15.3	43.8	71.9	94.7	
12	4/18/83	+3/4	13.4	35.4	58.9	77.3	94.0	
13	4/19/83	+3/4	9.1	30.4	55.0	74.4	95.1	
14	4/20/83	+3/4	6.3	6.3	48.5	68.9	87.6	
15	4/21/83	+3/4	6.9	23.6	46.1	66.7	88.5	
16	4/22/83	+1/2	5.7	13.9	28.9	48.4	84.2	
17	4/23/83	+1/2	6.4	21.5	41.0	63.5	83.8	
18	4/26/83	+1/4	3.2	9.2	23.6	42.0	79.7	
19	4/26/83	+1/4	12.7	29.4	47.5	66.2	88.1	
20	4/27/83	-3/4,+1/4	18.4	49.4	97.3	99.7	100.0	
21	4/28/83	-3/4,+1/4	22.2	65.2	98.5	100.0	100.0	
Averages			+3/4	8.2	23.1	44.2	63.9	88.7
			+1/2	6.0	17.7	35.0	55.9	84.0
			+1/4	8.0	19.3	35.6	54.1	83.9
			-3/4,+1/4	20.3	57.3	97.9	99.8	100.0

Table C-3

Coal Size Distribution After Screen

		Screen	Cumulative Mass Fraction, %				
		Mesh	<u>less than stated mesh size, inch</u>				
Sample		Size					
Number	Date	inch	1/4	1/2	3/4	1	1 1/2
<hr/>							
1	4/11/83	+3/4	0.1	0.1	5.2	38.3	79.6
2	4/11/83	+3/4	0.1	0.2	8.3	45.5	83.7
3	4/11/83	+3/4	0.2	0.3	6.5	32.3	69.6
4	4/13/83	+3/4	2.8	2.9	16.5	48.4	81.6
5	4/13/83	+3/4	0.8	0.8	9.5	41.0	82.7
7	4/15/83	+3/4	0.8	1.0	14.3	51.8	89.0
8	4/16/83	+3/4	1.8	2.1	15.1	53.6	93.0
9	4/12/83	+3/4	0.3	0.4	3.8	27.8	66.1
10	4/12/83	+3/4	0.3	0.4	4.6	26.2	67.8
11	4/17/83	+3/4	0.3	0.6	6.2	37.6	80.4
12	4/18/83	+3/4	0.2	0.6	17.5	60.9	95.3
13	4/19/83	+3/4	0.4	0.6	6.8	45.1	84.7
14	4/20/83	+3/4	0.3	0.3	6.7	42.9	81.9
15	4/21/83	+3/4	0.5	0.8	6.4	34.8	80.2
16	4/22/83	+1/2	0.5	2.2	18.6	40.9	74.4
17	4/23/83	+1/2	0.8	15.4	39.0	60.6	88.4
18	4/26/83	+1/4	1.2	20.6	43.0	61.7	88.4
19	4/26/83	+1/4	1.0	8.3	21.3	40.2	75.0
20	4/27/83	-3/4,+1/4	2.1	47.0	96.6	99.1	100.0
21	4/28/83	-3/4,+1/4	2.4	55.0	98.5	100.0	100.0
<hr/>							
Averages		+3/4	0.6	0.8	9.1	41.9	81.1
		+1/2	0.7	8.8	28.8	50.7	81.4
		+1/4	1.1	14.5	32.2	50.9	81.7
		-3/4,+1/4	2.2	51.0	97.6	99.6	100.0

APPENDIX D

Coal Consumption Log

Coal Weights are given in short tons.

DATE	TIME	SAMPLE NUMBER	SCREEN IN	WASH?	START WT.	STOP WT.	NET WT.
04/11	0645	coke	0.75	no	4.93	.03	4.90
04/11	0810	003C20	0.75	no	8.33	1.99	6.34
04/11	0930	"	"	no	1.99	1.99	0.0
04/11	1030	"	"	no	10.64	10.55	.09
04/11	1130	"	"	no	10.56	10.15	.41
04/11	1235	"	"	no	10.17	9.73	.44
04/11	1400	"	"	no	9.75	8.88	.87
04/11	1430	"	"	no	8.88	8.67	.21
04/11	1530	"	"	no	8.67	8.15	.52
04/11	1630	003C21	"	no	8.15	7.46	.69
04/11	1730	"	"	no	7.46	6.86	.60
04/11	1830	"	"	no	6.865	6.18	.68
04/11	1930	"	"	no	6.18	5.55	.63
04/11	2030	"	"	no	5.55	4.75	.80
04/11	2130	"	"	no	8.60	7.99	.61
04/11	2230	"	"	no	10.91	10.31	.60
04/11	2330	"	"	no	10.31	9.62	.69
04/12	0030	003C22	"	no	9.62	8.98	.64
04/12	0130	"	"	no	8.98	8.34	.64
04/12	0230	"	"	no	8.34	7.70	.64
04/12	0330	"	"	no	7.70	7.08	.62
04/12	0430	"	"	no	7.08	6.41	.67
04/12	0530	"	"	no	11.95	11.35	.60
04/12	0630	"	"	no	11.35	10.73	.62
04/12	0730	"	"	no	10.72	10.04	.68
04/12	0830	003C23	"	no	10.03	9.26	.77
04/12	0930	"	"	no	9.26	8.88	.38
04/12	1030	"	"	no	8.87	8.19	.68
04/12	1130	"	"	no	8.18	7.62	.56
04/12	1230	"	"	no	7.61	6.94	.67
04/12	1330	"	"	no	12.09	11.46	.63
04/12	1430	"	"	no	11.46	10.88	.60
04/12	1530	"	"	no	10.88	10.30	.58
04/12	1630	"	"	no	10.30	9.68	.62
04/12	1730	"	"	no	9.68	9.16	.52
04/12	1830	"	"	no	9.16	8.53	.63
04/12	1930	"	"	no	8.53	7.97	.56
04/12	2030	"	"	no	8.55	7.95	.60
04/12	2130	"	"	no	12.49	11.87	.62
04/12	2230	"	"	no	11.86	11.28	.58
04/12	2330	003C25	"	no	11.28	10.65	.63
04/13	0030	"	"	no	10.65	9.98	.67
04/13	0130	"	"	no	9.98	9.34	.64
04/13	0230	"	"	no	9.34	8.64	.70
04/13	0330	"	"	no	8.64	8.01	.63
04/13	0430	"	"	no	8.01	7.27	.74
04/13	0530	"	"	no	11.44	10.65	.79
04/13	0630	"	"	no	10.65	9.84	.81
04/13	0730	003C26	"	no	9.82	9.05	.77
04/13	0830	"	"	no	9.04	8.21	.83
04/13	0930	"	"	no	8.20	7.27	.93
04/13	1030	"	"	no	7.27	6.32	.95

DATE	TIME	SAMPLE NUMBER	SCREEN IN	WASH?	START WT.	STOP WT.	NET WT.
04/13	1130	"	"	no	6.31	5.08	1.23
04/13	1230	"	"	no	5.07	3.78	1.29
04/13	1330	"	"	no	8.20	6.82	1.38
04/13	1430	"	"	no	9.98	8.67	1.31
04/13	1530	003C27	"	no	10.58	9.14	1.44
04/13	1630	"	"	no	9.14	7.62	1.52
04/13	1730	"	"	no	7.62	6.19	1.43
04/13	1830	"	"	no	6.19	4.94	1.25
04/13	1930	"	"	no	4.94	3.68	1.26
04/13	2030	"	"	no	3.68	2.39	1.29
04/13	2130	"	"	no	5.86	4.90	.96
04/13	2230	"	"	no	7.73	6.61	1.12
04/13	2330	003C28	"	no	12.23	11.25	.98
04/14	0030	"	"	no	11.25	10.16	1.09
04/14	0130	"	"	no	10.16	9.20	.96
04/14	0230	"	"	no	9.20	8.02	1.18
04/14	0330	"	"	no	8.02	7.15	.87
04/14	0430	"	"	no	7.15	6.03	1.12
04/14	0530	"	"	no	10.00	9.36	.64
POWER FAILURE				POWER FAILURE			
04/15	0915	003C32	"	no	9.46	4.65	4.81
04/15	1030	"	"	no	4.70	3.85	.85
04/15	1130	"	"	no	3.77	3.21	.56
04/15	1230	"	"	no	8.50	7.86	.64
04/15	1330	"	"	no	12.35	11.92	.43
04/15	1430	"	"	no	11.87	11.29	.58
04/15	1530	003C33	"	no	11.28	10.57	.71
04/15	1630	"	"	no	10.57	9.62	.95
04/15	1730	"	"	no	9.62	8.44	1.18
04/15	1830	"	"	no	8.44	7.25	1.19
04/15	1930	"	"	no	7.25	6.04	1.21
04/15	2030	"	"	no	8.02	6.80	1.22
04/15	2130	"	"	no	12.56	11.34	1.22
04/15	2230	"	"	no	11.34	10.0	1.34
04/15	2330	003C34	"	no	9.99	8.84	1.15
04/16	0030	"	"	no	8.84	7.56	1.28
04/16	0130	"	"	no	7.56	6.28	1.28
04/16	0230	"	"	no	6.28	5.04	1.24
04/16	0330	"	"	no	5.04	3.84	1.20
04/16	0430	"	"	no	3.84	2.56	1.28
04/16	0530	"	"	no	11.26	10.11	1.15
04/16	0630	"	"	no	10.11	8.76	1.35
04/16	0730	003C35	"	no	8.76	7.55	1.21
04/16	0830	"	"	no	7.54	6.33	1.21
04/16	0930	"	"	no	6.32	5.07	1.25
04/16	1030	"	"	no	5.06	3.83	1.23
04/16	1130	"	"	no	3.82	2.49	1.33
04/16	1230	"	"	no	5.20	3.96	1.24
04/16	1330	"	"	no	10.64	9.39	1.25
04/16	1430	"	"	no	9.38	7.94	1.44
04/16	1530	003C36	"	no	7.93	6.61	1.32
04/16	1630	"	"	no	6.61	5.28	1.33

DATE	TIME	SAMPLE NUMBER	SCREEN IN	WASH?	START WT.	STOP WT.	NET WT.
04/16	1730	"	"	no	5.28	4.09	1.19
04/16	1830	"	"	no	4.08	2.86	1.22
04/16	1930	"	"	no	2.86	1.75	1.11
04/16	2030	"	"	no	4.29	3.25	1.04
04/16	2130	"	"	no	11.60	10.60	1.00
04/16	2230	"	"	no	12.36	11.25	1.11
04/16	2330	003C37	"	no	11.25	10.13	1.12
04/17	0030	"	"	no	10.13	8.95	1.18
04/17	0130	"	"	no	8.95	7.88	1.07
04/17	0230	"	"	no	7.88	6.72	1.16
04/17	0330	"	"	no	6.72	5.59	1.13
04/17	0430	"	"	no	5.59	4.44	1.15
04/17	0530	"	"	no	12.57	11.45	1.12
04/17	0630	"	"	no	11.47	10.29	1.18
04/17	0730	003C38	"	no	10.28	9.14	1.14
04/17	0830	"	"	no	9.14	7.95	1.19
04/17	0930	"	"	no	7.94	6.78	1.16
04/17	1030	"	"	no	6.77	5.61	1.16
04/17	1130	"	"	no	5.60	4.48	1.12
04/17	1230	"	"	no	4.47	3.33	1.14
04/17	1330	"	"	no	6.68	5.56	1.12
04/17	1430	"	"	no	12.04	10.85	1.19
04/17	1530	003C39	"	no	10.84	9.70	1.14
04/17	1630	"	"	no	9.70	8.55	1.15
04/17	1730	"	"	no	8.54	7.47	1.07
04/17	1830	"	"	no	7.46	6.28	1.18
04/17	1930	"	"	no	6.28	5.16	1.12
04/17	2030	"	"	no	5.16	4.10	1.06
04/17	2130	"	"	no	11.78	10.75	1.03
04/17	2230	"	"	no	12.79	11.56	1.23
04/17	2330	003C40	"	no	11.56	10.52	1.04
04/18	0030	"	"	no	10.56	9.30	1.26
04/18	0130	"	"	no	9.30	8.14	1.16
04/18	0230	"	"	no	8.14	6.95	1.19
04/18	0330	"	"	no	6.95	5.72	1.23
04/18	0430	"	"	no	5.72	4.46	1.26
04/18	0530	"	"	no	12.96	11.69	1.27
04/18	0630	"	"	no	11.69	10.38	1.31
04/18	0730	003C41	"	no	10.38	9.15	1.23
04/18	0830	"	"	no	9.15	7.74	1.41
04/18	0930	"	"	no	7.73	6.47	1.26
04/18	1030	"	"	no	6.46	5.11	1.35
04/18	1130	"	"	no	5.10	3.71	1.39
04/18	1230	"	"	no	3.70	2.04	1.66
04/18	1330	"	"	no	11.98	10.13	1.85
04/18	1430	"	"	no	10.12	8.55	1.57
04/18	1530	003C42	"	no	8.53	6.79	1.74
04/18	1630	"	"	no	6.79	5.01	1.78
04/18	1730	"	"	no	5.00	3.20	1.80
04/18	1830	"	"	no	3.18	1.44	1.74
04/18	1930	"	"	no	4.73	2.99	1.74
04/18	2030	"	"	no	4.27	2.58	1.69

DATE	TIME	SAMPLE NUMBER	SCREEN IN	WASH?	START WT.	STOP WT.	NET WT.
04/18	2130	"	"	no	12.34	10.68	1.66
04/18	2230	"	"	no	13.21	11.40	1.81
04/18	2330	003C43	"	no	11.41	9.65	1.76
04/19	0030	"	"	no	9.65	7.90	1.75
04/19	0130	"	"	no	7.90	6.21	1.69
04/19	0230	"	"	no	6.21	4.45	1.76
04/19	0330	"	"	no	4.45	2.64	1.81
04/19	0430	"	"	no	2.64	.84	1.80
04/19	0530	"	"	no	12.22	10.47	1.75
04/19	0630	"	"	no	12.26	10.44	1.82
04/19	0730	003C44	"	no	10.43	8.25	2.18
04/19	0830	"	"	no	8.24	6.56	1.68
04/19	0930	"	"	no	6.55	4.74	1.81
04/19	1030	"	"	no	12.02	10.11	1.91
04/19	1130	"	"	no	10.10	8.36	1.74
04/19	1230	"	"	no	8.35	6.60	1.75
04/19	1330	"	"	no	9.31	7.47	1.84
04/19	1430	"	"	no	12.46	10.78	1.68
04/19	1530	003C45	"	no	10.78	9.11	1.67
04/19	1630	"	"	no	9.10	7.40	1.70
04/19	1730	"	"	no	7.40	5.75	1.65
04/19	1830	"	"	no	5.74	4.14	1.60
04/19	1930	"	"	no	4.13	2.58	1.55
04/19	2030	"	"	no	2.57	.81	1.76
04/19	2130	"	"	no	9.80	8.18	1.62
04/19	2230	"	"	no	13.04	11.44	1.60
04/19	2330	003C46	"	no	11.44	9.77	1.67
04/20	0030	"	"	no	9.77	8.14	1.63
04/20	0130	"	"	no	8.14	6.52	1.62
04/20	0230	"	"	no	6.52	4.98	1.54
04/20	0330	"	"	no	4.98	3.45	1.53
04/20	0430	"	"	no	3.45	1.81	1.64
04/20	0530	"	"	no	11.89	10.31	1.58
04/20	0630	"	"	no	12.81	11.20	1.61
04/20	0730	003C47	"	no	11.19	9.50	1.69
04/20	0830	"	"	no	9.51	7.93	1.58
04/20	0930	"	"	no	7.92	6.35	1.57
04/20	1030	"	"	no	6.34	4.52	1.82
04/20	1130	"	"	no	4.51	2.54	1.97
04/20	1230	"	"	no	6.79	4.82	1.97
04/20	1330	"	"	no	11.91	9.96	1.95
04/20	1430	"	"	no	9.96	8.06	1.90
04/20	1530	003C48	"	no	11.72	9.75	1.97
04/20	1630	"	"	no	9.75	7.61	2.14
04/20	1730	"	"	no	7.60	5.54	2.06
04/20	1830	"	"	no	5.53	3.32	2.21
04/20	1930	"	"	no	7.93	5.79	2.14
04/20	2030	"	"	no	5.77	3.60	2.17
04/20	2130	"	"	no	10.02	7.91	2.11
04/20	2230	"	"	no	13.68	11.58	2.10
04/20	2330	003C49	"	no	11.58	9.53	2.05
04/21	0030	"	"	no	9.53	7.57	1.96

DATE	TIME	SAMPLE NUMBER	SCREEN IN	WASH?	START WT.	STOP WT.	NET WT.
04/21	0130	"	"	no	7.57	5.68	1.89
04/21	0230	"	"	no	5.68	3.80	1.88
04/21	0330	"	"	no	12.15	10.20	1.95
04/21	0430	"	"	no	10.20	8.24	1.96
04/21	0530	"	"	no	12.93	11.15	1.78
04/21	0630	"	"	no	13.60	11.71	1.89
04/21	0730	003C50	"	no	11.72	9.86	1.86
04/21	0830	"	"	no	9.86	7.96	1.90
04/21	0930	"	"	no	7.96	6.09	1.87
04/21	1030	"	"	no	6.09	4.22	1.87
04/21	1130	"	"	no	4.22	2.24	1.98
04/21	1230	"	"	no	2.24	.69	1.55
04/21	1330	"	"	no	5.11	3.01	2.10
04/21	1430	"	"	no	12.19	10.27	1.92
04/21	1530	003C51	"	no	10.25	8.25	2.00
04/21	1630	"	"	no	8.25	6.24	2.01
04/21	1730	"	"	no	6.24	4.38	1.86
04/21	1830	"	"	no	4.38	2.43	1.95
04/21	1930	"	"	no	2.43	.54	1.89
04/21	2030	"	"	no	.54	.14	.40
04/21	2145	"	0.50	no	14.46	11.01	3.45
04/21	2230	"	"	no	11.01	9.11	1.90
04/21	2330	003C52	"	no	9.11	7.61	1.50
04/22	0030	"	"	no	7.61	6.25	1.36
04/22	0130	"	"	no	6.25	5.26	.99
04/22	0230	"	"	no	5.26	4.65	.61
04/22	0330	"	"	no	4.65	3.58	1.07
04/22	0430	"	"	no	3.58	2.39	1.19
04/22	0530	"	"	no	13.16	12.10	1.06
04/22	0630	"	"	no	13.73	12.72	1.01
04/22	0730	003C53	"	no	12.72	11.76	.96
04/22	0830	"	"	no	11.76	10.67	1.09
04/22	0930	"	"	no	10.67	9.59	1.08
04/22	1030	"	"	no	9.59	8.36	1.23
04/22	1130	"	"	no	8.36	7.16	1.20
04/22	1230	"	"	no	7.16	5.81	1.35
04/22	1330	"	"	no	8.83	7.34	1.49
04/22	1430	"	"	no	11.91	10.29	1.62
04/22	1530	003C54	"	no	10.28	8.60	1.68
04/22	1630	"	"	no	8.59	6.97	1.62
04/22	1730	"	"	no	6.96	5.36	1.60
04/22	1830	"	"	no	5.36	3.71	1.65
04/22	1930	"	"	no	3.71	2.22	1.49
04/22	2030	"	"	no	2.22	.78	1.44
04/22	2130	"	"	no	13.69	11.89	1.80
04/22	2230	"	"	no	11.89	10.33	1.56
04/22	2330	003C55	"	no	10.34	8.84	1.50
04/23	0030	"	"	no	8.84	7.18	1.66
04/23	0130	"	"	no	7.18	5.59	1.59
04/23	0230	"	"	no	5.59	4.08	1.51
04/23	0330	"	"	no	4.08	2.48	1.60
04/23	0430	"	"	no	2.48	.78	1.70

DATE	TIME	SAMPLE NUMBER	SCREEN IN	WASH?	START WT.	STOP WT.	NET WT.
04/23	0530	"	"	no	11.45	9.77	1.68
04/23	0630	"	"	no	9.77	8.16	1.61
04/23	0730	003C56	"	no	8.16	6.56	1.60
04/23	0830	"	"	no	6.55	4.96	1.59
04/23	0930	"	"	no	4.96	3.30	1.66
04/23	1030	"	"	no	3.30	1.65	1.65
04/23	1130	"	"	no	1.65	.32	1.33
04/23	1230	--	--	--	--	--	--
04/23	1330	--	--	--	--	--	--
04/23	1430	"	0.25	no	12.80	7.80	5.00
04/23	1530	003C57	"	no	7.79	7.03	.76
04/23	1630	"	"	no	7.03	6.14	.89
04/23	1730	"	"	no	6.13	5.27	.86
04/23	1830	"	"	no	5.27	4.29	.98
04/23	1930	"	"	no	4.29	3.68	.61
04/23	2030	"	"	no	3.68	2.90	.78
04/23	2130	"	"	no	8.00	7.44	.56
04/23	2230	"	"	no	12.86	12.12	.74
04/23	2330	003C58	"	no	12.12	11.49	.63
04/24	0030	"	"	no	11.49	10.90	.59
04/24	0130	"	"	no	10.90	10.30	.60
04/24	0230	"	"	no	10.30	9.67	.63
04/24	0330	"	"	no	9.67	9.09	.58
04/24	0430	"	"	no	9.09	8.50	.59
04/24	0530	"	"	no	12.39	11.75	.64
04/24	0630	"	"	no	11.75	11.12	.63
04/24	0730	003C59	"	no	11.12	10.50	.62
04/24	0830	"	"	no	10.50	9.82	.68
04/24	0930	"	"	no	9.82	9.09	.73
04/24	1030	"	"	no	9.09	8.25	.84
04/24	1130	"	"	no	8.25	7.31	.94
04/24	1230	"	"	no	7.31	6.33	.98
04/24	1330	"	"	no	12.92	11.97	.95
04/24	1430	"	"	no	11.97	11.06	.91
04/24	1530	003C60	"	no	11.06	10.08	.98
04/24	1630	"	"	no	10.08	9.14	.94
04/24	1730	"	"	no	9.14	8.13	1.01
04/24	1830	"	"	no	8.13	7.03	1.10
04/24	1930	"	"	no	7.03	6.12	.91
04/24	2030	"	"	no	8.34	7.44	.90
04/24	2130	"	"	no	13.26	12.28	.98
04/24	2230	"	"	no	12.28	11.26	1.02
04/24	2330	003C61	"	no	11.26	10.27	.99
04/25	0030	"	"	no	10.27	9.36	.91
04/25	0130	"	"	no	9.36	8.42	.94
04/25	0230	"	"	no	8.42	7.45	.97
04/25	0330	"	"	no	7.45	6.52	.93
04/25	0430	"	"	no	6.52	5.64	.88
04/25	0530	"	"	no	13.17	12.33	.84
04/25	0630	"	"	no	12.33	11.40	.93
04/25	0730	003C62	"	no	11.40	10.42	.98
04/25	0830	"	"	no	10.42	9.37	1.05

DATE	TIME	SAMPLE NUMBER	SCREEN IN	WASH?	START WT.	STOP WT.	NET WT.
04/25	0930	"	"	no	9.39	8.37	1.02
04/25	1030	"	"	no	8.37	7.23	1.14
04/25	1130	"	"	no	7.22	6.16	1.06
04/25	1230	"	"	no	6.16	5.06	1.10
04/25	1330	"	"	no	12.11	10.95	1.16
04/25	1430	"	"	no	11.60	10.36	1.24
04/25	1530	003C63	"	no	10.35	9.33	1.02
04/25	1630	"	"	no	9.33	7.93	1.40
04/25	1730	"	"	no	7.93	6.63	1.30
04/25	1830	"	"	no	6.63	5.42	1.21
04/25	1930	"	"	no	5.42	4.02	1.40
04/25	2030	"	"	no	4.02	2.54	1.48
04/25	2130	"	"	no	13.00	11.45	1.55
04/25	2230	"	"	no	11.45	9.97	1.48
04/25	2330	003C64	"	no	9.97	8.39	1.58
04/26	0030	"	"	no	8.39	6.73	1.66
04/26	0130	"	"	no	13.22	11.69	1.53
04/26	0230	"	"	no	11.69	10.23	1.46
04/26	0330	"	"	no	10.23	8.87	1.36
04/26	0430	"	"	no	8.87	7.46	1.43
04/26	0530	"	"	no	13.32	11.92	1.40
04/26	0630	"	"	no	11.92	10.55	1.37
04/26	0730	003C65	"	no	10.55	9.16	1.39
04/26	0830	"	"	no	9.16	7.68	1.48
04/26	0930	"	"	no	7.68	6.18	1.50
04/26	1030	"	"	no	6.18	4.52	1.66
04/26	1130	"	"	no	4.52	2.81	1.71
04/26	1230	"	"	no	13.33	11.54	1.79
04/26	1330	"	"	no	11.54	9.55	1.99
04/26	1430	"	"	no	9.55	7.53	2.02
04/26	1530	003C66	"	no	7.53	5.53	2.00
04/26	1630	"	"	no	5.51	3.51	2.00
04/26	1730	"	"	no	3.51	1.37	2.14
04/26	1830	"	"	no	6.12	4.09	2.03
04/26	1930	"	"	no	4.09	1.86	2.23
04/26	2030	"	"	no	4.02	2.42	1.60
04/26	2130	"	"	no	13.03	10.99	2.04
04/26	2230	"	"	no	10.99	8.83	2.16
04/26	2330	003C67	"	no	8.83	6.62	2.21
04/27	0030	"	"	no	6.62	4.41	2.21
04/27	0130	"	"	no	13.67	11.56	2.11
04/27	0230	"	"	no	11.56	9.45	2.11
04/27	0330	"	"	no	10.13	7.98	2.15
04/27	0430	"	"	no	7.98	5.79	2.19
04/27	0530	"	"	no	5.79	3.59	2.20
04/27	0630	"	"	no	3.59	1.42	2.17
04/27	0730	003C68	"	no	1.42	.31	1.11
04/27	0830	"	"	no	8.17	3.78	4.39
04/27	0930	"	"	no	3.78	3.23	.55
04/27	1030	"	"	no	3.23	2.34	.89
04/27	1130	"	"	no	2.34	1.44	.90
04/27	1230	"	"	no	12.28	11.45	.83

DATE	TIME	SAMPLE NUMBER	SCREEN IN	WASH?	START WT.	STOP WT.	NET WT.
04/27	1330	"	"	no	11.45	10.74	.71
04/27	1430	"	"	no	10.74	10.03	.71
04/27	1530	003C69	"	no	10.03	9.43	.60
04/27	1630	"	"	no	10.03	9.43	.60
04/27	1730	"	"	no	9.43	8.83	.60
04/27	1830	"	"	no	8.19	7.57	.62
04/27	1930	"	"	no	7.57	6.95	.62
04/27	2030	"	"	no	6.94	6.26	.68
04/27	2130	"	"	no	13.42	12.73	.69
04/27	2230	"	"	no	12.72	12.07	.65
04/27	2330	003C70	"	no	12.07	11.34	.73
04/28	0030	"	"	no	11.34	10.62	.72
04/28	0130	"	"	no	10.62	9.88	.74
04/28	0230	"	"	no	9.88	9.08	.80
04/28	0330	"	"	no	9.08	8.44	.64
04/28	0430	"	"	no	13.43	12.78	.65
04/28	0530	"	"	no	12.78	12.11	.67
04/28	0630	"	"	no	12.11	11.36	.75
04/28	0730	003C71	"	no	11.36	10.62	.74
04/28	0830	"	"	no	10.62	9.79	.83
04/28	0930	"	"	no	9.79	8.85	.94
04/28	1030	"	"	no	8.85	7.77	1.08
04/28	1130	"	"	no	7.77	6.65	1.12
04/28	1230	"	"	no	6.65	5.49	1.16
04/28	1330	"	"	no	12.85	11.67	1.88
04/28	1430	"	"	no	11.67	10.56	1.11
04/28	1530	003C72	"	no	10.56	9.35	1.20
04/28	1630	"	"	no	9.35	8.18	1.17
04/28	1730	"	"	no	8.18	7.02	1.16
04/28	1830	"	"	no	7.00	5.92	1.08
04/28	1930	"	"	no	5.92	4.84	1.08
04/28	2030	"	"	no	4.84	3.66	1.18
04/28	2130	"	"	no	12.96	11.83	1.13
04/28	2230	"	"	no	11.83	10.68	1.15
04/28	2330	003C73	"	no	10.68	9.55	1.13
04/29	0030	"	"	no	9.55	8.37	1.18
04/29	0130	"	"	no	8.37	7.20	1.17
04/29	0230	"	"	no	7.20	6.00	1.20
04/29	0330	"	"	no	6.00	4.82	1.18
04/29	0430	"	"	no	13.52	12.73	.79
04/29	0530	"	"	no	12.73	11.52	1.21
04/29	0630	"	"	no	11.52	10.24	1.28
04/29	0730	003C74	"	no	10.24	9.12	1.12
04/29	0830	"	"	no	9.12	7.89	1.23
04/29	0930	"	"	no	7.89	6.59	1.30
04/29	1030	"	"	no	6.59	5.25	1.34
04/29	1130	"	"	no	5.25	3.97	1.28
04/29	1230	"	"	no	3.97	2.56	1.41
04/29	1330	"	"	no	12.28	10.70	1.58
04/29	1430	"	"	no	10.70	9.12	1.58
04/29	1530	003C75	"	no	9.11	7.59	1.52
04/29	1630	"	"	no	7.58	6.04	1.54

DATE	TIME	SAMPLE NUMBER	SCREEN IN	WASH?	START WT.	STOP WT.	NET WT.
04/29	1730	"	"	no	6.04	4.52	1.52
04/29	1830	"	"	no	4.52	2.98	1.54
04/29	1930	"	"	no	2.98	1.46	1.52
04/29	2030	"	"	no	5.62	4.08	1.54
04/29	2130	"	"	no	10.74	9.43	1.31
04/29	2230	"	"	no	11.56	10.05	1.51
04/29	2330	003C76	"	no	10.05	8.62	1.43
04/30	0030	"	"	no	8.62	7.20	1.42
04/30	0130	"	"	no	7.20	5.91	1.29
04/30	0230	"	"	no	5.91	4.60	1.31
04/30	0330	"	"	no	4.60	3.25	1.35
04/30	0430	"	"	no	3.25	1.93	1.32
04/30	0530	"	"	no	1.93	.45	1.48
04/30	0630	"	"	no	.45	.13	.32
04/30	0730	switch to Stahlman Stoker coal					

APPENDIX E
Ash Analysis Data

ASH ANALYSIS FOR BOM/FGT-003

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	4/11/83	19:14	17.3	40.0	55.8	75.7	100.0	—	14	4.6	0.35
2	4/11/83	22:29	19.1	43.9	67.6	74.9	100.0	0.96	12	2.6	0.32
3	4/12/83	6:00	26.2	50.0	64.4	78.0	95.0	0.92	15	2.8	0.20
4	4/12/83	8:00	32.8	54.0	67.8	78.6	100.0	0.96	15	1.7	0.28
5	4/12/83	12:14	31.1	53.2	67.3	73.9	87.0	0.95	16	7.8	0.15
6	4/12/83	15:30	19.6	35.6	51.4	72.3	93.0	0.83	16	6.7	0.30
7	4/12/83	20:00	40.7	66.8	79.3	91.5	100.0	0.79	23	4.3	0.16
8	4/13/83	1:00	35.7	62.1	78.9	93.1	100.0	0.73	18	0.0	0.28
9	4/13/83	5:00	42.3	67.9	79.7	86.5	100.0	0.68	20	1.0	0.05
10	4/13/83	6:30	45.8	64.1	72.2	81.6	96.6	0.73	13	3.8	0.06
11	4/13/83	9:00	27.5	80.2	88.2	95.3	100.0	0.71	11	7.8	0.13
12	4/13/83	11:00	52.8	76.5	84.6	90.9	100.0	0.71	25	5.0	0.04
13	4/13/83	13:00	18.4	40.6	55.0	79.9	92.2	0.71	13	5.0	0.09
14	4/13/83	14:30	20.5	44.7	65.7	83.3	100.0	0.71	11	20.5	0.19
15	4/13/83	16:29	69.1	84.3	90.1	93.8	100.0	0.75	33	18.9	0.21
16	4/13/83	19:00	72.9	90.4	96.2	100.0	100.0	0.75	23	4.2	0.12
17	4/13/83	20:29	32.3	51.6	64.1	75.6	100.0	0.65	11	24.9	0.23
18	4/13/83	23:00	38.4	63.8	77.2	85.8	94.9	0.62	24	22.2	0.22
19	4/14/83	2:00	32.2	54.8	68.0	74.8	100.0	0.61	29	21.9	0.22
20	4/14/83	7:00	29.6	51.5	62.4	72.7	91.6	0.61	27	11.5	0.14
21	4/15/83	10:00	43.5	72.0	82.5	90.7	100.0	0.61	6	9.1	0.12
22	4/15/83	13:50	33.2	53.2	68.7	82.9	100.0	0.61	24	5.7	0.07
23	4/15/83	17:29	50.0	72.6	82.2	90.5	100.0	0.64	28	7.6	0.14
24	4/15/83	19:00	39.4	60.5	74.6	83.6	100.0	0.71	23	12.9	0.15
25	4/15/83	21:29	26.6	49.4	65.1	78.9	100.0	0.69	17	16.8	0.18
26	4/15/83	22:00	40.3	65.7	77.9	88.5	100.0	0.74	18	18.7	0.20
28	4/16/83	3:29	27.8	49.3	67.3	83.9	100.0	0.70	29	24.3	0.24
29	4/16/83	4:30	50.4	75.9	87.1	93.8	100.0	0.65	26	31.1	0.21
30	4/16/83	6:30	28.1	50.5	67.3	79.6	100.0	0.72	23	18.1	0.28
31	4/16/83	8:14	44.9	74.3	87.2	95.8	100.0	0.67	24	17.4	0.18
32	4/16/83	11:00	29.9	58.4	77.8	87.8	100.0	0.63	19	29.0	0.25
33	4/16/83	13:19	58.4	75.5	84.2	89.9	100.0	0.65	14	19.8	0.20
34	4/16/83	15:00	34.6	57.8	71.6	80.6	90.9	0.65	14	28.2	0.25
35	4/16/83	16:20									
36	4/16/83	18:10	25.4	48.0	59.9	70.5	92.1	0.65	15	18.3	0.20
37	4/16/83	20:10									
38	4/16/83	22:00	33.8	63.1	78.2	88.2	97.5	0.56	21	20.1	0.25
39	4/17/83	0:30									
40	4/17/83	2:34	21.5	43.4	65.1	82.3	98.9	0.67	21	23.0	0.24
41	4/17/83	5:34									
42	4/17/83	9:00	16.2	43.2	61.8	76.8	98.3	0.69	14	19.9	0.24
43	4/17/83	11:00									
44	4/17/83	13:00	29.6	58.4	76.9	87.3	99.3	0.64	16	25.2	0.36
45	4/17/83	15:00									

ASH ANALYSIS FOR BOM/FGT-003

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				
46	4/17/83	17:00	26.1	50.1	69.2	86.3	100.0	0.71	20	24.7	0.29
47	4/17/83	19:04									
48	4/17/83	20:29	35.6	78.5	86.9	95.1	100.0	0.68	21	18.0	0.20
49	4/17/83	22:29									
50	4/18/83	1:00	23.2	59.2	75.5	86.3	100.0	0.67	18	24.0	0.16
51	4/18/83	3:00									
52	4/18/83	5:30	33.0	59.2	75.7	89.8	100.0	0.65	18	22.0	0.19
53	4/18/83	7:44									
54	4/18/83	9:00	51.6	72.1	83.0	88.2	95.3	0.72	29	14.0	0.18
55	4/18/83	11:00									
56	4/18/83	13:00	19.3	48.9	67.2	82.5	93.2	0.73	17	49.5	0.55
57	4/18/83	15:00									
58	4/18/83	16:14	45.8	68.9	78.3	85.7	96.1	0.74	16	45.8	0.32
59	4/18/83	17:20									
60	4/18/83	19:02	51.0	73.9	85.9	93.7	100.0	0.61	23	31.9	0.19
61	4/18/83	20:14									
62	4/18/83	22:20	40.5	65.1	82.0	90.6	100.0	0.67	20	21.8	0.34
63	4/19/83	0:20									
64	4/19/83	2:00	46.5	67.0	82.0	89.5	100.0	0.72	23	19.7	0.17
65	4/19/83	3:45									
66	4/19/83	4:30	29.1	57.5	74.2	84.9	100.0	0.61	14	21.1	0.19
67	4/19/83	6:00									
68	4/19/83	8:14	25.4	45.1	60.8	73.1	89.2	0.64	12	18.2	0.14
69	4/19/83	10:30									
70	4/19/83	13:00	26.1	46.7	55.0	61.8	73.4	0.64	17	13.4	0.17
71	4/19/83	15:05									
72	4/19/83	15:19	34.9	54.3	66.5	76.1	100.0	0.65	20	6.9	0.14
73	4/19/83	17:00									
74	4/19/83	19:00	47.7	68.7	79.7	86.8	100.0	0.59	23	21.5	0.16
75	4/19/83	20:10									
76	4/19/83	22:10	50.8	67.2	78.4	86.0	100.0	0.70	19	15.7	0.14
77	4/20/83	1:00									
78	4/20/83	1:00	43.4	69.3	80.4	86.0	100.0	0.56	27	15.6	0.16

ASH ANALYSIS FOR BQM/FGT-003

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				
80	4/20/83	4:44	33.0	53.1	65.4	76.4	94.1	0.64	20	12.7	0.12
81	4/20/83	6:00									
82	4/20/83	6:44	21.4	36.9	50.0	61.4	80.1	0.71	19	18.1	0.15
83	4/20/83	9:00									
84	4/20/83	11:05	43.1	78.3	88.2	92.5	100.0	0.73	21	23.2	0.16
85	4/20/83	13:00									
86	4/20/83	15:00	52.0	69.6	77.4	88.2	96.6	0.71	4	23.9	0.17
87	4/20/83	17:00									
88	4/20/83	18:35	55.2	82.1	88.5	93.4	100.0	0.63	20	22.6	0.21
89	4/20/83	20:29									
90	4/20/83	22:29	47.8	63.8	73.2	80.6	97.6	0.61	25	22.8	0.17
91	4/20/83	23:35									
92	4/21/83	1:00	41.9	69.2	78.0	86.2	100.0	0.63	24	17.7	0.27
93	4/21/83	3:29									
94	4/21/83	5:30	29.7	58.8	72.8	82.2	96.0	0.63	22	10.8	0.11
95	4/21/83	6:55									
96	4/21/83	9:00	35.3	72.4	82.5	91.6	100.0	0.56	24	22.1	0.49
97	4/21/83	11:00									
98	4/21/83	13:00	30.7	50.5	62.2	72.3	85.0	0.69	13	13.9	0.13
99	4/21/83	15:00									
100	4/21/83	17:00	30.1	40.5	46.2	51.3	66.2	0.67	17	4.7	0.05
101	4/21/83	19:00									
102	4/21/83	21:50	21.5	38.4	54.3	68.7	90.8	0.57	8	14.8	0.12
103	4/22/83	3:00									
104	4/22/83	5:00	35.3	67.3	79.6	88.0	94.7	0.59	26	14.1	0.15
105	4/22/83	6:44									
106	4/22/83	11:00	30.5	58.9	73.5	82.7	93.3	0.64	21	32.4	0.45
107	4/22/83	15:00									
108	4/22/83	18:00	40.6	64.9	79.4	90.8	100.0	0.74	21	23.4	0.19
109	4/22/83	21:04									
110	4/23/83	1:00	29.1	56.6	75.3	86.2	100.0	0.73	19	34.2	0.39
111	4/23/83	3:00									

ASH ANALYSIS FOR BOM/FGT-003

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				
112	4/23/83	4:34	43.7	71.9	84.5	92.8	100.0	0.65	17	28.1	0.26
113	4/23/83	6:50									
114	4/23/83	8:30	33.9	50.1	62.8	67.3	79.5	0.57	14	26.4	0.17
115	4/23/83	10:30	36.9	55.4	64.3	71.5	75.5	0.72	14	28.0	0.16
116	4/23/83	13:00									
117	4/23/83	15:00	42.3	76.1	88.2	94.9	100.0	0.63	11	23.3	0.19
118	4/23/83	17:00									
119	4/23/83	22:00	40.7	65.9	81.3	89.2	98.4	0.62	21	19.8	0.30
120	4/24/83	9:00									
121	4/24/83	13:00	37.3	56.3	68.1	73.1	84.0	0.73	15	11.5	0.15
122	4/24/83	18:29									
123	4/24/83	22:10	67.4	86.1	92.8	97.3	100.0	0.73	18	0.2	0.01
124	4/24/83	22:45									
125	4/25/83	3:00	49.5	78.9	89.4	94.5	100.0	0.73	20	24.9	0.19
126	4/25/83	5:30									
127	4/25/83	9:00	50.6	83.7	92.9	97.0	100.0	0.71	22	19.9	0.17
128	4/25/83	13:14									
129	4/25/83	19:50	45.4	86.6	94.7	97.6	100.0	0.72	24	20.6	0.22
131	4/26/83	0:00	53.0	72.0	82.0	89.7	100.0	0.69	16	13.2	0.15
132	4/26/83	1:00	50.9	80.0	93.7	98.4	100.0	0.67	17	17.5	0.42
133	4/26/83	3:00	38.1	62.5	76.0	87.1	100.0	0.62	17	14.8	0.17
134	4/26/83	5:00	47.8	65.2	76.2	82.1	91.6	0.63	21	17.3	0.20
135	4/26/83	7:00	52.1	71.1	76.2	82.8	84.8	0.54	24	9.2	0.15
136	4/26/83	9:19	39.2	61.3	72.2	79.0	89.8	0.68	24	14.2	0.16
137	4/26/83	11:00	34.6	56.2	71.5	82.1	95.8	0.62	19	23.0	0.24
138	4/26/83	13:00	48.0	80.7	90.5	96.7	100.0	0.63	15	0.0	0.00
139	4/26/83	15:30	38.8	65.2	82.7	91.0	100.0	0.65	15	14.2	0.13
140	4/26/83	16:29	65.1	81.5	88.2	94.2	100.0	0.70	26	12.7	0.16
141	4/26/83	19:00	27.2	49.9	63.6	72.0	96.3	0.63	22	17.9	0.15
142	4/26/83	20:00	32.1	58.2	75.4	84.1	100.0	0.60	18	18.0	0.25
143	4/26/83	23:00	42.8	72.3	85.5	94.0	100.0	0.62	30	—	—
144	4/27/83	1:04	31.0	64.4	80.3	88.4	100.0	0.61	27	25.4	0.16
145	4/27/83	2:45	57.4	79.1	84.6	91.1	100.0	0.66	36	17.4	0.11
146	4/27/83	4:05	57.9	80.3	92.2	95.3	100.0	0.59	34	25.6	0.18
147	4/27/83	6:30	41.8	68.1	80.8	89.2	100.0	0.55	16	21.6	0.17
148	4/27/83	7:00	19.2	31.6	41.4	48.5	62.0	0.00	32	13.4	0.14
149	4/27/83	9:00	6.6	11.0	12.7	17.8	34.5	0.00	19	7.5	0.12
150	4/27/83	13:00	47.1	61.3	67.9	72.7	92.7	0.68	32	9.7	0.09
151	4/27/83	19:29	34.6	66.0	82.6	87.6	100.0	0.66	16	6.4	0.07
152	4/28/83	1:00	47.4	69.2	79.7	87.8	100.0	0.69	26	5.9	0.07
153	4/28/83	4:55	55.0	82.6	93.7	98.2	100.0	0.65	23	4.2	0.08

ASH ANALYSIS FOR BOM/FGT-003

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				
154	4/28/83	9:14	41.2	79.1	89.8	94.8	100.0	0.60	25	4.2	0.08
155	4/28/83	13:00	23.7	42.6	51.8	53.9	65.2	0.72	11	5.7	0.14
156	4/28/83	18:29	51.8	84.1	96.6	100.0	100.0	0.70	29	5.9	0.11
157	4/28/83	21:29	67.0	90.3	98.6	100.0	100.0	0.70	30	5.0	0.10
158	4/29/83	0:15	68.2	89.9	97.7	100.0	100.0	—	31	4.5	0.14
159	4/29/83	3:00	77.0	91.9	97.0	97.4	100.0	—	31	4.4	0.05
160	4/29/83	5:30	71.2	91.9	98.3	100.0	100.0	0.72	35	3.2	0.06
161	4/29/83	7:00	74.5	90.9	97.2	100.0	100.0	0.71	25	2.3	0.05
162	4/29/83	9:00	44.5	59.6	68.0	68.5	68.5	0.63	20	3.2	0.05
163	4/29/83	11:19	32.9	57.9	71.5	75.7	77.6	0.65	12	1.4	0.08
164	4/29/83	13:30	63.0	83.5	88.2	89.0	89.9	0.70	9	4.6	0.06
165	4/29/83	14:55	68.7	87.5	94.6	96.0	100.0	0.57	19	3.4	0.05
166	4/29/83	16:29	54.0	75.4	88.0	93.7	100.0	0.58	20	5.0	0.05
167	4/29/83	18:29	49.4	70.7	82.4	90.4	100.0	0.57	22	6.5	0.05
168	4/29/83	22:00	51.6	82.7	90.8	96.4	100.0	0.52	22	8.8	0.07
169	4/29/83	23:29	46.5	73.5	84.2	87.6	90.9	0.59	19	10.4	0.08
170	4/30/83	2:50	62.8	86.5	95.7	97.8	100.0	0.56	33	7.0	0.05
171	4/30/83	7:00	39.5	69.1	83.2	87.2	100.0	0.56	24	4.2	0.08

APPENDIX F

Ash Removal Log

Ash weights are given in pounds.
(multiply by 1.24 to obtain corected load cell readings.)

Flush water is given in gallons.

DATE	TIME	SAMPLE NUMBER	INITIAL DRY	FINAL DRY	NET DRY	INITIAL WET	FINAL WET	NET WET	NET DRY +NET WET	FLUSH WATER
04/11	1915	003-A001	473	76	397	405	70	335	732	30
04/11	2218	003-A002	500	78	422	438	70	368	790	30
04/12	0600	003-A003	1032	72	960	488	65	423	1383	30
04/12	0800	003-A004	486	77	409	420	67	353	762	30
04/12	1215	003-A005	482	80	402	448	69	379	781	30
04/12	1530	003-A006	475	81	394	412	66	346	740	30
04/12	2000	003-A007	467	81	386	448	61	387	773	30
04/13	0100	003-A008	594	75	519	460	63	397	916	30
04/13	0500	003-A009	658	75	583	517	66	451	1034	30
04/13	0630	003-A010	503	73	430	454	65	389	819	30
04/13	0900	003-A011	579	75	504	484	66	418	922	30
04/13	1100	003-A012	515	85	430	530	63	467	897	30
04/13	1300	003-A013	605	86	519	474	65	409	928	30
04/13	1430	003-A014	658	110	548	455	65	390	938	30
04/13	1630	003-A015	158	85	73				1600	
04/13	1900	003-A016	844	86	758	1022	70	952	1710	30
04/13	2030	003-A017	584	71	513	404	63	341	854	30
04/13	2300	003-A018	625	77	548	394	60	334	882	30
04/14	0200	003-A019	585	74	511	404	63	341	852	30
04/14	0700	003-A020	1000	74	926					30
		POWER FAILURE				POWER FAILURE				
04/15	1000	003-A021	648	70	578	--	60	---	---	36
04/15	1350	003-A022	482	67	415	450	66	384	799	30
04/15	1730	003-A023	493	67	426	687	67	620	1046	30
04/15	1900	003-A024	482	82	400	440	67	373	773	30
04/15	2130	003-A025	674	74	600	408	64	344	944	30
04/15	2200	003-A026	410	83	327	443	62	381	708	30
04/16	0040	003-A027	562	75	487	403	63	340	827	30
04/16	0330	003-A028	645	77	568	492	69	423	991	30
04/16	0430	003-A029	484	86	398	408	67	341	739	30
04/16	0630	003-A030	557	77	480	463	69	394	874	30
04/16	0815	003-A031	519	76	443	470	69	401	884	30
04/16	1100	003-A032	861	77	784	405	65	340	1124	30
04/16	1320	003-A033	712	72	640	460	66	394	1034	30
04/16	1500	003-A034	895	73	822	443	64	379	1201	30
04/16	1620	003-A035	557	71	486	412	69	343	829	30
04/16	1810	003-A036	619	82	537	389	68	321	858	30
04/16	2010	003-A037	481	80	401	383	65	318	719	30
04/16	2200	003-A038	471	80	391	386	78	308	699	30
04/17	0030	003-A039	628	81	547	389	62	327	874	30
04/17	0235	003-A040	568	77	491	384	71	313	804	30
04/17	0535	003-A041	770	78	692	428	65	363	1055	30
04/17	0900	003-A042	795	76	719	406	70	336	1055	30
04/17	1100	003-A043	426	76	350	399	72	327	677	30
04/17	1300	003-A044	450	79	371	515	69	446	817	30
04/17	1500	003-A045	501	76	425	450	68	382	807	30
04/17	1700	003-A046	454	85	369	395	63	332	701	30
04/17	1905	003-A047	523	82	441	400	65	335	776	30
04/17	2030	003-A048	430	73	357	392	64	328	685	30
04/17	2230	003-A049	480	70	410	465	62	403	813	30
04/18	0100	003-A050	609	89	520	475	64	411	931	30
04/18	0300	003-A051	600	77	523	562	53	509	1032	30

DATE	TIME	SAMPLE NUMBER	INITIAL DRY	FINAL DRY	NET DRY	INITIAL WET	FINAL WET	NET WET	NET DRY +NET WET	FLUSH WATER
04/18	0530	003-A052	836	89	747	558	66	492	1239	30
04/18	0745	003-A053	664	86	578	511	72	439	1017	30
04/18	0900	003-A054	484	93	391	536	72	464	855	30
04/18	1100	003-A055	432	63	369	456	70	386	755	30
04/18	1300	003-A056	585	68	517	515	69	446	963	30
04/18	1500	003-A057	1001	111	890	840	55	785	1675	30
04/18	1615	003-A058	680	74	606	451	68	383	989	30
04/18	1720	003-A059	621	85	536	390	62	328	864	30
04/18	1830	003-A060	820	67	753	455	62	393	1146	30
04/18	2015	003-A061	875	82	793	540	62	478	1271	30
04/18	2220	003-A062	890	77	813	460	56	404	1217	30
04/19	0010	003-A063	830	97	733	360	180	180	913	30
04/19	0200	003-A064	670	73	597	440	66	374	971	30
04/19	0345	003-A065	757	52	705	458	54	404	1109	30
04/19	0430	003-A066	670	76	594	475	68	407	1001	30
04/19	0600	003-A067	1002	89	913	444	63	381	1294	30
04/19	0815	003-A068	1130	120	1010	734	72	662	1672	30
04/19	1030	003-A069	1187	85	1102	609	90	519	1621	30
04/19	1300	003-A070	1067	91	976	568	76	492	1468	30
04/19	1505	003-A071	680	87	593	468	64	404	997	30
04/19	1520	003-A072	850	83	767	465	65	400	1167	30
04/19	1700	003-A073	774	84	690	366	66	300	990	30
04/19	1900	003-A074	704	88	616	370	65	305	921	30
04/19	2010	003-A075	698	97	601	414	69	345	946	30
04/19	2210	330-A076	640	76	564	380	67	313	877	30
04/20	0010	003-A077	755	92	663	415	68	347	1010	30
04/20	0100	003-A078	397	90	307	390	78	312	619	30
04/20	0300	003-A079	707	68	639	383	68	315	954	30
04/20	0445	003-A080	540	77	463	400	69	331	794	30
04/20	0600	003-A081	345	72	273	360	68	292	565	30
04/20	0645	003-A082	400	71	329	400	73	327	656	30
04/20	0900	003-A083	742	75	667	453	69	384	1051	30
04/20	1100	003-A084	985	93	892	550	73	477	1369	30
04/20	1300	003-A085	1001	85	916	460	70	390	1306	70
04/20	1500	003-A086	1088	65	1023	534	70	464	1487	30
04/20	1700	003-A087	1150	90	1060	534	64	470	1530	30
04/20	1835	003-A088	1181	90	1091	486	68	418	1509	30
04/20	2030	003-A089	1474	82	1392	530	70	460	1852	30
04/20	2230	003-A090	1150	102	1048	475	58	417	1465	30
04/20	2335	003-A091	846	83	763	416	62	254	1117	30
04/21	0100	003-A092	660	80	580	390	61	329	909	30
04/21	0330	003-A093	891	59	832	435	61	374	1206	30
04/21	0530	003-A094	876	78	798	464	58	406	1204	30
04/21	0655	003-A095	500	69	431	382	57	325	756	30
04/21	0900	003-A096	919	97	822	431	65	366	1188	30
04/21	1100	003-A097	710	73	637	417	61	356	993	30
04/21	1300	003-A098	863	90	773	536	67	469	1242	30
04/21	1500	003-A099	1038	88	950	462	68	394	1344	30
04/21	1700	003-A100	920	76	844	419	52	367	1211	30.
04/21	1900	003-A101	1070	62	1008	405	53	352	1360	30
04/21	2150	003-A102	1384	69	1315	402	60	342	1657	30
04/22	0300	003-A103	767	65	702	365	67	298	1000	30

DATE	TIME	SAMPLE NUMBER	INITIAL DRY	FINAL DRY	NET DRY	INITIAL WET	FINAL WET	NET WET	NET DRY +NET WET	FLUSH WATER
04/22	0500	003-A104	482	70	412	410	70	340	752	30
04/22	0645	003-A105	356	74	282	324	60	264	546	30
04/22	1100	003-A106	578	85	493	500	70	430	923	30
04/22	1500	003-A107	897	190	707	550	70	480	1187	30
04/22	1800	003-A108	988	89	899	610	75	535	1434	30
04/22	2145	003-A109	1200	63	1137	490	61	429	1566	30
04/23	0100	003-A110	968	69	899	450	63	387	1286	30
04/23	0300	003-A111	675	104	571	480	62	418	989	30
04/23	0435	003-A112	691	115	576	420	61	359	935	30
04/23	0650	003-A113	958	80	878	500	64	436	1314	30
04/23	0830	003-A114	1030	101	929	545	65	480	1409	30
04/23	1030	003-A115	1063	119	944	350	62	288	1232	30
04/23	1300	003-A116	1020	93	927	392	68	324	1251	30
04/23	1500	003-A117	560	90	470	458	74	384	854	30
04/23	1700	003-A118	648	88	560	477	65	412	972	30
04/23	2200	003-A119	860	67	793	437	60	377	1170	30
04/24	0900	003-A120	515	85	430	349	60	289	719	30
04/24	1300	003-A121	610	68	542	426	58	368	910	30
04/24	1830	003-A122	937	79	858	437	63	374	1232	30
04/24*	2210	003-A123	760	74	686	455	56	399	1085	30
*2210 is listed in the written log as 2100 and dump ash at 864 pounds instead of 760 pounds.										
04/24	2245	003-A124	640	64	576	666	58	608	1184	30
04/25	0300	003-A125	688	86	602	493	59	434	1036	30
04/25	0530	003-A126	438	97	341	643	63	580	921	30
04/25	0900	003-A127	544	69	475	611	62	549	1024	30
04/25	1315	003-A128	685	64	621	517	67	450	1071	30
04/25	1915	003-A129	1118	102	1016	720	61	659	1675	30
04/25	2220	003-A130	715	66	649	440	57	383	1032	30
04/26	0000	003-A131	860	64	796	1022	64	958	1754	30
04/26	0100	003-A132	900	66	834	500	57	443	1277	30
04/26	0300	003-A133	820	87	733	515	67	448	1181	30
04/26	0500	003-A134	495	67	428	456	71	385	813	30
04/26	0700	003-A135	555	91	464	548	67	481	945	30
04/26	0920	003-A136	528	69	459	360	66	294	753	30
04/26	1100	003-A137	585	108	477	495	67	428	905	30
04/26	1300	003-A138	995	112	883	529	75	454	1337	30
04/26	1530	003-A139	956	129	827	375	67	308	1135	30
04/26	1630	003-A140	1133	150	983	428	61	367	1350	30
04/26	1900	003-A141	1197	155	1042	375	68	307	1349	30
04/26	2000	003-A142	1239	135	1104	479	56	423	1527	30
04/26	2300	003-A143	938	78	860	760	65	695	1555	30
04/27	0105	003-A144	1106	108	998	378	57	321	1319	30
04/27	0245	003-A145	1264	52	1212	512	59	453	1665	30
04/27	0405	003-A146	907	59	848	568	65	503	1351	30
04/27	0630	003-A147	960	57	903	520	68	452	1355	30
04/27	0700	003-A148	1140	60	1080	512	58	454	1534	30
04/27	0900	003-A149	1250	64	1186	582	58	524	1710	30
04/27	1300	003-A150	732	77	655	399	57	342	997	30
04/27	1930	003-A151	535	76	459	455	75	380	839	30
04/28	0100	003-A152	546	79	467	437	57	380	847	30
04/28	0455	003-A153	516	65	451	425	62	363	814	30

DATE	TIME	SAMPLE NUMBER	INITIAL DRY	FINAL DRY	NET DRY	INITIAL WET	FINAL WET	NET WET	NET DRY +NET WET	FLUSH WATER
04/28	0915	003-A154	380	88	292	455	57	398	690	30
04/28	1300	003-A155	649	120	529	440	59	381	910	30
04/28	1830	003-A156	682	83	599	572	53	519	1118	30
04/28	2130	003-A157	506	108	398	585	56	529	927	30
04/29	0015	003-A158	416	109	307	606	52	554	861	30
04/29	0300	003-A159	943	105	838	490	61	429	1267	30
04/29	0530	003-A160	748	146	602	435	54	381	983	30
04/29	0700	003-A161	602	123	479	554	56	498	977	30
04/29	0900	003-A162	425	126	299	476	51	425	724	30
04/29	1120	003-A163	742	108	634	630	55	575	1209	30
04/29	1330	003-A164	850	95	755	475	49	426	1181	30
04/29	1455	003-A165	596	104	492	387	54	333	825	30
04/29	1630	003-A166	740	88	652	389	56	333	985	30
04/29	1830	003-A167	770	98	672	699	98	601	1273	30
04/29	2200	003-A168	919	99	820	420	59	361	1181	30
04/29	2330	003-A169	575	83	492	309	44	265	757	30
04/30	0250	003-A170	559	86	473	557	59	498	971	30
04/30	0700	003-A171	476	98	378	422	58	364	742	30
04/30	0900	004-A001	420	95	325	405	55	350	675	30
04/30	1100	004-A002	540	60	480	390	55	335	815	30
04/30	1210	004-A003	1365	71	1294	420	91	329	1623	25
04/30	2100	004-A004	1115	65	1050	---	---	---	---	---
04/30	2235	004-A005	832	167	665	542	48	494	1159	30

APPENDIX G

Operator Logged Data

Included are three tables of data:

G-1. Freeboard Data

G-2. Firetest Data

G-3. Miscellaneous Operator Logged Data

Water flows in gpm.

Water totals in gallons.

Steam flows in lb/min.

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 et al, 1984).

Table G-1

FREEBOARD MEASUREMENTS

DATE	TIME	#1	#2	#3	#4	#5	#6	AVE
04/11	1150	42.0			38.0			40.0
04/11	1300		41.0			44.0		42.5
04/11	1400			41.0			42.0	41.5
04/11	1500	43.0	48.0			48.0		46.3
04/11	1600		48.0			48.0		48.0
04/11	1700			49.0			50.0	49.5
04/11	1800				49.0			49.0
40/11	1900	48.0			50.0			49.0
04/11	2000		47.0			47.0		47.0
04/11	2100			48.0			49.0	48.5
04/11	2200	47.0			49.0			48.0
04/11	2300		48.0			50.0		49.0
04/12	0000			44.0			44.0	44.0
04/12	0100	44.0			44.0			44.0
04/12	0200		43.0			42.0		42.5
04/12	0300			42.0			43.0	42.5
04/12	0400	44.0			44.0			44.0
04/12	0500		40.0			40.0		40.0
04/12	0600			40.0			39.0	39.5
04/12	0700	44.0			46.0			45.0
04/12	0800		44.0			44.0		44.0
04/12	0900			44.0			42.0	43.0
04/12	1000	41.0	44.0	44.0	42.0	45.0	43.0	43.2
04/12	1100	43.0			44.0			43.5
04/12	1200		45.0			43.0		44.0
04/12	1300			45.0			44.0	44.5
04/12	1400	43.0	43.0	44.0	44.0	45.0	45.0	44.0
04/12	1500	41.0		45.0				43.0
04/12	1600				47.0		49.0	48.0
04/12	1700		47.0			50.0		48.5
04/12	1800			49.0			48.0	48.5
04/12	1900	47.0				48.0		47.5
04/12	2000		48.0			47.0		47.5
04/12	2200			47.0			47.0	47.0
04/12	2300	47.0			48.0			47.5
04/13	0000		43.0			44.0		43.5
04/13	0100			45.0			48.0	46.5
04/13	0200	42.0			42.0			42.0
04/13	0300		43.0			44.0		43.5
04/13	0400			44.0			44.0	44.0
04/13	0500	42.0			41.0			41.5
04/13	0600		45.0			43.0		44.0
04/13	0700			43.0			41.0	42.0
04/13	0800	43.0			43.0			43.0
04/13	0900		47.0			34.0		40.5
04/13	1000			45.0			45.0	45.0
04/13	1100	40.0			42.0			41.0
04/13	1200		41.0			42.0		41.5
04/13	1300			43.0			43.0	43.0

FREEBOARD MEASUREMENTS

DATE	TIME	#1	#2	#3	#4	#5	#6	AVE
04/13	1400	41.0	46.0	47.0	43.0	43.0	45.0	44.2
04/13	1500	42.0			43.0			42.5
04/13	1600		47.0			48.0		47.5
04/13	1700			46.0			48.0	47.0
04/13	1800	47.0			48.0			47.5
04/13	1900		49.0			50.0		49.5
04/14	0000			47.0			47.0	47.0
04/14	0100	40.0			42.0			41.0
04/14	0200		45.0			45.0		45.0
04/14	0300			42.0			41.0	41.5
04/14	0400	44.0			45.0			44.5
		POWER FAILURE			POWER FAILURE			
04/15	1015	40.0			45.0			42.5
04/15	1100		43.0			46.0		44.5
04/15	1200			43.0			46.0	44.5
04/15	1300	40.0			39.0			39.5
04/15	1400		45.0			46.0		45.5
04/15	1500			45.0			46.0	45.5
04/15	1600	46.0			47.0			46.5
04/15	1700		47.0			48.0		47.5
04/15	1800			46.0			47.0	46.5
04/15	1900	46.0			46.0			46.0
04/15	2000		48.0			48.0		48.0
04/15	2100			46.0			46.0	46.0
04/15	2200	47.0			48.0			47.5
04/15	2300		46.0			46.0		46.0
04/16	0000			48.0			46.0	47.0
04/16	0100	41.0		41.0				41.0
04/16	0200		43.0			42.0		42.5
04/16	0300			42.0			40.0	41.0
04/16	0400	41.0			42.0			41.5
04/16	0500		41.0			40.0		40.5
04/16	0600			45.0			44.0	44.5
04/16	0700	45.0			46.0			45.5
04/16	0800		45.0			44.0		44.5
04/16	0900			45.0			44.0	44.5
04/16	1000	43.0			44.0			43.5
04/16	1100		43.0			46.0		44.5
04/16	1200			44.0			43.0	43.5
04/16	1300	43.0			42.0			42.5
04/16	1400		45.0			46.0		45.5
04/16	1500			44.0			43.0	43.5
04/16	1600	47.0			47.0			47.0
04/16	1700		49.0			47.0		48.0
04/16	1800			47.0			46.0	46.5
04/16	1900	46.0			48.0			47.0
04/16	2000		49.0			49.0		49.0
04/16	2100			48.0			47.0	47.5
04/16	2200	47.0			47.0			47.0
04/16	2300		48.0			49.0		48.5
04/17	0000			46.0			45.0	45.5

FREEBOARD MEASUREMENTS

DATE	TIME	#1	#2	#3	#4	#5	#6	AVE
04/17	0100	44.0			45.0			44.5
04/17	0200		45.0			43.0		44.0
04/17	0300			43.0			42.0	42.5
04/17	0400	43.0			44.0			43.5
04/17	0500		41.0			41.0		41.0
04/17	0600			42.0			40.0	41.0
04/17	0700	40.0			40.0			40.0
04/17	0800		44.0			43.0		43.5
04/17	0900			45.0			42.0	43.5
04/17	1000	43.0			45.0			44.0
04/17	1100		46.0			45.0		45.5
04/17	1200			43.0			44.0	43.5
04/17	1300	43.0			43.0			43.0
04/17	1400		45.0			44.0		44.5
04/17	1500			45.0		44.0		44.5
04/17	1600	48.0			46.0			47.0
04/17	1700		47.0			49.0		48.0
04/17	1800			47.0			48.0	47.5
04/17	1900	45.0			48.0			46.5
04/17	2000		48.0			46.0		47.0
04/17	2100			48.0			47.0	47.5
04/17	2200	47.0			47.0			47.0
04/17	2300		48.0			48.0		48.0
04/18	0000			45.0			45.0	45.0
04/18	0100	45.0			45.0			45.0
04/18	0200		46.0			45.0		45.5
04/18	0300			42.0			42.0	42.0
04/18	0400	40.0			40.0			40.0
04/18	0500		41.0			41.0		41.0
04/18	0600			42.0			42.0	42.0
04/18	0700	41.0			41.0			41.0
04/18	0800		45.0			44.0		44.5
04/18	0900			42.0			43.0	42.5
04/18	1000	42.0			41.0			41.5
04/18	1100		42.0			42.0		42.0
04/18	1200			42.0		42.0		42.0
04/18	1300	41.0			44.0			42.5
04/18	1400		44.0			43.0		43.5
04/18	1500			45.0			42.0	43.5
04/18	1600	46.0			44.0			45.0
04/18	1700		47.0			46.0		46.5
04/18	1800			48.0			48.0	48.0
04/18	1900	47.0			46.0			46.5
04/18	2000		49.0			48.0		48.5
04/18	2100			48.0			49.0	48.5
04/18	2200	47.0			47.0			47.0
04/18	2300		49.0			48.0		48.5
04/19	0000	45.0			42.0			43.5
04/19	0100		42.0			42.0		42.0
04/19	0200			43.0			42.0	42.5
04/19	0300	41.0			41.0			41.0

FREEBOARD MEASUREMENTS

DATE	TIME	#1	#2	#3	#4	#5	#6	AVE
04/19	0400		44.0		44.0			44.0
04/19	0500			41.0			41.0	41.0
04/19	0600	42.0			42.0			42.0
04/19	0700		42.0			41.0		41.5
04/19	0800			43.0			44.0	43.5
04/19	0900	42.0			43.0			42.5
04/19	1000		42.0			44.0		43.0
04/19	1100			41.0			43.0	42.0
04/19	1200	43.0			42.0			42.5
04/19	1300		43.0			42.0		42.5
04/19	1400			41.0			42.0	41.5
04/19	1500	42.0			41.0			41.5
04/19	1600		45.0			44.0		44.5
04/19	1700			47.0			45.0	46.0
04/19	1800	46.0			47.0			46.5
04/19	1900		48.0			48.0		48.0
04/19	2000			48.0			47.0	47.5
04/19	2100	46.0			48.0			47.0
04/19	2200		48.0			48.0		48.0
04/19	2300			47.0			48.0	47.5
04/20	0000	44.0			43.0			43.5
04/20	0100		42.0			42.0		42.0
04/20	0200			45.0			43.0	44.0
04/20	0300	42.0			42.0			42.0
04/20	0400		44.0			44.0		44.0
04/20	0500			43.0			40.0	41.5
04/20	0600	41.0			40.0			40.5
04/20	0700		42.0			43.0		42.5
04/20	0800			43.0			42.0	42.5
04/20	0900	41.0			42.0			41.5
04/20	1000		42.0			44.0		43.0
04/20	1100			42.0			41.0	41.5
04/20	1200	43.0			41.0			42.0
04/20	1300		41.0			43.0		42.0
04/20	1400			43.0			41.0	42.0
04/20	1500	41.0			43.0			42.0
04/20	1600			44.0			43.0	43.5
04/20	1700		48.0			48.0		48.0
04/20	1800	44.0			48.0			46.0
04/20	1900		48.0			47.0		47.5
04/20	2000			46.0			48.0	47.0
04/20	2100	44.0			46.0			45.0
04/20	2200		48.0			48.0		48.0
04/20	2300			48.0			46.0	47.0
04/21	0000	44.0			44.0			44.0
04/21	0100		41.0			41.0		41.0
04/21	0200			44.0			43.0	43.5
04/21	0300	42.0			40.0			41.0
04/21	0400		46.0			43.0		44.5
04/21	0500			43.0			43.0	43.0
04/21	0600	42.0			42.0			42.0

FREEBOARD MEASUREMENTS

DATE	TIME	#1	#2	#3	#4	#5	#6	AVE
04/21	0700		43.0			43.0		43.0
04/21	0800			43.0			42.0	42.5
04/21	0900	41.0			40.0			40.5
04/21	1000		40.0			43.0		41.5
04/21	1100			45.0			41.0	43.0
04/21	1200	42.0			44.0			43.0
04/21	1300		41.0			44.0		42.5
04/21	1400			44.0			41.0	42.5
04/21	1500	40.0			45.0			42.5
04/21	1600		48.0			49.0		48.5
04/21	1700			47.0			48.0	47.5
04/21	1800	46.0			46.0			46.0
04/21	1900		48.0			47.0		47.5
04/21	2000			48.0			47.0	47.5
04/21	2100	47.0			47.0			47.0
04/21	2200		46.0			46.0		46.0
04/21	2300			48.0			46.0	47.0
04/22	0000	41.0			42.0			41.5
04/22	0100		---			---		---
04/22	0200		43.0			43.0		43.0
04/22	0300			43.0			43.0	43.0
04/22	0400	45.0			44.0			44.5
04/22	0500		40.0			41.0		40.5
04/22	0600			42.0			41.0	41.5
04/22	0700	45.0			45.0			45.0
04/22	0800		45.0			44.0		44.5
04/22	0900			40.0			42.0	41.0
04/22	1000	40.0			44.0			42.0
04/22	1100		40.0			41.0		40.5
04/22	1200			42.0			45.0	43.5
04/22	1300	43.0			42.0			42.5
04/22	1400		43.0			44.0		43.5
04/22	1500			42.0			43.0	42.5
04/22	1600	47.0			48.0			47.5
04/22	1700		49.0			48.0		48.5
04/22	1800			48.0			45.0	46.5
04/22	1900	48.0			47.0			47.5
04/22	2000		48.0			47.0		47.5
04/22	2100	--			--			--
04/22	2200			48.0			46.0	47.0
04/22	2300	47.0			47.0			47.0
04/23	0000	45.0			44.0			44.5
04/23	0100		43.0			43.0		43.0
04/23	0200			44.0			43.0	43.5
04/23	0300	42.0			42.0			42.0
04/23	0400		46.0			44.0		45.0
04/23	0500			43.0			43.0	43.0
04/23	0600	44.0			42.0			43.0
04/23	0700		42.0			41.0		41.5
04/23	0800			43.0			44.0	43.5
04/23	0900	41.0			42.0			41.5

FREEBOARD MEASUREMENTS

DATE	TIME	#1	#2	#3	#4	#5	#6	AVE
04/23	1000		40.0			43.0		41.5
04/23	1100			40.0			42.0	41.0
04/23	1200	43.0			43.0			43.0
04/23	1300		44.0			43.0		43.5
04/23	1400			38.0			39.0	38.5
04/23	1500	41.0			40.0			40.5
04/23	1600		46.0			47.0		46.5
04/23	1700			46.0			48.0	47.0
04/23	1800	46.0			46.0			46.0
04/23	1900		47.0			46.0		46.5
04/23	2000			46.0			47.0	46.5
04/23	2100	46.0			48.0			47.0
04/23	2200		47.0			48.0		47.5
04/23	2300			49.0			47.0	48.0
04/24	0000	43.0			43.0			43.0
04/24	0100		42.0			43.0		42.5
04/24	0200			41.0			43.0	42.0
04/24	0300	43.0			43.0			43.0
04/24	0400		41.0			42.0		41.5
04/24	0500			41.0			40.0	40.5
04/24	0600	40.0			41.0			40.5
04/24	0700		41.0			42.0		41.5
04/24	0800			42.0			41.0	41.5
04/24	0900	40.0			41.0			40.5
04/24	1000		43.0			44.0		43.5
04/24	1100			40.0			43.0	41.5
04/24	1200	41.0			42.0			41.5
04/24	1300		41.0			43.0		42.0
04/24	1400			40.0			43.0	41.5
04/24	1500	46.0			45.0			45.5
04/24	1600		44.0			47.0		45.5
04/24	1700			44.0			46.0	45.0
04/24	1800	46.0			47.0			46.5
04/24	1900		46.0			45.0		45.5
04/24	2000			46.0			46.0	46.0
04/24	2100	47.0			46.0			46.5
04/24	2200		46.0			46.0		46.0
04/24	2300			43.0			43.0	43.0
04/25	0000	42.0			42.0			42.0
04/25	0100		42.0			41.0		41.5
04/25	0200			45.0			45.0	45.0
04/24	0300	45.0			45.0			45.0
04/25	0400		45.0			43.0		44.0
04/25	0500			42.0			42.0	42.0
04/25	0600	44.0			42.0			43.0
04/25	0700		42.0			41.0		41.5
04/25	0800			40.0			42.0	41.0
04/25	0900	40.0			41.0			40.5
04/25	1000		39.0			40.0		39.5
04/25	1100			41.0			42.0	41.5
04/25	1200	39.0			42.0			40.5

FREEBOARD MEASUREMENTS

DATE	TIME	#1	#2	#3	#4	#5	#6	AVE
04/25	1300		42.0			41.0		41.5
04/25	1400			41.0			40.0	40.5
04/25	1500	45.0			45.0			45.0
04/25	1600		46.0			45.0		45.5
04/25	1700			46.0			46.0	46.0
04/25	1800	47.0			46.0			46.5
04/25	1900		47.0			47.0		47.0
04/25	2000			46.0			47.0	46.5
04/25	2100	46.0			46.0			46.0
04/25	2200		49.0			45.0		47.0
04/25	2300			47.0			46.0	46.5
04/26	0000	45.0			45.0			45.0
04/26	0100		42.0			42.0		42.0.
04/26	0200			46.0			43.0	44.5
04/26	0300	42.0			42.0			42.0
04/26	0400		44.0			43.0		43.5
04/26	0500			40.0			41.0	40.5
04/26	0600	44.0			42.0			43.0
04/26	0700		39.0			40.0		39.5
04/26	0800			41.0			41.0	41.0
04/26	0900	40.0			41.0			40.5
04/26	1000		40.0			42.0		41.0
04/26	1100			42.0			40.0	41.0
04/26	1200	41.0			41.0			41.0
04/26	1300		41.0			42.0		41.5
04/26	1400			41.0			42.0	41.5
04/26	1500	46.0			46.0			46.0
04/26	1600		45.0			45.0		45.0
04/26	1700			46.0			45.0	45.5
04/26	1800	46.0			46.0			46.0
04/26	1900		47.0			46.0		46.5
04/26	2000			47.0			45.0	46.0
04/26	2100	47.0			47.0			47.0
04/26	2200		43.0			43.0		43.0
04/26	2300			46.0			48.0	47.0
04/27	0000	40.0			43.0			41.5
04/27	0100		41.0			41.0		41.0
04/27	0200			42.0			43.0	42.5
04/27	0300	41.0			40.0			40.5
04/27	0400		44.0			43.0		43.5
04/27	0500			40.0			41.0	40.5
04/27	0600	43.0			43.0			43.0
04/27	0700		41.0			44.0		41.5
04/27	0800			42.0			41.0	41.5
Went from 1/4" X 2 1/2" to 1/4" X 3/4"								
04/27	0900	43.0			42.0			42.5
04/27	1000		43.0			42.0		42.5
04/27	1100			40.0			38.0	39.0
04/27	1200	41.0			42.0			41.5
04/27	1300		39.0			41.0		40.0
04/27	1400			41.0			42.0	41.5

FREEBOARD MEASUREMENTS

DATE	TIME	#1	#2	#3	#4	#5	#6	AVE
04/27	1500	44.0			46.0			45.0
04/27	1600		44.0			42.0		43.0
04/27	1700			43.0			42.0	43.0
04/27	1800	45.0			45.0			45.0
04/27	1900		44.0			44.0		44.0
04/27	2000			43.0			44.0	43.5
04/27	2100	45.0			46.0			45.5
04/27	2200		44.0			45.0		44.5
04/27	2300			44.0			44.0	44.0
04/28	0000	43.0			42.0			42.5
04/28	0100		40.0			40.0		40.0
04/28	0200			42.0			42.0	42.0
04/28	0300	40.0			40.0			40.0
04/28	0400		42.0			40.0		41.0
04/28	0500			41.0			41.0	41.0
04/28	0600	40.0	41.0	41.0	41.0	40.0	40.0	40.5
04/28	0700	39.0			39.0			39.0
04/28	0800		40.0			41.0		40.5
04/28	0900			42.0			40.0	41.0
04/28	1000	42.0	40.0	42.0	41.0	40.0	42.0	41.2
04/28	1100	37.0	39.0	36.0	40.0	39.0	40.0	38.5
04/28	1200	38.0	40.0	39.0	38.0	39.0	38.0	38.7
04/28	1300	37.0			39.0			38.0
04/28	1400		37.0			38.0		37.5
04/28	1500			43.0			41.0	42.0
04/28	1600	38.0			40.0			39.0
04/28	1700		38.0			37.0		37.5
04/28	1800			40.0			39.0	39.5
04/28	1900	42.0			41.0			41.5
04/28	2000		41.0			42.0		41.5
04/28	2100			41.0			40.0	40.5
04/28	2200	42.0			41.0			41.5
04/28	2300		43.0			45.0		44.0
04/29	0000	43.0			43.0			43.0
04/29	0100		40.0			41.0		40.5
04/29	0200			42.0			42.0	42.0
04/29	0300	41.0			40.0			40.5
04/29	0400		40.0			40.0		40.0
04/29	0500			40.0			39.0	39.5
04/29	0600	39.0			40.0			39.5
04/29	0700		39.0			39.0		39.0
04/29	0800			44.0			42.0	43.0
04/29	0900	37.0	38.0	38.0	36.0	40.0	40.0	38.2
04/29	1000	40.0			40.0			40.0
04/29	1100		38.0			39.0		38.5
04/29	1200			40.0			42.0	41.0
04/29	1300	38.0			39.0			38.5
04/29	1400		38.0			40.0		39.0
04/29	1500			42.0			43.0	42.5
04/29	1600	43.0			42.0			42.5
04/29	1700		41.0			39.0		40.0

FREEBOARD MEASUREMENTS

DATE	TIME	#1	#2	#3	#4	#5	#6	AVE
04/29	1800			44.0			43.0	43.5
04/29	1900	43.0			43.0			43.0
04/29	2000		42.0			40.0		41.0
04/29	2100			40.0			40.0	40.0
04/29	2200	43.0			44.0			43.3
04/29	2300		42.0			42.0		42.0
04/30	0000			42.0			41.0	41.5
04/30	0100	40.0			40.0			40.0
04/30	0200		40.0			40.0		40.0
04/30	0300			39.0			40.0	39.5
04/30	0400	40.0			41.0			40.5
04/30	0500		41.0			39.0		40.0
04/30	0600			40.0			40.0	40.0
04/30	0700	39.0	38.0	37.0	39.0	38.0	38.0	38.2
04/30	0800	38.0	38.0	40.0	39.0	41.0	40.0	39.3

Table G-2

FIRETEST RESULTS

Date	Time	#1	#2	#3	#4	#5	#6	#7	Average
4/11	1130	16.0	24.0	10.0	16.0	18.0	10.0	12.0	15.1
4/11	1330	20.0	10.0	17.0	22.0	18.0	14.0	9.0	15.7
4/11	1600	16.0	19.0	20.0	20.0	18.0	19.0	10.0	17.4
4/11	1800	15.0	18.0	10.0	14.0	19.0	17.0	7.0	14.3
4/11	2000	16.0	18.0	18.0	16.0	17.0	16.0	5.0	15.1
4/11	2200	16.0	17.0	18.0	17.0	16.0	15.0	6.0	15.0
4/11	2400	8.0	19.0	15.0	24.0	18.0	10.0	4.0	14.0
4/12	0200	13.0	22.0	20.0	21.0	17.0	14.0	4.0	15.9
4/12	0400	14.0	19.0	9.0	21.0	9.0	4.0	5.0	11.6
4/12	0600	11.0	23.0	9.0	13.0	25.0	15.0	3.0	14.1
4/12	0800	11.0	16.0	3.0	16.0	17.0	14.0	6.0	11.9
4/12	1000	7.0	13.0	14.0	23.0	14.0	4.0	6.0	11.6
4/12	1200	16.0	18.0	15.0	8.0	17.0	11.0	6.0	13.0
4/12	1400	12.0	21.0	22.0	19.0	16.0	10.0	4.0	14.9
4/12	1600	11.0	28.0	17.0	13.0	21.0	23.0	6.0	17.0
4/12	1800	15.0	23.0	9.0	15.0	24.0	17.0	8.0	15.9
4/12	2000	22.0	22.0	16.0	11.0	18.0	20.0	9.0	16.0
4/12	2200	17.0	33.0	21.0	19.0	22.0	22.0	16.0	21.4
4/13	0000	15.0	22.0	14.0	14.0	14.0	14.0	6.0	14.1
4/13	0200	12.0	38.0	13.0	11.0	11.0	17.0	10.0	16.0
4/13	0400	13.0	43.0	13.0	13.0	39.0	16.0	9.0	20.9
4/13	0600	9.0	32.0	14.0	13.0	27.0	14.0	6.0	16.4
4/13	0800	13.0	36.0	13.0	12.0	17.0	15.0	7.0	16.1
4/13	1000	15.0	28.0	12.0	12.0	29.0	12.0	14.0*	17.4
* #7 SEEMED TO BREAK THROUGH CRUST-POKED TWICE									
4/13	1200	12.0	32.0	18.0	12.0	15.0	11.0	10.0	15.3
4/13	1400	13.0	16.0	11.0	16.0	12.0	14.0	18.0	14.3
4/13	1600	11.0	12.0	13.0	13.0	13.0	11.0	12.0	12.1
4/13	1800	12.0	13.0	12.0	10.0	12.0	12.0	8.0	11.3
4/13	2000	6.0	6.0	4.0	--	12.0	10.0	--	7.6
4/13	2200	BOILER FAILURE							
4/14	0000	10.0	5.0	11.0	3.0	11.0	9.0	3.0	7.4
4/14	0200	9.0	11.0	11.0	14.0	18.0	9.0	7.0	1.3
4/14	0400	11.0	11.0	12.0	10.0	13.0	12.0	5.0	10.6
POWER FAILURE POWER FAILURE									
4/15	0800	14.0**	--	19.0**	--	--	12.0**	--	15.0
** ABOUT 3 FEET INCANDESCENT ZONE									
4/15	0930	7.0	4.0	5.0	10.0	18.0	10.0	4.0	8.3
4/15	1100	4.0	6.0	7.0	7.0	10.0	4.0	4.0	6.0
4/15	1300	5.0	3.0	7.0	8.0	10.0	7.0	5.0	6.4
4/15	1400	5.0	5.0	12.0	14.0	13.0	10.0	9.0	9.7
4/15	1600	13.0	16.0	19.0	15.0	26.0	30.0	14.0	19.0
4/15	1800	14.0	14.0	14.0	11.0	16.0	16.0	6.0	13.0
4/15	2000	15.0	17.0	15.0	12.0	9.0	14.0	7.0	12.7
4/15	2200	14.0	15.0	14.0	15.0	17.0	14.0	6.0	13.6
4/16	0000	14.0	16.0	16.0	12.0	12.0	15.0	2.0	12.4
4/16	0200	15.0	16.0	20.0	14.0	16.0	14.0	3.0	13.4
4/16	0400	14.0	16.0	17.0	14.0	16.0	14.0	3.0	13.4
4/16	0600	15.0	19.0	14.0	15.0	13.0	15.0	2.0	13.3

FIRETEST RESULTS

Date	Time	#1	#2	#3	#4	#5	#6	#7	Average
4/16	0800	13.0	12.0	12.0	13.0	14.0	14.0	6.0	12.0
4/16	1000	12.0	14.0	12.0	12.0	13.0	14.0	5.0	11.7
4/16	1200	14.0	15.0	15.0	16.0	15.0	15.0	4.0	13.4
4/16	1400	12.0	15.0	12.0	14.0	14.0	15.0	5.0	12.4
4/16	1600	9.0	10.0	12.0	13.0	12.0	9.0	6.0	10.1
4/16	1800	12.0	12.0	9.0	10.0	10.0	12.0	0	9.3
4/16	2000	14.0	12.0	12.0	9.0	10.0	10.0	4.0	10.1
4/16	2200	12.0	11.0	10.0	10.0	12.0	11.0	6.0	10.3
4/17	0000	14.0	12.0	12.0	9.0	12.0	9.0	8.0	10.9
4/17	0200	13.0	13.0	13.0	9.0	15.0	9.0	2.0	10.6
4/17	0400	13.0	13.0	14.0	12.0	12.0	9.0	7.0	11.4
4/17	0600	12.0	15.0	12.0	13.0	12.0	12.0	4.0	11.4
4/17	0800	11.0	16.0	14.0	10.0	13.0	13.0	7.0	12.0
4/17	1000	13.0	16.0	12.0	12.0	14.0	11.0	5.0	11.9
4/17	1200	12.0	16.0	16.0	13.0	11.0	10.0	5.0	11.9
4/17	1400	9.0	13.0	13.0	13.0	11.0	13.0	4.0	10.9
4/17	1600	11.0	19.0	14.0	14.0	18.0	13.0	9.0	14.0
4/17	1800	12.0	18.0	13.0	15.0	22.0	11.0	7.0	14.0
4/17	2000	10.0	18.0	15.0	16.0	20.0	13.0	6.0	14.0
4/17	2200	11.0	17.0	15.0	15.0	18.0	15.0	7.0	14.0
4/18	0000	13.0	20.0	14.0	13.0	16.0	17.0	4.0	13.9
4/18	0200	14.0	21.0	15.0	11.0	23.0	9.0	9.0	14.6
4/18	0400	13.0	14.0	19.0	12.0	20.0	12.0	4.0	13.4
4/18	0600	16.0	14.0	15.0	14.0	18.0	10.0	2.0	12.7
4/18	0800	16.0	17.0	9.0	13.0	14.0	15.0	6.0	12.9
4/18	1000	19.0	13.0	16.0	14.0	16.0	14.0	7.0	14.1
4/18	1200	24.0	17.0	17.0	14.0	28.0	14.0	11.0	17.9
4/18	1400	18.0	22.0	19.0	24.0	24.0	16.0	10.0	19.0
4/18	1600	14.0	18.0	14.0	15.0	20.0	17.0	8.0	15.1
4/18	1800	12.0	15.0	12.0	13.0	15.0	13.0	4.0	12.0
4/18	2000	13.0	16.0	12.0	12.0	15.0	17.0	8.0	13.3
4/18	2200	13.0	17.0	13.0	17.0	17.0	11.0	8.0	13.7
4/19	0000	12.0	18.0	18.0	12.0	18.0	11.0	10.0	14.1
4/19	0200	13.0	21.0	19.0	15.0	25.0	14.0	9.0	16.6
4/19	0400	13.0	22.0	13.0	12.0	15.0	11.0	16.0	14.6
4/19	0600	13.0	20.0	12.0	8.0	22.0	10.0	12.0	13.9
4/19	0800	10.0	19.0	13.0	20.0	17.0	10.0	3.0	13.1
4/19	1000	10.0	15.0	17.0	16.0	16.0	9.0	5.0	12.6
4/19	1200	10.0	16.0	15.0	16.0	11.0	11.0	2.0	11.6
4/19	1400	9.0	17.0	15.0	17.0	15.0	11.0	1.0	12.1
4/19	1600	10.0	5.0	14.0	10.0	13.0	8.0	0.0	8.6
4/19	1800	13.0	15.0	8.0	8.0	17.0	6.0	2.0	9.9
4/19	2000	8.0	12.0	10.0	14.0	13.0	13.0	2.0	10.3
4/19	2200	10.0	12.0	10.0	13.0	12.0	12.0	3.0	10.3
4/20	0000	13.0	19.0	15.0	17.0	12.0	12.0	0.0	12.6
4/20	0200	11.0	13.0	6.0	15.0	23.0	1.0	0.0	9.9
4/20	0400	11.0	14.0	22.0	8.0	22.0	10.0	0.0	12.4
4/20	0600	18.0	25.0	20.0	12.0	21.0	9.0	8.0	16.1
4/20	0800	18.0	15.0	19.0	21.0	20.0	15.0	10.0	16.9
4/20	1000	16.0	26.0	17.0	18.0	23.0	15.0	13.0	18.3
4/20	1200	16.0	45.0	17.0	11.0	24.0	16.0	10.	19.9

FIRETEST RESULTS

Date	Time	#1	#2	#3	#4	#5	#6	#7	Average
4/20	1400	15.0	29.0	15.0	27.0	16.0	18.0	11.0	18.7
4/20	1600	16.0	14.0	20.0	13.0	26.0	12.0	8.0	15.6
4/20	1800	13.0	13.0	12.0	11.0	14.0	7.0	7.0	11.0
4/20	2000	14.0	12.0	13.0	12.0	16.0	11.0	6.0	12.0
4/20	2200	14.0	13.0	13.0	14.0	14.0	12.0	7.0	12.4
4/21	0000	10.0	12.0	8.0	7.0	6.0	3.0	12.0	8.3
4/21	0200	13.0	15.0	8.0	13.0	7.0	11.0	10.0c	11.0
4/21	0400	7.0	12.0	17.0	11.c	13.0	10.0	5.0c	10.7
4/21	0600	11.0	18.0	8.0	12.0	12.0	15.0	1.0	11.0
4/21	0800	14.0	25.0	16.0	17.0	6.d	14.0	3.0	13.6
4/21	1000	18.0	17.0	14.0	16.0	10.0	4.0	1.0	11.4
4/21	1200	16.0	21.0	15.0	10.0	17.0	15.0	2.0	13.7
4/21	1400	14.0	26.0	10.d	11.0	14.0	13.0	3.0	13.0
4/21	1600	14.0	30.0	6.0	11.0	18.0	17.0	8.0	14.9
4/21	1800	15.0	17.0	15.0	17.0	15.0	16.0	6.0	14.4
4/21	2000	16.0	14.0	13.0	30.0	21.0	15.0	9.0	16.9
4/21	2200	14.0	16.0	15.0	17.0	19.0	14.0	8.0	14.7
4/22	0000	9.0	11.0	4.c	8.0	11.0	11.0	0.0	7.7
4/22	0200	7.0	12.0	10.0	7.0	10.0	10.0	4.0	8.6
4/22	0400	7.0	10.0	7.0	12.0	12.0	8.0	2.0c	8.3
4/22	0600	7.0	6.0	4.0	7.0	9.0	12.0	0.0c	6.4
4/22	0800	10.0	13.0	12.0	12.0	13.0	7.0	11.0	11.1
Number 7 off cone at an angle									
4/22	1000	16.c	13.0	11.0	13.0	17.0	14.c	1.0c	12.1
4/22	1200	14.c	15.0	18.0	15.0	18.0	16.c	12.0	15.4
4/22	1400	22.0	28.0	20.0	18.0	26.0	24.0	11.0	21.3
4/22	1600	18.0	17.0	26.0	11.0	17.0	14.0	6.0	15.6
4/22	1800	12.0	20.0	21.0	17.0	16.0	9.0	9.0	14.9
4/22	2000	20.0	25.0	14.0	17.0	23.0	17.0	9.0	17.9
4/22	2200	15.0	16.0	17.0	19.0	16.0	18.0	9.0	15.7
4/23	0000	18.0	31.0	16.0	25.0	20.0	15.d	9.0	19.1
4/23	0200	15.0	19.0	35.0	24.0	19.0	15.0	11.0	19.7
4/23	0400	19.0	28.0	29.0	12.0	19.0	13.d	10.0	18.6
4/23	0600	14.0	23.0	12.0	16.0	13.0	10.0	7.0	13.0
4/23	0800	15.0	24.0	13.0	11.0	11.0	10.0	7.0	13.0
4/23	1000	15.0	18.0	10.0	11.0	15.0	11.0	4.0	12.0
4/23	1200	12.0	11.0	9.0	13.0	11.0	13.0	7.0	10.9
4/23	1400	12.0	15.0	15.0	14.0	11.0	13.0	3.0	11.9
4/23	1600	11.0	13.0	12.0	6.0	3.0	9.0	1.0	7.9
4/23	1800	10.0	8.0	12.0	10.0	5.0	8.0	0.0	7.6
4/23	2000	12.0	10.0	14.0	10.0	10.0	9.0	2.0	9.6
4/23	2200	9.0	10.0	10.0	14.0	12.0	6.0	7.0	9.7
4/24	0000	10.0	9.0	12.c	6.0	7.0	6.0	1.0	7.3
4/24	0200	12.0	15.0	9.0	10.0	6.0	11.0	3.0	9.4
4/24	0400	15.0	20.0	9.0	9.c	9.0	9.c	6.0	11.0
4/24	0600	13.0	23.0	10.0	11.0	11.0	13.0	8.0	12.7
4/24	0800	15.c	18.c	12.0	13.0	18.0	14.0	7.0	13.9
4/24	1000	15.c	18.c	19.0	16.0	28.0	16.0	9.0	17.3
4/24	1200	14.c	22.0	16.0	12.0	23.0	12.0	11.0	15.7
4/24	1400	12.0	21.0	14.0	13.0	17.0	12.0	10.0	14.1
4/24	1600	11.0	16.0	12.0	12.0	13.0	16.0	6.0	12.3

FIRETEST RESULTS

Date	Time	#1	#2	#3	#4	#5	#6	#7	Average
4/24	1800	14.0	13.0	27.0	11.0	12.0	18.0	4.0	14.1
4/24	2000	13.0	16.0	14.0	15.0	13.0	13.0	6.0	12.9
4/24	2200	12.0	16.0	11.0	12.0	18.0	11.0	8.0	12.6
4/25	0000	13.0	14.0	9.0	11.0	13.0	12.0	5.0	11.0
4/25	0200	10.0	16.0	15.0	10.0	11.0	10.0	4.0	10.9
4/25	0400	13.0	16.0	14.0	7.0	14.0	11.0	0.0	10.7
4/25	0600	11.0	22.0	17.0	13.0	15.0	10.0	6.0c	13.4
4/25	0800	15.0	18.0	11.0	13.0	20.0	14.0	1.0	13.1
4/25	1000	13.0	12.0	14.0	15.0	21.0	13.0	5.0	13.3
4/25	1200	15.0	16.0	19.0	20.0	19.0	13.0	19.0	17.3
grate was down for ten minutes									
4/25	1400	18.0	23.0	24.0	16.0	24.0	15.0	15.0	19.3
4/25	1600	20.0	16.0	32.0	17.0	29.0	19.0	14.0	21.0
4/25	1800	15.0	26.0	36.0	13.0	22.0	15.0	13.0	20.0
4/25	2000	14.0	22.0	24.0	19.0	26.0	26.0	18.0	21.3
4/25	2200	15.0	21.0	23.0	20.0	24.0	24.0	14.0	20.1
4/26	0000	11.0	23.0	12.0	11.0	13.0	9.0	2.0	11.6
4/26	0200	11.0	12.0	7.0	9.0	5.0	4.0	7.0c	7.9
4/26	0400	11.0	14.0	10.0	6.d	13.0	12.0	9.0c	10.7
4/26	0600	12.0	15.0	12.0	8.0	6.0	10.0	6.0c	9.9
4/26	0800	14.c	19.0	15.0	13.0	14.0	12.0	5.0	13.1
4/26	1000	18.0	18.d	16.0	15.0	22.0	14.0	8.0	15.9
4/26	1200	14.0	28.0	15.0	14.0	19.0	15.0	1.0	15.1
4/26	1400	10.0	16.0	14.0	19.0	10.0	11.0	1.0	11.6
4/26	1600	9.0	14.0	15.0	4.0	4.0	9.0	7.0	8.9
4/26	1800	11.0	10.0	10.0	12.0	13.0	12.0	6.0	10.6
4/26	2000	11.0	18.0	8.0	12.0	6.0	13.0	7.0	10.7
4/26	2200	11.0	16.0	10.0	14.0	12.0	14.0	6.0	11.9
4/27	0000	18.0	27.0	16.0	14.0	9.0	12.0	8.0c	14.9
4/26	0200	14.0	16.0	13.0	14.0	13.0	16.0	0.0	12.3
4/27	0400	10.0	17.0	14.0	10.0	17.0	11.0	0.0	12.3
4/27	0600	14.0	15.0	14.0	9.0	10.0	10.0	3.0	10.7
4/27	0800	15.0	12.0	20.0	14.0	13.0	15.0	0.0	12.7
4/27	1000	14.0	15.0	14.0	14.c	12.0	9.c	2.0	11.4
4/27	1200	12.0	2.0	10.0	13.0	14.c	11.0	0.0	8.9
4/27	1400	17.0	16.0	12.0	12.0	10.0	16.c	1.0	12.0
4/27	1600	12.0	13.0	12.0	9.0	13.0	17.0	3.0	11.3
4/27	1800	13.0	12.0	13.0	1.0	12.0	14.0	2.0	11.0
4/27	2000	24.0	14.0	15.0	14.0	23.0	10.0	7.0	15.3
4/27	2200	18.0	14.0	14.0	10.0	10.0	17.0	9.0	13.1
4/28	0000	24.0	21.0	19.0	12.0	13.0	19.0	6.0c	16.3
4/28	0200	11.0	11.0	15.0	14.0	14.0	14.0	2.0	11.6
4/28	0400	12.0	18.0	11.0	19.0	14.0	12.0	0.0	12.3
4/28	0600	12.0	11.0	10.0	17.0	15.0	13.0	1.0	11.3
4/28	0800	21.0	25.0	15.0	8.0	14.0	13.0	4.0	14.3
4/28	1000	20.c	19.0	20.h	13.0	21.c	13.0	12.0d	16.9
4/28	1200	18.c	23.0	21.0	16.d	19.0	14.c	21.0	18.9
4/28	1400	24.0	21.0	20.d	19.0	18.0	12.c	23.0	19.6
4/28	1600	19.0	19.0	33.0	18.0	15.0	21.0	22.0	21.0
4/28	1800	21.0	27.0	34.0	18.0	25.0	39.0	26.0	27.1
4/28	2000	20.d	24.0	27.0	19.0	17.0	39.0	11.0	22.4

FIRETEST RESULTS

Date	Time	#1	#2	#3	#4	#5	#6	#7	Average
4/28	2200	21.d	22.0	40.0	20.0	19.0	19.0	30.0	24.4
4/29	0000	24.0	22.d	22.0	22.0	19.0	21.0	14.0	20.6
4/29	0200	23.0	29.0	28.0	20.0	21.0	22.0	17.0	22.9
4/29	0400	24.0	44.0	20.0	20.0	18.0	18.0	13.0	22.4
4/29	0600	19.0	23.0	17.0	18.0	18.0	16.0	15.0	18.0
4/29	0800	18.0	21.0	16.d	22.0	40.0	13.0	21.0	21.6
4/29	1000	19.0	15.0	11.0	18.0	25.0	14.0	13.0	16.4
4/29	1200	15.0	15.0	13.0	14.0	27.0	12.0	7.0	14.7
4/29	1400	12.0	8.0	8.0	12.0	9.0	11.0	8.0	9.7
4/29	1600	11.0	7.0	11.0	18.0	10.0	8.0	4.0	9.9
4/29	1800	12.0	11.0	8.0	4.0	10.0	9.0	1.0	7.9
4/29	2000	13.0	10.0	12.0	10.0	10.0	12.0	0.0	9.6
4/29	2200	12.0	11.0	13.0	11.0	12.0	13.0	2.0	10.6
4/30	0000	7.0	0.d	0.0	10.0	5.0	9.0	5.0c	5.1
4/30	0200	17.0	7.0	4.0	19.0	7.0	12.0	0.0	9.4
4/30	0400	12.0	13.0	16.0	13.0	7.c	11.0	1.0	10.4
4/30	0600	12.0	9.0	13.0	15.0	15.0	16.0	5.0	12.1
4/30	0800	21.0	18.0	8.0	12.0	10.0	26.d	6.0	14.4

Table G-3

OPERATOR LOG 1
BOM/FGT-003 LEUCITE HILLS

DATE	TIME	AGIT WATER FLOW	JACKT WATER FLOW	JACKT WATER FLOW TOTAL	JACKT WATER HRLY USAGE	STEAM RATE FLOW	SATURATED METER INLET PRESS	STEAM INLET VALVE PRESS	OUTLET VALVE PRESS	VALVE POSIT %	AGIT COUNT RDNG	AGIT HRLY SWPS	AGIT DRIVE SETNG SWP/HR	GRATE GEAR COUNTR RDNG	GRATE RPH	GRATE DRIVE SETNG
4/11	1030	3.0	3.0	2100	100	2.4	10.5	12.5	--	--	--	--	--	--	--	----
4/11	1130	3.0	3.0	2102	200	3.8	11.7	11.4	1.3	20	--	--	--	--	--	----
4/11	1230	3.0	2.8	2103	100	2.4	30.+	30.+	--	7.5	--	--	--	--	--	----
4/11	1330	3.0	7.5	2108	500	2.45	11.5	11.0	3.0	26	--	--	--	--	--	----
4/11	1430	2.5	8.5	2112	400	3.2	12.0	11.5	3.0	22	--	--	--	4	--	4/.94
4/11	1530	2.5	9.0	2116	400	2.45	12.0	11.5	--	20	--	--	--	17	13	4/.94
4/11	1630	2.5	9.0	2121	500	2.42	12.0	12.0	--	20	--	--	--	36	19	4/.94
4/11	1730	2.5	9.0	2126	500	2.42	12.0	11.5	2.0	20	--	--	--	43	7	----
4/11	1830	2.5	9.0	2131	500	2.42	12.0	11.0	2.0	20	--	--	--	50	7	----
4/11	1930	2.5	9.0	2136	500	2.42	12.0	11.0	3.0	24	--	--	--	67	17	----
4/11	2030	2.5	9.0	2141	500	2.42	12.0	11.0	2.0	24	--	--	--	85	18	----
4/11	2130	2.5	9.0	2146	500	2.42	12.0	11.5	3.0	24	--	--	--	102	17	----
4/11	2230	2.5	9.0	2151	500	2.42	12.0	11.0	3.0	26	--	--	--	117	15	----
4/11	2330	3.0	8.0	2156	500	4.5	11.5	11.0	4.5	26	--	--	--	136	19	----
4/12	0030	3.0	8.0	2161	500	4.5	11.5	11.0	3.5	26	--	--	--	152	16	----
4/12	0130	3.0	8.5	2166	500	4.5	11.5	11.0	4.0	26	--	--	--	169	17	----
4/12	0230	3.0	8.5	2171	500	4.5	11.5	11.5	4.0	24	--	--	--	185	16	----
4/12	0330	3.0	8.5	2176	500	4.5	12.0	11.5	4.0	24	--	--	--	202	17	----
4/12	0430	3.0	8.5	2181	500	4.5	11.5	11.0	4.5	24	--	--	--	219	17	----
4/12	0530	3.0	8.5	2186	500	4.5	11.5	11.0	4.0	26	--	--	--	236	17	----
4/12	0630	3.0	8.5	2191	500	4.5	11.5	11.0	4.0	28	--	--	--	253	17	----
4/12	0800	3.0	8.0	2198	700	4.4	11.5	11.0	4.0	28	--	--	--	273	20	1/FULL
4/12	0900	3.0	8.0	2203	500	4.4	11.5	11.25	4.7	26	--	--	--	297	24	----
4/12	1000	3.0	8.5	2206	300	4.4	11.5	11.5	3.7	26	--	--	--	306	9	----
4/12	1100	2.5	8.0	2211	500	4.4	11.0	11.5	2.9	25	--	--	--	320	14	----
4/12	1200	3.0	8.5	2215	400	4.4	11.5	11.0	2.9	24	--	--	--	337	17	----
4/12	1300	3.0	8.5	2221	600	4.4	11.5	11.0	2.8	24	--	--	--	357	20	----
4/12	1400	3.0	8.5	2226	500	4.0	11.5	11.5	2.8	24	--	--	--	371	14	----
4/12	1500	3.0	8.5	2231	500	4.0	11.5	11.0	3.0	26	--	--	--	390	19	----
4/12	1530	3.0	8.5	2235	400	4.0	11.5	11.5	3.0	24	--	--	--	404	14	----
4/12	1630	3.0	8.5	2241	600	4.4	11.5	11.5	3.0	24	--	--	--	424	20	----
4/12	1730	3.0	8.5	2245	400	4.5	11.5	11.0	3.0	24	--	--	--	439	15	----
4/12	1830	3.0	8.5	2250	500	4.5	11.5	11.0	3.0	24	--	--	--	456	17	----
4/12	1930	3.0	8.5	2255	500	4.5	11.5	11.0	3.0	24	--	--	--	471	15	----
4/12	2030	3.0	8.5	2261	600	4.0	11.5	11.0	2.0	20	--	--	--	487	16	----
4/12	2130	3.0	8.5	2265	400	4.0	11.5	11.0	2.0	22	--	--	--	505	18	----
4/12	2230	3.0	8.5	2270	500	4.0	11.5	11.0	2.0	22	--	--	--	520	15	----
4/12	2330	3.0	8.5	2275	500	4.0	11.5	11.0	3.5	24	--	--	--	563	43	2/FULL
4/13	0030	3.0	8.5	2280	500	4.0	12.0	11.5	3.0	22	--	--	--	595	32	----
4/13	0130	3.0	8.5	2285	500	4.0	11.5	11.5	2.5	22	--	--	--	629	34	----
4/13	0230	3.0	8.5	2290	500	4.0	11.5	11.0	3.0	24	--	--	--	661	32	----
4/13	0330	3.0	8.5	2295	500	4.0	11.5	11.0	2.5	24	--	--	--	695	34	----
4/13	0430	3.0	8.5	2300	500	4.0	11.5	11.0	3.0	22	--	--	--	746	51	4/FULL

DATE	TIME	AGIT	JACKT	JACKT	JACKT	STEAM	SATURATED STEAM			VALVE	AGIT	AGIT	AGIT	GRATE	GRATE	GRATE
		WATER	WATER	WATER	WATER		METER	INLET	OUTLET							
		FLOW	FLOW	FLOW	HRLY	FLOW	INLET	VALVE	VALVE	POSIT	COUNT	HRLY	DRIVE	GEAR	GRATE	DRIVE
				TOTAL	USAGE		PRESS	PRESS	PRESS	%	RDNG	SWPS	SETNG	COUNTR	RPH	SETNG
													SWP/HR	RDNG		
4/13	0530	3.0	8.5	2305	500	4.0	12.0	11.5	3.0	24	--	--	--	812	66	----
4/13	0630	3.0	8.5	2310	500	4.0	11.5	11.0	3.0	24	--	--	--	883	71	----
4/13	0700	3.0	8.5	2315	500	4.0	11.5	11.0	3.0	25	--	--	--	954	71	----
4/13	0800	3.0	8.5	2320	500	5.7	11.5	11.0	6.5	34	--	--	--	1021	67	----
4/13	0900	3.0	8.5	2324	400	6.0	11.1	11.5	7.0	38	--	--	--	1085	64	----
4/13	1000	3.0	7.0	2329	500	6.8	11.7	11.0	8.0	40	--	--	--	1155	70	6/FULL
4/13	1100	3.0	7.0	2333	400	6.8	11.6	11.0	7.0	34	--	--	--	1274	119	----
4/13	1200	3.0	7.0	2337	400	6.8	11.5	11.8	7.0	31	--	--	--	1411	137	6/4.75
4/13	1300	3.0	7.0	2341	400	6.8	11.5	11.0	6.4	32	--	--	--	1570	159	----
4/13	1400	3.0	7.0	2346	500	6.8	11.6	11.2	6.5	31	--	--	--	1727	157	----
4/13	1500	3.0	7.0	2349	300	6.8	11.6	11.2	6.5	32	--	--	--	1860	133	----
4/13	1600	3.0	7.0	2353	600	6.8	11.5	11.5	7.0	32	--	--	--	2002	142	----
4/13	1730	3.0	7.0	2358	500	6.8	11.5	11.5	7.0	34	--	--	--	2122	120	6/3.41
4/13	1830	3.0	7.0	2363	500	6.8	11.5	11.5	7.0	32	--	--	--	2217	95	6/2.87
4/13	1930	3.0	7.0	2366	300	7.0	11.5	11.5	6.5	30	--	--	--	2311	94	6/2.87
4/13	2330	3.0	7.0	2380	400	5.5	11.5	11.0	4.5	26	--	--	--	2592	281	6/2.10
4/14	0030	3.0	7.0	2384	400	5.5	11.5	11.5	4.0	26	--	--	--	2639	47	6/1.00
4/14	0130	3.0	7.0	2388	400	5.5	11.5	11.5	4.0	26	--	--	--	2670	31	6/1.00
4/14	0230	3.0	7.0	2392	400	5.5	11.0	10.5	3.5	26	--	--	--	2707	37	6/1.43
4/14	0330	3.0	7.0	2396	400	5.5	11.5	11.5	4.0	26	--	--	--	2741	34	6/1.43
4/14	0430	3.0	7.0	2401	500	5.5	11.5	11.5	4.5	26	--	--	--	2795	54	6/1.43
4/14	0530	3.0	7.0	2405	400	2.0	7.0	7.5	0.0	20	--	--	--	2714	19	6/1.43
				POWER FAILURE						POWER FAILURE						
4/14	2330	3.5	5.0	2483	7800	2.1	11.0	11.0	0.0	20	2	--	--	2924	110	4/7.00
4/15	1030	3.0	5.0	2486	300	2.4	11.5	11.0	1.8	22	2	--	--	2985	61	6/0.97
4/15	1130	3.0	5.0	2488	200	2.4	11.5	11.1	1.8	22	2	--	--	3009	24	6/0.28
4/15	1230	3.0	5.0	2491	300	2.3	11.4	11.0	1.4	20	2	--	--	3033	24	3/1.05
4/15	1330	3.0	5.0	2494	300	2.3	11.4	11.0	1.7	20	3	--	--	3051	18	2/1.05
4/15	1430	3.0	5.0	2497	300	2.3	12.0	11.5	0.9	18.5	4	--	--	3064	13	2/1.05
4/15	1530	3.0	5.0	2499	200	2.3	11.5	11.5	1.0	16	4	--	--	3074	10	2/1.07
4/15	1630	3.0	7.0	2503	400	7.3	11.5	11.5	3.0	22	4	--	--	3101	27	4/3.14
4/15	1730	3.0	7.0	2507	400	5.0	11.5	11.5	5.0	30	4	--	--	3159	58	4/3.14
4/15	1830	3.0	7.0	2511	400	5.0	11.5	11.5	5.5	30	4	--	--	3225	66	4/3.14
4/15	1930	3.0	7.0	2515	400	5.5	11.5	11.5	6.0	32	4	--	--	3298	73	4/3.14
4/15	2030	3.0	7.0	2520	500	5.5	11.5	11.5	6.0	32	4	--	--	3360	62	4/3.14
4/15	2130	3.0	7.0	2524	400	5.2	11.5	11.5	6.0	30	4	--	--	3432	72	4/3.14
4/15	2230	3.0	7.0	2528	400	5.2	4.5	11.5	6.0	30	4	--	--	3502	70	4/3.14
4/15	2330	3.0	7.0	2532	400	5.5	11.5	11.0	6.0	30	4	--	--	3569	67	4/3.14
4/16	0030	3.0	7.0	2537	500	6.0	11.5	11.0	6.0	30	4	--	--	3631	62	4/3.14
4/16	0130	3.0	7.0	2541	400	6.0	11.5	11.0	6.0	30	4	--	--	3696	65	4/3.14
4/16	0230	3.0	7.0	2545	400	6.0	11.5	11.0	5.5	30	4	--	--	3764	68	4/3.50
4/16	0330	3.0	7.0	2549	400	6.0	11.5	11.0	6.0	30	4	--	--	3840	76	4/3.50
4/16	0430	3.0	7.0	2553	400	6.0	11.5	11.0	6.0	30	4	--	--	3913	73	4/3.50
4/16	0530	3.0	7.0	2557	400	6.0	11.5	11.0	6.0	30	4	--	--	3983	70	4/3.50
4/16	0630	3.0	7.0	2562	500	6.0	11.5	11.0	6.0	30	4	--	--	4062	79	4/3.50
4/16	0730	3.0	7.0	2566	400	6.0	11.4	11.0	6.0	30	4	--	--	4138	76	4/3.50
4/16	0830	3.0	7.0	2570	400	6.0	11.6	11.5	4.0	28	4	--	--	4211	73	4/3.50
4/16	0930	3.0	7.0	2574	400	6.0	11.8	11.5	4.0	26	4	--	--	4285	74	4/3.50

DATE	TIME	AGIT	JACKT	JACKT	JACKT	STEAM	SATURATED STEAM			VALVE	COUNT	AGIT	AGIT	AGIT	GRATE	GRATE
		WATER	WATER	WATER	WATER		METER	INLET	OUTLET							
		FLOW	FLOW	FLOW	HRLY	RATE	INLET	VALVE	VALVE	POSIT	RDNG	HRLY	DRIVE	GEAR	RPH	DRIVE
				TOTAL	USAGE	FLOW	PRESS	PRESS	PRESS	%		SWPS	SETNG	COUNTR		SETNG
													SWP/HR			
4/16	1030	3.0	7.0	2579	500	6.0	11.5	11.3	4.0	26	4	--	--	4358	73	4/3.50
4/16	1130	3.0	7.0	2583	400	5.8	11.5	11.0	4.3	27	4	--	--	4440	82	4/3.50
4/16	1230	3.0	7.0	2587	400	6.0	11.5	11.0	4.3	27	4	--	--	4523	83	6/3.50
4/16	1330	3.0	7.0	2591	400	6.0	11.5	11.0	4.5	28	4	--	--	4644	121	6/3.50
4/16	1430	3.0	7.0	2595	400	5.8	11.5	11.0	4.5	27	4	--	--	4742	98	6/3.50
4/16	1530	3.0	7.0	2599	400	5.8	11.5	11.0	5.0	28	4	--	--	4836	94	6/3.50
4/16	1630	3.0	7.0	2603	400	5.2	11.5	11.0	5.0	28	4	--	--	4948	112	6/2.69
4/16	1730	3.0	7.0	2608	500	5.2	11.5	11.0	4.5	28	4	--	--	5040	92	6/2.69
4/16	1830	3.0	7.0	2612	400	5.0	11.5	11.0	4.5	76	4	--	--	5111	71	6/1.76
4/16	1930	3.0	7.0	2616	400	5.0	11.5	11.0	3.0	22	4	--	--	5162	51	6/1.76
4/16	2030	3.0	7.0	2620	400	5.0	11.5	11.0	3.0	22	4	--	--	5213	51	6/1.76
4/16	2130	3.0	7.0	2625	500	5.0	11.5	11.0	3.0	22	4	--	--	-----	--	-----
4/16	2230	3.0	7.0	2629	400	4.5	11.5	11.0	3.0	20	4	--	--	5332	119	6/1.76
4/16	2330	3.0	7.0	2633	400	4.5	11.5	11.5	1.5	22	4	--	--	5390	58	6/1.76
4/17	0030	3.0	7.0	2637	400	4.0	11.5	11.5	2.0	22	4	--	--	5447	57	6/1.76
4/17	0130	3.0	7.0	2641	400	4.0	11.5	11.5	2.0	22	4	--	--	5498	51	6/1.76
4/17	0230	3.0	7.0	2645	400	4.0	11.5	11.0	2.5	24	4	--	--	5553	55	6/1.76
4/17	0330	3.0	7.0	2650	500	4.0	11.5	11.0	3.0	26	4	--	--	5610	57	6/1.76
4/17	0430	3.0	7.0	2654	400	4.0	11.5	11.0	3.0	26	4	--	--	5665	55	6/1.75
4/17	0530	3.0	7.0	2658	400	4.0	11.5	11.0	3.0	24	4	--	--	5719	54	6/1.57
4/17	0630	3.0	7.0	2662	400	4.0	11.5	11.0	3.0	24	4	--	--	5776	57	6/1.57
4/17	0730	3.0	7.0	2667	500	4.0	11.5	11.0	3.0	24	4	--	--	5836	60	6/1.75
4/17	0830	3.0	7.0	2671	400	4.0	11.6	11.5	2.0	21	4	--	--	5896	60	6/1.75
4/17	0930	3.0	7.0	2675	400	3.8	11.5	11.5	1.8	21	4	--	--	5947	51	6/1.75
4/17	1030	3.0	7.0	2680	500	3.8	11.4	11.0	2.0	21	4	--	--	6008	61	6/1.75
4/17	1130	3.0	7.0	2685	500	3.8	11.5	11.5	2.0	21	4	--	--	6058	50	6/1.75
4/17	1230	3.0	7.0	2688	300	3.8	11.5	11.0	2.0	22	4	--	--	6117	59	6/1.75
4/17	1330	3.0	7.0	2691	300	3.8	11.6	11.5	2.0	22	4	--	--	6164	47	6/1.75
4/17	1430	3.0	7.0	2696	500	3.5	11.8	11.3	2.0	20	4	--	--	6227	63	6/1.75
4/17	1530	3.0	7.0	2700	400	3.2	11.5	11.5	1.5	20	4	--	--	6278	51	6/1.75
4/17	1630	3.0	7.0	2704	400	3.2	11.5	11.5	1.5	20	4	--	--	6335	57	6/1.75
4/17	1730	3.0	7.0	2708	400	3.2	11.5	11.5	1.5	20	4	--	--	6387	52	6/1.75
4/17	1830	3.0	7.0	2713	500	3.1	11.5	11.5	1.5	20	4	--	--	6447	60	6/1.75
4/17	1930	3.0	7.0	2717	400	3.1	11.5	11.5	2.0	20	4	--	--	6500	53	6/1.75
4/17	2030	3.0	7.0	2721	400	3.1	11.5	11.5	2.0	20	4	--	--	6555	55	6/1.75
4/17	2130	3.0	7.0	2725	400	3.2	11.5	11.5	2.0	20	4	--	--	6612	57	6/1.75
4/17	2230	3.0	7.0	2729	400	3.1	11.5	11.5	2.0	20	4	--	--	6669	57	6/1.75
4/17	2330	3.0	7.0	2733	400	3.0	11.5	11.0	2.0	20	4	--	--	6721	52	6/1.75
4/18	0030	3.0	7.0	2737	400	3.0	11.5	11.0	2.0	20	4	--	--	6783	62	6/2.25
4/18	0130	3.0	7.0	2742	500	3.0	11.5	11.0	2.5	20	4	--	--	6857	74	6/2.25
4/18	0230	3.0	7.0	2746	400	3.0	11.5	11.0	2.0	22	4	--	--	6932	75	6/2.75
4/18	0330	3.0	7.0	2750	400	3.0	11.5	11.0	2.0	22	4	--	--	7020	88	6/2.75
4/18	0430	3.0	7.0	2754	400	3.0	11.5	11.0	2.0	22	4	--	--	7110	90	6/2.75
4/18	0530	3.0	7.0	2759	500	3.0	11.5	11.0	2.5	22	4	--	--	7196	86	6/2.75
4/18	0630	3.0	7.0	2763	400	5.0	11.5	11.0	5.0	30	4	--	--	7284	88	6/2.75
4/18	0730	3.0	7.0	2767	400	5.8	11.4	11.0	6.4	33	4	--	--	7373	89	6/2.75
4/18	0830	3.0	7.0	2772	500	6.0	11.5	10.9	6.0	35	4	--	--	7483	110	6/2.75
4/18	0930	3.0	7.0	2775	300	6.0	11.4	11.0	6.0	35	4	--	--	7545	62	6/2.75

DATE	TIME	AGIT	JACKT	JACKT	JACKT	STEAM	SATURATED STEAM			VALVE	COUNT	AGIT	AGIT	AGIT	GRATE	GRATE	GRATE
		WATER	WATER	WATER	WATER		METER	INLET	OUTLET								
		FLOW	FLOW	FLOW	HRLY	RATE	INLET	VALVE	VALVE	POSIT	RDNG	HRLY	DRIVE	GEAR	GRATE	GRATE	DRIVE
				TOTAL	USAGE	FLOW	PRESS	PRESS	PRESS	%		SWPS	SETNG	COUNTR	RPH		SETNG
4/18	1030	3.0	7.0	2780	500	6.0	11.4	10.7	7.0	35	4	--	--	7647	102		6/2.75
4/18	1130	3.0	7.0	2784	400	6.1	11.6	11.0	7.5	36	4	--	--	7732	85		6/2.75
4/18	1230	3.0	7.0	2788	400	6.7	11.4	10.6	8.6	45	4	--	--	7854	122		6/4.00
4/18	1330	3.0	7.0	2791	300	7.0	11.5	10.7	8.8	46	4	--	--	7952	98		6/4.00
4/18	1430	3.0	7.0	2796	500	7.0	11.5	11.5	9.0	52	4	--	--	8096	144		8/4.00
4/18	1530	3.0	7.0	2799	300	7.0	11.5	11.5	9.0	52	4	--	--	8237	141		8/4.00
4/18	1630	3.0	7.0	2804	500	7.0	11.5	11.5	9.5	58	4	--	--	8429	192		8/4.00
4/18	1730	3.0	7.0	2807	300	7.0	11.5	11.5	10.0	58	4	--	--	8566	137		8/4.00
4/18	1830	3.0	7.0	2812	500	7.0	11.5	11.5	10.0	64	4	--	--	8736	170		8/3.00
4/18	1930	3.0	7.0	2816	400	7.0	11.5	11.5	9.5	62	4	--	--	8861	125		8/3.00
4/18	2030	3.0	7.0	2820	400	7.0	11.5	11.5	9.5	62	4	--	--	8978	117		8/3.00
4/18	2130	3.0	7.0	2824	400	7.0	11.5	11.5	8.5	38	4	--	--	9120	142		8/3.00
4/18	2230	3.0	7.0	2829	500	7.0	11.5	11.5	8.5	38	4	--	--	9245	129		8/3.00
4/18	2330	3.0	7.0	2833	400	7.0	11.5	11.0	8.0	40	4	--	--	9390	141		8/3.00
4/19	0030	3.0	7.0	2837	400	7.0	11.3	11.0	8.7	36	4	--	--	9516	126		8/3.00
4/19	0130	3.0	7.0	2841	400	7.0	11.5	11.0	8.5	50	4	--	--	9647	131		8/3.00
4/19	0230	3.0	7.0	2846	500	7.0	11.5	11.0	9.5	52	4	--	--	9782	135		8/4.00
4/19	0330	3.0	7.0	2850	400	7.3	11.5	10.8	9.8	60	4	--	--	9954	172		8/4.00
4/19	0430	3.0	7.0	2854	400	7.0	11.5	10.5	9.8	70	4	--	--	10118	164		8/4.00
4/19	0530	3.0	7.0	2858	400	7.5	11.5	11.0	10.0	90	4	--	--	10291	173		8/4.00
4/19	0630	3.0	7.0	2862	400	7.5	11.5	11.0	10.5	90	4	--	--	10456	165		8/4.00
4/19	0730	3.0	7.0	2867	500	7.4	10.5	10.8	8.5	45	4	--	--	10632	176		8/4.00
4/19	0830	3.0	7.0	2871	400	7.4	11.5	11.0	6.6	32	4	--	--	10821	189		8/4.00
4/19	0930	3.0	7.0	2875	400	6.9	10.6	11.1	6.0	30	4	--	--	10982	161		8/4.00
4/19	1030	3.0	7.0	2880	500	6.0	11.5	11.1	5.4	29	4	--	--	11160	178		8/4.00
4/19	1130	3.0	7.0	2884	400	6.0	11.7	11.1	5.6	30	4	--	--	11324	164		8/4.00
4/19	1230	3.0	7.0	2888	400	6.0	11.5	11.1	5.5	30	4	--	--	11466	142		8/2.75
4/19	1330	3.0	7.0	2892	400	6.0	11.5	11.1	5.0	28	4	--	--	11578	112		8/2.75
4/19	1430	3.0	7.0	2896	400	6.0	11.6	11.4	5.0	28	4	--	--	11695	117		8/2.75
4/19	1530	3.0	7.0	2899	300	6.0	11.6	11.4	5.0	28	4	--	--	11789	94		8/2.75
4/19	1630	3.0	7.0	2902	300	6.0	11.6	11.5	4.0	22	4	--	--	11886	97		8/2.00
4/19	1730	3.0	7.0	2908	600	6.0	11.5	11.5	2.5	22	4	--	--	11984	98		8/2.00
4/19	1830	3.0	7.0	2912	400	6.0	11.5	11.5	2.5	22	4	--	--	12063	79		8/2.00
4/19	1930	3.0	7.0	2916	400	6.0	11.5	11.5	3.0	24	4	--	--	12143	80		8/2.00
4/19	2030	3.0	7.0	2920	400	4.0	11.8	11.2	4.0	26	4	--	--	12253	110		8/2.00
4/19	2130	3.0	7.0	2926	600	4.0	11.8	11.2	4.0	26	4	--	--	12350	97		8/2.00
4/19	2230	3.0	7.0	2930	400	4.0	11.8	11.2	4.0	26	4	--	--	12448	98		8/2.00
4/19	2330	3.0	7.0	2933	300	4.5	11.5	11.0	4.5	28	4	--	--	12511	63		8/2.00
4/20	0030	3.0	7.0	2937	400	4.5	11.8	11.0	3.5	24	4	--	--	12596	85		8/2.00
4/20	0130	3.0	7.0	2941	400	4.5	11.5	11.0	4.0	26	4	--	--	12680	84		8/2.00
4/20	0230	3.0	7.0	2946	500	4.5	11.8	11.0	4.0	26	4	--	--	12752	72		7/1.50
4/20	0330	3.0	7.0	2950	400	5.0	11.5	11.0	3.5	26	4	--	--	12806	54		7/1.50
4/20	0430	3.0	7.0	2954	400	5.0	11.5	11.0	4.5	28	4	--	--	12864	58		7/1.50
4/20	0530	3.0	7.0	2958	400	5.0	12.0	11.0	5.0	28	4	--	--	12916	52		7/1.50
4/20	0630	3.0	7.0	2962	400	5.5	11.5	11.0	6.5	22	4	--	--	12980	64		7/2.00
4/20	0730	3.0	7.0	2967	500	5.8	11.6	11.0	6.8	34	4	--	--	13058	78		7/2.00
4/20	0830	3.0	7.0	2971	400	6.8	11.5	10.5	8.9	48	4	--	--	13125	67		8/2.00
4/20	0930	3.0	7.0	2976	500	7.0	11.5	10.5	9.5	60	4	--	--	13229	10		8/2.50

DATE	TIME	AGIT	JACKT	JACKT	JACKT	STEAM	SATURATED		STEAM	VALVE	COUNT	AGIT	AGIT	AGIT	GRATE	GRATE	GRATE
		WATER	WATER	WATER	WATER		METER	INLET	OUTLET								
		FLOW	FLOW	FLOW	HRLY	RATE	INLET	VALVE	VALVE	POSIT	RDNG	HRLY	DRIVE	DRIVE	GEAR	RPH	DRIVE
				TOTAL	USAGE	FLOW	PRESS	PRESS	PRESS	%		SWPS	SETNG	SWP/HR	COUNTR		SETNG
4/20	1030	3.0	7.0	2980	400	6.2	11.5	10.7	10.1	76	4	--	--	--	13377	148	8/4.50
4/20	1130	3.0	7.0	2983	300	7.2	11.5	10.6	10.3	94	4	--	--	--	13555	178	8/4.50
4/20	1230	3.0	7.0	2987	400	7.8	11.5	11.0	10.5	100	4	--	--	--	13745	190	8/4.50
4/20	1330	3.0	5.0	2992	500	7.5	11.5	10.5	10.3	100	4	--	--	--	13956	211	8/4.50
4/20	1430	3.0	5.0	2995	700	7.5	11.5	11.0	10.5	96	4	--	--	--	14148	192	9/4.50
4/20	1630	3.0	5.0	3000	500	7.0	11.5	11.0	10.0	64	4	--	--	--	14570	422	9/4.50
4/20	1730	3.0	5.0	3003	300	7.0	11.5	11.5	7.5	34	4	--	--	--	14756	186	9/4.50
4/20	1830	3.0	5.0	3005	200	7.0	11.5	11.5	6.5	30	4	--	--	--	14954	198	9/4.50
4/20	1930	3.0	5.0	3008	300	6.5	11.5	11.5	5.5	28	4	--	--	--	15136	182	9/4.00
4/20	2030	3.0	5.0	3011	300	6.5	11.5	11.5	5.5	28	4	--	--	--	15318	182	9/4.00
4/20	2130	3.0	5.0	3014	300	6.0	11.5	11.5	5.0	26	4	--	--	--	15507	189	9/4.00
4/20	2230	3.0	5.0	3017	300	5.5	11.5	11.5	5.5	30	4	--	--	--	15750	243	9/4.00
4/20	2330	3.0	5.0	3020	300	6.0	11.5	11.0	5.0	30	4	--	--	--	15933	183	9/4.00
4/21	0030	3.0	5.0	3022	200	6.0	12.0	11.5	5.0	28	4	--	--	--	16097	164	9/2.50
4/21	0130	3.0	5.0	3025	300	5.0	11.5	11.0	3.0	24	4	--	--	--	16215	118	9/2.50
4/21	0230	3.0	5.0	3028	300	4.0	11.5	11.0	3.0	22	4	--	--	--	16331	116	9/2.50
4/21	0330	3.0	5.0	3031	300	4.0	11.7	11.5	2.5	24	4	--	--	--	16451	120	9/2.50
4/21	0430	3.0	5.0	3037	300	4.0	11.7	11.5	3.0	24	4	--	--	--	16559	108	9/2.00
4/21	0530	3.0	5.0	3037	300	4.0	11.5	11.0	2.5	22	4	--	--	--	16652	93	9/2.00
4/21	0630	3.0	5.0	3039	200	5.0	11.5	11.0	4.0	24	4	--	--	--	16748	96	9/2.00
4/21	0730	3.0	5.0	3042	300	5.0	11.8	11.2	3.5	26	4	--	--	--	16845	97	9/2.00
4/21	0830	3.0	5.0	3045	300	5.0	11.5	11.0	4.0	26	4	--	--	--	16949	104	9/2.50
4/21	0930	3.0	5.0	3048	300	5.0	11.3	10.6	5.9	31	4	--	--	--	17077	128	9/2.50
4/21	1030	3.0	5.0	3050	200	5.5	11.9	11.0	5.6	29	4	--	--	--	17187	110	9/2.50
4/21	1130	3.0	5.0	3053	300	5.5	12.0	11.4	5.0	28	4	--	--	--	17307	120	9/2.50
4/21	1230	3.0	5.0	3056	300	5.2	11.6	11.5	4.0	26	4	--	--	--	17433	126	9/2.50
4/21	1330	3.0	5.0	3059	300	5.0	11.5	11.2	3.6	26	4	--	--	--	17547	114	9/2.50
4/21	1430	3.0	5.0	3062	300	4.0	11.5	11.0	3.0	24	4	--	--	--	17670	123	9/2.50
4/21	1530	3.0	5.0	3064	200	4.0	11.5	11.0	2.5	22	4	--	--	--	17772	102	9/2.50
4/21	1630	3.0	5.0	3067	300	4.0	11.5	11.0	4.5	22	4	--	--	--	17915	143	9/2.50
4/21	1730	3.0	5.0	3070	300	5.0	11.5	11.5	4.0	26	4	--	--	--	18029	114	9/2.50
4/21	1830	3.0	5.0	3073	300	5.0	11.5	11.5	4.0	24	4	--	--	--	18143	114	9/2.50
4/21	1930	3.0	5.0	3076	300	5.0	11.5	11.5	4.0	26	4	--	--	--	18288	115	9/2.50
4/21	2030	3.0	5.0	3079	300	4.0	11.5	11.0	3.5	20	4	--	--	--	18372	14	9/2.50
4/21	2130	3.0	5.0	3082	300	4.0	11.5	11.0	3.5	20	4	--	--	--	18487	115	9/2.50
4/21	2230	3.0	5.0	3084	200	2.42	11.5	11.0	2.5	20	4	--	--	--	18605	118	9/2.50
4/21	2330	3.0	5.0	3087	300	3.0	12.0	11.0	3.0	24	4	--	--	--	18744	139	9/2.50
4/22	0030	3.0	5.0	3090	300	3.0	11.5	11.0	2.0	22	4	--	--	--	18840	96	9/2.00
4/22	0130	3.0	5.0	3093	300	2.0	11.5	11.0	0.0	18	4	--	--	--	18896	56	8/2.00
4/22	0230	3.0	5.0	3095	200	3.0	12.0	11.0	3.0	24	4	--	--	--	18951	55	9/1.50
4/22	0330	3.0	5.0	3098	300	4.0	11.5	11.0	2.5	22	4	--	--	--	19014	63	9/1.50
4/22	0430	3.0	5.0	3101	300	3.0	11.5	11.5	.5	20	4	--	--	--	19075	61	7/1.50
4/22	0530	3.0	5.0	3104	300	2.0	12.0	11.0	.5	18	4	--	--	--	19124	49	7/1.50
4/22	0630	3.0	7.0	3107	300	2.0	11.5	10.5	2.5	20	4	--	--	--	19166	42	4/1.50
4/22	0730	3.0	7.0	3110	300	2.0	11.6	11.0	2.5	22	4	--	--	--	19200	34	4/1.50
4/22	0830	3.0	7.0	3116	600	4.0	11.0	11.5	3.0	22	4	--	--	--	19231	31	4/1.50
4/22	0930	3.0	7.0	3120	400	4.0	12.0	11.5	3.0	22	4	--	--	--	19261	30	4/1.50
4/22	1030	3.0	7.0	3124	400	4.0	12.0	11.5	2.8	22	4	--	--	--	19295	34	4/1.50

DATE	TIME	AGIT	JACKT	JACKT	JACKT	STEAM	SATURATED STEAM			VALVE	COUNT	AGIT	AGIT	AGIT	GRATE	GRATE	GRATE
		WATER	WATER	WATER	WATER		METER	INLET	OUTLET								
		FLOW	FLOW	FLOW	HRLY	RATE	INLET	VALVE	VALVE	POSIT	RDNG	SWPS	SETNG	SWP/HR	COUNTR	RPH	SETNG
				TOTAL	USAGE	FLOW	PRESS	PRESS	PRESS	%							
4/22	1130	3.0	7.0	3128	400	4.0	11.5	11.0	3.0	22	4	--	--		19325	30	4/1.50
4/22	1230	3.0	7.0	3132	400	4.0	11.8	11.1	3.6	24	4	--	--		19377	52	6/3.00
4/22	1330	3.0	7.0	3136	400	4.8	12.0	11.0	5.5	28	4	--	--		19478	101	6/3.00
4/22	1430	3.0	7.0	3140	400	5.8	11.3	10.8	7.0	34	4	--	--		19576	98	8/3.38
4/22	1530	3.0	7.0	3144	400	5.8	11.5	11.5	7.0	42	4	--	--		19724	148	8/3.38
4/22	1630	3.0	7.0	3148	400	5.8	11.5	11.5	7.0	41	4	--	--		19873	149	8/3.38
4/22	1730	3.0	7.0	3152	400	6.0	11.5	11.5	8.0	38	4	--	--		19978	105	8/3.38
4/23	1830	3.0	7.0	3156	400	6.0	11.5	11.5	8.0	38	4	--	--		20130	152	8/3.78
4/22	1930	3.0	7.0	3160	400	6.0	11.5	11.5	8.0	34	4	--	--		20283	153	8/3.78
4/22	2030	3.0	7.0	3164	400	7.0	11.5	11.5	8.0	36	4	--	--		20418	135	8/3.75
4/22	2130	3.0	7.0	3168	400	7.0	11.5	11.5	7.5	32	4	--	--		20576	158	8/3.75
4/22	2230	3.0	7.0	3172	400	7.0	11.5	11.5	6.5	30	4	--	--		20733	157	8/3.75
4/22	2330	3.0	7.0	3177	500	6.5	11.5	10.5	7.5	34	4	--	--		20905	172	8/3.75
4/23	0030	3.0	7.0	3181	400	6.5	11.8	11.0	8.5	30	4	--	--		21069	164	8/4.25
4/23	0130	3.0	7.0	3185	400	7.0	11.5	11.0	9.0	46	4	--	--		21255	186	8/4.25
4/23	0230	3.0	7.0	3189	400	7.0	11.5	11.0	9.0	50	4	--	--		21421	166	10/3.50
4/23	0330	3.0	7.0	3193	400	7.5	11.5	11.0	10.0	72	4	--	--		21595	174	10/3.50
4/23	0430	3.0	7.0	3197	400	7.5	11.5	11.0	10.5	86	4	--	--		21794	199	10/4.00
4/23	0530	3.0	7.0	3201	400	7.8	11.5	11.0	11.0	90	4	--	--		22006	212	10/4.00
4/23	0630	3.0	7.0	3205	400	7.8	11.5	11.0	10.0	50	4	--	--		22207	201	10/3.50
4/23	0730	3.0	7.0	3210	500	7.6	11.5	11.2	8.0	35	4	--	--		22404	197	10/3.50
4/23	0830	3.0	7.0	3214	400	7.5	11.5	11.4	8.0	35	4	--	--		22610	206	10/3.50
4/23	0930	3.0	7.0	3218	400	7.2	11.5	11.0	6.7	32	4	--	--		22776	166	10/3.50
4/23	1030	3.0	7.0	3222	400	7.0	11.5	11.1	6.9	32	4	--	--		22941	165	10/3.50
4/23	1130	3.0	7.0	3226	400	7.0	11.5	11.0	6.8	32	4	--	--		23129	188	10/3.50
4/23	1230	3.0	7.0	3231	500	7.0	11.5	11.1	6.3	30	4	--	--		23270	141	10/1.50
4/23	1330	3.0	7.0	3234	300	6.0	11.7	11.5	4.0	26	4	--	--		23336	66	10/1.50
4/23	1430	3.0	7.0	3238	400	4.2	12.0	11.5	3.0	24	4	--	--		23416	80	4/3.00
4/23	1530	3.0	7.0	3242	400	4.2	12.0	11.5	3.0	24	4	--	--		23486	70	4/3.00
4/23	1630	3.0	7.0	3246	400	2.8	11.5	11.5	2.5	24	4	--	--		2357	71	4/2.00
4/23	1730	3.0	7.0	3250	400	2.8	11.5	11.5	2.5	24	4	--	--		23629	72	4/2.00
4/23	1830	3.0	7.0	3254	400	2.2	11.5	11.5	2.5	24	4	--	--		23671	42	4/1.05
4/23	1930	3.0	7.0	3260	400	2.2	11.5	11.5	2.5	24	4	--	--		23713	43	4/1.05
4/23	2030	3.0	7.0	3264	400	2.2	11.5	11.5	2.5	22	4	--	--		23756	43	4/1.05
4/23	2130	3.0	7.0	3268	400	3.0	11.5	11.5	2.5	22	4	--	--		23786	30	4/1.05
4/23	2230	3.0	7.0	3271	300	3.5	11.5	11.0	2.8	22	4	--	--		23814	28	4/1.05
4/23	2330	3.0	7.0	3276	500	4.0	11.7	11.5	2.5	22	4	--	--		23835	21	2/1.05
4/24	0030	3.0	7.0	3280	400	4.0	11.5	11.4	2.5	22	4	--	--		23844	9	1/1.05
4/24	0130	3.0	7.0	3284	400	4.0	11.5	11.0	2.5	22	4	--	--		23849	5	1/1.05
4/24	0230	3.0	7.0	3288	400	4.0	11.5	11.0	2.5	22	4	--	--		23855	6	1/1.05
4/24	0330	3.0	7.0	3292	400	4.0	11.5	11.5	2.5	22	4	--	--		23860	5	1/1.05
4/24	0430	3.0	7.0	3296	400	3.8	11.5	11.0	2.5	22	4	--	--		23867	7	1/1.50
4/24	0530	3.0	7.0	3301	500	3.8	11.5	11.0	2.5	22	4	--	--		23877	10	1/2.00
4/24	0630	3.0	7.0	3305	400	3.8	11.5	11.0	3.0	25	4	--	--		23887	10	1/2.00
4/24	0730	3.0	7.0	3309	400	3.8	11.4	11.0	2.8	24	4	--	--		23898	11	2/2.25
4/24	0830	3.0	7.0	3313	400	3.9	11.4	10.9	3.4	25	4	--	--		23911	13	2/2.25
4/23	0930	3.0	7.0	3317	400	4.0	11.5	10.9	3.9	25	4	--	--		23937	26	2/2.25
4/24	0030	3.0	7.0	3321	400	4.0	11.6	11.0	4.0	26	4	--	--		23970	33	6/2.50

DATE	TIME	AGIT	JACKT	JACKT	JACKT	STEAM	SATURATED STEAM			VALVE	COUNT	AGIT	AGIT	AGIT	GRATE	GRATE	GRATE
		WATER	WATER	WATER	WATER		METER	INLET	OUTLET								
		FLOW	FLOW	FLOW	HRLY	RATE	INLET	VALVE	VALVE	POSIT	RDNG	SWPS	SETNG	DRIVE	GEAR	RPH	SETNG
				TOTAL	USAGE	FLOW	PRESS	PRESS	PRESS	%			SWP/HR		RDNG		
4/24	1130	3.0	7.0	3325	400	4.0	11.7	11.0	4.5	26	4	--	--		24065	95	6/2.50
4/24	1230	3.0	7.0	3330	500	4.2	11.6	11.0	4.5	27	4	--	--		24137	72	6/2.75
4/24	1330	3.0	7.0	3334	400	5.0	11.6	11.0	5.0	27	4	--	--		24220	83	6/3.25
4/24	1430	3.0	7.0	3338	400	5.0	11.5	11.5	5.0	26	4	--	--		24328	108	6/3.25
4/24	1530	3.0	7.0	3342	400	5.0	11.5	11.5	5.0	28	4	--	--		24418	90	6/3.25
4/24	1630	3.0	7.0	3346	400	5.0	11.5	11.5	5.0	26	4	--	--		24517	99	6/3.25
4/24	1730	3.0	7.0	3350	400	5.0	11.5	11.5	5.0	28	4	--	--		24617	100	6/3.25
4/24	1830	3.0	7.0	3354	400	5.0	11.5	11.5	5.0	26	4	--	--		24734	117	6/3.25
4/24	1930	3.0	7.0	3358	400	5.0	11.7	11.2	5.0	26	4	--	--		24827	93	6/3.25
4/24	2030	3.0	7.0	3362	400	5.0	11.7	11.2	5.0	26	4	--	--		24932	105	6/3.25
4/24	2130	3.0	7.0	3366	400	5.0	11.7	11.5	8.0	20	4	--	--		25060	128	6/3.25
4/24	2230	3.0	7.0	3370	400	2.42	11.5	11.5	2.0	18	4	--	--		25141	81	6/3.25
4/24	2330	3.0	7.0	3375	500	2.42	11.8	11.5	2.0	18	4	--	--		25251	110	6/3.25
4/25	0030	3.0	7.0	3379	400	2.42	11.8	11.5	2.0	20	4	--	--		25339	88	6/2.75
4/25	0130	3.0	7.0	3383	400	2.42	11.5	11.0	2.0	20	4	--	--		25427	88	6/2.75
4/25	0230	3.0	7.0	3387	400	2.42	11.0	11.5	2.0	18	4	--	--		25509	82	6/2.00
4/25	0330	3.0	7.0	3391	400	2.42	11.8	11.5	2.0	18	4	--	--		25576	67	6/2.00
4/25	0430	3.0	7.0	3395	400	2.42	11.5	11.5	1.0	18	4	--	--		25631	55	6/1.50
4/25	0530	3.0	7.0	3399	400	2.42	11.5	11.0	2.0	20	4	--	--		25675	44	6/1.50
4/25	0630	3.0	7.0	3404	500	2.42	12.0	11.0	2.5	21	4	--	--		25754	79	6/2.50
4/25	0730	3.0	7.0	3408	400	2.42	11.9	11.1	2.4	22	4	--	--		25831	77	6/2.50
4/25	0830	3.0	7.0	3412	400	2.42	11.5	11.4	2.4	20	4	--	--		25913	82	6/2.50
4/25	0930	3.0	7.0	3416	400	2.42	11.5	10.9	2.5	22	4	--	--		25989	76	6/2.50
4/25	1030	3.0	7.0	3420	400	2.45	12.0	11.0	2.5	24	4	--	--		26067	78	6/2.75
4/25	1130	3.0	7.0	3424	400	2.42	11.6	11.0	2.6	22	4	--	--		26139	72	6/2.75
4/25	1230	3.0	7.0	3428	400	2.42	11.6	11.3	2.6	22	4	--	--		26223	84	6/3.50
4/25	1330	3.0	7.0	3432	400	2.43	11.5	11.1	3.0	22	4	--	--		26338	115	6/3.50
4/25	1430	3.0	7.0	3436	400	2.42	11.5	11.1	2.5	22	4	--	--		26472	134	6/4.00
4/25	1530	3.0	7.0	3441	400	3.0	11.7	11.5	2.0	19	4	--	--		26514	42	9/4.00
4/25	1630	3.0	7.0	3445	400	2.42	11.5	11.5	3.0	22	4	--	--		26683	169	9/4.00
4/25	1730	3.0	7.0	3449	400	2.42	11.5	11.5	3.0	22	4	--	--		26852	169	9/4.00
4/25	1830	3.0	7.0	3453	400	3.0	11.5	11.5	2.0	22	4	--	--		27058	206	9/4.50
4/25	1930	3.0	7.0	3457	400	3.0	11.5	11.5	3.0	22	4	--	--		27258	200	9/4.50
4/25	2030	3.0	7.0	3460	300	3.5	11.5	11.5	4.0	24	4	--	--		27461	203	9/4.50
4/25	2130	3.0	7.0	3464	400	3.5	11.5	11.5	4.0	24	4	--	--		27667	206	9/4.50
4/25	2230	3.0	7.0	3469	500	5.0	12.0	11.5	5.0	18	4	--	--		27932	265	9/4.50
4/25	2330	3.0	7.0	3473	400	5.0	12.0	11.2	4.5	26	4	--	--		28148	216	9/4.50
4/26	0030	3.0	7.0	3472	500	5.0	11.5	11.2	4.5	26	4	--	--		28345	197	9/3.75
4/26	0130	3.0	7.0	3482	400	5.0	11.7	11.2	4.5	26	4	--	--		28521	176	9/3.75
4/26	0230	3.0	7.0	3486	400	5.0	11.5	11.2	3.5	24	4	--	--		28637	116	9/1.25
4/26	0330	3.0	7.0	3490	400	4.0	11.8	11.5	3.5	20	4	--	--		28698	61	9/1.25
4/26	0430	3.0	7.0	3494	400	3.0	11.8	11.5	2.0	20	4	--	--		28761	63	9/1.50
4/26	0530	3.0	7.0	3498	400	3.0	11.8	11.5	2.5	20	4	--	--		28833	72	9/1.50
4/26	0630	3.0	7.0	3503	500	4.0	11.5	10.9	4.1	26	4	--	--		28902	69	9/1.25
4/26	0730	3.0	7.0	3507	400	5.0	11.7	10.9	5.0	28	4	--	--		28959	57	9/1.25
4/26	0830	3.0	7.0	3511	400	5.0	11.5	10.9	5.5	29	4	--	--		29028	69	9/1.75
4/26	0930	3.0	7.0	3515	400	5.2	11.6	11.0	6.0	30	4	--	--		29105	77	9/1.75
4/26	1030	3.0	7.0	3519	400	5.4	11.6	11.0	6.0	30	4	--	--		29203	98	9/2.50

DATE	TIME	AGIT	JACKT	JACKT	JACKT	STEAM	SATURATED STEAM			VALVE	COUNT	AGIT	AGIT	AGIT	GRATE	GRATE	GRATE
		WATER	WATER	WATER	WATER		METER	INLET	OUTLET								
		FLOW	FLOW	FLOW	HRLY	RATE	INLET	VALVE	VALVE	POSIT	RDNG	SWPS	SETNG	SWP/HR	GEAR	RPH	DRIVE
				TOTAL	USAGE	FLOW	PRESS	PRESS	PRESS	%					COUNTR		SETNG
4/26	1130	3.0	7.0	3524	500	5.8	11.5	11.1	5.6	29	4	--	--		29344	141	9/2.50
4/26	1230	3.0	7.0	3527	300	5.8	11.5	11.0	6.0	30	4	--	--		29491	147	9/4.20
4/26	1330	3.0	7.0	3532	500	5.8	11.6	11.1	5.5	28	4	--	--		29704	213	9/4.20
4/26	1430	3.0	7.0	3535	300	5.8	11.5	11.1	9.0	60	4	--	--		29845	141	9/3.50
4/26	1530	3.0	7.0	3540	500	7.5	11.5	11.0	11.0	90	4	--	--		30035	190	9/3.50
4/26	1630	3.0	7.0	3543	300	7.5	11.5	11.0	11.0	92	4	--	--		30174	139	9/3.00
4/26	1730	3.0	7.0	3548	500	7.5	11.5	11.0	11.0	100	4	--	--		30332	139	9/3.00
4/26	1830	3.0	7.0	3552	400	7.5	11.5	11.0	11.00	100	4	--	--		30490	158	9/3.00
4/26	1930	3.0	7.0	3556	400	6.0	11.5	11.0	8.5	46	4	--	--		30618	158	9/3.00
4/26	2030	3.0	7.0	3560	400	6.0	1.5	11.0	8.5	40	4	--	--		30747	128	9/3.00
4/26	2130	3.0	7.0	3564	400	6.0	11.5	11.0	8.5	42	4	--	--		30876	129	9/3.00
4/26	2230	3.0	7.0	3568	400	6.0	11.5	11.0	7.0	86	4	--	--		31056	180	9/3.00
4/26	2330	3.0	7.0	3573	500	7.5	11.5	11.0	11.0	100	4	--	--		31204	148	9/3.00
4/27	0030	3.0	7.0	3577	400	7.5	11.5	11.0	10.5	100	4	--	--		31354	150	9/3.50
4/27	0130	3.0	7.0	3581	400	7.5	11.5	11.0	11.0	100	4	--	--		31524	170	9/3.50
4/27	0230	3.0	7.0	3585	400	7.8	11.5	11.0	11.0	100	4	--	--		31678	154	10/3.25
4/27	0330	3.0	7.0	3589	400	8.0	11.5	11.0	11.0	100	4	--	--		31855	177	10/3.00
4/27	0430	3.0	7.0	3593	400	8.0	11.5	11.0	11.0	100	4	--	--		32011	156	10/3.00
4/27	0530	3.0	7.0	3597	400	8.0	11.5	11.0	10.5	100	4	--	--		32168	157	10/3.00
4/27	0630	3.0	7.0	3601	400	7.8	11.5	11.0	11.0	100	4				32315	147	10/2.50
4/27	0730	3.0	7.0	3606	500	7.8	11.5	11.0	11.0	100	4				32455	140	10/2.50
4/27	0830	3.0	7.0	3610	400	7.8	12.0	11.5	11.0	100	4				32582	127	10/2.25
4/27	0930	3.0	9.0	3614	400	3.3	12.0	11.5	1.8	19	4				32664	82	4/2.25
4/27	1030	3.0	9.0	3619	500	3.1	11.6	11.2	3.0	24	4				32706	42	4/1.80
4/27	1130	3.0	9.0	3624	500	3.5	11.7	11.0	3.5	24	4				32751	45	4.1.80
4/27	1230	3.0	9.0	3629	500	3.5	11.9	11.1	3.5	24	4				32773	22	2/1.50
4/27	1330	3.0	9.0	3634	500	3.7	11.9	11.0	3.6	24	4				32788	15	2/1.50
4/27	1430	3.0	9.0	3639	500	3.7	11.9	11.0	3.6	24	4				32803	15	2/1.50
4/27	1530	3.0	9.0	3644	500	3.7	11.5	11.0	3.5	24	4				32819	16	2/1.50
4/27	1630	3.0	9.0	3649	500	3.5	11.5	11.0	3.5	24	4				32840	21	2/1.50
4/27	1730	3.0	9.0	3654	500	3.5	11.5	11.0	3.5	24	4				32858	18	2/1.50
4/27	1830	3.0	9.0	3660	600	3.5	11.3	11.0	3.5	24	4				32877	19	2/1.50
4/27	1930	3.0	9.0	3665	500	4.0	11.5	10.8	3.8	25	4				32898	21	2/1.50
4/27	2030	3.0	9.0	3670	500	4.0	11.5	11.0	4.0	26	4				32917	19	2/2.00
4/27	2130	3.0	9.0	3675	500	4.0	11.5	11.0	4.0	26	4				32943	26	2/2.00
4/27	2230	3.0	9.0	3681	600	4.5	11.5	11.0	4.0	26	4				32971	28	2/2.00
4/27	2330	3.0	9.0	3686	500	4.5	11.5	11.0	4.0	28	4				32999	28	2/2.00
4/28	0030	3.0	9.0	3692	600	4.5	11.5	11.0	4.0	28	4				33027	28	2/2.75
4/28	0130	3.0	9.0	3697	500	5.0	11.5	11.0	4.5	26	4				33065	38	2/2.75
4/28	0230	3.0	9.0	3703	600	5.0	11.0	11.0	5.0	28	4				33097	32	2/2.40
4/28	0330	3.0	9.0	3708	500	5.0	11.5	11.0	5.0	26	4				33128	31	2/2.40
4/28	0430	3.0	9.0	3713	500	5.0	11.5	11.0	4.5	26	4				33161	33	2/2.40
4/28	0530	3.0	9.0	3718	500	5.0	11.5	11.0	5.5	30	5		1		33191	30	2/2.40
4/28	0630	3.0	9.0	3724	600	5.8	11.6	11.0	6.8	32	6		1		33224	33	2/2.40
4/28	0730	3.0	9.0	3729	500	7.0	11.5	10.5	9.5	32	6				33254	30	2/2.40
4/28	0830	3.0	9.0	3735	600	7.5	11.5	11.0	10.6	80	6				33292	38	2/2.80
4/28	0930	3.0	6.0	3740	500	7.5	11.5	10.4	10.7	100	6			5.2	33343	51	4/2.80
4/28	1030	3.0	6.0	3743	300	7.5	11.5	11.0	10.9	94	13		7	5.2	33417	74	6/4.00

DATE	TIME	AGIT	JACKT	JACKT	JACKT	STEAM	SATURATED STEAM			VALVE	COUNT	AGIT	AGIT	AGIT	GRATE	GRATE	GRATE
		WATER	WATER	WATER	WATER		METER	INLET	OUTLET								
		FLOW	FLOW	FLOW	HRLY	RATE	INLET	VALVE	VALVE	POSIT	RDNG	SWPS	SETNG	SWP/HR	COUNTR	RPH	SETNG
				TOTAL	USAGE	FLOW	PRESS	PRESS	PRESS	%							
4/28	1130	3.0	6.0	3746	300	7.5	11.7	11.0	10.5	64	16	3	5.2		33537	120	6/4.00
4/28	1230	3.0	6.0	3749	300	7.5	11.7	11.0	10.5	64	23	7	5.2		33656	119	8/4.80
4/28	1330	3.0	6.0	3753	400	7.5	11.5	11.0	10.5	64	29	6	5.2		33872	216	10/3.84
4/28	1430	3.0	6.0	3757	400	6.0	11.5	11.5	5.5	26	34	5	5.3		34056	184	10/3.84
4/28	1530	3.0	6.0	3760	300	6.0	12.0	11.5	5.0	26	38	4	5.3		34225	169	10/3.84
4/28	1630	3.0	6.0	3764	400	6.0	12.0	11.5	5.0	26	45	7	5.3		34439	214	10/4.00
4/28	1730	3.0	6.0	3767	300	6.0	11.5	11.5	5.0	26	50	5	5.3		34633	194	10/4.00
4/28	1830	3.0	6.0	3771	400	5.5	11.5	11.5	4.5	25	55	5	5.3		34819	186	10/4.00
4/28	1930	3.0	6.0	3774	300	5.0	11.5	11.0	5.0	27	65	5	5.3		35011	192	10/4.00
4/28	2030	3.0	6.0	3778	400	5.0	11.5	11.0	5.0	27	65	5	5.3		35194	183	10/4.00
4/28	2130	3.0	6.0	3782	400	5.0	11.5	11.0	5.0	27	70	5	5.3		35378	184	10/4.00
4/28	2230	3.0	6.0	3785	300	5.0	11.0	11.0	5.0	28	76	6	5.3		35588	210	10/4.00
4/28	2330	3.0	6.0	3788	300	5.0	11.8	11.5	5.0	26	81	5	5.3		35777	189	10/4.00
4/29	0030	3.0	6.0	3792	400	5.0	11.5	11.0	4.0	26	87	6	5.3		35978	201	10/4.50
4/29	0130	3.0	6.0	3795	300	5.0	11.5	11.0	4.0	26	92	5	5.3		36194	216	10/4.50
4/29	0230	3.0	6.0	3799	400	5.0	11.5	11.5	4.0	24	97	5	5.3		36413	219	10/5.00
4/29	0330	3.0	6.0	3802	300	5.0	11.8	11.5	4.0	24	103	6	5.3		36654	241	10/5.00
4/29	0430	3.0	6.0	3806	400	5.0	11.5	11.0	4.0	26	108	5	5.3		36900	246	10/5.00
4/29	0530	3.0	6.0	3809	300	4.0	11.8	11.5	3.0	22	114	6	5.3		37134	234	10/5.00
4/29	0630	3.0	6.0	3813	400	4.0	12.0	11.2	2.0	19	119	5	5.7		37382	248	10/5.00
4/29	0730	3.0	6.0	3816	300	4.0	12.0	11.5	2.0	19	122	3			37631	249	10/5.00
4/29	0830	3.0	6.0	3820	400	4.0	11.9	11.5	2.0	19	122				37882	251	10/5.00
4/29	0930	3.0	6.0	3823	300	4.0	12.0	11.5	1.6	17	123	1	5.7		38110	228	10/5.00
4/29	1030	3.0	6.0	3827	400	4.0	11.6	11.5	1.8	17	130	7	5.7		38316	206	10/5.00
4/29	1130	3.0	6.0	3831	400	4.0	12.0	11.7	1.5	16	136	6	5.7		38511	195	10/5.00
4/29	1230	3.0	6.0	3834	300	4.0	12.0	11.5	1.6	17	142	6	5.7		38738	227	10/5.00
4/29	1330	3.0	6.0	3837	300	4.0	12.0	11.5	2.0	18	148	6	5.7		39002	264	10/5.00
4/29	1430	3.0	6.0	3841	400	4	11.6	11.2	1.6	18	153	5	5.7		39198	196	10/2.50
4/29	1530	3.0	6.0	3844	300	2.1	11.5	11.5	0.0	15	159	6	5.7		39330	132	10/2.50
4/29	1630	3.0	8.0	3849	500	2.3	11.5	11.5	1.0	16	165	6	5.7		39461	131	10/2.50
4/29	1730	3.0	8.0	3854	500	3.0	12.0	11.5	1.0	18	170	5	5.7		39601	140	10/2.50
4/29	1830	3.0	8.0	3859	500	3.0	12.0	11.5	1.0	16	175	5	5.7		39742	141	10/7.00
4/29	1930	3.0	8.0	3863	400	1.0	11.5	11.0	1.0	18	181	6	5.7		39815	73	10/2.00
4/29	2030	3.0	8.0	3868	500	1.0	11.5	11.0	1.0	18	187	6	5.7		39923	108	10/2.00
4/29	2130	3.0	8.0	3873	500	1.0	11.5	10.5	2.0	20	194	7	5.7		40048	125	10/2.00
4/29	2230	3.0	8.0	3877	400	2.0	12.0	11.0	2.0	20	199	5	5.7		40142	94	10/2.00
4/29	2330	3.0	8.0	3882	500	2.0	11.5	11.0	2.0	20	205	6	5.7		40250	108	10/2.00
4/30	0030	3.0	8.0	3887	500	2.0	11.8	11.0	2.0	20	210	5	5.7		40324	74	3/1.50
4/30	0130	3.0	8.0	3891	400	2.0	11.5	11.0	1.0	18	216	6	5.7		40356	32	3/1.50
4/30	0230	3.0	8.0	3896	500	2.0	12.0	11.0	2.0	20	222	6	5.7		40387	31	3/1.50
4/30	0330	3.0	8.0	3901	500	2.0	12.0	11.5	1.0	18	227	5	5.7		40420	33	3/1.50
4/30	0430	3.0	8.0	3906	500	2.0	11.8	11.5	1.0	18	233	6	5.7		40450	30	4/1.75
4/30	0530	3.0	8.0	3910	400	2.0	12.0	11.0	1.0	18	239	6	5.7		40490	40	4/1.75
4/30	0630	3.0	8.0	3915	500	2.0	11.6	11.0	1.0	20	245	6	5.6		40530	40	4/1.75
4/30	0730	3.0	8.0	3919	400	2.0	12.0	11.1	1.8	18	250	5	5.6		40562	32	4/1.75

END OF BOM/FGT 003 LEUCITE HILLS

APPENDIX H

Gas Chromatograph Data

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

4/11/1983															
13:30	17.297	9.122	0.032	0.117	0.551	47.60	1.400	22.86	0.021	0.000	146.6	136.4	99.00	24.56	0.848
14: 1	18.854	9.204	0.035	0.111	0.374	45.93	1.592	22.85	0.021	0.030	154.3	143.0	99.00	24.14	0.833
14:30	18.481	8.924	0.033	0.106	0.228	45.61	1.496	24.08	0.019	0.031	155.9	144.9	99.00	24.20	0.835
15: 1	18.178	8.525	0.038	1.090	0.296	45.23	1.530	24.06	0.018	0.031	172.7	160.3	99.00	24.23	0.836
16:31	16.874	9.008	0.040	0.141	0.342	46.96	1.716	23.85	0.029	0.037	153.3	142.8	99.00	24.61	0.849
17: 0	17.117	8.710	0.037	0.305	0.222	46.16	1.704	24.68	0.026	0.040	159.5	148.6	99.00	24.50	0.846
17:29	17.081	8.454	0.035	0.118	0.257	46.19	1.582	25.23	0.024	0.033	156.3	145.9	99.00	24.48	0.845
17:58	17.162	8.104	0.035	0.121	0.257	45.85	1.608	25.80	0.025	0.039	158.9	148.4	99.00	24.40	0.842
18:26	16.944	7.878	0.037	0.127	0.563	46.55	1.611	25.23	0.026	0.039	156.5	146.1	99.00	24.43	0.843
18:55	17.617	7.898	0.040	0.143	0.264	45.11	1.836	26.02	0.030	0.039	164.0	153.0	99.00	24.22	0.836
19:24	17.938	7.435	0.040	0.140	0.259	44.80	1.843	26.47	0.029	0.042	166.6	155.4	99.00	24.06	0.831
19:53	18.336	7.495	0.041	0.137	0.253	44.43	1.849	26.39	0.029	0.043	167.6	156.2	99.00	23.97	0.827
20:22	17.803	7.639	0.040	0.137	0.350	45.19	1.808	25.96	0.028	0.042	164.0	152.9	99.00	24.14	0.833
20:51	18.237	7.591	0.038	0.126	0.251	44.59	1.801	26.30	0.027	0.041	166.2	155.0	99.00	24.01	0.829
21:19	18.505	3.808	0.040	1.301	0.450	46.11	1.717	27.02	0.011	0.043	189.0	176.0	99.00	23.38	0.807
21:48	18.942	7.123	0.037	0.129	0.199	43.40	1.741	27.36	0.024	0.039	171.2	159.6	99.00	23.76	0.820
22:17	18.814	6.847	0.037	0.129	0.191	43.31	1.734	27.87	0.024	0.040	172.3	160.9	99.00	23.75	0.820
22:46	18.698	6.782	0.039	0.136	0.201	43.47	1.731	27.88	0.028	0.043	172.3	160.8	99.00	23.77	0.821
23:15	18.883	7.032	0.038	0.131	0.233	43.57	1.752	27.30	0.024	0.040	171.0	159.5	99.00	23.76	0.820
23:44	18.821	7.277	0.038	0.129	0.235	43.85	1.768	26.83	0.039	0.012	169.0	157.6	99.00	23.81	0.822
4/12/1983															
0:12	18.547	7.215	0.038	0.124	0.268	44.29	1.755	26.70	0.024	0.039	167.8	156.5	99.00	23.88	0.824
0:41	19.636	7.994	0.040	0.138	0.174	40.20	1.850	28.90	0.025	0.041	179.8	167.8	99.00	23.71	0.818
2:38	18.646	7.531	0.038	0.125	0.166	44.26	1.757	26.41	0.027	0.038	167.3	155.9	99.00	23.90	0.825
3: 7	18.772	7.601	0.030	0.135	0.125	44.08	1.756	26.44	0.026	0.033	167.7	156.3	99.00	23.88	0.824
3:36	17.909	7.119	3.779	0.130	0.149	42.51	1.707	25.64	0.025	0.032	221.7	207.0	99.00	24.03	0.830
4: 5	18.245	7.159	0.038	0.126	0.604	45.35	1.724	25.69	0.026	0.037	163.4	152.2	99.00	23.97	0.827
4:34	18.484	7.258	0.040	0.138	0.170	44.15	1.787	26.91	0.027	0.037	169.0	157.6	99.00	23.90	0.825
5: 3	17.910	6.843	3.713	0.120	0.157	42.32	1.716	26.16	0.024	0.035	222.3	207.7	99.00	23.99	0.828
5:32	18.645	7.117	0.038	0.118	0.157	43.92	1.731	27.21	0.026	0.037	169.5	158.1	99.00	23.84	0.823
6: 2	18.386	7.053	0.038	0.123	0.417	44.57	1.689	26.66	0.026	0.035	166.5	155.3	99.00	23.91	0.825
6:31	18.479	6.905	0.039	0.129	0.189	44.13	1.708	27.36	0.028	0.036	169.4	158.1	99.00	23.85	0.823
7: 0	18.256	7.002	0.000	0.121	0.410	44.63	1.680	26.84	0.025	0.035	165.9	154.8	99.00	23.93	0.826
7:29	18.583	6.979	0.039	0.126	0.185	43.97	1.662	27.41	0.020	0.034	169.1	157.9	99.00	23.84	0.823
7:58	18.611	6.997	0.037	0.120	0.153	43.86	1.657	27.51	0.024	0.034	169.5	158.2	99.00	23.83	0.823
8:27	20.086	6.530	0.037	0.116	0.154	42.00	1.710	28.30	0.026	0.036	177.4	165.3	99.00	23.37	0.807
8:57	19.947	5.875	0.041	0.137	0.058	41.83	1.787	29.26	0.031	0.036	181.3	169.2	99.00	23.29	0.804
9:26	19.576	5.538	0.038	0.124	0.072	41.98	1.708	29.90	0.028	0.036	181.0	169.2	99.00	23.34	0.806
9:55	19.704	5.529	0.040	0.129	0.075	41.83	1.711	29.92	0.029	0.033	181.6	169.7	99.00	23.31	0.804
10:24	19.602	5.510	0.039	0.127	0.122	42.17	1.696	29.67	0.028	0.037	180.3	168.5	99.00	23.33	0.805
12:35	19.329	5.545	0.049	0.139	0.119	42.06	1.846	29.85	0.033	0.034	181.9	170.1	99.00	23.39	0.807
13: 5	19.723	5.571	0.044	0.137	0.080	41.93	1.801	29.65	0.032	0.035	182.0	170.0	99.00	23.30	0.804
13:34	19.754	5.635	0.043	0.137	0.079	41.96	1.789	29.53	0.031	0.039	181.7	169.7	99.00	23.30	0.804
14: 3	19.642	5.541	0.042	0.134	0.104	42.13	1.773	29.56	0.030	0.039	181.2	169.2	99.00	23.32	0.805
14:32	19.449	5.559	0.041	0.130	0.105	42.29	1.719	29.65	0.030	0.034	180.0	168.3	99.00	23.38	0.807
15:32	19.476	5.702	0.041	0.121	0.083	42.31	1.588	29.62	0.029	0.031	178.4	166.8	99.00	23.41	0.808
16: 1	18.292	5.339	0.038	0.118	0.399	44.70	1.545	28.51	0.027	0.030	170.4	159.5	99.00	23.67	0.817
16:30	18.953	5.699	0.040	0.118	0.109	42.82	1.574	29.63	0.028	0.030	176.6	165.2	99.00	23.55	0.813

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

4/12/1983															
16:59	19.033	5.675	0.041	0.111	0.079	42.61	1.613	29.78	0.030	0.032	177.6	166.2	99.00	23.52	0.812
17:28	19.037	5.647	0.041	0.122	0.082	42.53	1.620	29.86	0.029	0.036	178.2	166.8	99.00	23.51	0.812
17:58	19.412	5.685	0.042	0.122	0.078	42.32	1.613	29.67	0.030	0.031	178.7	167.1	99.00	23.42	0.808
19:25	18.972	5.488	0.045	0.132	0.083	42.95	1.671	29.59	0.033	0.039	178.1	166.6	99.00	23.50	0.811
19:25	19.265	5.573	0.045	0.134	0.084	43.61	0.170	30.04	0.033	0.039	165.4	155.3	99.00	23.61	0.815
19:55	18.408	5.734	0.043	0.013	0.386	44.50	1.611	28.25	0.029	0.033	169.0	158.0	99.00	23.70	0.818
20:24	17.946	6.573	0.058	0.154	0.435	42.87	1.887	29.00	0.031	0.044	175.7	164.5	99.00	23.93	0.826
21:20	18.133	7.197	0.036	0.119	0.661	45.66	1.692	25.44	0.026	0.036	161.7	150.6	99.00	24.01	0.829
23:57	14.787	6.358	0.074	0.217	0.360	45.04	2.005	30.05	0.051	0.058	172.2	162.3	99.00	24.70	0.853
4/13/1983															
0:25	17.621	5.939	0.061	0.161	0.583	42.71	1.897	29.95	0.036	0.042	178.1	167.0	99.00	23.91	0.825
7:14	18.627	5.662	0.063	0.180	0.530	41.51	2.120	30.21	0.041	0.053	185.2	173.3	99.00	23.58	0.814
7:42	19.020	5.721	0.063	0.183	0.446	41.12	2.131	30.23	0.037	0.046	186.4	174.3	99.00	23.48	0.811
8:11	19.455	6.308	0.060	0.179	0.566	40.69	2.085	29.57	0.037	0.052	185.3	173.0	99.00	23.48	0.810
8:40	20.161	7.210	0.061	0.177	0.440	39.98	2.080	28.82	0.030	0.042	184.7	172.1	99.00	23.43	0.809
9: 9	19.820	7.138	0.061	0.178	0.455	40.34	2.062	28.87	0.034	0.043	183.7	171.3	99.00	23.51	0.812
9:38	20.464	7.130	0.060	0.176	0.406	39.83	2.103	28.74	0.042	0.049	186.1	173.3	99.00	23.34	0.806
10: 7	20.699	6.216	0.078	0.180	0.678	40.22	2.224	28.62	0.040	0.047	187.9	174.9	99.00	23.12	0.798
13:13	18.674	6.579	0.058	0.156	0.257	43.06	1.874	28.26	0.035	0.043	175.7	164.1	99.00	23.73	0.819
13:42	18.807	6.542	0.054	0.161	0.288	43.16	1.908	27.99	0.039	0.049	175.9	164.2	99.00	23.69	0.818
14:13	18.778	6.632	0.052	0.149	0.331	43.33	1.928	27.72	0.038	0.048	174.8	163.1	99.00	23.71	0.818
14:44	18.978	6.407	0.058	0.159	0.287	42.90	1.957	28.17	0.040	0.045	177.5	165.6	99.00	23.62	0.815
15:14	19.143	6.445	0.053	0.169	0.349	42.64	1.972	28.15	0.035	0.044	178.0	166.1	99.00	23.58	0.814
15:43	19.536	6.788	0.054	0.184	0.271	42.34	2.018	27.71	0.043	0.055	179.1	166.9	99.00	23.53	0.812
16:13	22.067	5.808	0.051	0.167	0.190	39.74	2.030	28.85	0.038	0.051	190.5	177.0	99.00	22.71	0.784
16:42	22.174	5.985	0.052	0.170	0.085	39.12	2.057	29.26	0.043	0.052	192.7	179.1	99.00	22.70	0.784
17:11	21.831	6.182	0.050	0.150	0.100	39.51	2.028	29.06	0.041	0.051	190.2	176.8	99.00	22.83	0.788
17:41	22.065	6.306	0.050	0.148	0.093	39.32	2.020	28.92	0.036	0.043	190.0	176.6	99.00	22.78	0.786
18:10	21.699	6.373	0.049	0.149	0.201	40.06	2.037	28.35	0.036	0.043	187.2	173.9	99.00	22.89	0.790
18:39	21.452	6.342	0.048	0.158	0.151	40.08	1.994	28.69	0.038	0.048	187.4	174.3	99.00	22.95	0.792
19: 8	21.807	6.473	0.047	0.154	0.125	39.59	1.998	28.72	0.036	0.046	188.5	175.2	99.00	22.88	0.790
19:37	21.562	6.300	0.045	0.147	0.121	39.83	1.920	29.01	0.032	0.039	187.4	174.3	99.00	22.92	0.791
20:38	22.388	6.724	0.101	0.169	0.154	37.29	2.417	29.76	0.000	0.000	197.1	183.1	99.00	22.71	0.784
21: 8	20.680	5.870	0.045	0.143	0.126	40.71	1.837	29.51	0.034	0.043	185.4	172.9	99.00	23.10	0.797
21:37	18.994	4.308	0.045	0.142	0.127	42.12	1.766	31.42	0.038	0.044	185.4	173.8	99.00	23.29	0.804
4/14/1983															
0: 5	20.841	6.623	0.042	0.138	0.269	41.51	1.781	27.72	0.033	0.041	179.4	166.8	99.00	23.19	0.800
0:34	20.939	6.698	0.041	0.130	0.134	40.80	1.734	28.46	0.029	0.035	181.2	168.7	99.00	23.17	0.800
1: 4	20.809	6.558	0.041	0.128	0.214	41.32	1.704	28.16	0.031	0.034	179.5	167.1	99.00	23.19	0.800
1:33	19.506	7.123	0.039	0.128	0.271	43.31	1.566	27.00	0.025	0.030	169.9	158.3	99.00	23.64	0.816
2: 2	19.307	7.221	0.041	0.137	0.258	43.36	1.613	27.00	0.028	0.037	170.2	158.5	99.00	23.70	0.818
2:31	19.402	6.974	0.040	0.133	0.284	43.46	1.593	27.05	0.028	0.036	170.3	158.7	99.00	23.64	0.816
3: 1	20.608	6.569	0.042	0.126	0.124	41.52	1.638	28.30	0.032	0.038	178.7	166.5	99.00	23.25	0.803
3:30	20.580	6.667	0.042	0.126	0.127	41.41	1.625	28.35	0.032	0.038	178.7	166.4	99.00	23.27	0.803
4: 0	20.642	6.608	0.044	0.132	0.157	41.41	1.695	28.24	0.030	0.035	179.3	166.9	99.00	23.24	0.802
4:29	21.029	6.441	0.044	0.138	0.144	41.05	1.735	28.35	0.024	0.035	181.3	168.7	99.00	23.11	0.798
4:58	21.703	6.220	0.051	0.156	0.136	38.88	2.065	29.71	0.037	0.043	192.0	178.7	99.00	22.86	0.789
5:27	22.365	4.558	0.049	0.161	0.216	38.37	2.452	30.76	0.031	0.043	201.4	187.3	99.00	22.38	0.772

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

4/15/1983															
17:49	19.330	6.098	0.049	0.141	0.273	43.34	1.682	28.02	0.029	0.034	174.4	162.7	99.00	23.51	0.811
18:19	19.600	6.232	0.049	0.136	0.294	42.94	1.662	28.03	0.030	0.033	175.0	163.2	99.00	23.46	0.810
18:48	19.691	6.009	0.049	0.141	0.258	42.73	1.692	28.36	0.029	0.036	176.8	164.9	99.00	23.40	0.808
19:18	19.661	5.843	0.048	0.140	0.249	42.87	1.691	28.43	0.030	0.034	176.8	165.0	99.00	23.38	0.807
19:47	19.685	5.956	0.049	0.139	0.254	42.67	1.709	28.47	0.029	0.036	177.2	165.3	99.00	23.39	0.807
20:17	19.792	6.218	0.045	0.117	0.272	42.81	1.660	28.02	0.027	0.034	175.1	163.2	99.00	23.41	0.808
20:46	19.752	6.148	0.047	0.138	0.252	42.80	1.668	28.13	0.028	0.036	175.9	164.0	99.00	23.41	0.808
21:16	19.873	6.299	0.046	0.133	0.252	42.76	1.706	27.87	0.030	0.033	175.7	163.7	99.00	23.39	0.807
21:45	19.589	6.178	0.046	0.134	0.253	42.98	1.656	28.10	0.028	0.034	175.0	163.2	99.00	23.45	0.810
22:15	19.343	6.118	0.047	0.136	0.345	43.19	1.691	28.06	0.028	0.034	174.5	162.8	99.00	23.51	0.811
22:44	19.984	5.931	0.049	0.145	0.254	42.38	1.761	28.43	0.030	0.038	178.8	166.7	99.00	23.30	0.804
23:14	19.803	6.205	0.046	0.142	0.260	42.66	1.724	28.10	0.031	0.036	176.6	164.6	99.00	23.40	0.808
23:44	19.643	6.286	0.027	0.140	0.257	42.88	1.740	27.96	0.031	0.038	175.5	163.6	99.00	23.45	0.809
4/16/1983															
0:13	19.568	6.449	0.048	0.141	0.290	43.03	1.776	27.63	0.029	0.036	174.9	163.0	99.00	23.49	0.811
0:43	19.844	6.421	0.049	0.146	0.261	42.80	1.792	27.62	0.030	0.038	176.1	164.0	99.00	23.41	0.808
1:12	19.682	6.302	0.046	0.144	0.264	42.89	1.753	27.85	0.029	0.036	175.7	163.8	99.00	23.44	0.809
1:42	19.899	6.228	0.050	0.146	0.264	42.62	1.794	27.94	0.030	0.037	177.3	165.2	99.00	23.37	0.807
2:12	19.637	6.428	0.045	0.140	0.294	42.78	1.725	27.89	0.028	0.034	175.3	163.4	99.00	23.47	0.810
2:41	19.827	6.356	0.045	0.137	0.256	42.75	1.678	27.89	0.024	0.035	175.3	163.4	99.00	23.42	0.808
3:11	19.499	6.293	0.046	0.133	0.255	42.96	1.673	28.08	0.030	0.035	174.9	163.1	99.00	23.49	0.811
3:40	19.649	6.230	0.046	0.139	0.253	42.93	1.677	28.01	0.031	0.034	175.3	163.4	99.00	23.44	0.809
4:10	19.865	6.390	0.027	0.138	0.263	42.53	1.706	28.01	0.031	0.036	176.0	164.0	99.00	23.41	0.808
4:40	19.461	6.185	0.048	0.137	0.261	42.88	1.695	28.26	0.031	0.035	175.7	163.9	99.00	23.48	0.811
5: 9	19.957	6.151	0.048	0.141	0.256	42.55	1.765	28.06	0.032	0.036	177.5	165.4	99.00	23.34	0.806
6: 9	19.779	6.133	0.049	0.141	0.560	43.45	1.780	27.03	0.032	0.038	173.8	161.8	99.00	23.40	0.808
7:15	19.914	6.350	0.048	0.142	0.287	42.89	1.796	27.51	0.029	0.037	175.8	163.7	99.00	23.38	0.807
7:45	19.752	6.479	0.050	0.145	0.275	42.93	1.811	27.48	0.033	0.039	175.6	163.5	99.00	23.44	0.809
8:15	19.574	6.418	0.046	0.147	0.290	43.09	1.757	27.62	0.030	0.037	174.8	162.9	99.00	23.49	0.811
8:45	19.330	5.780	0.050	0.149	0.273	43.22	1.811	28.32	0.032	0.040	177.0	165.1	99.00	23.44	0.809
9:15	19.472	5.287	0.047	0.148	0.264	43.00	1.761	28.95	0.033	0.038	178.9	167.0	99.00	23.33	0.805
9:45	19.269	5.294	0.047	0.142	0.269	43.07	1.701	29.14	0.031	0.036	178.0	166.3	99.00	23.39	0.807
10:15	19.280	5.386	0.046	0.137	0.290	42.96	1.681	29.15	0.033	0.036	177.8	166.2	99.00	23.41	0.808
10:44	18.806	5.274	0.046	0.138	0.270	43.53	1.636	29.23	0.032	0.035	176.1	164.7	99.00	23.52	0.812
11:14	18.419	5.157	0.047	0.142	0.272	44.25	1.644	29.01	0.031	0.036	174.3	163.1	99.00	23.60	0.815
12: 6	18.456	5.311	0.046	0.137	0.347	43.89	1.660	29.09	0.034	0.034	174.7	163.5	99.00	23.61	0.815
12:35	18.813	5.560	0.048	0.128	0.301	43.38	1.706	28.99	0.032	0.038	176.0	164.5	99.00	23.55	0.813
13: 5	19.283	5.563	0.050	0.148	0.287	43.07	1.820	28.70	0.035	0.040	178.2	166.4	99.00	23.42	0.808
13:35	19.458	5.446	0.052	0.153	0.195	42.79	1.861	28.97	0.033	0.040	180.1	168.1	99.00	23.35	0.806
14: 5	19.852	5.533	0.050	0.152	0.243	42.55	1.887	28.67	0.033	0.039	180.6	168.4	99.00	23.26	0.803
14:35	19.652	5.482	0.051	0.150	0.256	42.83	1.852	28.65	0.034	0.039	179.6	167.5	99.00	23.30	0.804
15: 5	19.842	5.498	0.049	0.148	0.229	42.33	1.869	28.97	0.033	0.039	181.3	169.1	99.00	23.25	0.803
15:35	19.454	5.627	0.050	0.157	0.316	42.79	1.887	28.64	0.035	0.041	179.4	167.4	99.00	23.38	0.807
16: 5	19.683	5.529	0.048	0.155	0.543	43.27	1.902	27.80	0.033	0.040	177.5	165.4	99.00	23.31	0.805
16:35	19.927	5.593	0.049	0.157	0.208	42.36	1.915	28.72	0.033	0.040	181.4	169.1	99.00	23.24	0.802
17: 4	19.865	5.851	0.047	0.153	0.177	42.37	1.905	28.56	0.033	0.039	180.5	168.3	99.00	23.30	0.804
17:34	19.786	5.734	0.045	0.141	0.203	42.58	1.766	28.71	0.000	0.037	178.2	166.3	99.00	23.31	0.805
18: 4	18.948	5.853	0.043	0.134	0.490	43.78	1.675	28.01	0.032	0.036	172.9	161.4	99.00	23.58	0.814

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

4/16/1983															
18:35	19.158	5.734	0.043	0.130	0.229	43.33	1.626	28.67	0.036	0.039	175.3	163.8	99.00	23.50	0.811
19: 5	19.002	5.819	0.043	0.128	0.294	43.55	1.614	28.47	0.035	0.039	174.0	162.5	99.00	23.56	0.813
19:35	19.046	5.900	0.043	0.127	0.235	43.51	1.575	28.50	0.029	0.038	173.7	162.2	99.00	23.56	0.813
20: 5	18.694	5.761	0.043	0.128	0.521	44.51	1.586	27.68	0.036	0.039	170.2	158.9	99.00	23.64	0.816
20:35	19.226	5.841	0.043	0.131	0.243	43.35	1.594	28.49	0.038	0.040	174.7	163.2	99.00	23.50	0.811
21: 5	19.011	5.822	0.045	0.137	0.237	44.12	1.698	27.85	0.039	0.042	173.2	161.7	99.00	23.54	0.813
21:35	19.082	5.900	0.044	0.129	0.245	43.49	1.647	28.39	0.038	0.040	174.4	162.9	99.00	23.54	0.813
22: 5	19.001	5.988	0.045	0.134	0.257	43.69	1.639	28.17	0.038	0.040	173.5	162.0	99.00	23.58	0.814
22:35	18.785	6.034	0.044	0.130	0.250	43.85	1.618	28.21	0.038	0.040	172.7	161.3	99.00	23.65	0.816
23: 5	18.517	5.872	0.044	0.129	0.238	44.75	1.565	27.81	0.038	0.040	169.9	158.8	99.00	23.70	0.818
23:35	18.806	6.043	0.044	0.129	0.235	43.82	1.614	28.24	0.035	0.040	172.7	161.3	99.00	23.64	0.816
4/17/1983															
0: 5	20.099	0.000	0.048	0.141	0.344	46.92	1.754	29.61	0.038	0.043	183.1	170.9	99.00	22.33	0.771
0:35	18.584	5.874	0.046	0.135	0.244	44.09	1.623	28.32	0.039	0.042	172.6	161.3	99.00	23.67	0.817
1: 5	19.100	5.852	0.047	0.139	0.249	43.54	1.714	28.27	0.038	0.043	175.1	163.5	99.00	23.52	0.812
1:35	18.706	5.878	0.046	0.133	0.246	43.85	1.657	28.41	0.037	0.041	173.5	162.1	99.00	23.64	0.816
2: 5	18.547	5.759	0.045	0.131	0.646	44.83	1.586	27.38	0.037	0.040	168.9	157.7	99.00	23.68	0.818
2:36	18.817	5.837	0.045	0.127	0.244	43.87	1.611	28.37	0.036	0.040	173.1	161.7	99.00	23.61	0.815
3: 6	18.845	5.568	0.045	0.131	0.251	43.77	1.614	28.70	0.037	0.040	174.4	163.0	99.00	23.56	0.813
3:36	18.820	5.741	0.045	0.100	0.260	43.66	1.518	28.78	0.039	0.040	173.1	161.8	99.00	23.60	0.815
4: 6	17.929	5.616	0.043	0.121	0.600	45.33	1.522	27.76	0.035	0.039	167.2	156.4	99.00	23.83	0.822
4:36	18.624	5.673	0.044	0.124	0.248	43.99	1.551	28.67	0.035	0.039	172.7	161.5	99.00	23.64	0.816
5: 6	18.666	5.792	0.046	0.132	0.252	43.85	1.629	28.55	0.037	0.041	173.5	162.2	99.00	23.64	0.816
5:36	18.696	5.703	0.046	0.132	0.253	43.85	1.634	28.61	0.037	0.041	173.9	162.5	99.00	23.61	0.815
6: 6	18.628	5.647	0.046	0.134	0.333	43.79	1.653	28.69	0.037	0.041	174.1	162.8	99.00	23.62	0.815
6:36	18.989	5.692	0.047	0.133	0.251	43.53	1.599	28.67	0.040	0.042	174.8	163.3	99.00	23.54	0.813
7: 7	18.957	5.604	0.048	0.139	0.253	43.66	1.704	28.56	0.039	0.043	175.5	163.9	99.00	23.52	0.812
9: 1	15.270	5.401	0.052	0.159	0.265	45.57	1.777	30.46	0.042	0.009	170.0	160.3	99.00	24.44	0.844
9:31	18.007	4.630	0.048	0.141	0.300	44.61	1.679	29.51	0.034	0.038	175.0	164.0	99.00	23.62	0.815
10: 0	18.223	4.690	0.050	0.141	0.459	44.39	1.729	29.25	0.034	0.038	175.4	164.2	99.00	23.57	0.814
10:30	18.029	4.999	0.046	0.130	0.282	44.11	1.601	29.74	0.034	0.035	174.7	163.8	99.00	23.68	0.817
10:59	18.103	4.859	0.045	0.133	0.259	44.00	1.608	29.93	0.032	0.036	175.7	164.7	99.00	23.64	0.816
11:29	17.696	4.827	0.046	0.126	0.275	44.41	1.533	30.02	0.031	0.034	173.7	163.0	99.00	23.75	0.820
11:59	18.105	4.757	0.047	0.119	0.347	44.88	0.552	30.12	0.032	0.035	165.4	155.5	99.00	23.75	0.820
12:28	17.602	4.807	0.046	0.123	0.294	44.61	1.503	29.95	0.032	0.034	172.8	162.2	99.00	23.77	0.821
12:58	18.138	4.830	0.047	0.131	0.288	44.06	1.595	29.84	0.034	0.036	175.4	164.4	99.00	23.62	0.815
13:27	17.794	5.032	0.048	0.132	0.245	44.28	1.587	29.81	0.033	0.034	174.1	163.3	99.00	23.75	0.820
13:57	17.897	4.872	0.050	0.141	0.534	44.78	1.646	29.01	0.034	0.036	172.7	161.8	99.00	23.70	0.818
14:27	17.590	4.966	0.049	0.132	0.469	44.93	1.588	29.20	0.034	0.038	171.6	160.9	99.00	23.80	0.821
14:56	17.172	4.988	0.051	0.142	0.519	45.17	1.665	29.22	0.035	0.037	171.3	160.7	99.00	23.90	0.825
17:57	17.846	4.745	0.074	0.147	1.513	45.91	1.810	26.89	0.030	0.032	167.7	156.6	99.00	23.71	0.818
18:26	17.919	4.646	0.050	0.132	0.561	44.86	1.610	29.16	0.033	0.034	172.7	161.7	99.00	23.66	0.817
18:56	18.323	4.917	0.050	0.122	0.291	43.85	1.634	29.75	0.033	0.035	175.9	164.8	99.00	23.59	0.814
19:26	17.953	4.859	0.049	0.126	0.254	44.24	1.565	29.89	0.031	0.033	174.5	163.6	99.00	23.68	0.817
19:56	17.762	4.965	0.050	0.135	0.377	44.49	1.573	29.58	0.032	0.034	173.2	162.4	99.00	23.75	0.820
20:26	17.848	4.765	0.047	0.123	0.424	44.77	1.490	29.47	0.031	0.032	171.9	161.2	99.00	23.71	0.818
4/18/1983															
51	18.389	4.967	0.052	0.138	0.373	44.25	1.694	29.07	0.032	0.035	174.9	163.7	99.00	23.57	0.814

GAS CHROMATOGRAPH DATA

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

4/18/1983															
1:20	17.890	4.818	0.051	0.131	0.332	44.68	1.619	29.41	0.033	0.035	173.5	162.6	99.00	23.69	0.818
1:50	17.749	4.735	0.052	0.143	0.313	44.59	1.678	29.66	0.035	0.038	174.8	163.9	99.00	23.70	0.818
2:19	17.903	4.681	0.049	0.133	0.315	44.53	1.608	29.71	0.034	0.036	174.4	163.5	99.00	23.66	0.817
2:49	17.753	4.706	0.049	0.133	0.262	44.45	1.610	29.97	0.034	0.036	174.8	164.0	99.00	23.70	0.818
3:19	17.766	4.440	0.050	0.135	0.273	44.18	1.640	30.45	0.035	0.037	176.8	165.9	99.00	23.65	0.816
3:49	17.777	4.558	0.049	0.134	0.256	44.25	1.608	30.29	0.034	0.036	175.9	165.1	99.00	23.67	0.817
4:19	17.745	4.591	0.484	0.130	0.283	44.22	1.574	29.91	0.033	0.036	181.1	169.9	99.00	23.69	0.818
4:49	17.958	4.634	0.049	0.139	0.248	44.18	1.651	30.07	0.035	0.038	176.4	165.4	99.00	23.63	0.816
5:19	17.977	4.647	0.049	0.136	0.251	44.23	1.641	30.00	0.034	0.038	176.0	165.1	99.00	23.63	0.816
5:49	18.083	4.666	0.052	0.148	0.247	44.02	1.744	29.96	0.036	0.040	177.7	166.5	99.00	23.59	0.814
6:19	18.716	5.189	0.051	0.142	0.285	43.33	1.729	29.48	0.036	0.039	177.9	166.4	99.00	23.52	0.812
6:49	19.243	6.044	0.051	0.146	0.241	42.90	1.802	28.50	0.036	0.041	177.3	165.5	99.00	23.51	0.811
7:18	19.128	6.215	0.048	0.140	0.252	43.24	1.735	28.17	0.035	0.039	174.9	163.3	99.00	23.57	0.814
7:48	19.595	6.178	0.048	0.141	0.250	42.93	1.749	28.03	0.034	0.038	176.1	164.2	99.00	23.44	0.809
8:18	19.648	6.128	0.047	0.137	0.038	43.09	1.682	28.16	0.034	0.037	175.9	164.0	99.00	23.42	0.808
8:48	19.891	6.070	0.049	0.139	0.243	42.61	1.806	28.12	0.035	0.038	177.9	165.8	99.00	23.34	0.806
9:18	19.386	5.850	0.049	0.181	0.243	43.07	1.609	28.54	0.034	0.036	176.3	164.6	99.00	23.46	0.810
9:48	19.875	6.018	0.050	0.130	0.206	42.81	1.657	28.18	0.035	0.035	176.4	164.4	99.00	23.35	0.806
10:18	19.532	6.191	0.047	0.116	0.250	43.16	1.495	28.14	0.032	0.031	173.0	161.5	99.00	23.49	0.811
10:48	19.134	6.106	0.049	0.116	0.238	43.56	1.439	28.29	0.032	0.031	171.7	160.4	99.00	23.59	0.814
11:18	18.904	6.206	0.055	0.111	0.203	43.75	1.438	28.26	0.033	0.030	170.9	159.7	99.00	23.66	0.817
11:48	19.118	6.448	0.065	0.114	0.186	43.70	1.424	27.88	0.035	0.030	170.4	159.1	99.00	23.64	0.816
12:18	19.173	6.454	0.067	0.120	0.201	44.02	0.990	27.91	0.037	0.032	166.6	155.6	99.00	23.68	0.818
12:47	19.461	6.410	0.074	0.129	0.186	43.47	1.582	27.61	0.039	0.033	172.8	161.2	99.00	23.53	0.812
13:17	18.798	6.863	0.076	0.138	0.221	44.02	1.655	27.15	0.041	0.036	170.3	158.9	99.00	23.77	0.820
15:12	19.223	6.404	0.073	0.133	0.243	43.50	1.636	27.72	0.039	0.035	173.1	161.4	99.00	23.59	0.814
15:42	19.717	6.204	0.067	0.161	0.293	43.05	1.742	27.69	0.039	0.037	176.1	164.1	99.00	23.42	0.808
16:12	19.115	6.304	0.073	0.158	0.377	43.76	1.714	27.42	0.041	0.037	173.1	161.4	99.00	23.60	0.815
16:43	19.500	6.193	0.063	0.151	0.246	43.10	1.662	28.00	0.044	0.039	175.5	163.7	99.00	23.48	0.811
17:13	19.296	6.458	0.067	0.152	0.478	44.99	1.570	25.91	0.045	0.040	167.3	155.7	99.00	23.60	0.815
17:43	19.501	6.123	0.067	0.152	0.271	43.14	1.642	28.02	0.046	0.039	175.5	163.7	99.00	23.47	0.810
18:13	19.539	6.269	0.065	0.160	0.266	42.83	1.670	28.11	0.047	0.041	176.4	164.5	99.00	23.48	0.811
18:43	19.844	6.270	0.069	0.155	0.244	42.72	1.667	27.94	0.046	0.041	176.8	164.7	99.00	23.40	0.808
19:13	19.679	6.359	0.068	0.160	0.471	44.47	1.637	26.07	0.048	0.042	170.1	158.1	99.00	23.47	0.810
19:43	19.935	6.262	0.060	0.158	0.243	42.39	1.713	28.15	0.045	0.041	178.1	166.0	99.00	23.37	0.807
20:13	19.927	6.353	0.058	0.152	0.248	42.70	1.675	27.81	0.043	0.039	176.3	164.3	99.00	23.39	0.808
20:43	19.593	6.434	0.057	0.141	0.231	42.98	1.569	27.91	0.041	0.037	174.2	162.5	99.00	23.51	0.811
21:13	19.634	6.431	0.061	0.151	0.239	43.01	1.636	27.75	0.044	0.040	174.9	163.0	99.00	23.49	0.811
21:43	19.558	6.361	0.062	0.155	0.246	43.12	1.708	27.70	0.044	0.039	175.3	163.4	99.00	23.49	0.811
22:43	19.623	6.411	0.062	0.154	0.461	44.80	1.600	25.80	0.045	0.041	168.3	156.5	99.00	23.50	0.811
23:13	19.560	6.237	0.061	0.152	0.451	43.66	1.666	27.13	0.044	0.040	173.0	161.1	99.00	23.48	0.811
23:13	19.616	6.515	0.066	0.158	0.224	43.11	1.721	27.50	0.046	0.042	175.2	163.2	99.00	23.50	0.811
23:43	19.644	6.308	0.061	0.157	0.235	43.11	1.706	27.70	0.045	0.041	175.6	163.7	99.00	23.46	0.810
4/19/1983															
0:13	19.646	6.312	0.062	0.159	0.242	43.07	1.716	27.71	0.046	0.042	175.8	163.9	99.00	23.46	0.810
0:43	19.853	5.916	0.059	0.150	0.199	42.69	1.655	28.39	0.044	0.040	177.8	165.8	99.00	23.34	0.806
1:13	19.598	5.982	0.059	0.148	0.169	42.78	1.623	28.56	0.043	0.039	177.1	165.3	99.00	23.42	0.809
1:43	19.901	6.056	0.058	0.148	0.158	42.68	1.621	28.29	0.043	0.039	177.2	165.2	99.00	23.36	0.806

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

4/19/1983															
2:13	19.483	6.204	0.062	0.151	0.165	42.87	1.655	28.32	0.045	0.040	176.4	164.6	99.00	23.49	0.811
2:45	19.811	6.249	0.061	0.153	0.191	42.79	1.678	27.99	0.045	0.040	176.7	164.7	99.00	23.41	0.808
3:15	19.388	6.281	0.068	0.162	0.224	43.29	1.745	27.75	0.048	0.043	175.7	163.8	99.00	23.52	0.812
3:45	19.648	6.177	0.066	0.158	0.226	43.08	1.714	27.84	0.047	0.041	176.3	164.3	99.00	23.43	0.809
4:15	19.418	5.886	0.065	0.159	0.246	43.05	1.695	28.40	0.047	0.043	177.2	165.4	99.00	23.45	0.809
4:46	19.821	5.734	0.068	0.165	0.231	42.63	1.774	28.48	0.049	0.044	179.8	167.7	99.00	23.31	0.805
5:16	19.694	6.163	0.069	0.165	0.235	42.89	1.765	27.93	0.050	0.044	177.6	165.5	99.00	23.42	0.808
6: 0	18.963	6.098	0.059	0.148	0.351	43.60	1.682	28.04	0.035	0.032	173.6	162.1	99.00	23.61	0.815
6:29	19.814	6.244	0.055	0.153	0.209	42.75	1.665	28.04	0.036	0.036	176.3	164.4	99.00	23.40	0.808
6:59	20.220	6.437	0.058	0.153	0.183	42.34	1.678	27.85	0.038	0.036	177.3	165.1	99.00	23.33	0.805
7:28	20.298	6.423	0.061	0.176	0.219	42.16	1.915	27.67	0.041	0.041	180.0	167.5	99.00	23.28	0.804
7:58	20.029	6.454	0.063	0.166	0.229	42.55	1.810	27.62	0.040	0.041	177.7	165.5	99.00	23.37	0.807
8:27	20.325	5.937	0.064	0.183	0.251	42.25	2.017	27.89	0.041	0.043	182.0	169.4	99.00	23.18	0.800
8:57	19.350	5.840	0.053	0.156	0.245	43.19	1.746	28.35	0.036	0.037	176.7	164.9	99.00	23.45	0.810
9:26	19.133	5.475	0.055	0.162	0.249	43.21	1.735	28.91	0.038	0.039	177.9	166.2	99.00	23.45	0.810
9:56	18.953	5.680	0.053	0.155	0.252	43.39	1.668	28.78	0.037	0.037	176.0	164.5	99.00	23.54	0.813
10:25	19.063	5.770	0.054	0.160	0.285	43.39	1.724	28.47	0.037	0.039	176.1	164.4	99.00	23.52	0.812
10:54	19.006	6.209	0.054	0.156	0.259	43.53	1.687	28.02	0.037	0.038	174.0	162.4	99.00	23.61	0.815
11:25	19.321	5.906	0.056	0.163	0.259	43.05	1.760	28.40	0.038	0.040	177.2	165.4	99.00	23.47	0.810
11:54	19.155	6.020	0.028	0.155	0.255	43.30	1.732	28.28	0.036	0.037	175.3	163.6	99.00	23.53	0.812
12:24	19.362	5.877	0.052	0.159	0.280	43.06	1.736	28.40	0.037	0.039	176.9	165.1	99.00	23.46	0.810
12:53	19.351	5.645	0.051	0.149	0.257	42.85	1.673	28.96	0.035	0.036	177.7	166.0	99.00	23.43	0.809
13:23	19.243	5.662	0.053	0.155	0.257	43.06	1.678	28.81	0.036	0.037	177.1	165.4	99.00	23.46	0.810
13:53	19.169	5.573	0.049	0.143	0.261	43.10	1.600	29.04	0.034	0.034	176.4	164.9	99.00	23.47	0.810
14:22	18.727	5.828	0.049	0.144	0.286	43.61	1.572	28.71	0.034	0.035	173.7	162.4	99.00	23.63	0.816
14:52	18.768	5.866	0.050	0.143	0.258	43.69	1.570	28.59	0.034	0.034	173.4	162.1	99.00	23.63	0.816
15:21	19.093	5.884	0.054	0.153	0.259	43.32	1.652	28.51	0.037	0.037	175.4	163.8	99.00	23.54	0.813
15:51	19.292	5.933	0.050	0.149	0.259	43.18	1.665	28.40	0.035	0.036	175.6	163.9	99.00	23.49	0.811
16:21	19.235	6.188	0.056	0.166	0.277	43.21	1.768	28.02	0.038	0.039	175.8	164.0	99.00	23.54	0.812
16:50	19.200	6.310	0.050	0.144	0.238	43.40	1.614	27.97	0.034	0.035	173.3	161.7	99.00	23.58	0.814
17:20	19.320	6.255	0.052	0.151	0.236	43.30	1.692	27.92	0.035	0.036	174.5	162.8	99.00	23.53	0.812
17:49	19.216	6.225	0.050	0.141	0.232	43.47	1.586	28.01	0.033	0.034	173.1	161.5	99.00	23.57	0.813
18:20	19.255	5.898	0.052	0.146	0.253	43.33	1.606	28.39	0.035	0.035	174.8	163.2	99.00	23.50	0.811
18:50	18.988	5.943	0.050	0.145	0.246	43.39	1.614	28.55	0.035	0.035	174.5	163.0	99.00	23.58	0.814
19:20	18.995	5.911	0.052	0.149	0.252	43.48	1.606	28.48	0.036	0.036	174.4	162.9	99.00	23.57	0.814
19:49	19.238	5.953	0.051	0.015	0.250	43.49	1.653	28.28	0.035	0.036	172.6	161.1	99.00	23.51	0.811
20:19	19.070	6.083	0.053	0.155	0.281	43.55	1.686	28.05	0.037	0.037	174.2	162.6	99.00	23.57	0.814
20:49	19.305	5.452	0.051	0.146	0.249	43.39	1.656	28.68	0.035	0.035	176.4	164.7	99.00	23.41	0.808
21:19	19.318	5.705	0.057	0.156	0.267	43.27	1.696	28.46	0.037	0.037	176.5	164.8	99.00	23.45	0.809
21:49	19.203	6.133	0.053	0.143	0.235	43.34	1.614	28.21	0.036	0.034	174.1	162.5	99.00	23.55	0.813
22:18	19.070	5.863	0.053	0.141	0.249	43.55	1.549	28.46	0.036	0.034	173.8	162.3	99.00	23.55	0.813
22:48	18.752	5.995	0.054	0.147	0.248	43.85	1.600	28.28	0.037	0.035	172.9	161.6	99.00	23.65	0.816
23:18	18.935	5.970	0.054	0.149	0.256	43.63	1.606	28.33	0.037	0.036	173.8	162.3	99.00	23.60	0.815
23:48	19.105	5.904	0.052	0.146	0.256	43.39	1.610	28.47	0.035	0.035	174.7	163.1	99.00	23.54	0.813
4/20/1983															
0:18	18.241	6.367	0.052	0.144	0.278	44.58	1.573	27.69	0.035	0.034	169.0	157.9	99.00	23.85	0.823
0:48	19.408	5.888	0.053	0.145	0.257	43.35	1.634	28.19	0.036	0.035	175.0	163.3	99.00	23.46	0.810
1:18	18.699	6.167	0.055	0.147	0.266	44.04	1.609	27.95	0.035	0.035	171.7	160.4	99.00	23.69	0.818

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

4/20/1983															
1:47	19.053	6.031	0.053	0.139	0.260	43.75	1.558	28.09	0.034	0.033	172.6	161.1	99.00	23.58	0.814
2:17	18.852	5.992	0.049	0.139	0.280	43.93	1.524	28.17	0.034	0.033	171.7	160.4	99.00	23.63	0.816
2:47	19.009	5.861	0.051	0.149	0.262	43.76	1.541	28.31	0.034	0.033	173.1	161.6	99.00	23.57	0.814
3:17	18.624	5.842	0.052	0.139	0.286	43.95	1.508	28.53	0.035	0.033	172.1	160.9	99.00	23.67	0.817
3:47	18.637	5.795	0.057	0.146	0.283	43.92	1.586	28.51	0.037	0.034	173.1	161.8	99.00	23.65	0.816
4:17	18.852	5.755	0.058	0.145	0.304	43.84	1.572	28.40	0.038	0.035	173.4	162.0	99.00	23.59	0.814
4:47	18.782	5.924	0.060	0.146	0.267	44.08	1.598	28.07	0.038	0.035	172.4	161.0	99.00	23.63	0.816
5:16	19.053	5.691	0.062	0.145	0.266	43.90	1.584	28.22	0.039	0.034	173.6	162.1	99.00	23.53	0.812
5:46	19.065	5.608	0.061	0.152	0.277	43.58	1.655	28.52	0.040	0.036	175.5	163.9	99.00	23.50	0.811
6:16	18.553	5.541	0.065	0.148	0.303	43.98	1.573	28.76	0.047	0.039	174.0	162.7	99.00	23.64	0.816
6:46	18.975	5.582	0.066	0.155	0.266	43.66	1.637	28.57	0.048	0.041	175.7	164.1	99.00	23.52	0.812
7:17	18.852	5.313	0.066	0.154	0.264	43.52	1.625	29.11	0.048	0.041	176.9	165.4	99.00	23.52	0.812
7:47	18.986	5.412	0.063	0.145	0.286	43.52	1.570	28.94	0.046	0.038	175.8	164.4	99.00	23.50	0.811
8:17	19.105	6.014	0.062	0.145	0.264	43.38	1.551	28.40	0.046	0.038	174.3	162.8	99.00	23.57	0.814
8:46	19.118	6.355	0.059	0.137	0.254	43.45	1.510	28.04	0.043	0.036	172.5	161.0	99.00	23.62	0.815
9:16	18.978	6.270	0.060	0.139	0.252	43.66	1.486	28.08	0.044	0.037	172.0	160.6	99.00	23.65	0.816
9:46	19.209	6.239	0.063	0.140	0.231	43.36	1.515	28.16	0.045	0.036	173.4	161.9	99.00	23.58	0.814
10:16	18.907	6.297	0.067	0.145	0.243	43.65	1.524	28.08	0.047	0.038	172.4	161.1	99.00	23.67	0.817
10:46	19.315	6.154	0.069	0.151	0.237	43.28	1.620	28.09	0.048	0.040	175.0	163.3	99.00	23.53	0.812
11:16	19.017	6.193	0.076	0.157	0.260	43.56	1.664	27.98	0.051	0.041	174.4	162.8	99.00	23.61	0.815
11:46	19.223	6.385	0.077	0.146	0.230	43.49	1.576	27.79	0.050	0.038	173.3	161.7	99.00	23.59	0.814
12:16	19.146	6.485	0.085	0.169	0.254	43.58	1.759	27.42	0.054	0.044	174.5	162.7	99.00	23.61	0.815
12:46	19.552	6.098	0.073	0.151	0.241	43.09	1.645	28.06	0.050	0.039	176.0	164.1	99.00	23.46	0.810
13:16	19.269	5.997	0.088	0.161	0.250	43.36	1.717	28.06	0.054	0.042	176.4	164.6	99.00	23.51	0.811
13:46	18.893	6.171	0.080	0.146	0.356	43.84	1.586	27.86	0.030	0.039	172.2	160.7	99.00	23.65	0.816
14:16	19.150	6.590	0.089	0.156	0.253	43.45	1.671	27.55	0.054	0.041	173.8	162.1	99.00	23.64	0.816
14:46	19.555	6.972	0.082	0.144	0.243	43.46	1.570	26.89	0.051	0.038	171.5	159.7	99.00	23.60	0.815
15:16	18.559	7.336	0.125	0.155	0.500	46.44	1.637	24.15	0.057	0.042	161.3	149.9	99.00	23.92	0.826
15:46	18.966	6.954	0.106	0.150	0.257	43.94	1.701	26.83	0.053	0.040	171.3	159.7	99.00	23.74	0.819
16:16	18.974	6.726	0.102	0.159	0.382	44.56	1.732	26.26	0.055	0.042	170.0	158.3	99.00	23.70	0.818
16:46	19.760	6.583	0.077	0.148	0.255	42.84	1.605	27.64	0.050	0.038	175.0	163.0	99.00	23.48	0.811
17:16	19.527	6.575	0.073	0.166	0.235	43.19	1.743	27.40	0.053	0.045	175.3	163.3	99.00	23.53	0.812
17:46	19.718	6.163	0.067	0.156	0.240	42.84	1.689	28.04	0.048	0.041	176.9	164.9	99.00	23.42	0.808
18:16	19.790	6.120	0.076	0.168	0.238	42.74	1.801	27.97	0.052	0.045	178.6	166.4	99.00	23.38	0.807
18:46	19.450	6.166	0.068	0.159	0.256	43.09	1.712	28.00	0.049	0.042	176.3	164.4	99.00	23.49	0.811
23:10	19.964	6.208	0.056	0.141	0.265	42.51	1.645	28.14	0.036	0.036	176.7	164.7	99.00	23.36	0.806
23:40	19.907	6.549	0.054	0.143	0.281	43.19	1.708	27.10	0.036	0.037	173.9	161.8	99.00	23.43	0.809
4/21/1983															
0: 9	19.682	6.429	0.026	0.142	0.360	43.26	1.655	27.37	0.036	0.037	173.0	161.2	99.00	23.48	0.810
0:39	19.681	6.581	0.057	0.144	0.281	42.99	1.681	27.51	0.038	0.037	174.3	162.4	99.00	23.49	0.811
1: 8	19.360	6.583	0.056	0.138	0.275	43.59	1.645	27.28	0.037	0.035	172.0	160.3	99.00	23.58	0.814
1:38	19.578	6.498	0.055	0.132	0.275	43.37	1.602	27.42	0.035	0.034	172.5	160.8	99.00	23.52	0.812
2: 7	19.283	6.555	0.052	0.132	0.381	43.94	1.573	27.01	0.034	0.034	169.9	158.3	99.00	23.61	0.815
2:37	19.820	6.895	0.027	0.134	0.277	43.25	1.603	26.92	0.035	0.034	171.3	159.5	99.00	23.52	0.812
3: 6	19.387	7.006	0.054	0.133	0.282	43.75	1.578	26.74	0.035	0.034	169.5	157.9	99.00	23.65	0.816
3:36	19.578	6.695	0.055	0.140	0.281	43.48	1.667	27.03	0.036	0.036	172.1	160.3	99.00	23.54	0.813
4: 5	19.201	6.609	0.056	0.144	0.287	43.83	1.659	27.13	0.037	0.037	171.3	159.7	99.00	23.63	0.816
4:35	19.766	6.535	0.055	0.138	0.284	43.19	1.657	27.30	0.036	0.035	173.5	161.6	99.00	23.47	0.810

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

4/21/1983															
5: 4	19.436	6.635	0.027	0.135	0.293	43.73	1.568	27.11	0.036	0.035	170.3	158.7	99.00	23.58	0.814
5:34	18.337	6.085	0.054	0.135	0.287	45.05	1.571	27.42	0.035	0.034	168.2	157.1	99.00	23.78	0.821
6: 3	19.087	6.334	0.031	0.132	0.470	44.13	1.546	27.20	0.035	0.034	169.2	157.8	99.00	23.63	0.816
6:33	19.463	6.570	0.027	0.131	0.294	43.56	1.548	27.34	0.035	0.033	170.9	159.3	99.00	23.56	0.813
7: 3	19.244	6.417	0.054	0.129	0.279	43.71	1.524	27.58	0.035	0.033	171.1	159.6	99.00	23.60	0.815
7:32	18.951	6.810	0.057	0.135	0.285	44.03	1.584	27.07	0.037	0.034	169.3	157.9	99.00	23.73	0.819
8: 2	19.097	6.720	0.026	0.127	0.469	44.60	1.506	26.39	0.036	0.033	166.1	154.7	99.00	23.70	0.818
8:31	19.320	6.620	0.058	0.138	0.263	43.60	1.615	27.32	0.034	0.035	171.6	160.0	99.00	23.60	0.815
9: 1	19.105	6.539	0.030	0.132	0.290	43.86	1.554	27.42	0.037	0.034	170.1	158.7	99.00	23.65	0.816
9:30	18.927	6.598	0.027	0.133	0.279	43.91	1.575	27.48	0.037	0.034	169.9	158.6	99.00	23.70	0.818
10: 0	18.712	6.866	0.026	0.124	0.413	44.56	1.443	26.79	0.035	0.032	165.4	154.3	99.00	23.82	0.822
10:30	19.266	6.593	0.056	0.132	0.305	43.62	1.547	27.41	0.037	0.034	171.0	159.4	99.00	23.62	0.815
10:59	19.198	6.609	0.055	0.127	0.290	43.73	1.506	27.42	0.035	0.033	170.2	158.7	99.00	23.64	0.816
11:29	19.427	6.523	0.058	0.136	0.243	43.50	1.590	27.45	0.037	0.034	172.2	160.5	99.00	23.56	0.813
11:59	19.175	6.596	0.057	0.130	0.258	43.68	1.523	27.51	0.036	0.033	170.7	159.2	99.00	23.65	0.816
12:29	19.963	6.425	0.061	0.145	0.235	42.84	1.703	27.55	0.039	0.036	175.7	163.6	99.00	23.39	0.807
12:59	19.479	6.572	0.058	0.133	0.208	43.36	1.568	27.55	0.037	0.032	172.3	160.7	99.00	23.55	0.813
13:29	19.454	5.355	0.059	0.131	0.292	44.62	1.588	27.43	0.038	0.033	172.1	160.4	99.00	23.37	0.807
13:59	18.859	6.739	0.027	0.121	0.282	44.10	1.435	27.37	0.035	0.031	167.6	156.4	99.00	23.76	0.820
14:28	18.857	6.728	0.055	0.127	0.315	44.09	1.464	27.30	0.036	0.032	168.3	157.0	99.00	23.76	0.820
14:58	18.890	6.898	0.066	0.141	0.320	44.10	1.592	26.92	0.036	0.036	169.0	157.6	99.00	23.76	0.820
15:28	19.580	6.909	0.066	0.151	0.233	43.50	1.772	26.71	0.041	0.037	172.7	160.7	99.00	23.56	0.813
15:58	19.341	6.709	0.061	0.142	0.273	43.82	1.665	26.91	0.039	0.037	171.2	159.5	99.00	23.60	0.815
16:28	19.864	6.671	0.061	0.142	0.305	43.24	1.759	26.89	0.038	0.038	173.7	161.7	99.00	23.45	0.810
16:57	19.375	6.707	0.058	0.136	0.248	43.68	1.612	27.11	0.037	0.035	171.1	159.5	99.00	23.60	0.815
17:27	19.462	6.539	0.057	0.134	0.224	43.58	1.590	27.34	0.036	0.034	171.9	160.2	99.00	23.55	0.813
17:57	19.393	6.270	0.055	0.125	0.219	43.51	1.501	27.86	0.035	0.032	172.1	160.6	99.00	23.54	0.812
18:27	19.536	6.224	0.060	0.139	0.238	43.18	1.608	27.94	0.038	0.035	174.4	162.7	99.00	23.48	0.811
18:57	19.638	6.821	0.064	0.137	0.214	43.38	1.609	27.06	0.039	0.034	171.9	160.1	99.00	23.55	0.813
19:27	19.608	6.665	0.064	0.148	0.215	43.26	1.731	27.23	0.039	0.037	173.9	162.0	99.00	23.52	0.812
19:56	19.853	6.853	0.058	0.135	0.211	43.29	1.628	26.91	0.037	0.034	172.1	160.2	99.00	23.50	0.811
20:26	19.994	6.711	0.062	0.152	0.244	43.10	1.773	26.89	0.039	0.037	174.5	162.4	99.00	23.42	0.808
20:56	19.831	6.661	0.056	0.131	0.201	43.26	1.579	27.21	0.036	0.033	172.4	160.6	99.00	23.48	0.810
21:26	18.983	6.747	0.057	0.126	0.208	44.05	1.462	27.30	0.035	0.032	168.7	157.4	99.00	23.72	0.819
21:56	20.340	6.359	0.062	0.149	0.189	42.12	1.784	27.92	0.039	0.037	179.0	166.7	99.00	23.27	0.803
22:26	19.801	6.975	0.061	0.181	0.135	42.88	2.111	26.77	0.041	0.046	177.7	165.2	99.00	23.47	0.810
22:56	19.935	7.306	0.058	0.169	0.237	42.32	2.030	26.86	0.039	0.043	177.2	164.8	99.00	23.50	0.811
23:26	20.233	6.793	0.057	0.178	0.144	42.40	2.124	26.99	0.040	0.046	179.8	167.1	99.00	23.33	0.805
23:55	20.654	6.854	0.059	0.178	0.174	42.13	2.187	26.68	0.039	0.045	180.8	167.8	99.00	23.22	0.802
4/22/1983															
0:25	19.832	6.685	0.026	0.177	0.244	42.92	1.958	27.07	0.044	0.047	176.6	164.3	99.00	23.44	0.809
0:56	19.800	6.750	0.048	0.168	0.258	42.97	1.890	27.03	0.041	0.045	175.8	163.6	99.00	23.47	0.810
1:26	18.765	6.226	0.056	0.222	0.812	43.25	2.697	26.86	0.048	0.062	181.7	169.1	99.00	23.58	0.814
1:56	18.993	6.646	0.040	0.163	0.290	43.41	1.884	27.49	0.038	0.045	174.4	162.6	99.00	23.66	0.817
2:26	18.302	7.398	0.038	0.152	0.394	44.89	1.641	26.10	0.037	0.043	164.9	153.7	99.00	23.99	0.828
2:56	19.096	6.985	0.042	0.155	0.261	43.61	1.725	27.05	0.039	0.043	171.5	159.8	99.00	23.71	0.818
3:26	19.454	6.607	0.043	0.156	0.259	43.26	1.755	27.38	0.039	0.043	174.1	162.2	99.00	23.55	0.813
3:56	19.677	6.565	0.044	0.155	0.256	43.05	1.747	27.43	0.039	0.041	174.8	162.9	99.00	23.48	0.811

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

4/22/1983															
4:26	19.266	6.703	0.043	0.152	0.273	43.42	1.702	27.36	0.039	0.041	172.7	161.0	99.00	23.62	0.815
4:56	19.564	7.049	0.044	0.155	0.255	43.49	1.747	26.61	0.038	0.042	171.8	159.9	99.00	23.59	0.814
5:26	19.116	7.074	0.044	0.153	0.282	44.00	1.744	26.51	0.038	0.042	170.0	158.3	99.00	23.71	0.819
5:56	19.464	7.245	0.044	0.154	0.256	43.72	1.752	26.28	0.039	0.043	170.5	158.6	99.00	23.65	0.816
6:26	19.374	6.975	0.043	0.148	0.277	43.84	1.712	26.56	0.037	0.040	170.5	158.7	99.00	23.63	0.816
6:56	19.137	6.820	0.043	0.147	0.258	43.92	1.633	26.97	0.037	0.040	170.2	158.6	99.00	23.68	0.817
7:25	18.993	6.914	0.041	0.135	0.265	44.13	1.565	26.88	0.035	0.037	168.4	157.0	99.00	23.74	0.819
7:55	18.888	6.916	0.042	0.139	0.365	44.43	1.566	26.58	0.036	0.039	167.3	155.9	99.00	23.77	0.821
8:25	19.017	6.831	0.042	0.141	0.289	43.94	1.600	27.06	0.038	0.039	169.7	158.2	99.00	23.72	0.819
8:55	19.160	6.862	0.043	0.140	0.260	43.92	1.570	26.97	0.038	0.038	169.5	158.0	99.00	23.69	0.818
9:25	18.705	6.674	0.043	0.133	0.264	45.32	1.502	26.29	0.031	0.036	164.8	153.6	99.00	23.78	0.821
9:55	19.159	6.755	0.046	0.140	0.255	44.00	1.558	27.01	0.039	0.038	169.6	158.1	99.00	23.67	0.817
10:25	19.306	6.656	0.046	0.134	0.229	43.97	1.515	27.07	0.037	0.035	169.6	158.1	99.00	23.62	0.815
10:55	18.914	6.734	0.047	0.133	0.207	44.16	1.480	27.25	0.038	0.035	168.6	157.3	99.00	23.74	0.819
11:25	18.664	6.557	0.046	0.119	0.212	44.53	1.345	27.46	0.036	0.031	166.7	155.7	99.00	23.79	0.821
11:55	18.780	6.636	0.051	0.127	0.208	44.47	1.400	27.26	0.039	0.033	167.3	156.1	99.00	23.77	0.820
12:25	18.452	6.655	0.049	0.124	0.266	44.80	1.353	27.23	0.038	0.033	165.5	154.6	99.00	23.86	0.824
12:56	22.081	7.848	0.066	0.166	0.173	41.22	1.703	25.65	0.048	0.042	177.3	164.1	99.00	23.07	0.796
19:30	19.028	6.293	0.068	0.139	0.212	44.37	1.586	27.22	0.044	0.036	170.5	159.0	99.00	23.63	0.816
19:59	19.242	6.362	0.076	0.131	0.196	44.41	1.569	26.94	0.043	0.034	170.0	158.5	99.00	23.58	0.814
20:29	19.175	6.409	0.069	0.138	0.241	44.46	1.606	26.82	0.043	0.036	169.9	158.3	99.00	23.61	0.815
20:58	19.373	6.468	0.063	0.130	0.192	44.26	1.529	26.91	0.040	0.034	169.7	158.1	99.00	23.57	0.814
21:28	19.468	6.550	0.070	0.149	0.190	44.10	1.727	26.66	0.043	0.038	171.8	159.9	99.00	23.54	0.812
21:57	19.339	6.358	0.063	0.131	0.184	44.32	1.563	26.97	0.039	0.033	170.0	158.5	99.00	23.56	0.813
22:27	19.233	6.423	0.059	0.131	0.235	44.52	1.497	26.83	0.038	0.033	168.5	157.1	99.00	23.60	0.815
22:57	19.289	6.107	0.059	0.129	0.180	44.38	1.505	27.28	0.038	0.033	170.2	158.7	99.00	23.54	0.812
23:26	19.095	6.319	0.062	0.138	0.217	44.32	1.577	27.19	0.041	0.035	170.4	158.8	99.00	23.61	0.815
23:56	19.368	6.341	0.066	0.139	0.226	44.25	1.605	26.93	0.041	0.035	170.8	159.1	99.00	23.54	0.813
4/23/1983															
0:25	18.981	6.538	0.068	0.138	0.256	44.57	1.599	26.78	0.042	0.034	169.0	157.5	99.00	23.68	0.817
0:55	18.775	6.494	0.069	0.124	0.248	45.00	1.483	26.74	0.039	0.031	166.6	155.4	99.00	23.74	0.819
1:24	18.561	6.511	0.081	0.126	0.414	45.66	1.518	26.05	0.040	0.033	164.4	153.2	99.00	23.80	0.821
1:54	18.947	6.573	0.077	0.144	0.252	44.91	1.584	26.44	0.043	0.037	167.9	156.5	99.00	23.70	0.818
2:23	16.932	6.324	0.071	0.132	1.099	47.36	1.486	25.52	0.040	0.034	157.0	146.7	99.00	24.22	0.836
2:53	19.238	6.504	0.081	0.147	0.236	44.28	1.707	26.73	0.040	0.037	171.1	159.4	99.00	23.59	0.814
3:22	19.009	6.171	0.078	0.143	0.238	44.48	1.658	27.14	0.043	0.037	171.2	159.6	99.00	23.61	0.815
3:52	19.138	6.193	0.085	0.138	0.237	44.30	1.605	27.22	0.042	0.035	171.2	159.7	99.00	23.58	0.814
4:21	19.308	6.059	0.074	0.144	0.274	44.18	1.659	27.23	0.038	0.037	172.3	160.5	99.00	23.51	0.812
4:51	17.433	6.627	0.145	0.126	0.284	47.70	1.596	25.00	0.050	0.032	159.4	148.6	99.00	24.10	0.832
5:20	19.734	6.137	0.072	0.160	0.260	43.41	1.768	27.37	0.045	0.041	175.7	163.6	99.00	23.40	0.808
5:50	20.131	6.180	0.060	0.156	0.246	43.04	1.782	27.32	0.042	0.040	176.6	164.4	99.00	23.30	0.804
6:20	19.655	6.370	0.060	0.147	0.275	43.63	1.730	27.06	0.040	0.038	173.5	161.5	99.00	23.46	0.810
6:49	19.395	6.514	0.064	0.146	0.258	43.96	1.656	26.93	0.040	0.037	171.5	159.7	99.00	23.56	0.813
7:19	19.371	5.854	0.054	0.149	0.243	43.78	1.701	27.77	0.038	0.039	174.4	162.7	99.00	23.46	0.810
7:49	19.935	5.826	0.056	0.157	0.253	43.30	1.784	27.61	0.040	0.040	176.8	164.7	99.00	23.30	0.804
8:19	19.613	5.815	0.055	0.153	0.268	43.50	1.732	27.79	0.040	0.039	175.7	163.8	99.00	23.38	0.807
8:51	19.536	5.844	0.055	0.143	0.242	43.69	1.700	27.72	0.038	0.036	174.7	162.8	99.00	23.41	0.808
9:20	19.105	6.195	0.067	0.141	0.242	44.38	1.653	27.14	0.039	0.037	171.1	159.5	99.00	23.58	0.814

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

4/23/1983															
11:10	19.126	6.273	0.057	0.153	0.245	43.90	1.737	27.42	0.042	0.041	173.2	161.4	99.00	23.58	0.814
11:40	19.846	6.094	0.051	0.154	0.246	43.23	1.799	27.50	0.040	0.040	176.2	164.1	99.00	23.36	0.806
12: 9	19.669	6.169	0.051	0.147	0.258	43.54	1.711	27.37	0.039	0.039	174.2	162.3	99.00	23.43	0.809
12:39	19.944	6.125	0.052	0.155	0.254	43.19	1.825	27.38	0.040	0.041	176.5	164.3	99.00	23.34	0.806
13: 9	19.422	6.215	0.043	0.127	0.257	43.76	1.543	27.57	0.032	0.034	171.5	159.9	99.00	23.52	0.812
13:39	19.074	6.478	0.046	0.137	0.265	44.24	1.585	27.10	0.036	0.037	169.7	158.3	99.00	23.65	0.816
14: 9	19.380	6.571	0.050	0.144	0.309	44.19	1.646	26.64	0.038	0.039	170.1	158.4	99.00	23.58	0.814
14:39	20.372	5.488	0.049	0.146	0.266	42.11	1.839	28.66	0.038	0.039	181.8	169.4	99.00	23.12	0.798
15: 8	19.925	6.393	0.027	0.143	0.255	43.19	2.064	26.91	0.040	0.048	176.9	164.5	99.00	23.36	0.806
15:38	19.619	6.724	0.048	0.173	0.261	43.59	2.064	26.43	0.040	0.046	175.2	162.9	99.00	23.49	0.811
16: 8	19.121	6.402	0.042	0.154	0.666	44.78	1.900	25.86	0.035	0.041	169.4	157.6	99.00	23.60	0.815
16:38	19.511	6.606	0.042	0.155	0.266	43.75	1.919	26.67	0.036	0.042	173.5	161.4	99.00	23.51	0.812
17: 8	19.509	6.245	0.042	0.155	0.374	43.65	1.920	27.02	0.036	0.042	174.7	162.6	99.00	23.46	0.810
17:38	19.732	6.333	0.042	0.156	0.259	43.49	1.924	26.98	0.036	0.042	175.3	163.1	99.00	23.41	0.808
18: 8	18.903	6.193	0.041	0.149	0.933	45.11	1.832	25.76	0.034	0.041	167.5	155.9	99.00	23.64	0.816
18:38	19.491	6.444	0.042	0.156	0.302	43.50	1.923	27.06	0.036	0.042	174.8	162.7	99.00	23.49	0.811
19: 8	19.649	6.477	0.040	0.147	0.325	43.85	1.824	26.62	0.034	0.041	172.5	160.5	99.00	23.47	0.810
19:37	19.509	6.569	0.039	0.143	0.245	43.55	1.807	27.07	0.033	0.039	173.2	161.3	99.00	23.52	0.812
20: 8	19.650	6.749	0.040	0.153	0.249	43.65	1.825	26.60	0.037	0.042	172.7	160.7	99.00	23.51	0.812
20:38	19.420	6.974	0.041	0.157	0.251	44.01	1.851	26.22	0.037	0.044	171.2	159.2	99.00	23.60	0.815
21: 8	19.512	6.720	0.041	0.156	0.259	43.79	1.839	26.60	0.037	0.043	172.5	160.5	99.00	23.54	0.813
21:38	19.625	6.725	0.041	0.157	0.249	43.69	1.869	26.56	0.037	0.043	173.1	161.0	99.00	23.51	0.811
22: 8	19.630	6.567	0.040	0.154	0.270	43.86	1.848	26.55	0.036	0.042	172.8	160.7	99.00	23.49	0.811
22:38	19.485	6.528	0.040	0.152	0.370	44.18	1.824	26.34	0.036	0.042	171.3	159.4	99.00	23.52	0.812
23: 8	19.311	6.714	0.039	0.149	0.288	44.14	1.817	26.46	0.035	0.041	171.0	159.1	99.00	23.60	0.814
23:38	19.173	6.724	0.037	0.141	0.287	44.51	1.729	26.32	0.034	0.039	168.9	157.3	99.00	23.64	0.816
4/24/1983															
0: 8	19.164	6.715	0.037	0.137	0.354	44.79	1.678	26.06	0.033	0.038	167.4	155.8	99.00	23.65	0.816
0:38	19.301	6.725	0.037	0.137	0.269	44.51	1.684	26.27	0.033	0.038	168.6	156.9	99.00	23.61	0.815
1: 8	19.093	6.734	0.035	0.131	0.321	44.80	1.607	26.21	0.032	0.036	166.7	155.2	99.00	23.68	0.817
1:38	19.144	6.580	0.034	0.123	0.263	44.63	1.525	26.64	0.030	0.034	167.2	155.8	99.00	23.65	0.816
2: 8	18.906	6.564	0.036	0.129	0.325	44.84	1.549	26.59	0.032	0.036	166.7	155.4	99.00	23.71	0.818
2:38	19.071	6.590	0.035	0.127	0.266	44.65	1.545	26.65	0.031	0.035	167.3	155.9	99.00	23.67	0.817
3: 8	18.986	6.708	0.035	0.128	0.286	44.81	1.553	26.42	0.031	0.035	166.4	155.1	99.00	23.71	0.818
3:38	18.877	6.718	0.035	0.125	0.270	44.97	1.512	26.43	0.031	0.034	165.6	154.3	99.00	23.74	0.820
4: 8	18.869	6.657	0.036	0.129	0.277	44.84	1.539	26.59	0.032	0.035	166.5	155.2	99.00	23.73	0.819
4:38	18.589	6.649	0.035	0.123	0.304	45.11	1.479	26.64	0.031	0.034	165.0	153.9	99.00	23.81	0.822
5: 8	18.566	6.647	0.035	0.126	0.332	45.25	1.500	26.48	0.031	0.035	164.7	153.6	99.00	23.82	0.822
5:38	18.525	6.595	0.035	0.125	0.294	45.32	1.483	26.56	0.031	0.034	164.6	153.5	99.00	23.82	0.822
6: 8	18.724	6.610	0.036	0.126	0.282	45.12	1.500	26.54	0.032	0.034	165.4	154.2	99.00	23.77	0.820
6:38	18.416	6.763	0.036	0.123	0.276	45.36	1.458	26.50	0.032	0.034	163.8	152.8	99.00	23.88	0.824
7: 8	18.566	6.684	0.036	0.123	0.272	45.24	1.462	26.55	0.031	0.034	164.5	153.4	99.00	23.82	0.822
7:38	18.777	6.558	0.036	0.120	0.253	44.97	1.437	26.78	0.031	0.033	165.6	154.4	99.00	23.75	0.820
8: 8	18.298	6.072	0.036	0.123	0.421	45.93	1.455	26.60	0.033	0.034	163.7	152.8	99.00	23.80	0.822
8:38	18.724	6.817	0.038	0.126	0.234	44.99	1.451	26.55	0.034	0.034	165.0	153.9	99.00	23.81	0.822
10:39	18.906	4.638	0.045	0.127	0.281	45.85	1.511	27.57	0.033	0.033	169.6	158.3	99.00	23.40	0.808
11: 9	18.567	7.527	0.046	0.132	0.253	44.06	1.589	26.75	0.033	0.034	166.8	155.6	99.00	23.94	0.827
11:39	18.566	6.689	0.045	0.137	0.254	44.38	1.645	27.22	0.034	0.036	168.9	157.7	99.00	23.80	0.822

GAS CHROMATOGRAPH DATA

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

4/24/1983															
12: 9	18.515	6.904	0.046	0.139	0.533	44.78	1.645	26.37	0.034	0.036	166.2	154.9	99.00	23.86	0.824
12:39	18.686	6.835	0.044	0.135	0.280	44.12	1.636	27.20	0.033	0.034	169.1	157.8	99.00	23.80	0.821
13: 9	18.946	6.551	0.047	0.144	0.271	43.73	1.738	27.50	0.035	0.037	172.3	160.7	99.00	23.67	0.817
13:38	18.910	6.486	0.047	0.143	0.261	43.85	1.717	27.51	0.035	0.038	171.9	160.4	99.00	23.67	0.817
14: 8	18.579	6.897	0.044	0.134	0.414	44.26	1.645	26.95	0.033	0.035	168.1	156.8	99.00	23.84	0.823
14:37	19.036	6.531	0.045	0.137	0.262	44.02	1.641	27.26	0.034	0.036	170.6	159.1	99.00	23.66	0.817
15: 7	18.979	7.138	0.047	0.139	0.264	43.53	1.653	27.18	0.035	0.037	170.4	158.9	99.00	23.77	0.820
15:36	19.174	6.836	0.046	0.142	0.255	43.47	1.690	27.32	0.035	0.038	171.9	160.2	99.00	23.66	0.817
16: 6	18.570	6.052	0.044	0.134	0.739	45.26	1.615	26.52	0.033	0.036	166.3	155.1	99.00	23.72	0.819
16:35	19.105	6.867	0.046	0.141	0.262	43.54	1.675	27.29	0.034	0.038	171.4	159.8	99.00	23.69	0.818
17: 5	19.088	6.980	0.047	0.149	0.238	43.23	1.741	27.45	0.036	0.040	172.8	161.1	99.00	23.70	0.818
17:35	19.361	6.391	0.047	0.151	0.232	43.25	1.787	27.71	0.037	0.041	175.0	163.1	99.00	23.53	0.812
18: 4	19.163	6.025	0.046	0.148	0.441	43.94	1.757	27.40	0.036	0.040	173.0	161.3	99.00	23.54	0.812
18:34	19.436	6.121	0.046	0.148	0.266	43.41	1.756	27.75	0.036	0.040	174.9	163.1	99.00	23.47	0.810
19: 3	19.365	6.640	0.045	0.146	0.223	43.13	1.748	27.62	0.035	0.039	174.2	162.4	99.00	23.58	0.814
19:33	19.350	6.536	0.045	0.145	0.219	43.28	1.726	27.62	0.035	0.039	173.9	162.1	99.00	23.56	0.813
20: 2	19.232	6.300	0.045	0.146	0.229	43.70	1.731	27.54	0.035	0.039	173.3	161.6	99.00	23.56	0.813
20:32	18.467	4.282	0.045	0.150	0.285	44.85	1.741	29.10	0.036	0.040	176.0	164.7	99.00	23.44	0.809
21: 1	18.404	4.208	0.046	0.147	0.225	44.56	1.732	29.60	0.035	0.039	177.2	165.9	99.00	23.44	0.809
21:31	18.201	3.895	0.044	0.143	0.231	44.78	1.667	29.97	0.034	0.038	177.0	165.8	99.00	23.45	0.809
22: 1	18.095	4.005	0.046	0.147	0.268	44.98	1.668	29.72	0.035	0.040	176.0	164.9	99.00	23.50	0.811
22:31	18.169	4.372	0.045	0.145	0.235	44.70	1.669	29.59	0.034	0.039	175.7	164.6	99.00	23.53	0.812
23: 1	17.008	3.498	0.045	0.145	0.236	46.79	1.642	29.56	0.035	0.039	171.6	161.1	99.00	23.70	0.818
23:31	18.083	3.827	0.045	0.146	0.231	45.00	1.677	29.92	0.035	0.039	176.7	165.6	99.00	23.47	0.810
4/25/1983															
0: 0	17.548	3.791	0.045	0.146	0.643	46.24	1.650	28.86	0.035	0.039	171.3	160.5	99.00	23.62	0.815
0:30	17.931	4.587	0.046	0.151	0.233	44.81	1.712	29.45	0.036	0.041	175.2	164.1	99.00	23.63	0.816
1: 0	18.127	4.212	0.045	0.148	0.237	44.86	1.693	29.60	0.035	0.040	176.0	164.9	99.00	23.52	0.812
1:30	18.306	4.404	0.045	0.148	0.238	44.79	1.703	29.29	0.035	0.040	175.7	164.4	99.00	23.50	0.811
2: 0	18.085	4.456	0.045	0.147	0.238	44.97	1.693	29.29	0.035	0.039	174.8	163.7	99.00	23.57	0.813
2:29	18.090	4.234	0.044	0.147	0.287	45.22	1.694	29.21	0.035	0.040	174.6	163.5	99.00	23.53	0.812
2:59	18.300	4.445	0.044	0.143	0.244	44.97	1.682	29.10	0.033	0.038	174.6	163.4	99.00	23.51	0.812
3:29	18.092	4.295	0.044	0.143	0.243	45.28	1.673	29.15	0.034	0.038	174.1	163.0	99.00	23.54	0.813
3:59	17.907	4.659	0.043	0.138	0.315	45.25	1.608	29.01	0.033	0.037	172.2	161.3	99.00	23.66	0.817
4:29	17.898	4.684	0.042	0.132	0.257	45.08	1.565	29.28	0.032	0.035	172.4	161.5	99.00	23.67	0.817
4:58	17.976	4.283	0.041	0.128	0.292	45.55	1.511	29.16	0.030	0.034	171.5	160.7	99.00	23.59	0.814
5:28	18.229	5.129	0.041	0.130	0.248	44.74	1.541	28.87	0.031	0.035	171.9	160.9	99.00	23.65	0.816
5:58	18.162	5.757	0.039	0.122	0.257	44.83	1.453	28.32	0.030	0.032	168.7	157.8	99.00	23.78	0.821
8:31	18.017	6.560	0.044	0.138	0.288	44.62	1.598	27.67	0.034	0.036	168.1	157.2	99.00	23.93	0.826
9: 0	18.271	6.334	0.044	0.136	0.249	44.51	1.584	27.80	0.034	0.037	169.2	158.2	99.00	23.83	0.823
9:30	18.458	5.574	0.043	0.132	0.213	44.64	1.573	28.30	0.033	0.034	171.2	160.0	99.00	23.66	0.817
9:59	18.277	5.927	0.046	0.136	0.243	44.72	1.566	28.01	0.035	0.036	169.8	158.7	99.00	23.77	0.820
10:28	18.392	5.544	0.043	0.130	0.270	44.88	1.520	28.15	0.032	0.034	169.9	158.8	99.00	23.68	0.817
10:58	18.358	5.846	0.045	0.132	0.257	44.69	1.512	28.09	0.034	0.035	169.6	158.6	99.00	23.74	0.819
11:27	18.446	5.200	0.045	0.129	0.261	44.97	1.493	28.39	0.033	0.033	170.5	159.5	99.00	23.61	0.815
11:57	18.223	5.222	0.044	0.121	0.256	45.25	1.406	28.41	0.032	0.031	168.8	158.0	99.00	23.69	0.818
15:29	18.357	5.329	0.045	0.113	0.213	45.25	1.333	28.30	0.033	0.029	168.0	157.2	99.00	23.67	0.817
15:59	18.465	5.517	0.053	0.136	0.204	45.17	1.537	27.84	0.038	0.034	169.7	158.6	99.00	23.65	0.816

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

4/25/1983															
16:29	18.754	5.368	0.053	0.141	0.257	44.94	1.623	27.79	0.039	0.035	171.5	160.1	99.00	23.55	0.813
16:58	18.669	5.199	0.052	0.136	0.246	44.88	1.573	28.17	0.038	0.035	171.8	160.5	99.00	23.55	0.813
17:28	18.581	5.205	0.053	0.141	0.257	44.90	1.614	28.17	0.039	0.036	172.1	160.8	99.00	23.57	0.813
17:57	18.961	5.150	0.054	0.143	0.260	44.57	1.643	28.15	0.039	0.036	173.6	162.1	99.00	23.46	0.810
18:27	18.212	5.270	0.050	0.130	0.308	45.47	1.485	28.01	0.037	0.034	168.7	157.8	99.00	23.69	0.818
18:56	18.367	5.356	0.052	0.130	0.240	45.21	1.487	28.09	0.037	0.034	169.5	158.5	99.00	23.66	0.817
19:26	18.520	5.265	0.054	0.130	0.235	45.30	1.463	27.96	0.037	0.033	169.4	158.3	99.00	23.61	0.815
19:55	18.579	5.367	0.061	0.128	0.229	45.56	1.465	27.54	0.039	0.032	168.3	157.2	99.00	23.61	0.815
20:26	18.246	5.625	0.066	0.143	0.312	45.66	1.577	27.29	0.042	0.037	168.1	157.0	99.00	23.73	0.819
20:56	18.771	5.376	0.066	0.141	0.230	44.85	1.613	27.88	0.043	0.035	172.0	160.6	99.00	23.54	0.813
21:25	18.039	5.649	0.091	0.158	0.251	45.84	1.748	27.14	0.049	0.042	169.7	158.4	99.00	23.77	0.820
21:55	19.057	5.519	0.083	0.162	0.258	44.64	1.816	27.37	0.048	0.041	174.3	162.5	99.00	23.47	0.810
22:25	19.042	5.274	0.088	0.154	0.232	44.52	1.753	27.85	0.047	0.040	175.0	163.3	99.00	23.44	0.809
22:55	18.934	5.318	0.095	0.161	0.232	44.75	1.846	27.57	0.047	0.042	175.0	163.2	99.00	23.47	0.810
23:24	19.073	4.890	0.066	0.163	0.224	44.16	1.815	28.52	0.046	0.043	177.8	166.0	99.00	23.37	0.807
23:54	19.389	5.066	0.058	0.156	0.234	43.82	1.767	28.42	0.042	0.040	177.6	165.7	99.00	23.32	0.805
4/26/1983															
0:24	19.251	5.080	0.059	0.160	0.239	43.89	1.793	28.44	0.043	0.043	177.6	165.8	99.00	23.35	0.806
0:54	19.462	5.072	0.057	0.146	0.221	43.83	1.690	28.44	0.039	0.038	176.8	165.0	99.00	23.31	0.805
1:24	19.370	5.415	0.052	0.144	0.224	43.87	1.633	28.21	0.039	0.038	175.0	163.4	99.00	23.39	0.807
1:53	19.358	5.353	0.049	0.143	0.231	43.87	1.639	28.28	0.037	0.037	175.2	163.5	99.00	23.38	0.807
2:23	19.319	5.217	0.048	0.133	0.245	43.91	1.567	28.49	0.036	0.035	174.7	163.1	99.00	23.38	0.807
2:53	19.396	5.421	0.047	0.133	0.224	44.03	1.557	28.13	0.035	0.035	173.6	162.0	99.00	23.39	0.808
3:23	19.173	5.406	0.046	0.131	0.232	44.34	1.524	28.08	0.033	0.035	172.3	160.9	99.00	23.45	0.810
3:53	19.196	5.490	0.049	0.131	0.214	44.15	1.535	28.17	0.036	0.034	172.9	161.4	99.00	23.46	0.810
4:23	19.072	5.648	0.050	0.139	0.239	44.42	1.580	27.78	0.037	0.037	172.0	160.5	99.00	23.51	0.812
4:52	19.238	5.677	0.048	0.140	0.285	44.55	1.608	27.38	0.036	0.037	171.5	159.9	99.00	23.47	0.810
5:22	19.270	5.442	0.048	0.138	0.209	44.19	1.584	28.05	0.030	0.037	173.3	161.7	99.00	23.43	0.809
5:52	19.166	5.320	0.047	0.136	0.242	44.32	1.575	28.13	0.034	0.036	173.1	161.6	99.00	23.44	0.809
6:22	19.140	5.498	0.046	0.131	0.214	44.36	1.517	28.02	0.035	0.035	172.0	160.6	99.00	23.48	0.810
6:51	19.953	6.176	0.045	0.126	0.239	43.65	1.499	27.25	0.034	0.033	171.8	160.0	99.00	23.38	0.807
7:21	18.477	5.800	0.044	0.121	0.217	45.53	1.417	27.33	0.032	0.031	166.3	155.3	99.00	23.71	0.818
7:51	19.707	6.370	0.049	0.130	0.218	44.05	1.526	26.88	0.036	0.034	170.3	158.6	99.00	23.47	0.810
8:21	19.809	6.525	0.051	0.131	0.237	44.13	1.504	26.54	0.038	0.034	169.4	157.7	99.00	23.47	0.810
8:50	19.866	6.514	0.052	0.140	0.224	43.95	1.602	26.58	0.039	0.036	171.0	159.1	99.00	23.44	0.809
9:21	19.762	6.521	0.049	0.134	0.236	44.13	1.547	26.55	0.037	0.035	169.8	158.0	99.00	23.48	0.810
9:51	20.046	6.338	0.049	0.131	0.237	43.74	1.538	26.85	0.036	0.034	171.5	159.6	99.00	23.37	0.807
10:21	20.071	6.142	0.048	0.132	0.248	43.62	1.528	27.15	0.036	0.034	172.4	160.5	99.00	23.34	0.806
10:51	20.008	6.362	0.050	0.131	0.228	43.78	1.540	26.83	0.036	0.034	171.3	159.4	99.00	23.39	0.807
11:20	20.000	6.390	0.052	0.133	0.245	43.77	1.544	26.79	0.038	0.034	171.3	159.4	99.00	23.39	0.808
11:50	20.097	6.276	0.052	0.127	0.236	43.61	1.498	27.03	0.036	0.032	171.7	159.9	99.00	23.36	0.806
12:20	20.085	6.209	0.059	0.150	0.258	43.54	1.659	26.96	0.043	0.040	174.0	161.9	99.00	23.33	0.805
12:50	20.267	6.319	0.058	0.143	0.231	43.52	1.649	26.74	0.041	0.037	173.5	161.3	99.00	23.30	0.804
13:20	20.288	6.450	0.064	0.161	0.239	43.47	1.781	26.45	0.046	0.042	174.6	162.3	99.00	23.30	0.804
13:50	20.306	6.448	0.057	0.138	0.226	43.61	1.606	26.54	0.040	0.035	172.4	160.2	99.00	23.32	0.805
14:20	20.582	6.594	0.059	0.158	0.233	43.08	1.782	26.43	0.043	0.041	175.3	162.8	99.00	23.25	0.803
14:50	21.006	6.832	0.054	0.136	0.224	42.82	1.613	26.24	0.039	0.035	173.6	161.1	99.00	23.20	0.801
15:20	21.034	7.205	0.059	0.146	0.224	43.01	1.717	25.53	0.042	0.038	172.9	160.3	99.00	23.2	0.802

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

4/26/1983															
15:50	20.970	7.398	0.050	0.125	0.234	43.48	1.473	25.20	0.034	0.031	168.3	156.0	99.00	23.31	0.805
16:20	20.939	7.266	0.049	0.128	0.246	43.16	1.554	25.59	0.036	0.033	170.4	158.0	99.00	23.29	0.804
16:50	20.816	7.369	0.053	0.125	0.221	43.35	1.519	25.48	0.037	0.031	169.2	157.0	99.00	23.34	0.806
17:20	20.793	7.455	0.059	0.135	0.224	43.31	1.590	25.36	0.040	0.034	170.0	157.6	99.00	23.35	0.806
17:50	20.962	7.239	0.056	0.124	0.217	43.30	1.512	25.52	0.036	0.031	169.8	157.5	99.00	23.28	0.804
18:20	21.224	7.394	0.067	0.157	0.231	42.94	1.782	25.12	0.046	0.040	173.3	160.5	99.00	23.21	0.801
18:50	21.075	7.872	0.054	0.121	0.220	43.53	1.484	24.58	0.035	0.030	166.8	154.4	99.00	23.36	0.806
19:20	21.088	7.873	0.062	0.142	0.218	43.23	1.657	24.66	0.042	0.036	169.6	157.0	99.00	23.34	0.806
19:50	20.819	8.049	0.054	0.126	0.218	44.32	1.494	23.85	0.037	0.031	163.8	151.6	99.00	23.45	0.810
20:20	20.676	7.489	0.068	0.145	0.288	43.78	1.693	24.78	0.045	0.037	169.2	156.8	99.00	23.38	0.807
20:50	20.733	7.329	0.062	0.130	0.217	43.49	1.568	25.39	0.041	0.032	169.6	157.3	99.00	23.35	0.806
21:20	20.100	6.956	0.057	0.137	0.214	44.40	1.609	25.45	0.040	0.035	168.2	156.2	99.00	23.45	0.809
22: 5	20.433	7.123	0.064	0.138	0.210	43.55	1.624	25.78	0.043	0.034	170.7	158.4	99.00	23.39	0.807
22:34	20.421	6.812	0.064	0.131	0.229	43.66	1.593	26.02	0.041	0.032	170.9	158.7	99.00	23.35	0.806
23: 4	20.319	6.874	0.068	0.150	0.220	43.53	1.672	26.09	0.046	0.038	172.2	160.0	99.00	23.38	0.807
23:33	20.787	6.570	0.061	0.133	0.215	43.20	1.619	26.34	0.040	0.032	173.3	161.0	99.00	23.21	0.801
4/27/1983															
0: 2	20.319	6.582	0.069	0.143	0.333	43.60	1.638	26.24	0.045	0.036	172.2	160.0	99.00	23.34	0.806
0:32	20.832	6.947	0.055	0.125	0.208	43.26	1.520	25.99	0.036	0.030	170.9	158.7	99.00	23.27	0.803
1: 1	20.791	7.555	0.060	0.135	0.198	43.43	1.576	25.18	0.041	0.034	169.2	156.9	99.00	23.37	0.807
1:31	20.385	7.481	0.059	0.132	0.197	43.90	1.581	25.19	0.039	0.032	167.9	155.8	99.00	23.46	0.810
2: 0	20.560	7.242	0.067	0.133	0.198	43.57	1.544	25.61	0.043	0.033	169.7	157.5	99.00	23.38	0.807
2:30	20.436	7.485	0.065	0.132	0.212	44.03	1.561	25.01	0.041	0.032	167.4	155.2	99.00	23.45	0.810
2:59	20.141	6.741	0.078	0.141	0.216	43.71	1.554	26.33	0.048	0.035	171.2	159.2	99.00	23.41	0.808
3:29	20.675	7.044	0.069	0.141	0.214	43.47	1.652	25.66	0.044	0.035	171.5	159.1	99.00	23.31	0.805
3:58	20.282	7.256	0.088	0.148	0.210	43.80	1.644	25.48	0.052	0.037	170.3	158.0	99.00	23.45	0.809
4:28	20.756	7.027	0.065	0.136	0.224	43.42	1.596	25.70	0.042	0.034	171.1	158.8	99.00	23.29	0.804
4:58	20.504	7.282	0.065	0.134	0.218	43.52	1.507	25.70	0.043	0.034	169.4	157.3	99.00	23.41	0.808
5:27	20.877	7.421	0.062	0.138	0.222	43.36	1.637	25.21	0.041	0.034	170.3	157.9	99.00	23.32	0.805
5:57	20.609	7.645	0.079	0.134	0.226	43.74	1.577	24.91	0.047	0.032	168.2	155.9	99.00	23.43	0.809
6:26	20.771	7.195	0.070	0.143	0.222	43.45	1.652	25.42	0.044	0.036	171.1	158.7	99.00	23.31	0.805
6:56	20.654	7.349	0.067	0.135	0.223	43.63	1.565	25.30	0.044	0.033	169.2	157.0	99.00	23.38	0.807
7:25	20.703	7.550	0.075	0.144	0.225	43.68	1.700	24.84	0.045	0.036	169.7	157.2	99.00	23.38	0.807
7:55	20.684	7.225	0.068	0.125	0.222	43.57	1.474	25.56	0.042	0.030	169.0	156.8	99.00	23.36	0.806
8:24	20.888	7.098	0.063	0.140	0.221	43.21	1.678	25.63	0.041	0.034	172.2	159.7	99.00	23.26	0.803
8:54	20.696	8.010	0.069	0.129	0.217	43.80	1.496	24.51	0.044	0.031	166.0	153.8	99.00	23.48	0.810
9:23	20.594	6.246	0.074	0.216	0.182	42.73	2.391	26.45	0.056	0.058	183.5	170.3	99.00	23.12	0.798
9:53	20.123	6.320	0.064	0.207	0.170	43.48	2.419	26.11	0.049	0.056	180.7	167.7	99.00	23.25	0.803
10:23	19.661	6.028	0.057	0.198	0.238	44.01	2.349	26.36	0.046	0.054	178.9	166.2	99.00	23.33	0.805
10:53	20.257	5.855	0.062	0.206	0.169	43.24	2.431	26.67	0.050	0.054	183.0	169.9	99.00	23.14	0.799
11:23	20.355	5.524	0.077	0.210	0.172	42.78	2.477	27.29	0.057	0.055	186.2	173.0	99.00	23.06	0.796
11:53	20.678	5.052	0.076	0.193	0.170	42.28	2.416	28.04	0.050	0.049	188.4	175.2	99.00	22.90	0.791
12:23	20.664	5.122	0.058	0.169	0.220	42.67	2.218	27.79	0.042	0.043	184.6	171.6	99.00	22.94	0.792
12:52	20.054	4.926	0.048	0.157	0.200	43.15	2.011	28.38	0.031	0.041	181.7	169.2	99.00	23.09	0.797
13:22	19.692	4.841	0.046	0.154	0.213	43.42	1.961	28.60	0.036	0.039	180.7	168.5	99.00	23.18	0.800
13:52	19.857	5.054	0.044	0.148	0.219	43.40	1.915	28.29	0.035	0.038	179.6	167.4	99.00	23.17	0.800
14:22	19.431	5.178	0.038	0.129	0.261	44.07	1.716	28.11	0.031	0.033	175.0	163.2	99.00	23.33	0.805
14:51	19.313	5.239	0.021	0.135	0.221	44.15	1.740	28.12	0.028	0.034	174.6	162.9	99.00	23.36	0.806

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

4/27/1983															
15:21	19.241	5.233	0.039	0.128	0.236	44.16	1.637	28.26	0.032	0.033	174.1	162.5	99.00	23.39	0.808
15:51	19.199	5.140	0.038	0.122	0.228	44.25	1.575	28.38	0.031	0.032	173.5	162.0	99.00	23.40	0.808
16:21	18.679	5.346	0.036	0.117	0.284	44.94	1.467	28.07	0.030	0.031	169.5	158.4	99.00	23.58	0.814
16:51	18.894	5.326	0.043	0.135	0.226	44.53	1.614	28.16	0.034	0.035	172.6	161.2	99.00	23.50	0.811
17:50	18.482	5.418	0.038	0.118	0.222	44.98	1.463	28.21	0.031	0.031	169.4	158.4	99.00	23.64	0.816
20:15	17.772	5.215	0.037	0.114	0.282	45.69	1.391	28.44	0.030	0.030	167.0	156.4	99.00	23.80	0.822
20:45	18.208	5.315	0.040	0.127	0.218	45.17	1.504	28.35	0.033	0.034	169.7	158.8	99.00	23.69	0.818
21:15	18.368	5.081	0.041	0.130	0.222	44.85	1.546	28.70	0.034	0.035	171.8	160.8	99.00	23.61	0.815
21:45	17.772	4.802	0.038	0.121	0.857	46.59	1.465	27.29	0.031	0.032	164.2	153.6	99.00	23.75	0.820
22:15	18.526	4.974	0.039	0.125	0.243	44.74	1.515	28.78	0.032	0.033	172.1	161.0	99.00	23.55	0.813
22:45	18.670	4.894	0.042	0.136	0.220	44.41	1.603	28.96	0.035	0.036	174.4	163.1	99.00	23.49	0.811
23:16	18.491	4.835	0.040	0.127	0.227	44.55	1.538	29.13	0.033	0.033	173.4	162.3	99.00	23.54	0.812
23:45	18.625	4.730	0.039	0.126	0.231	44.39	1.527	29.26	0.033	0.033	174.1	163.0	99.00	23.49	0.811
4/28/1983															
0:15	18.579	4.819	0.022	0.133	0.245	44.48	1.578	29.08	0.034	0.035	173.8	162.7	99.00	23.51	0.811
0:45	18.717	4.863	0.045	0.141	0.234	44.27	1.630	29.03	0.036	0.037	175.2	163.9	99.00	23.47	0.810
1:16	18.546	4.715	0.045	0.141	0.231	44.40	1.640	29.21	0.036	0.037	175.4	164.1	99.00	23.49	0.811
1:46	18.556	4.820	0.042	0.135	0.250	44.46	1.601	29.07	0.035	0.036	174.4	163.1	99.00	23.51	0.812
2:16	18.516	4.889	0.042	0.132	0.300	44.66	1.563	28.82	0.035	0.035	173.0	161.8	99.00	23.54	0.813
2:46	18.690	4.811	0.044	0.134	0.230	44.40	1.594	29.03	0.036	0.035	174.6	163.3	99.00	23.48	0.810
3:16	18.384	4.939	0.043	0.124	0.239	44.76	1.505	28.94	0.033	0.032	172.1	161.1	99.00	23.59	0.814
3:46	18.522	4.990	0.051	0.134	0.231	44.67	1.602	28.72	0.036	0.035	173.3	162.1	99.00	23.55	0.813
4:16	18.016	5.111	0.025	0.121	0.311	45.41	1.488	28.45	0.034	0.032	168.8	158.0	99.00	23.71	0.819
4:46	18.412	5.162	0.052	0.127	0.227	44.84	1.536	28.58	0.030	0.034	171.5	160.4	99.00	23.61	0.815
5:16	17.932	4.869	0.051	0.127	0.355	45.56	1.548	28.49	0.034	0.033	169.9	159.0	99.00	23.69	0.818
5:46	18.988	5.624	0.055	0.146	0.291	44.24	1.705	27.88	0.038	0.037	173.5	161.9	99.00	23.52	0.812
6:16	18.626	6.033	0.049	0.121	0.271	45.04	1.490	27.30	0.034	0.032	167.5	156.4	99.00	23.70	0.818
6:46	18.908	6.149	0.049	0.127	0.229	44.66	1.545	27.27	0.035	0.033	169.0	157.7	99.00	23.64	0.816
7:16	19.278	6.649	0.051	0.117	0.223	44.52	1.483	26.61	0.033	0.031	167.3	155.8	99.00	23.63	0.816
7:45	19.219	6.880	0.053	0.121	0.234	44.61	1.518	26.30	0.034	0.031	166.6	155.1	99.00	23.68	0.817
8:15	19.136	6.861	0.051	0.119	0.255	44.73	1.499	26.29	0.033	0.031	166.0	154.6	99.00	23.70	0.818
8:45	19.231	6.775	0.054	0.116	0.221	44.70	1.468	26.37	0.034	0.029	166.2	154.8	99.00	23.66	0.817
9:15	18.861	6.602	0.054	0.110	0.224	45.04	1.396	26.65	0.034	0.028	165.0	153.9	99.00	23.74	0.819
9:45	19.073	6.217	0.059	0.116	0.228	44.62	1.448	27.18	0.036	0.030	168.2	156.9	99.00	23.62	0.815
10:15	19.400	6.878	0.060	0.120	0.250	44.47	1.507	26.25	0.037	0.030	167.0	155.5	99.00	23.63	0.816
10:45	19.910	6.685	0.057	0.131	0.243	43.73	1.620	26.55	0.037	0.033	171.0	159.1	99.00	23.46	0.810
11:15	20.084	6.437	0.056	0.140	0.235	43.39	1.687	26.89	0.038	0.035	173.6	161.5	99.00	23.36	0.806
11:45	19.893	6.378	0.054	0.130	0.235	43.57	1.605	27.07	0.037	0.032	172.4	160.5	99.00	23.41	0.808
13:39	20.185	6.213	0.051	0.133	0.279	43.12	1.626	27.32	0.036	0.033	174.4	162.3	99.00	23.31	0.805
14: 8	19.743	6.246	0.050	0.135	0.344	43.56	1.660	27.19	0.036	0.033	172.9	161.0	99.00	23.43	0.809
14:38	19.398	5.095	0.048	0.133	0.189	43.76	1.608	28.70	0.035	0.033	176.0	164.3	99.00	23.33	0.805
15: 7	19.394	4.327	0.049	0.142	0.173	43.34	1.661	29.84	0.037	0.037	180.4	168.7	99.00	23.21	0.801
15:37	19.291	4.292	0.048	0.138	0.173	43.46	1.619	29.91	0.036	0.034	179.8	168.1	99.00	23.23	0.802
16: 6	18.773	4.178	0.047	0.134	0.438	44.48	1.574	29.31	0.035	0.034	175.6	164.3	99.00	23.36	0.806
16:36	19.199	4.378	0.047	0.135	0.170	43.65	1.552	29.80	0.036	0.034	178.3	166.8	99.00	23.28	0.803
17: 5	19.026	4.319	0.047	0.132	0.164	43.77	1.512	29.97	0.035	0.033	177.8	166.5	99.00	23.32	0.805
17:35	18.991	4.354	0.048	0.135	0.159	43.70	1.548	29.99	0.036	0.034	178.3	166.9	99.00	23.33	0.805
18: 4	18.313	4.083	0.044	0.124	0.428	44.92	1.447	29.58	0.033	0.031	173.3	162.4	99.00	23.48	0.811

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

4/28/1983															
18:34	18.497	4.012	0.048	0.130	0.187	44.21	1.513	30.34	0.035	0.032	177.3	166.2	99.00	23.41	0.808
19: 3	18.869	4.390	0.051	0.131	0.167	43.95	1.539	29.83	0.036	0.032	177.2	165.9	99.00	23.37	0.807
19:33	18.627	4.473	0.050	0.131	0.164	44.23	1.528	29.73	0.035	0.032	175.9	164.8	99.00	23.44	0.809
20: 2	18.473	4.480	0.055	0.132	0.199	44.38	1.535	29.68	0.037	0.033	175.5	164.4	99.00	23.49	0.811
20:32	18.642	4.472	0.047	0.131	0.263	44.36	1.538	29.48	0.035	0.033	175.3	164.1	99.00	23.44	0.809
21: 2	18.324	4.873	0.053	0.128	0.220	44.97	1.495	28.87	0.036	0.032	171.9	160.9	99.00	23.59	0.814
21:31	18.582	4.536	0.055	0.133	0.220	44.41	1.510	29.49	0.037	0.033	175.0	163.9	99.00	23.47	0.810
22: 0	18.650	4.190	0.051	0.146	0.340	44.21	1.601	29.73	0.039	0.038	177.3	166.0	99.00	23.39	0.807
22:30	18.779	4.334	0.051	0.134	0.224	44.04	1.545	29.82	0.036	0.033	177.0	165.8	99.00	23.38	0.807
23: 0	18.757	4.483	0.052	0.138	0.227	44.14	1.550	29.58	0.037	0.035	176.4	165.1	99.00	23.41	0.808
23:29	18.620	4.705	0.050	0.129	0.221	44.47	1.482	29.26	0.035	0.032	173.9	162.8	99.00	23.49	0.811
23:59	18.536	4.459	0.052	0.129	0.222	44.41	1.485	29.64	0.036	0.032	174.9	163.8	99.00	23.47	0.810
4/29/1983															
0:28	18.415	4.261	0.050	0.137	0.271	44.52	1.527	29.74	0.037	0.035	175.5	164.4	99.00	23.47	0.810
0:58	18.452	4.713	0.050	0.125	0.236	44.67	1.446	29.24	0.035	0.031	172.8	161.8	99.00	23.54	0.813
1:28	18.392	4.468	0.052	0.128	0.257	44.62	1.465	29.55	0.035	0.032	173.9	162.9	99.00	23.51	0.812
1:58	18.360	4.677	0.051	0.125	0.262	44.84	1.433	29.19	0.034	0.031	172.2	161.3	99.00	23.56	0.813
2:28	18.346	4.574	0.049	0.134	0.308	44.81	1.505	29.20	0.036	0.034	173.2	162.2	99.00	23.54	0.813
2:58	18.401	4.353	0.054	0.136	0.264	44.62	1.522	29.58	0.037	0.034	174.9	163.8	99.00	23.49	0.811
3:28	18.179	4.425	0.053	0.132	0.270	44.88	1.461	29.53	0.036	0.033	173.3	162.4	99.00	23.56	0.813
3:57	18.259	4.405	0.054	0.129	0.262	44.90	1.467	29.45	0.036	0.032	173.3	162.3	99.00	23.54	0.813
4:27	18.053	4.592	0.056	0.134	0.343	45.27	1.490	28.99	0.037	0.034	171.6	160.7	99.00	23.62	0.815
4:57	18.178	4.846	0.057	0.139	0.311	45.06	1.521	28.81	0.038	0.036	171.9	160.9	99.00	23.63	0.816
5:27	17.832	4.400	0.054	0.139	0.272	45.38	1.527	29.32	0.037	0.036	172.4	161.6	99.00	23.64	0.816
5:56	17.298	3.857	0.051	0.136	0.290	45.88	1.505	29.92	0.035	0.035	172.2	161.7	99.00	23.70	0.818
6:26	17.716	3.528	0.054	0.154	0.264	45.19	1.668	30.35	0.039	0.040	177.1	166.2	99.00	23.52	0.812
6:56	17.626	3.562	0.057	0.156	0.266	45.26	1.674	30.32	0.041	0.040	177.0	166.1	99.00	23.55	0.813
7:26	17.017	3.267	0.049	0.128	0.335	46.07	1.460	30.61	0.034	0.031	172.7	162.4	99.00	23.68	0.818
7:55	17.164	3.362	0.053	0.132	0.239	45.71	1.472	30.80	0.036	0.033	174.2	163.8	99.00	23.66	0.817
8:25	16.824	3.279	0.053	0.139	0.562	46.51	1.490	30.06	0.038	0.035	171.1	160.8	99.00	23.74	0.820
8:55	17.169	3.329	0.056	0.146	0.242	45.58	1.594	30.81	0.040	0.037	176.0	165.4	99.00	23.64	0.816
9:25	17.176	3.361	0.053	0.144	0.246	45.60	1.571	30.77	0.038	0.036	175.5	164.9	99.00	23.64	0.816
9:55	17.703	3.378	0.058	0.171	0.239	44.97	1.777	30.61	0.046	0.046	179.7	168.6	99.00	23.49	0.811
10:25	17.820	3.445	0.055	0.170	0.280	45.00	1.784	30.36	0.044	0.045	179.2	168.1	99.00	23.47	0.810
10:55	17.890	3.459	0.053	0.158	0.210	44.87	1.689	30.58	0.041	0.041	178.8	167.8	99.00	23.46	0.810
11:25	17.339	3.362	0.050	0.145	0.211	45.70	1.581	30.54	0.039	0.037	175.4	164.7	99.00	23.60	0.815
11:54	17.448	3.319	0.051	0.144	0.217	45.32	1.570	30.86	0.038	0.037	176.6	165.9	99.00	23.56	0.813
12:24	17.274	3.289	0.051	0.144	0.365	45.64	1.548	30.61	0.039	0.037	175.1	164.5	99.00	23.61	0.815
13:26	17.610	3.158	0.053	0.155	0.257	44.84	1.653	31.19	0.040	0.041	179.4	168.6	99.00	23.49	0.811
13:56	17.969	2.999	0.053	0.156	0.218	44.44	1.669	31.42	0.041	0.042	181.5	170.5	99.00	23.37	0.807
14:25	17.867	3.033	0.052	0.151	0.263	44.49	1.617	31.44	0.041	0.039	180.6	169.6	99.00	23.41	0.808
14:55	18.001	3.129	0.050	0.144	0.225	44.43	1.584	31.36	0.038	0.037	180.1	169.2	99.00	23.39	0.807
15:24	17.996	3.116	0.051	0.146	0.223	44.43	1.603	31.36	0.039	0.037	180.4	169.4	99.00	23.39	0.807
15:54	17.775	3.184	0.050	0.143	0.222	44.69	1.576	31.28	0.038	0.037	179.0	168.2	99.00	23.46	0.810
16:23	17.587	3.411	0.049	0.142	0.264	45.11	1.555	30.81	0.037	0.036	176.6	165.9	99.00	23.55	0.813
16:53	17.836	3.362	0.048	0.139	0.218	44.80	1.558	30.97	0.036	0.035	177.9	167.1	99.00	23.47	0.810
17:23	17.495	3.550	0.048	0.136	0.226	45.19	1.523	30.76	0.036	0.035	175.7	165.0	99.00	23.59	0.814
17:52	17.694	3.537	0.048	0.138	0.227	45.04	1.529	30.72	0.036	0.036	176.3	165.6	99.00	23.54	0.813

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

4/29/1983															
18:22	17.234	3.454	0.047	0.137	0.347	45.62	1.504	30.59	0.036	0.035	174.1	163.6	99.00	23.65	0.816
18:51	17.620	3.281	0.047	0.137	0.222	45.12	1.536	30.97	0.036	0.035	176.9	166.2	99.00	23.52	0.812
19:21	17.442	3.361	0.048	0.138	0.229	45.20	1.548	30.96	0.036	0.035	176.5	165.8	99.00	23.57	0.814
19:50	17.727	3.435	0.050	0.148	0.227	44.93	1.628	30.78	0.038	0.038	177.9	167.0	99.00	23.50	0.811
20:20	17.541	3.446	0.050	0.145	0.241	45.13	1.601	30.77	0.038	0.037	176.9	166.2	99.00	23.56	0.813
21:38	15.973	3.463	0.052	0.151	0.230	45.43	1.637	31.98	0.041	0.040	176.4	166.4	99.00	23.96	0.827
22: 8	17.647	3.338	0.048	0.139	0.270	45.07	1.563	30.85	0.037	0.035	176.9	166.2	99.00	23.52	0.812
22:38	17.634	3.428	0.048	0.139	0.252	45.08	1.551	30.79	0.037	0.035	176.6	165.9	99.00	23.54	0.812
23: 7	17.714	3.397	0.047	0.137	0.226	44.88	1.532	31.00	0.036	0.034	177.2	166.5	99.00	23.51	0.812
23:37	17.687	3.503	0.050	0.146	0.229	45.02	1.629	30.66	0.038	0.037	177.4	166.5	99.00	23.52	0.812
23:57	17.719	3.305	0.051	0.147	0.218	44.95	1.595	30.94	0.040	0.037	178.1	167.2	99.00	23.49	0.811
4/30/1983															
0: 7	17.441	3.239	0.045	0.128	0.497	45.72	1.450	30.41	0.034	0.032	173.3	162.8	99.00	23.58	0.814
0:37	17.717	3.179	0.047	0.133	0.256	44.87	1.524	31.20	0.036	0.033	177.7	167.0	99.00	23.48	0.810
1: 6	17.607	3.396	0.046	0.127	0.220	45.20	1.461	30.88	0.034	0.032	175.5	164.9	99.00	23.55	0.813
1:36	17.445	3.555	0.045	0.123	0.180	45.36	1.395	30.83	0.034	0.031	174.0	163.6	99.00	23.62	0.815
2: 6	17.202	3.512	0.043	0.116	0.268	45.82	1.341	30.64	0.033	0.029	171.9	161.6	99.00	23.69	0.818
2:35	17.628	3.434	0.044	0.118	0.172	45.21	1.361	30.97	0.033	0.029	174.5	164.0	99.00	23.56	0.813
3: 6	17.291	3.203	0.045	0.120	0.185	45.41	1.369	31.31	0.033	0.030	174.7	164.4	99.00	23.61	0.815
3:35	17.583	3.537	0.047	0.128	0.177	45.19	1.456	30.82	0.035	0.032	175.2	164.6	99.00	23.57	0.814
4: 5	17.222	3.520	0.046	0.123	0.476	46.24	1.396	29.92	0.034	0.030	170.4	160.0	99.00	23.68	0.818
4:35	17.418	3.592	0.047	0.124	0.175	45.54	1.405	30.63	0.035	0.030	173.4	163.0	99.00	23.63	0.816
5: 5	17.489	3.537	0.048	0.128	0.208	45.50	1.438	30.59	0.036	0.032	174.0	163.5	99.00	23.60	0.815
5:34	17.509	3.616	0.049	0.129	0.200	45.57	1.449	30.41	0.036	0.032	173.7	163.1	99.00	23.61	0.815
6: 4	17.268	3.501	0.049	0.128	0.214	45.57	1.417	30.79	0.036	0.031	173.7	163.3	99.00	23.66	0.817

APPENDIX I

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 (Section 7.2).

AVERAGE FROM PERIOD: 4/12/83 8:30 TO 4/12/83 20:00

SIGNAL	AVERAGE	UNITS	STD.DEV.
T-701	5.320	DEG C	1.367
T-702	17.285	DEG C	1.147
T-703	--OFF--	DEG C	
T-710	6.658	DEG C	0.162
T-711	75.583	DEG C	0.444
T-712	6.764	DEG C	0.177
T-713	12.379	DEG C	0.463
T-705	248.924	DEG C	28.223
T-706	222.514	DEG C	8.661
T-707	203.955	DEG C	7.018
T-812	523.792	DEG C	18.501
T-813	--OFF--	DEG C	
T-814	466.820	DEG C	14.014
T-815	2063.433	DEG C	3956.051
T-816	475.687	DEG C	13.903
T-817	365.101	DEG C	13.641
T-818	301.202	DEG C	11.215
T-819	414.274	DEG C	11.633
T-820	384.259	DEG C	5.849
T-823	58.816	DEG C	2.676
T-822	58.141	DEG C	2.582
T-806	170.182	DEG C	5.059
T-811	534.794	DEG C	23.602
F-701	--OFF--	SCFM	
TT2-703	62.635	DEG C	0.204
P-703	7.083	IN WC	0.953
P-704	4.583	IN WC	0.858
P-705	2.500	IN WC	0.242
P-706	2.527	IN WC	0.239
F-707	1420.145	SCFM	3317.639
WT-720	8.758	TONS	1.189
P-707	3.519	IN WC	9.356
P-810	-0.468	IN WC	0.013
F-802	--OFF--	CFM	
F-803	--OFF--	CFM	
TT1-703	62.500	DEG C	0.197
CO	29.526	%	0.447
CO2	5.973	%	0.259
O2	-0.244	%	0.262
SIGMA	--OFF--	BTU/SCF	
T-715	147.020	DEG C	2.525
T-821	384.125	DEG C	7.056
T-703A	19.462	DEG C	3.103
PH	0.010	PH	0.002
AG VEL	0.013	SPH	0.088
GR VEL	0.000	RPD/T	0.000
P-702	16.353	IN WC	21.125

AVERAGE BASE TEMPERATURE 17.902

AVERAGE FROM PERIOD: 4/12/83 20:00 TO 4/13/83 8:00

SIGNAL	AVERAGE	UNITS	STD.DEV.
T-701	4.423	DEG C	1.037
T-702	16.747	DEG C	0.997
T-703	--OFF--	DEG C	
T-710	6.579	DEG C	0.127
T-711	72.119	DEG C	1.737
T-712	6.632	DEG C	0.124
T-713	11.956	DEG C	0.555
T-705	227.705	DEG C	29.774
T-706	221.375	DEG C	17.532
T-707	204.886	DEG C	13.533
T-812	517.922	DEG C	20.907
T-813	--OFF--	DEG C	
T-814	472.140	DEG C	21.678
T-815	--OFF--	DEG C	
T-816	478.894	DEG C	16.990
T-817	369.220	DEG C	17.197
T-818	308.916	DEG C	16.892
T-819	418.505	DEG C	16.226
T-820	391.634	DEG C	12.283
T-823	59.695	DEG C	0.821
T-822	58.482	DEG C	0.836
T-806	173.773	DEG C	8.494
T-811	519.620	DEG C	20.418
F-701	731.310	SCFM	1.555
TT2-703	60.891	DEG C	0.239
P-703	7.613	IN WC	0.612
P-704	6.451	IN WC	0.510
P-705	1.163	IN WC	0.356
P-706	1.222	IN WC	0.329
F-707	541.518	SCFM	16.961
WT-720	9.460	TONS	0.744
P-707	1.059	IN WC	0.362
P-810	-0.470	IN WC	0.012
F-802	--OFF--	CFM	
F-803	--OFF--	CFM	
TT1-703	60.746	DEG C	0.245
CO	29.887	%	0.542
CO2	5.276	%	0.268
O2	-0.197	%	0.290
SIGMA	--OFF--	BTU/SCF	
T-715	147.192	DEG C	0.108
T-821	390.336	DEG C	12.495
T-703A	20.130	DEG C	1.277
PH	0.433	PH	0.209
AG VEL	0.000	SPH	0.000
GR VEL	0.000	RPD/T	0.000
P-702	--OFF--	IN WC	

AVERAGE BASE TEMPERATURE 17.202

AVERAGE FROM PERIOD: 4/12/83 20:00 TO 4/13/83 8:00

SIGNAL	AVERAGE	UNITS	STD.DEV.
T-701	4.423	DEG C	1.037
T-702	16.747	DEG C	0.997
T-703	--OFF--	DEG C	
T-710	6.579	DEG C	0.127
T-711	72.119	DEG C	1.737
T-712	6.632	DEG C	0.124
T-713	11.956	DEG C	0.555
T-705	227.705	DEG C	29.774
T-706	221.375	DEG C	17.532
T-707	204.886	DEG C	13.533
T-812	517.922	DEG C	20.907
T-813	--OFF--	DEG C	
T-814	472.140	DEG C	21.678
T-815	--OFF--	DEG C	
T-816	478.894	DEG C	16.990
T-817	369.220	DEG C	17.197
T-818	308.916	DEG C	16.892
T-819	418.505	DEG C	16.226
T-820	391.634	DEG C	12.283
T-823	59.695	DEG C	0.821
T-822	58.482	DEG C	0.836
T-806	173.773	DEG C	8.494
T-811	519.620	DEG C	20.418
F-701	731.310	SCFM	1.555
TT2-703	60.891	DEG C	0.239
P-703	7.613	IN WC	0.612
P-704	6.451	IN WC	0.510
P-705	1.163	IN WC	0.356
P-706	1.222	IN WC	0.329
F-707	541.518	SCFM	16.961
WT-720	9.460	TONS	0.744
P-707	1.059	IN WC	0.362
P-810	-0.470	IN WC	0.012
F-802	--OFF--	CFM	
F-803	--OFF--	CFM	
TT1-703	60.746	DEG C	0.245
CO	29.887	%	0.542
CO2	5.276	%	0.268
O2	-0.197	%	0.290
SIGMA	--OFF--	BTU/SCF	
T-715	147.192	DEG C	0.108
T-821	390.336	DEG C	12.495
T-703A	20.130	DEG C	1.277
PH	0.433	PH	0.209
AG VEL	0.000	SPH	0.000
GR VEL	0.000	RPD/T	0.000
P-702	--OFF--	IN WC	

AVERAGE BASE TEMPERATURE 17.202

AVERAGE FROM PERIOD: 4/15/83 16:00 TO 4/16/83 8:00

SIGNAL	AVERAGE	UNITS	STD.DEV.
T-701	2.889	DEG C	1.786
T-702	14.132	DEG C	1.806
T-703	--OFF--	DEG C	
T-710	7.224	DEG C	0.626
T-711	84.064	DEG C	0.872
T-712	7.109	DEG C	0.600
T-713	12.056	DEG C	0.721
T-705	245.901	DEG C	8.435
T-706	221.659	DEG C	5.235
T-707	208.826	DEG C	3.948
T-812	897.110	DEG C	12.187
T-813	--OFF--	DEG C	
T-814	828.831	DEG C	14.186
T-815	--OFF--	DEG C	
T-816	766.508	DEG C	11.946
T-817	685.257	DEG C	15.726
T-818	609.781	DEG C	20.642
T-819	708.236	DEG C	13.477
T-820	596.314	DEG C	13.764
T-823	66.239	DEG C	1.479
T-822	68.492	DEG C	0.502
T-806	191.287	DEG C	2.827
T-811	905.248	DEG C	11.912
F-701	1052.682	SCFM	3.081
TT2-703	64.818	DEG C	0.117
P-703	8.739	IN WC	0.678
P-704	7.038	IN WC	0.883
P-705	1.700	IN WC	0.510
P-706	1.652	IN WC	0.506
F-707	790.040	SCFM	132.366
WT-720	7.739	TONS	2.019
P-707	1.361	IN WC	0.503
P-810	-0.477	IN WC	0.015
F-802	--OFF--	CFM	
F-803	--OFF--	CFM	
TT1-703	64.651	DEG C	0.127
CO	28.730	%	0.372
CO2	0.732	%	0.092
O2	-0.391	%	0.137
SIGMA	162.496	BTU/SCF	2.701
T-715	147.640	DEG C	1.932
T-821	578.155	DEG C	8.563
T-703A	20.004	DEG C	2.581
PH	0.031	PH	0.048
AG VEL	-0.002	SPH	0.001
GR VEL	0.324	RPD/T	0.021
P-702	0.000	IN WC	0.000

AVERAGE BASE TEMPERATURE 17.185

AVERAGE FROM PERIOD: 4/16/83 8:00 TO 4/17/83 8:00

SIGNAL	AVERAGE	UNITS	STD.DEV.
T-701	1.929	DEG C	1.951
T-702	13.266	DEG C	1.965
T-703	--OFF--	DEG C	
T-710	7.377	DEG C	0.603
T-711	85.801	DEG C	2.113
T-712	7.345	DEG C	0.469
T-713	12.240	DEG C	0.503
T-705	248.504	DEG C	23.456
T-706	223.359	DEG C	17.881
T-707	209.636	DEG C	15.602
T-812	891.786	DEG C	29.219
T-813	--OFF--	DEG C	
T-814	826.479	DEG C	30.719
T-815	--OFF--	DEG C	
T-816	766.396	DEG C	28.987
T-817	690.448	DEG C	27.299
T-818	620.636	DEG C	25.721
T-819	712.093	DEG C	24.803
T-820	607.204	DEG C	16.624
T-823	68.239	DEG C	0.803
T-822	68.708	DEG C	0.808
T-806	192.047	DEG C	13.310
T-811	902.176	DEG C	29.961
F-701	820.757	SCFM	432.583
TT2-703	62.960	DEG C	0.221
P-703	7.812	IN WC	0.708
P-704	5.674	IN WC	1.160
P-705	2.138	IN WC	0.712
P-706	2.073	IN WC	0.718
F-707	753.623	SCFM	33.198
WT-720	6.952	TONS	2.620
P-707	1.801	IN WC	0.729
P-810	-0.481	IN WC	0.017
F-802	--OFF--	CFM	
F-803	--OFF--	CFM	
TT1-703	62.776	DEG C	0.207
CO	29.532	%	0.886
CO2	0.149	%	0.669
O2	-0.384	%	0.138
SIGMA	158.209	BTU/SCF	3.859
T-715	147.833	DEG C	1.705
T-821	581.219	DEG C	15.452
T-703A	17.945	DEG C	1.917
PH	0.210	PH	0.253
AG VEL	-0.002	SPH	0.001
GR VEL	0.241	RPD/T	0.082
P-702	0.000	IN WC	0.000

AVERAGE BASE TEMPERATURE 18.538

AVERAGE FROM PERIOD: 4/17/83 8:00 TO 4/18/83 6:00

SIGNAL	AVERAGE	UNITS	STD.DEV.
T-701	1.778	DEG C	2.004
T-702	13.175	DEG C	1.830
T-703	--OFF--	DEG C	
T-710	7.295	DEG C	0.539
T-711	86.162	DEG C	0.892
T-712	7.411	DEG C	0.626
T-713	12.106	DEG C	0.583
T-705	271.010	DEG C	15.854
T-706	242.346	DEG C	10.240
T-707	228.132	DEG C	8.245
T-812	880.234	DEG C	16.532
T-813	--OFF--	DEG C	
T-814	812.376	DEG C	16.311
T-815	--OFF--	DEG C	
T-816	752.965	DEG C	15.285
T-817	675.633	DEG C	12.090
T-818	604.583	DEG C	10.432
T-819	699.780	DEG C	9.857
T-820	599.152	DEG C	6.442
T-823	67.714	DEG C	0.374
T-822	68.544	DEG C	0.535
T-806	209.245	DEG C	6.654
T-811	891.701	DEG C	17.948
F-701	797.273	SCFM	448.036
TT2-703	60.973	DEG C	0.345
P-703	10.762	IN WC	1.314
P-704	8.432	IN WC	1.421
P-705	2.329	IN WC	0.296
P-706	2.264	IN WC	0.293
F-707	771.836	SCFM	44.924
WT-720	7.698	TONS	1.977
P-707	1.998	IN WC	0.287
P-810	-0.482	IN WC	0.016
F-802	--OFF--	CFM	
F-803	--OFF--	CFM	
TT1-703	60.783	DEG C	0.344
CO	24.940	%	11.215
CO2	-0.015	%	0.005
O2	0.130	%	2.390
SIGMA	157.930	BTU/SCF	11.676
T-715	148.595	DEG C	1.562
T-821	573.006	DEG C	6.293
T-703A	18.109	DEG C	2.087
PH	--OFF--	PH	
AG VEL	-0.002	SPH	0.002
GR VEL	0.196	RPD/T	0.038
P-702	0.787	IN WC	3.938

AVERAGE BASE TEMPERATURE 19.629

AVERAGE FROM PERIOD: 4/18/83 12:00 TO 4/19/83 8:00

SIGNAL	AVERAGE	UNITS	STD.DEV.
T-701	3.743	DEG C	3.283
T-702	14.442	DEG C	3.119
T-703	--OFF--	DEG C	
T-710	7.452	DEG C	0.858
T-711	84.091	DEG C	1.695
T-712	7.497	DEG C	0.966
T-713	13.175	DEG C	0.859
T-705	302.465	DEG C	22.711
T-706	281.054	DEG C	16.714
T-707	269.176	DEG C	14.020
T-812	1021.248	DEG C	17.443
T-813	--OFF--	DEG C	
T-814	1012.249	DEG C	19.238
T-815	--OFF--	DEG C	
T-816	959.441	DEG C	19.701
T-817	917.494	DEG C	21.482
T-818	868.668	DEG C	23.694
T-819	928.898	DEG C	18.305
T-820	779.514	DEG C	12.446
T-823	72.828	DEG C	0.439
T-822	73.881	DEG C	0.607
T-806	255.213	DEG C	11.931
T-811	1008.619	DEG C	16.848
F-701	1211.170	SCFM	508.840
TT2-703	64.827	DEG C	0.331
P-703	18.640	IN WC	0.905
P-704	15.906	IN WC	0.793
P-705	2.733	IN WC	0.320
P-706	2.362	IN WC	0.323
F-707	1247.951	SCFM	34.534
WT-720	6.868	TONS	2.853
P-707	1.957	IN WC	0.328
P-810	-0.480	IN WC	0.022
F-802	--OFF--	CFM	
F-803	--OFF--	CFM	
TT1-703	64.653	DEG C	0.334
CO	28.745	%	0.410
CO2	6.846	%	4.590
O2	-0.421	%	0.089
SIGMA	163.779	BTU/SCF	3.202
T-715	148.488	DEG C	1.418
T-821	720.921	DEG C	10.237
T-703A	21.484	DEG C	2.853
PH	--OFF--	PH	
AG VEL	-0.003	SPH	0.002
GR VEL	0.357	RPD/T	0.050
P-702	23.212	IN WC	61.811

AVERAGE BASE TEMPERATURE 20.160

AVERAGE FROM PERIOD: 4/19/83 8:00 TO 4/20/83 8:00

SIGNAL	AVERAGE	UNITS	STD.DEV.
T-701	6.248	DEG C	3.399
T-702	16.735	DEG C	3.332
T-703	--OFF--	DEG C	
T-710	7.120	DEG C	0.669
T-711	85.370	DEG C	1.715
T-712	7.234	DEG C	0.685
T-713	13.195	DEG C	0.830
T-705	296.079	DEG C	23.452
T-706	273.341	DEG C	19.797
T-707	260.942	DEG C	17.769
T-812	1072.430	DEG C	21.585
T-813	--OFF--	DEG C	
T-814	1044.487	DEG C	20.120
T-815	--OFF--	DEG C	
T-816	991.541	DEG C	20.024
T-817	934.345	DEG C	17.999
T-818	885.638	DEG C	17.877
T-819	935.160	DEG C	16.431
T-820	772.808	DEG C	13.794
T-823	72.760	DEG C	0.518
T-822	73.685	DEG C	0.487
T-806	247.402	DEG C	16.176
T-811	1059.223	DEG C	19.260
F-701	1420.841	SCFM	8.907
TT2-703	63.086	DEG C	0.296
P-703	12.334	IN WC	1.466
P-704	9.468	IN WC	1.561
P-705	2.866	IN WC	0.311
P-706	2.492	IN WC	0.275
F-707	2968.981	SCFM	2121.982
WT-720	7.447	TONS	2.557
P-707	2.071	IN WC	0.259
P-810	-0.478	IN WC	0.028
F-802	--OFF--	CFM	
F-803	--OFF--	CFM	
TT1-703	62.903	DEG C	0.297
CO	29.053	%	0.354
CO2	-1.695	%	0.001
O2	-0.383	%	0.100
SIGMA	165.300	BTU/SCF	6.643
T-715	149.733	DEG C	1.739
T-821	719.891	DEG C	10.109
T-703A	22.847	DEG C	2.145
PH	--OFF--	PH	
AG VEL	-0.002	SPH	0.001
GR VEL	0.236	RPD/T	0.082
P-702	19.388	IN WC	28.021

AVERAGE BASE TEMPERATURE 20.239

AVERAGE FROM PERIOD: 4/20/83 16:00 TO 4/21/83 22:00

SIGNAL	AVERAGE	UNITS	STD.DEV.
T-701	11.867	DEG C	5.526
T-702	22.342	DEG C	5.420
T-703	66.171	DEG C	0.773
T-710	7.613	DEG C	0.826
T-711	87.171	DEG C	1.729
T-712	7.665	DEG C	1.005
T-713	13.819	DEG C	0.981
T-705	307.228	DEG C	23.419
T-706	285.171	DEG C	18.343
T-707	275.964	DEG C	17.362
T-812	1193.640	DEG C	46.455
T-813	--OFF--	DEG C	
T-814	1228.370	DEG C	43.396
T-815	--OFF--	DEG C	
T-816	1210.280	DEG C	43.174
T-817	1192.672	DEG C	43.157
T-818	1167.732	DEG C	47.319
T-819	1175.003	DEG C	38.919
T-820	1004.870	DEG C	45.155
T-823	81.021	DEG C	13.989
T-822	79.467	DEG C	6.458
T-806	266.054	DEG C	16.138
T-811	1149.404	DEG C	48.857
F-701	1581.241	SCFM	127.816
TT2-703	64.884	DEG C	0.241
P-703	15.136	IN WC	1.902
P-704	12.540	IN WC	1.912
P-705	2.596	IN WC	0.283
P-706	1.926	IN WC	0.218
F-707	1094.489	SCFM	120.079
WT-720	6.902	TONS	2.959
P-707	0.983	IN WC	0.191
P-810	-0.245	IN WC	0.141
F-802	--OFF--	CFM	
F-803	7943.442	CFM	619.841
TT1-703	64.703	DEG C	0.238
CO	28.309	%	0.347
CO2	6.730	%	4.545
O2	-0.437	%	0.076
SIGMA	155.397	BTU/SCF	5.032
T-715	149.691	DEG C	1.504
T-821	900.207	DEG C	32.793
T-703A	39.228	DEG C	30.441
PH	0.000	PH	0.000
AG VEL	-0.002	SPH	0.002
GR VEL	0.287	RPD/T	0.081
P-702	22.492	IN WC	75.449

AVERAGE BASE TEMPERATURE 19.778

AVERAGE FROM PERIOD: 4/23/83 16:00 TO 4/24/83 8:00

SIGNAL	AVERAGE	UNITS	STD.DEV.
T-701	9.249	DEG C	4.208
T-702	21.452	DEG C	3.993
T-703	65.429	DEG C	0.427
T-710	7.311	DEG C	0.597
T-711	84.638	DEG C	2.038
T-712	7.210	DEG C	0.480
T-713	12.439	DEG C	0.726
T-705	255.017	DEG C	41.406
T-706	218.915	DEG C	26.812
T-707	204.847	DEG C	22.032
T-812	605.598	DEG C	41.128
T-813	--OFF--	DEG C	
T-814	488.389	DEG C	48.599
T-815	--OFF--	DEG C	
T-816	531.058	DEG C	37.700
T-817	422.574	DEG C	43.943
T-818	310.511	DEG C	46.359
T-819	502.296	DEG C	42.450
T-820	468.453	DEG C	36.392
T-823	61.800	DEG C	1.078
T-822	62.408	DEG C	1.346
T-806	181.644	DEG C	16.906
T-811	579.297	DEG C	48.730
F-701	732.602	SCFM	5.501
TT2-703	64.640	DEG C	0.110
P-703	5.857	IN WC	0.488
P-704	4.070	IN WC	0.399
P-705	1.786	IN WC	0.212
P-706	1.847	IN WC	0.222
F-707	5737.734	SCFM	1923.976
WT-720	8.124	TONS	2.517
P-707	1.533	IN WC	0.207
P-810	-0.476	IN WC	0.011
F-802	--OFF--	CFM	
F-803	--OFF--	CFM	
TT1-703	64.468	DEG C	0.103
CO	29.034	%	0.442
CO2	6.858	%	0.193
O2	-0.381	%	0.206
SIGMA	158.017	BTU/SCF	7.119
T-715	148.751	DEG C	0.939
T-821	439.890	DEG C	26.785
T-703A	43.734	DEG C	1.363
PH	0.000	PH	0.000
AG VEL	-0.001	SPH	0.001
GR VEL	0.139	RPD/T	0.047
P-702	5.536	IN WC	5.484

AVERAGE BASE TEMPERATURE 20.196

AVERAGE FROM PERIOD: 4/24/83 10:00 TO 4/24/83 20:00

SIGNAL	AVERAGE	UNITS	STD.DEV.
T-701	19.430	DEG C	1.641
T-702	30.827	DEG C	1.577
T-703	65.480	DEG C	0.519
T-710	7.853	DEG C	0.655
T-711	83.870	DEG C	1.484
T-712	7.923	DEG C	0.896
T-713	13.483	DEG C	0.974
T-705	275.620	DEG C	23.019
T-706	247.537	DEG C	16.199
T-707	234.351	DEG C	13.652
T-812	773.343	DEG C	24.774
T-813	--OFF--	DEG C	
T-814	645.970	DEG C	26.609
T-815	--OFF--	DEG C	
T-816	679.458	DEG C	21.592
T-817	564.309	DEG C	24.883
T-818	418.126	DEG C	24.356
T-819	635.416	DEG C	22.001
T-820	557.779	DEG C	17.434
T-823	66.603	DEG C	0.710
T-822	67.553	DEG C	0.831
T-806	215.392	DEG C	11.243
T-811	772.573	DEG C	26.048
F-701	856.359	SCFM	111.527
TT2-703	64.722	DEG C	0.120
P-703	15.200	IN WC	1.169
P-704	12.580	IN WC	1.157
P-705	2.620	IN WC	0.139
P-706	2.480	IN WC	0.130
F-707	478.346	SCFM	917.570
WT-720	8.539	TONS	1.289
P-707	2.026	IN WC	0.113
P-810	-0.472	IN WC	0.012
F-802	--OFF--	CFM	
F-803	--OFF--	CFM	
TT1-703	64.535	DEG C	0.125
CO	29.763	%	0.515
CO2	6.164	%	0.207
O2	-0.442	%	0.184
SIGMA	156.121	BTU/SCF	3.719
T-715	149.778	DEG C	1.095
T-821	531.367	DEG C	13.635
T-703A	50.950	DEG C	0.956
PH	0.000	PH	0.000
AG VEL	-0.002	SPH	0.001
GR VEL	0.292	RPD/T	0.045
P-702	1.117	IN WC	3.426

AVERAGE BASE TEMPERATURE 21.119

AVERAGE FROM PERIOD: 4/24/83 20:00 TO 4/25/83 5:00

SIGNAL	AVERAGE	UNITS	STD.DEV.
T-701	12.205	DEG C	2.312
T-702	24.060	DEG C	2.421
T-703	61.980	DEG C	0.751
T-710	7.917	DEG C	0.593
T-711	85.927	DEG C	1.080
T-712	7.950	DEG C	0.636
T-713	12.558	DEG C	0.673
T-705	241.704	DEG C	9.805
T-706	216.808	DEG C	4.961
T-707	206.112	DEG C	4.508
T-812	753.131	DEG C	14.453
T-813	--OFF--	DEG C	
T-814	632.115	DEG C	13.656
T-815	--OFF--	DEG C	
T-816	663.368	DEG C	11.908
T-817	554.525	DEG C	11.878
T-818	415.456	DEG C	10.044
T-819	625.438	DEG C	10.842
T-820	551.949	DEG C	8.351
T-823	65.903	DEG C	0.640
T-822	66.820	DEG C	0.645
T-806	186.968	DEG C	3.899
T-811	744.821	DEG C	16.133
F-701	881.526	SCFM	3.667
TT2-703	60.984	DEG C	0.128
P-703	14.195	IN WC	0.901
P-704	11.927	IN WC	0.897
P-705	2.268	IN WC	0.133
P-706	2.243	IN WC	0.122
F-707	6590.436	SCFM	550.216
WT-720	8.737	TONS	1.408
P-707	1.860	IN WC	0.107
P-810	-0.474	IN WC	0.011
F-802	--OFF--	CFM	
F-803	--OFF--	CFM	
TT1-703	60.779	DEG C	0.132
CO	31.316	%	0.435
CO2	4.617	%	0.232
O2	-0.426	%	0.147
SIGMA	156.843	BTU/SCF	3.225
T-715	149.442	DEG C	1.196
T-821	523.019	DEG C	7.656
T-703A	45.088	DEG C	1.647
PH	0.000	PH	0.000
AG VEL	-0.002	SPH	0.001
GR VEL	0.267	RPD/T	0.060
P-702	3.638	IN WC	2.363

AVERAGE BASE TEMPERATURE 22.088

AVERAGE FROM PERIOD: 4/26/83 14:00 TO 4/27/83 8:00

SIGNAL	AVERAGE	UNITS	STD.DEV.
T-701	15.589	DEG C	4.953
T-702	26.211	DEG C	4.810
T-703	68.171	DEG C	0.910
T-710	8.329	DEG C	0.708
T-711	86.835	DEG C	1.394
T-712	8.380	DEG C	0.672
T-713	14.645	DEG C	0.901
T-705	324.096	DEG C	15.570
T-706	299.414	DEG C	10.218
T-707	298.675	DEG C	13.051
T-812	1197.769	DEG C	16.035
T-813	--OFF--	DEG C	
T-814	1235.516	DEG C	15.912
T-815	--OFF--	DEG C	
T-816	1259.630	DEG C	18.138
T-817	1275.541	DEG C	16.061
T-818	1005.000	DEG C	246.599
T-819	1298.241	DEG C	17.903
T-820	1234.207	DEG C	30.433
T-823	82.069	DEG C	0.951
T-822	82.613	DEG C	0.809
T-806	290.101	DEG C	13.029
T-811	1145.104	DEG C	16.946
F-701	1697.400	SCFM	240.968
TT2-703	67.122	DEG C	0.585
P-703	22.613	IN WC	1.681
P-704	17.938	IN WC	1.486
P-705	4.675	IN WC	0.382
P-706	3.348	IN WC	0.362
F-707	4449.208	SCFM	2458.059
WT-720	6.443	TONS	2.890
P-707	1.250	IN WC	0.266
P-810	0.243	IN WC	0.168
F-802	--OFF--	CFM	
F-803	5795.858	CFM	135.065
TT1-703	66.841	DEG C	0.586
CO	27.572	%	0.643
CO2	7.900	%	0.400
O2	-0.433	%	0.298
SIGMA	151.867	BTU/SCF	6.193
T-715	148.702	DEG C	0.894
T-821	1052.362	DEG C	20.895
T-703A	52.950	DEG C	2.001
PH	0.000	PH	0.001
AG VEL	-0.003	SPH	0.002
GR VEL	0.303	RPD/T	0.029
P-702	5.990	IN WC	11.371

AVERAGE BASE TEMPERATURE 23.117

AVERAGE FROM PERIOD: 4/27/83 12:00 TO 4/28/83 5:00

SIGNAL	AVERAGE	UNITS	STD.DEV.
T-701	14.774	DEG C	2.229
T-702	26.796	DEG C	2.099
T-703	63.686	DEG C	0.653
T-710	8.470	DEG C	0.573
T-711	73.043	DEG C	2.946
T-712	8.611	DEG C	0.685
T-713	13.333	DEG C	0.873
T-705	272.019	DEG C	27.652
T-706	233.452	DEG C	20.592
T-707	227.645	DEG C	17.828
T-812	599.566	DEG C	33.007
T-813	--OFF--	DEG C	
T-814	464.161	DEG C	38.650
T-815	--OFF--	DEG C	
T-816	536.696	DEG C	28.628
T-817	429.037	DEG C	39.609
T-818	225.147	DEG C	21.291
T-819	513.742	DEG C	33.960
T-820	487.660	DEG C	35.722
T-823	60.149	DEG C	1.810
T-822	61.806	DEG C	1.330
T-806	204.921	DEG C	13.647
T-811	575.883	DEG C	37.776
F-701	722.311	SCFM	2.983
TT2-703	62.953	DEG C	0.237
P-703	6.990	IN WC	1.023
P-704	5.585	IN WC	1.006
P-705	1.406	IN WC	0.213
P-706	1.528	IN WC	0.205
F-707	3508.678	SCFM	2522.772
WT-720	9.348	TONS	1.018
P-707	1.180	IN WC	0.192
P-810	-0.462	IN WC	0.013
F-802	--OFF--	CFM	
F-803	--OFF--	CFM	
TT1-703	62.693	DEG C	0.235
CO	30.731	%	0.517
CO2	5.407	%	0.311
O2	-0.456	%	0.199
SIGMA	155.304	BTU/SCF	6.207
T-715	149.116	DEG C	0.779
T-821	456.251	DEG C	20.612
T-703A	45.519	DEG C	1.685
PH	0.000	PH	0.000
AG VEL	-0.002	SPH	0.001
GR VEL	0.192	RPD/T	0.044
P-702	3.037	IN WC	4.910

AVERAGE BASE TEMPERATURE 21.572

AVERAGE FROM PERIOD: 4/28/83 14:00 TO 4/29/83 5:00

SIGNAL	AVERAGE	UNITS	STD.DEV.
T-701	10.475	DEG C	3.947
T-702	21.973	DEG C	3.784
T-703	64.631	DEG C	17.448
T-710	8.569	DEG C	0.384
T-711	83.956	DEG C	1.593
T-712	8.670	DEG C	0.491
T-713	13.388	DEG C	0.647
T-705	287.952	DEG C	9.298
T-706	256.702	DEG C	4.908
T-707	253.056	DEG C	6.120
T-812	881.923	DEG C	26.462
T-813	--OFF--	DEG C	
T-814	758.546	DEG C	26.329
T-815	--OFF--	DEG C	
T-816	785.151	DEG C	24.561
T-817	685.414	DEG C	24.157
T-818	324.875	DEG C	22.004
T-819	739.681	DEG C	20.082
T-820	640.607	DEG C	14.085
T-823	69.115	DEG C	0.526
T-822	69.942	DEG C	0.479
T-806	233.702	DEG C	4.854
T-811	882.722	DEG C	36.640
F-701	1041.232	SCFM	8.003
TT2-703	63.155	DEG C	0.575
P-703	21.863	IN WC	1.521
P-704	19.327	IN WC	1.517
P-705	2.536	IN WC	0.178
P-706	2.326	IN WC	0.134
F-707	5747.624	SCFM	2093.456
WT-720	8.198	TONS	1.819
P-707	1.583	IN WC	0.115
P-810	-0.457	IN WC	0.034
F-802	--OFF--	CFM	
F-803	--OFF--	CFM	
TT1-703	62.914	DEG C	0.515
CO	31.543	%	0.520
CO2	4.763	%	0.391
O2	-0.423	%	0.163
SIGMA	165.202	BTU/SCF	3.774
T-715	148.840	DEG C	0.645
T-821	600.930	DEG C	12.873
T-703A	45.640	DEG C	2.396
PH	0.000	PH	0.001
AG VEL	0.525	SPH	0.012
GR VEL	0.418	RPD/T	0.045
P-702	0.977	IN WC	1.879

AVERAGE BASE TEMPERATURE 20.485

AVERAGE FROM PERIOD: 4/29/83 14:00 TO 4/30/83 8:00

SIGNAL	AVERAGE	UNITS	STD.DEV.
T-701	11.277	DEG C	1.847
T-702	22.010	DEG C	1.876
T-703	59.933	DEG C	0.480
T-710	9.314	DEG C	0.594
T-711	85.993	DEG C	1.343
T-712	9.376	DEG C	0.594
T-713	14.030	DEG C	0.686
T-705	271.327	DEG C	25.996
T-706	237.331	DEG C	19.830
T-707	241.404	DEG C	22.047
T-812	1151.913	DEG C	27.377
T-813	--OFF--	DEG C	
T-814	1077.530	DEG C	27.050
T-815	--OFF--	DEG C	
T-816	1093.279	DEG C	34.102
T-817	1013.153	DEG C	31.279
T-818	437.700	DEG C	11.779
T-819	1043.868	DEG C	37.725
T-820	887.576	DEG C	41.665
T-823	75.507	DEG C	0.979
T-822	75.866	DEG C	0.931
T-806	225.881	DEG C	18.807
T-811	1141.340	DEG C	35.083
F-701	1272.630	SCFM	4.223
TT2-703	59.107	DEG C	0.118
P-703	14.442	IN WC	0.780
P-704	11.690	IN WC	1.010
P-705	2.752	IN WC	0.368
P-706	2.104	IN WC	0.344
F-707	2575.356	SCFM	1907.260
WT-720	5.671	TONS	3.021
P-707	1.055	IN WC	0.323
P-810	-0.471	IN WC	0.054
F-802	--OFF--	CFM	
F-803	7206.515	CFM	798.234
TT1-703	58.968	DEG C	0.118
CO	32.599	%	0.290
CO2	3.645	%	0.150
O2	-0.508	%	0.098
SIGMA	171.075	BTU/SCF	5.683
T-715	148.548	DEG C	0.846
T-821	788.472	DEG C	27.052
T-703A	42.900	DEG C	0.889
PH	0.000	PH	0.000
AG VEL	0.562	SPH	0.010
GR VEL	0.194	RPD/T	0.036
P-702	2.682	IN WC	4.434

AVERAGE BASE TEMPERATURE 19.813

APPENDIX J

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.

Interpoll Inc.
4500 Ball Road N.E.
Circle Pines, Minnesota 55014

Telephone (612)786-6020
Telex 297095

RESULTS OF THE APRIL 26, 1983,
WYOMING SUBBITUMINOUS COAL
(SWEET WATER COUNTY)
TEST 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 Eng. Bldg.
111 Church Street S.E.
Minneapolis, Minnesota 55455

Attention: Dr. Ben Liu

Approved by:

Perry Lounes, Ph.D.
President

Report Number 3-1511
June 16, 1983

TABLE OF CONTENTS

ABBREVIATIONS

- 1 INTRODUCTION
- 2 SUMMARY AND DISCUSSION
- 3 RESULTS
 - 3.1 Results of Orsat and Moisture Analysis
 - 3.2 Results of Particulate Loading Determinations
 - 3.3 Results of Sulfur Dioxide Determinations
 - 3.4 Results of Opacity Observations
 - 3.5 Results of NO Measurements

APPENDICES:

- A - Results of Volumetric Flow Rate Measurements
- B - Process Flow Diagram and Location of Test Ports and Traverse Points
- C - Methods 3-6 Field Data Sheets
- D - Method 9 Field Data Sheets
- E - Laboratory Data Sheets
- F - Operating Conditions of the Gasifier and Fuel Composition
- G - Procedures
- H - Calculation of the Dry F-Factor
- 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 April 26, 1983, 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 J. Stock. Coordination between testing activities and gasifier operation was provided by Dick Pooler of Black, Sivalls and Bryson (BSB) and Dave Pui of the University of Minnesota. 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 10^6 BTU/HR (bituminous coal). A combustion test chamber is attached to the gasifier and it also has a nominal capacity of 30 10^6 BTU/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.

Particulate and sulfur dioxide determinations were performed in accordance with EPA Methods 1-6, CFR Title 40, Part 60, Appendix A (Revised July 1, 1982). 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 stainless steel-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 impingement

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 60 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 concentration ranged from .016 to .24 GR/ACF and the corresponding mass rate from 9.5 to 151 LB/HR. The particulate emission factor, the parameter used by most pollution control agencies to regulate emissions from boilers and combustors, ranged from .26 to 3.7 LB/10⁶BTU (EPA methods specify that the emission factor be calculated from oxygen concentrations in the flue gas derived from Orsat analysis). The heat input to the combustion test chamber was estimated to be approximately 37-40 10⁶BTU/HR using the F-factor calculated from the low BTU gas composition together with the particulate emission factor and the particulate mass rates. These heat input rates were 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 197 to 252 ppm. The SO₂ emission rate was approximately 39 LB/HR and the SO₂ emission factor 0.97 LB/10⁶BTU. Nitric oxide concentrations ranged from 148 to 180 ppm (dry). Plume opacity was estimated to be zero, however, the readings could not be performed at the stack outlet due to the existence of condensed moisture at that point. Estimations are based on readings taken downwind after the condensed moisture had evaporated.

Volumetric flow rate determinations were performed at three different locations. The results of the flow rate determinations performed at the combustor outlet are given in Table 1 and ranged from 14,800 to 15,800 DSCFM. The flow rate at the combustion air duct inlet was estimated at 8156 DSCFM. The flow rate at the stack test site was 27,700 DSCFM.

No difficulties were encountered in the field or in the laboratory evaluation of the flyash and sulfur dioxide 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 concentration emission rates and emission factors reported herein are accurate and closely reflect the actual values which existed at the time the tests were performed.

Table 1. Summary of the Results of the April 26, 1983 Particulate Emission Test on the Gasifier Combustor Outlet at the Bureau of Mines Coal Gasifier in Minneapolis, Minnesota.

ITEM	RUN 1	RUN 2	RUN 3
Time of test (HRS)	0910/1010	1050/1150	1235/1335
Estimated gas burning rate (DSCFM)	3605	3731	3915
Estimated heat input (MMBTU/HR)	37.2	38.5	40.4
Estimated percent of rated capacity	124.0	128.3	134.7
Volumetric flow			
ACTUAL (ACFM)	70500	71900	74500
STANDARD (DSCFM)	15800	15300	14800
Gas temperature (DEG-F)	1599	1708	1842
Moisture content (% v/v)	8.89	8.96	9.97
Gas composition (% v/v dry)			
carbon dioxide	8.00	8.40	9.20
oxygen	12.20	11.60	10.80
nitrogen	79.80	80.00	80.00
Oxygen analyzer (% v/v, dry)	12.34	11.08	9.94
Isokinetic variation (%)	102.1	99.3	98.3
Particulate concentration			
ACTUAL (GR/ACF)	.016	.078	.237
STANDARD (GR/DSCF)	.070	.364	1.193
Particulate mass rate (LB/HR)	9.5	47.7	150.9
Particulate emission factor (LB/MMBTU)			
F-factor method (O2 analyzer)	.26	1.17	3.44
F-factor method (Orsat)	.26	1.24	3.73

Table 2. Summary of the Results of the April 26, 1983 Sulfur Dioxide Emission Test on the Combustor Outlet of the Wellman-Galusha Gasifier at the Bureau of Mines Coal Gasifier in Minneapolis, Minnesota.

ITEM	Run 1	Run 2	Run 3
Time of test (HRS)	910-1010	1050-1150	1235-1335
SO ₂ concentration (PPM/dry)	216	247	280
(PPM/wet)	197	225	252
SO ₂ mass rate (LB/HR)	34	38	41
SO ₂ emission factor (LB/MMBTU) F-factor method	.91	.98	1.02

The results of all field and laboratory evaluations are presented in this section. Gas composition (Orsat and moisture) are presented first, followed by the computer printout of particulate, visible emission data and results of NO concentrations. 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.

Test No. 3
 Combuster Outlet

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

	Run 1	Run 2	Run 3
Date of run	04/26/83	04/26/83	04/26/83
Orsat basis (Orsat)			
carbon dioxide	8.00	8.40	9.20
oxygen	12.20	11.60	10.80
carbon monoxide	.00	.00	.00
nitrogen	79.80	80.00	80.00
Wet basis (Orsat)			
carbon dioxide	7.29	7.65	8.28
oxygen	11.12	10.56	9.72
carbon monoxide	.00	.00	.00
nitrogen	72.70	72.83	72.03
Moisture content	8.89	8.96	9.97
Dry molecular weight	29.77	29.81	29.90
Wet molecular weight	28.72	28.75	28.72
Specific gravity (relative to air)	.9921	.9931	.9920
Teledyne oxygen analyzer (velocity & time weighted avg.)	12.34	11.08	9.94
FO	1.09	1.11	1.10

Test No. 3
 Combuster Outlet

3.2 Results of Particulate Loading Determinations -- Method 5(BE)

	Run 1	Run 2	Run 3
Date of run	04/26/83	04/26/83	04/26/83
Time run start/end (HRS)	0910/1010	1050/1150	1235/1335
Pitot tube coefficient	.856	.856	.856
Water in sample			
condensate (ml)	51.0	55.0	61.0
silica gel (grams)	17.5	10.0	9.0
Total particulate material collected (grams) *	.1501	.7341	2.3018
Meter correction coefficient	.9986	.9986	.9986
Volume through gas meter			
at meter conditions, (CF)	34.77	33.33	32.18
standard conditions, (SCF)	33.05	31.10	29.77
Total sampling time (min)	60.0	60.0	60.0
Nozzle diameter (IN)	.374	.374	.374
Average stack gas temperature during determination, (DEG-F)	1599	1708	1842
Volumetric flow			
actual, (CFM)	70491	71857	74537
standard, (DSCFM)	15793	15279	14760
Isokinetic variation (%)	102.1	99.3	98.3
Particle concentration			
actual, (GR/ACF)	.0158	.0778	.2372
dry standard, (GR/DSCF)	.0701	.3642	1.1930
Particle mass flow (LB/HR)	9.49	47.70	150.94
Emission factor (LB/MMBTU)			
by F factor (320-F)	.259	1.172	3.440
by F factor (orsat)	.255	1.238	3.734

* Dry Catch Only

F factor: Run 1 =10587.0 Run 2 =10587.0 Run 3 =10587.0

Test No. 3
 Combustor Outlet

3.3 Results of Sulfur Dioxide Determinations -- Method 6

	Run 1	Run 2	Run 3
Date of run	4/26/83	4/26/83	4/26/83
Time run start/end (HRS)	910/1010	1050/1150	1235/1335
Average stack gas temperature during determination (DEG-F)	1599	1708	1842
Barometric Pressure (IN.HG.)	28.78	28.78	28.78
Meter Temperature (DEG-F)	74.8	84.6	81.8
Meter correction coefficient	.9994	.9994	.9994
Volume through gas meter			
at meter conditions... (cf)	34,770	33,330	32,180
standard conditions... (scf)	33,079	31,126	30,210
Total sampling time (MIN)	60	60	60
Moisture content (% v/v)	8.89	8.96	9.97
Oxygen content (% v/v dry)	12.20	11.60	10.80
Milliequivalents of SO ₂ in gas sample	16.7952	18.0888	19.9214
Sulfur dioxide concentration			
(GR/DSCF)	.2508	.2672	.3259
(MG/DSCM)	574	637	746
(PPM-dry)	216	247	280
(PPM-wet)	197	225	252
Dry standard volumetric flow (DSCFM)	15793	15279	14760
Sulfur dioxide mass rate (LB/HR)	33.97	37.61	41.23
Sulfur dioxide emission factor (LB/MMBTU)			
F-factor method*	.912	.976	1.020

Test No. 3
Scrubber Stack

3.4 Results of Opacity Observations - EPA Method 9

Percent Opacity	Optical Density	Relative Frequency (%)
0	.0000	100.00
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: J. Stock
Cert. Date: 6/6/82
Date of Observation: 4/26/83
Time of Observation: 1110-1116

Test No. 3
Combuster Outlet

3.5 Results of NO Measurement---Monitor Labs Cheminescent NO
Analyzer

NO Concentration (PPM-DRY)		
Run 1	Run 2	Run 3
148	160	162
151	161	168
155	164	170
158	162	170
160	165	170
162	162	171
170	162	177
169	161	177
169	162	180
169	182	182
165	185	180
167	180	180
Average:	157.7	167.2
		173.9

APPENDIX K

Retort Temperature and Pressure Probe Data

Reference: Thimsen et al (1984)

RETORT TEMPERATURE AND PRESSURE PROBE DATA

TEST: BOM/FGT-003
 DATE: 04/17/83
 RETORT ACCESS PORT NUMBER:

COAL: LEUCITE HILLS
 5

DATA: INCHES ABOVE GRATE	PRESSURE (inwc)	TEMPERATURE (deg C)	TIME (hrs)	1450
0	2.4	---	Blast Air	1000
6	3.3	---	(scfm)	
12	4.5	---	Saturation	60.7
18	4.6	1360	Temperature	
24	5.0	1099	(deg C)	
30	5.2	988		
36	5.5	960	Ashpit	10.2
42	5.8	932	Pressure	
48	6.0	899	(inwc)	
54	6.2	882		
60	6.4	860	Offtake	260
66	6.4	---	Temperature	
			(deg C)	

RETORT TEMPERATURE AND PRESSURE PROBE DATA

TEST: BOM/FGT-003

COAL: LEUCITE HILLS

DATE: 04/16/83

RETORT ACCESS PORT NUMBER:

5

DATA: INCHES ABOVE GRATE PRESSURE (inwc) TEMPERATURE (deg C)

TIME (hrs) 1500

0	2.5	---	Blast Air	1000
6	2.6	---	(scfm)	
12	2.9	1221	Saturation	62.0
18	3.6	1032	Temperature	
24	3.9	960	(deg C)	
30	4.1	888		
36	4.3	849	Ashpit	7.7
42	4.5	838	Pressure	
48	4.6	838	(inwc)	
54	4.9	832		
60	5.0	760	Offtake	205
66	5.1	---	Temperature	
72	5.2	---	(deg C)	

RETORT TEMPERATURE AND PRESSURE PROBE DATA

TEST: BOM/FGT-003

COAL: LEUCITE HILLS

DATE: 04/18/83

RETORT ACCESS PORT NUMBER:

5

DATA: INCHES ABOVE GRATE PRESSURE (inwc) TEMPERATURE (deg C)

TIME (hrs) 1500

0	2.0	---
6	4.6	---
12	8.0	---
18	---	1210
24	9.5	1160
30	10.4	1060
36	10.6	982
42	11.3	938
48	11.9	910
54	12.2	888
60	12.7	882
66	13.2	---
72	13.5	349

Blast Air 1500
(scfm)

Saturation 64.6
Temperature
(deg C)

Ashpit ---
Pressure
(inwc)

Offtake 300
Temperature
(deg C)

RETORT TEMPERATURE AND PRESSURE PROBE DATA

TEST: BOM/FGT-003

COAL: LEUCITE HILLS

DATE: 04/20/83

RETORT ACCESS PORT NUMBER:

5

DATA: INCHES ABOVE GRATE	PRESSURE (inwc)	TEMPERATURE (deg C)	TIME (hrs)	
0	4.0	---	800	
6	4.7	---	Blast Air	1400
12	6.0	---	(scfm)	
18	7.8	---	Saturation	63.1
24	8.2	1282	Temperature	
30	8.8	---	(deg C)	
36	9.1	1121		
42	9.7	---	Ashpit	12.0
48	9.9	1082	Pressure	
54	10.4	1021	(inwc)	
60	10.8	921		
66	11.1	---	Offtake	330
72	11.2	---	Temperature	
			(deg C)	

RETORT TEMPERATURE AND PRESSURE PROBE DATA

TEST: BOM/FGT-003

COAL: LEUCITE HILLS

DATE: 04/25/83

RETORT ACCESS PORT NUMBER:

5

DATA: INCHES ABOVE GRATE	PRESSURE (inwc)	TEMPERATURE (deg C)	TIME (hrs)	
0	2.8	---	1300	
6	3.1	---	Blast Air	1100
12	3.4	---	(scfm)	
18	10.8	1121	Saturation	62.0
24	14.1	932	Temperature	
30	14.7	888	(deg C)	
36	14.8	882	Ashpit	---
42	15.3	860	Pressure	
48	16.0	849	(inwc)	
54	16.2	838		
60	16.8	838		
66	17.1	---	Offtake	310
72	17.2	---	Temperature	
78	17.8	---	(deg C)	