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SYNTHANE PILOT PLANT, SOUTH PARK TOWNSHIP, PENNSYLVANIA

Run Report No. 2-DB for September 1977—September 1978

Work Performed Under Contract No. EY-76-C-02-0003

The Lummus Company
Bloomfield, New Jersey

U. S. DEPARTMENT OF ENERGY

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SYNTHANE PILOT PLANT,
SOUTH PARK TOWNSHIP, PENNSYLVANIA

RUN REPORT NO. 2-DB

OPERATING PERIOD
SEPTEMBER 1977 - SEPTEMBER, 1978

PREPARED BY

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A SUBSIDIARY OF COMBUSTION ENGINEERING
BLOOMFIELD, NEW JERSEY

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I. ABSTRACT

This report covers the operation of the Synthane Coal Gasification Pilot Plant, South Park Township, Allegheny County, Pennsylvania from September 1977 through September 1978. The facility is owned by the United States Government and operated by C-E Lummus.

Test Directive No. 2-DB directed the plant be operated with Illinois #6 coal from the River King Mine of the Peabody Coal Company at a pressure of 600 psig. Concurrent pretreater/gasifier operation was to take place at coal feed rates from 1.5 to 2.5 tons/hour. Gas was produced for 182 hours and 1,100 tons of coal were fed to the pretreater and gasifier. Continuous operation of up to 56 hours and carbon conversions based on char of up to 72% were achieved.

The successful operation during this period demonstrates that the coal gasification via the Synthane Process is viable. Additional data are required for the design of a commercial facility. However, the data obtained to date are adequate to recommend improvements and modifications to the Synthane Process Pilot Plant to increase on stream time efficiency.

During the 2-DB series of runs coal was fed first into the pretreater then into the fluidized bed of the gasifier

ABSTRACT (Cont'd)

by "deep bed" injection rather than by "free fall" as in previous studies. The earlier results showed conclusively that the "deep bed" injection method is advantageous because little tar, phenol, and oils are produced. Low by-product formation will have a considerable advantage in the capital cost and operation of a commercial facility.

The successful operation of the pilot plant with Illinois #6 coal demonstrates the feasibility of the Synthane Pilot Plant to process a caking type of coal. The ability to successfully pretreat a caking coal at high pressure in a plant of this size is a first and a direct result of the successful operation of the Synthane Process. Other similar type processes operated to date require pretreatment of a caking coal at atmospheric pressure with little or no recovery of the gases or heat produced during pretreatment.

II. INTRODUCTION

The Synthane Coal Gasification Pilot Plant, located in South Park Township, Allegheny County, Pennsylvania, is operated by C-E Lummus, a subsidiary of Combustion Engineering Inc., for the Department of Energy of the United States Government, who is the owner of the plant, under Contract EY-76-C-02-0003.*000. C-E Lummus designed the pilot plant and provided construction advisory services. Field construction and detailed engineering was done by Rust Engineering of Birmingham, Alabama under separate contract. C-E Lummus has been operating the pilot plant under the contract from August 1, 1975 through September 20, 1978.

The Synthane Process is a high pressure coal gasification technique developed by the Pittsburgh Energy Technology Center (PETC) of the Department of Energy. PETC was formerly part of the U.S. Bureau of Mines and then part of the U.S. Energy Research and Development Administration (ERDA). The plant is designed to convert bituminous coal, sub-bituminous coal, and lignite into a substitute natural gas with a heating value of 950 BTU's per cubic foot at a pressure of 1,000 pounds per square inch. The product gas is ready for direct feeding into existing gas pipelines.

II. INTRODUCTION - cont'd

The important advantage of the Synthane Process over the existing coal gasification technology is that it can process caking coals as well as noncaking coals as raw material. The Synthane Process pretreats caking coals at system operating pressure and discharges the pretreated coal and its gaseous components directly into the gasification system. It was developed in response to a need to process the large deposits of caking coals in the Appalachian region of the Eastern United States.

The objectives of the operating contract are to demonstrate the Synthane Process on a pilot plant scale and to obtain sufficient process information to design a demonstration and/or commercial coal gasification plant for the production of pipeline quality gas. These objectives are to be accomplished through the execution of experimental and operational programs in the Synthane Pilot Plant.

The pilot plant started operation on July 8, 1976 under Test Directive No. 1. The directive specified the operating procedures and process requirements for the gasification of Montana Rosebud coal. Test Directive No. 1 was discontinued in January 1977 because of the operating problems

II. INTRODUCTION - cont'd

associated with the large amounts of tar and oils formed during the "free fall" injection of the coal feed into the fluidized bed of the gasifier. The gasifier internal cyclone dip leg plugged repeatedly and the gas scrubbing area was unable to handle the tar, char, and fresh coal feed which were carried over from the gasifier. This carry-over caused continual plugging and fouling of the exchangers, pumps, vessels, and other equipment in the gas scrubbing area. Long runs could not be achieved under these conditions. Run Report No. 1 covers the operation of the pilot plant from July 7, 1976 to December 20, 1976 under Test Directive No. 1. It was issued March 7, 1978.

Tests at the Pittsburgh Energy Technology Center had shown that injecting the coal feed below the surface of the fluidized bed produces less tars and phenols (which are important from an environmental point of view) than by the "free fall" injection coal feeding method. The pilot plant, after suitable modifications, was operated under Test Directive No. 1-DB. The Test Directive specified "deep bed" injection of the coal feed, i.e. below the gasifier operating fluid

II. INTRODUCTION - cont'd

bed, and the continuation of the gasification of Montana Rosebud coal. In August 1977 the "deep bed" injection gasification runs on Montana Rosebud coal were considered successfully completed. Run Report No. 1-DB covers the successful operation of the pilot plant under Test Directive No. 1-DB. It was issued on May 8, 1978.

Test Directive No. 2-DB outlined the second phase of the plant operation. The objective of the new test directive was the gasification of Illinois No. 6 coal at 600 psig to a carbon conversion of 67% with on line coal pretreatment at the operating pressure.

This report covers the operating period September 1977 to September 1978 under Test Directive 2-DB. A brief process description of the operation is given in Section IV. Plant operations are described in chronological order in Section V. Equipment modifications and equipment failure analyses are presented in Sections VI and VII, respectively.

Section VIII presents the operating data evaluation techniques and associated problems arising therefrom. Run times, sample points, steady state definitions, etc. are in this section.

II. INTRODUCTION - cont'd

Section IX presents the analysis of the plant data to determine the effects of various process parameters on the performance of the gasification system. The actual data collected may be found in Appendix II.

Section X contains a discussion of the operating characteristics and possible solutions to the problems arising from the plant operation.

Section XI is a more detailed discussion of the summary, achievements and recommendations presented in Section III. The arguments presented in Section IX and X are combined to arrive at a specific recommendation for equipment modifications.

III. SUMMARY

Forty-seven test runs, designated as Run Series 2-DB and numbered from 2-DB-A-1 through 2-DB-0-3, were conducted at the Synthane Coal Gasification Pilot Plant, South Park Township, Pennsylvania from September 1977 through September 1978 under Test Directive No. 2-DB.

The Test Directive for these runs specified the gasification of Illinois No. 6 coal to a carbon conversion of about 67% at 600 psig pressure. Run lengths of five to seven days, at a minimum steady state period of 24 hours, were desirable. The Test Directive also required that the coal feed to the gasifier be injected below the surface of its fluidized bed by the "deep bed" injection method rather than by "free fall" method. Due to the caking properties of Illinois No. 6 coal; pretreatment of the coal was specified. Start up operating conditions for the pretreater were specified.

Under Test Directive No. 2-DB 1,100 tons of Illinois No. 6 coal were feed to the pretreater and gasifier. Gas was produced from the pretreater and gasifier for 182 hours. Continuous operations of up to 56 hours and carbon conversions, based on char analysis, of up to 72% were achieved. The

III. SUMMARY - cont'd

operations were carried out at a pressure of 600 psig, the gasifier temperatures ranged from 1,300°F to 1,550°F, and the coal feed rates were 1.5 to 2.5 tons/hour. The pretreater was placed in service for the first time (not required for Rosebud Montana Coal) during this test period. The "deep bed" injection method produced little tar, phenols, or oils in the waste water.

The major problems encountered during the Run Series 2-DB were: (1) plugging of various coal and char transfer lines, (2) clinker formation in the gasifier, (3) fines carry-over from the gasifier which caused operating problems in the gas scrubbing area, and (4) a number of mechanical upsets such as pump failures, circuit breaker trips, rupture disc failures, etc. Most of these problems were resolved through repairs and/or equipment modification. However, clinker formation and carry-over of fines from the top of the gasifier to the gas scrubbing area continued to be major problems. Initially pretreater agglomeration was a serious problem until operating techniques were learned to overcome it.

III. SUMMARY - cont'd

Run Series 2-DB has demonstrated that the Synthane Process is a viable coal gasification route. The general operability of the system was good and it improved significantly over the Run Series that were conducted under Test Directive No. 1 and 1-DB.

The major achievements accomplished during Run Series 2-DB, recommendations for the improvement of the process, and the solution of the remaining operating problems are summarized in the remainder of this section. Detailed discussion of the reasoning leading to these recommendations will be found in other parts of this report.

III. SUMMARY - cont'd

Achievements

1. The plant produced gas for a total of 182 hours and processed 1,100 tons of Illinois No. 6 coal at feed rates of 1.5 to 2.5 tons/hours.
2. An online pretreater operating concurrently with the gasifier at 600 psig has been demonstrated. This is the first time a caking coal has been pretreated at operating pressure in a plant of this size.
3. A carbon conversion of 72 percent based on char analysis has been achieved.
4. Extended run lengths of up to 56 continuous operating hours have been achieved.
5. A total of 7 steady state periods ranging from 1 hour and 30 minutes to 8 hours and 30 minutes have been achieved.
6. Overall material balance closures to within 80 to 92 percent have been achieved in the 7 steady state periods.
7. A dry coal feed system operating continuously at 600 psig has been demonstrated.
8. A system for discharging char continuously from 600 psig to atmospheric pressure has been operated successfully.

III. SUMMARY - cont'd

Achievements - cont'd

9. A process gas stream essentially free of tars and heavy oils has been obtained. This gas stream simplifies the downstream gas/liquid separation steps and enhances the environmental aspects of the Synthane Process.
10. An aqueous condensate with low phenol content and low chemical oxygen demand has been obtained from the overhead gas stream. This should permit water reuse without extensive treatment.
11. The Petrocarb dry coal feeding system to feed coal to the pretreater/gasifier at 600 PSIG was demonstrated.

III. SUMMARY - cont'd

Problem Areas

1. Gasifier fluid bed height control has improved over Run Series 1 and 1-DB, but still remains a problem.
2. Clinker formation in the gasifier at operating temperature still persists.
3. Fines carry-over from the gasifier to the gas scrubbing system due to inefficient internal cyclone performance remains a problem. Solution to this problem will permit the design of high pressure steam generation on the gasifier overhead gas resulting in an economic credit to the process.
4. Operating techniques for char removal from the gasifier must be improved.
5. Occassional problems with wet coal lumps, unground coal, and foreign objects in the coal feed system persist.

III. SUMMARY - cont'd

Recommendations

In view of the progress made in Run Series 2-DB in overcoming the problems encountered during Run Series 1 and 1-DB, additional time and effort should be expended toward the solution of the few remaining operating problems. The following additional work is recommended:

1. Provide a steam-oxygen feed connection to the existing deep bed coal feed pipe inside the gasifier. Extend this coal feed pipe to the cone line or below.
2. Install a separate 3-inch line connecting the existing 3/4-inch horizontal coal transport line directly into the gasifier. This new line will bypass the existing pretreater and its associated 3-inch feed line. This new line is to function as a parallel and alternate pretreater operating in an entrained flow versus the existing fluid bed mode. This change, plus No.-1 above will help minimize the oxygen concentration in the critical areas of the fluidized beds and therefore, aid in the prevention of clinker formation. The entrained pretreatment concept will also permit a higher tolerance for system upsets when compared to the existing fluidized

III. SUMMARY - cont'd

Recommendations - cont'd

- bed pretreater operating on caking type coals.
3. Extend the gasifier/char cooler standpipe to a point above the existing deep bed coal feed line inside the gasifier. The problem of char flow from the gasifier to the char cooler is unique to the existing Synthane Pilot Plant. Under Contract No. EY-76-C-02-0058.000 with the United States Department of Energy C-E Lummus designed a hot char let down system operating directly from the gasifier for the specific purpose of eliminating the existing char cooler and its attendant problems.
 4. Modify the gasifier to reduce coal fines entrainment with its product gas to the gas scrubbing area. Study means for the direct removal of fines from the gasifier fluidized bed to the char slurry area. This will aid in controlling the gasifier fluid bed height and density. Carry-over of fines to the gas scrubbing area will also be reduced.
 5. Accumulate more operating data in order to more accurately study the effect of operating conditions on the operating parameters.

III. SUMMARY - cont'd

Conclusions

The operations of the Synthane Pilot Plant were prematurely terminated. Runs 1-DB and 2-DB conducted with Montana Rosebud and Illinois No. 6 coals, respectively, demonstrated that the Synthane process offers specific advantages in coal gasification technology. The continuing operation, for an estimated two years, would permit this process to reach a level from which commercialization could be achieved. It is hoped that a re-examination of the coal gasification development program on the part of the U.S. Government or industrial sectors will lead to a reassessment of the possibilities of the Synthane process.

IV. PROCESS DESCRIPTION

A flow diagram of the equipment placed in service under Test Directive 2-DB is shown in Figure 1 at the end of this section. Three sub-systems of the Synthane Pilot Plant were not placed in service during this phase of operation. These sub-systems were: 1) the Benfield and Stretford Units for removal of carbon dioxide and sulfur respectively, 2) the shift converter for adjusting the hydrogen to carbon monoxide molar ratio for methanation, and 3) the methanation section for converting carbon monoxide and hydrogen to methane.

The first step in the process is coal preparation. Raw coal is trucked to the plant and dumped into the feed hopper. It is then carried by the feed conveyor to the bucket elevator for deposit in the raw coal storage bin.

Coal is withdrawn from the raw coal storage bin and fed by the weigh belt feeder to the pulverizer and dryer. The pulverizer is an impact mill. Hot gas from the drying air heater is tempered with recycled drying gas and enters the impact mill with the raw coal. The coal is flash dried to approximately 2 weight percent moisture and ground to a finer size. The ground coal from the flash drying mill is separated from the gas in the cyclone separator and is fed

IV. PROCESS DESCRIPTION - cont'd

to the vibrating screen. Coal particles larger than 20 mesh are returned to the flash drying mill for further grinding. Less than 33 weight percent of the material passing through the screen is finer than 200 mesh. The hot gases leaving the cyclone separator pass through the dust collector where small coal particles are removed. Part of the gas leaving the dust collector is vented while the major portion is recycled back to the drying air heater by the drying system fan. This fan is located immediately ahead of the dust collector. The coal particles removed from the recycle gas in the dust collector are normally fed to the pulverized coal storage bin. Provisions for removing the fines from the dust collector directly into a truck for disposal also exist.

The raw and pulverized coal storage bins, belt feeders, and bucket elevator (when operating) are kept under an inert gas blanket. The blanket systems maintains the oxygen content in the equipment below 5 volume percent.

Dry coal stored in the pulverized coal storage bin at atmospheric pressure is brought up to operating pressure by the Petrocarb lock hopper system shown in Figure 2 at the end of this section. A prescribed weight of coal is transferred

IV. PROCESS DESCRIPTION - cont'd

from the pulverized coal storage bin to the weigh hopper. The weigh hopper alternately feeds two storage injectors when level probes indicate that the injectors are empty. After a storage injector is filled with coal, it is isolated from the rest of the system and pressurized with inert gas or CO₂. When pressurization is complete, the coal is fed from the storage injector to the primary injector. When the storage injector is empty, it is depressured and prepared to receive another batch of coal. Cross pressurization of the storage injectors is employed to reduce the total gas demand in the Petrocarb Unit. The coal is then pneumatically transported by inert gas or CO₂ from the Petrocarb primary injector to the pretreater through a combination of a 3/4-inch horizontal and a 3-inch vertical line. Superheated steam and oxygen is injected into the 3-inch vertical line.

The pretreater is a 20-inch stainless steel, Type 316, vessel with an internal diameter of 18 inches and height of 13.5 feet. The caking property of the coal is destroyed by mild oxidation of the coal in the presence of steam, oxygen, and, inert gas or CO₂ at about 800°F. The pretreated coal, steam, inert gas or CO₂, and any unreacted oxygen overflow

IV. PROCESS DESCRIPTION - cont'd

into the gasifier through the "deep bed injection" line.

The gasifier, shown in Figure 3 at the end of this section, is constructed of monel clad carbon steel. It is about 62 feet high and is separated from a 33 foot high char cooler by an internal head. The gasifier is 5 feet in diameter and is lined with a 6-inch layer of insulating castable refractory and a 3-inch layer of a dense erosion resistant castable refractory. An Incoloy 800 shroud is placed inside the gasifier so that the actual working internal diameter is about 3 feet.

Coal enters the gasifier into its fluidized bed at a point 9 feet above the distribution cone break line through an overflow line from the pretreater. The height of the fluid bed is normally maintained between 10 and 20 feet. The coal is reacted with steam and oxygen at temperatures up to 1800°F to produce hot char and product gas.

The hot char from the gasifier flows through a standpipe to the char cooler where it is cooled by steam. Char from the char cooler is then conveyed by high pressure steam to the high pressure char slurry tank where it is further cooled and slurried with filtrate water.

The char slurry is let down to atmospheric pressure through a Willis Choke valve and is then dewatered by rotary

IV. PROCESS DESCRIPTION - cont'd

disc vacuum filters. The filter cake is dumped into hoppers for removal from the plant site. The filtrate is cooled and recycled to the high pressure char slurry tank for quenching and slurring of the fresh char.

The gas leaves the gasifier through an internal cyclone. If they are quenched with water in the venturi scrubber and the gas/liquid mixture is then separated in the scrubber surge tank. The gas leaving the scrubber surge tank is washed in a second venturi scrubber. It is then passed through the raw gas scrubber where the gas is cooled to approximately 330°F. After pressure reduction, the gas is fed to the flare header for burning.

The scrubber surge tank consists of three internal compartments. The discharge from the first venturi scrubber flows into one of the end compartments. This compartment overflows to the center compartment. The combined liquid from the second venturi scrubber and raw gas scrubber flow from the bottom of the raw gas scrubber to the other end compartment of the surge tank. This liquid also overflows into the center compartment. The material collected in the center compartment, which is a multiphase mixture of water, coal fines, and minor amounts of tars and oils, is sent to

IV. PROCESS DESCRIPTION - cont'd

the waste water receiver and then to the thermal oxidizer for disposal.

The plant's utility systems include air compressors, a boiler feed water treatment facility, low pressure and high pressure steam generators, plus a cooling tower. A liquid carbon dioxide storage unit and a pair of inert gas generators supply low pressure carbon dioxide and/or inert gas to compressors which provide pressurized gas for the Petrocarb System and for the instrument purges in the gasifier. A liquid oxygen storage unit provides the oxygen required for the pretreatment and gasification reactions.

Figure 1. Synthane Pilot Plant - RUN SERIES "2-DB"

Figure 2. Petrocarb High Pressure Coal Feed System-RUN SERIES 2-DB

Figure 3. Synthane Gasifier - RUN SERIES 2-DB

V. PLANT OPERATION

Table 1 at the end of this section is a summary of operations of the Synthane Pilot Plant with Illinois No. 6 coal during the period September 1977 to September 1978.

The total period of time can be divided into three groups: Runs 2-DB-A through F, Runs 2-DB-G through N, and Run 2-DB-O.

The accomplishments during the first group of runs (A through F) were:

1. Successful operation of the pretreater for 13.5 hours without agglomeration.
2. Successful transport of coal with superheated steam.

These accomplishments were the result of the following changes:

1. The superficial velocity in the pretreater was increased from 0.3 to 1.2 feet per second.
2. Coal and oxygen were fed simultaneously into an empty pretreater.
3. Oxygen was added to the bottom of the vertical portion of the coal transport line.

Prior to the start of the second group of runs (G through N), the coal feed line was changed to take advantage of the accomplishments noted above and a steam superheater

V. PLANT OPERATION - cont'd

was installed. As a result, the gasifier/pretreater was operated nine times, gasifying Illinois No. 6 coal successfully. The pretreater was operated alone an additional 18 times. It was determined that it was easier to pretreat coal that is ground to minus 50 U.S. mesh. Prior tests had all been conducted on coal ground to minus 20 U.S. mesh.

From the experience gained in the second series of runs, several procedural changes were made for run 2-DB-0:

1. The temperature at the top of the transport line was raised from 750°F to 800°F.
2. The superheated transport steam was reduced 25%.

This meant that some pretreatment was being done in the transport line itself. As a result, the gasifier/pretreater operated for their longest period of time.

The following results were accomplished:

1. Extended operating periods up to 48 hours occurred.
2. No agglomeration occurred in the pretreater despite frequent coal feed outages.
3. Temporary resolution of the gas scrubbing area problems was accomplished by the addition of anti-foam and flocculating agents to the scrubber surge tank.

V. PLANT OPERATION - cont'd

Problems noted during all three periods were:

1. Unsteady coal feed.
2. Clinker formation in gasifier took place when it was in operation.
3. High solids carry over from gasifier took place when it was in operation.

TABLE NO. 1

SUMMARY OF OPERATIONS - RUN SERIES 2-DB

PRETREAT AND GASIFY ILLINOIS NO. 6 COAL

RUN NO. 2-DB	DATE	DURATION (HOURS)		COAL FED (Tons)	Mechanical	CHANGES Procedure	PROBLEMS	ACCOMPLISHMENTS
		Pretreater	Gasifier					
A-1	9/13/77	0.25	-	Est. 0.5			Agglomeration in Pretreater Erratic Coal Feed Cycling Temperatures	
A-2	9/26/77	0.5	-	Est. 1.0	Lengthened Coal Feed Line Inside Pretreater. Added Desuperheat Station to Steam Lines.	Used Rosebud Coal in Primary Injector- This Run Only	SAME	
A-3	9/28/77	0.3	-	Est. 0.6		Changed Control Point From bottom to Middle TC	SAME	
A-4	9/30/77	1.2	-	Est. 2.1	Added Tee to Coal Feed Line inside PRTRTR		SAME	
B-1	10/25/77	1.5	-	Est. 1.5	Connected O ₂ To Trans- port Line. Added Hot Co ₂ to Primary Injector.		SAME	
B-2	10/29/77	1.3	-	Est. 1.5	Lengthened Coal Feed Line inside PRTRTR			
B-3	10/31/77	1.5	-	Est. 1.5		Transport Coal with steam	Loss of Coal Feed, Plugged Venturi, Agglomeration.	Successfully Transported Coal with Steam
C-1	11/8/77	0.2	-	Est. 0.4		Transport Coal with CO ₂	Lost CO ₂ Compressor O ₂ Valve Tripped, Agglomeration	
C-2	11/11/77	2	-	Est. 3.6			CO ₂ Compressor Trip Caused Loss of O ₂ ; Agglomeration	
D-1	12/3/77	8	-	-	Steam Coil Added To Drying Air Heater- Coal Transported with Steam. Coal Feed Line Changed to Enter at Bottom.		Erratic Coal Feed, Wet Lumps, Agglomeration	
D-2	12/9/77	2.5	-	-			SAME	
D-3	12/13/77	36	-	-			SAME	Run Continued After Obvious Agglomeration to conduct coal feed rate tests. Good Data Obtained.

TABLE NO. 1 CONTINUED

RUN NO. 2-DB	DATE	DURATION (HOURS)		COAL FED (Tons)	Mechanical	CHANGES Procedure	PROBLEMS	ACCOMPLISHMENTS
		Pretreater	Gasifier					
E-1	12/30/77	2.5	-	Est. 3.0			Pretreater Agglomerated	
E-2	1/20/78	.8	-	Est. 1.6		Raised Pretreater Superficial Velocity to 1.1 to 1.2 FPS	Gasifier Standpipe Plugged	Pretreater Ran Successfully - Very little Agglomeration
F-1	2/3/78	3	-	Erratic		Start-up with Empty Pretreater No Initial Inven- tory	Erratic Coal Feed- Wet Lumps of Coal in Venturi.	
F-2	2/4/78	1.5	-	Erratic			Venturi Plugged With Hard Coal	
F-3	2/5/78	13.6	-	15			Frozen Char Slurry Line	No Agglomeration Pretreated Successfully
G-1	3/26/78	5.5	-	17	Coal Feed Line Changed To 3/4" x 3" Combination		Primary Injector Ran Empty	
G-2	3/26/78	4.5	-	7.4			Flange on Raw Gas Scrubber Leaking - Caused Shut-Down Pretreater not opened.	
G-3	3/27/78	3	-	3.9			Same Problem - Pretreater Opened - Had Agglomerates in it.	
G-4	4/2/78	3	-	5			Foreign Object Plugged Coal Feed Venturi	Very little Agglomeration in Pretreater
G-5	4/6/78	17	5.5	42.5			Char Slurry Line Plugged	Gasified Ill. No. 6 Coal
G-6	4/7/78	8.5	5.5	16			Clinker in Gasifier	Gasified Ill. No. 6 Coal
H-1	4/20/78	5.0	1.0	11			Pretreater Overflow Line Failed	Gasifier Clean
H-2	4/26/78	11.5	2.5	22			Pretreater and Gasifier Filled with Agglomerated-- Coal	
I-1	5/9/78	0.5	-	Est. 1.0			Plugged Gasifier/Char Cooler Standpipe - Material Left from Previous Run. Pretreater Agglomerated	
I-2	5/17/78	5.1	-	Est. 11			Char Mix Tee Failed - Pre- treater not opened, Gas Scrubbing Pumps Causing Problems	

TABLE NO. 1 CONTINUED

RUN NO. 2-DB	DATE	DURATION (HOURS)		COAL FED (Tons)	Mechanical	CHANGES	Procedure	PROBLEMS	ACCOMPLISHMENTS
		Pretreater	Gasifier						
I-3	5/19/78	5.3	-	Est. 14				Coal Feed Erratic - Caused Agglomeration	
I-4	5/21/78	1.3	-	Est. 3.25				Plugged 3/4" Transport Line-Pretreater not opened.	
I-5	5/23/78	2.3	-					Erratic Coal Feed, Rupture Disc Blew - Agglomerated Pretreater Primary Injector	
I-6	5/28/78	7.8	1.8	Est 20				FSI Could not be Lowered to O.O. Pretreater and Gasifier Agglomerated - Coal Feed Outage Started Agglomeration.	
J-1	6/12/78	3.5	-	Erratic	Pressurizing Gas added to top of primary injector.			Erratic Coal Feed, Plugged Venturi, Agglomerates in Pretreater.	
J-2	6/17/78	9.2	-	Est. 15				Coal Feed Outages Agglomerates in Pretreater	
J-3	6/19/78	12.4	7.6	21		Changed Grind to 50 Mesh		Clinker in Gasifier Cone	No Agglomerates in Pretreater. Orderly Shut- Down of Pre- treater. Higher Gasifier Densities.
K-1	7/4/78	2.9	-	Erratic	Installed Modified O ₂ Distributor			Wet Coal-Plugged Transport Line	Small Amount of Agglomerates in Pretreater
K-2	7/11/78	14.2	11.0	22.7				Gas Scrubbing Circulation Lost-Coal Feed Outages	Agglomerates found in Pretreater. Clinker-Like Mass in Gasifier. Gasified Ill. No. 6 Coal Again. Higher Gasifier Densities.
L-1	7/20/78	0.7	-	1.1	Changed Location of Pressure Taps, Thermo- couple in Pretreater			Short Supply of CO ₂	Orderly Shut-down Vessels not opened
L-2	7/21/78	6.7	-	12				Coal Feed Outages. Agglomeration in Pretreater.	

TABLE NO. 1 CONCLUDED

RUN NO. 2-DB	DATE	DURATION (HOURS)		COAL FED (Tons)	CHANGES		PROBLEMS	ACCOMPLISHMENTS
		Pretreater	Gasifier		Mechanical	Procedure		
L-3	7/23/78	6.7	-	13.4			Coal Feed Outages Agglomeration in Pretreater	
M-1	7/27/78	11.75	10.6	20	Lengthened 3/4" Line Changed Venturi to 1/2"		Ran out of Coal In Primary - Level Probes Malfunctioned - Pretreater Agglomerated.	
M-2	7/31/78	13.25	11.25	24			Plugs in Coal Feed Line. Gas Scrubbing Circ. Probs. Agglomerates in Pretreater, Clinker in Gasifier.	Pretreater Operated with Agglomerates Gas Scrubbing Caused Shut- down.
N-1	8/9/78	11.2	-	18		Switched to 20 Mesh Coal	Coal Feed Outages - Loss of Scrubber Water, Rupture Disc Agglomerates in Pretreater.	Pretreater Worked Well Despite Most Coal Outages.
N-2	8/12/78	26	-	36			Plugs in PD1-21- Coal Outages - Gasifier/CC dP Swings Agglomerates in Pretreater.	
N-3	8/15/78	8.0	-	9.6			Had Difficulties Establishing Coal Feed. Agglomerates in Pretreater, also Gasifier.	
O-1	8/22/78	55.2	50.4	105	Changed Tees In 3/4" Line to Wide Radius Bends. Lengthened O ₂ Dist. Nozzles to 6"	Changed to 50 mesh Coal. Maintained Transport Line Top Temp. at 800°F, Reduced Velocity in 3" Transport Line.	Numerous Coal Feed Outages Heavy Carryover in Gas Scrubbing Leak in 3" Transport Line Caused Shutdown.	Successfully Pretreated and Gasified Ill. No. Coal - Recovered from Numerous Coal Outages without Signs of Agglomeration. Anti-foam in Gas Scrubbing Area Improved Operation.
O-2	8/25/78	Intermittent 66.6	62.8	119			Coal Feed Outages Terminated Run by Deliberately Running out of Coal.	SAME
O-3	8/29/78	11.6	11.6	19.2			Coal Feed Outage and Hole in Char Lift Line Caused Termination.	Small Football- sized Agglo- merates in Pretreater - Massive Clinker in Gasifier.

VI. EQUIPMENT MODIFICATIONS

The equipment modifications discussed in this section were made either immediately prior to the start of Run Series 2-DB or during outages between individual runs of the Series. Only modifications of significance which were done to eliminate equipment problems and/or improve plant operations are discussed in this report. Routine maintenance work is not reported. The equipment modifications are discussed by plant sections.

VI. EQUIPMENT MODIFICATIONS - cont'd

Raw Coal Handling

The raw coal handling equipment operated smoothly during Run Series 2-DB and no equipment modifications were made.

Coal Grinding and Dry Coal Storage

The flash drying mill was modified to grind coal to a finer size required for pretreatment. The hammers in the mill were changed from T-type to bar type and the mill rotational speed was changed from the original 1500 rpm to 1400 rpm. Additional speeds of 1300, 1400, and 2100 rpm were tried during the coal grinding tests.

The vibrating screen cloth was changed from 20 mesh Toncap to 40, 50, and 28 mesh at various times to get the desired grind and to improve the screen efficiency.

A report on the various coal grinding tests was issued during January 1979 under cover of 8530-RMS-05-79.

A pipe coil was installed in the drying air heater to be used as a temporary steam superheater for coal feed to the pretreater.

Petrocarb Unit

A 1/4" x 1/4" mesh screen was installed in the weigh hopper to catch lumps of wet or frozen coal to prevent

VI. EQUIPMENT MODIFICATIONS - cont'd

Petrocarb Unit - cont'd

plugging of the downstream restrictions in the Petrocarb Unit. Blockage of the coal transport line from the Petrocarb Unit was a frequent cause of operating upsets.

Nuclear level detectors were relocated from char lock hoppers to storage injectors and the primary injector for reliable level indication.

Prior to Run 2-DB-D, a steam line from the temporary superheater was connected to the coal transport line upstream of the coal injection point to use superheated steam for coal transport. An oxygen line was connected to the coal transport line to start pretreatment in the transport line.

The coal transport line was revised prior to Run 2-DB-H. The 1-inch Sch. 80 line was changed to 3/4-inch Sch. 160 in the horizontal run and to 3-inch Sch. 80 in the vertical run. Oxygen and superheated steam were injected at the base of the 3-inch vertical line. Hot inert gas was used to transport coal in the 3/4-inch line and superheated steam was used in the 3-inch line.

The length of the 3/4-inch line was increased by 60 feet to increase the pressure drop and the Petrocarb venturi

VI. EQUIPMENT MODIFICATIONS - cont'd

Petrocarb Unit - cont'd

was eliminated since it caused plugging at the restriction. The 3/4-inch line was again revised to eliminate sharp bends. The bends were replaced with long radius pipe bends.

Pretreater

The pretreater was modified prior to its commissioning. A distributor cone with nozzles was added to the bottom head for injecting oxygen and fluidizing steam.

The coal feed line to the pretreater was changed from the bottom nozzle to one of the side nozzles with internal pipe discharging downward.

Later, the coal feed line was changed from the side nozzle to the bottom nozzle. The pretreater dump pot and piping were removed because they were not needed with the revised feed piping. Additional thermowells and pressure taps were installed in the pretreater to monitor temperature and bed density characteristics.

A thermocouple in a well was added in the 3-inch overflow line from the pretreater to the gasifier.

One of the nozzles in the pretreater was piped to draw gas samples from the vapor space of the pretreater.

VI. EQUIPMENT MODIFICATIONS - cont'd

Gasifier

The major modifications made to the gasifier were installation of a secondary oxygen distributor and increasing the diameter of the deep bed injection line from 2-inches to 3-inches.

The secondary oxygen distributor was installed for better distribution of oxygen in the active reaction zone and to lower the oxygen concentration in the relatively stagnant cone area. The distributor consists of a 2-inch steam/oxygen pipe feeding the injection nozzles on the branches. The nozzles are located 6-inches above the cone line in a horizontal plane and are evenly distributed over the cross section of the gasifier.

The steam and oxygen lines to the distributor have control valves to divide the flows between the plenum zone and the secondary distributor.

The distributor nozzles were later extended and bent towards the center to prevent channeling of oxygen to the shroud.

The 2-inch deep bed injection line was replaced with a 3-inch line to minimize erosion of the line by reducing

VI. EQUIPMENT MODIFICATIONS - cont'd

Gasifier - cont'd

the velocity in the feed line.

The boiler feed water spray nozzles were removed from the char cooler since they were not used after installation of the steam desuperheater in the char cooler steam line.

The rupture disc between the gasifier and the char cooler was removed during the runs to equalize the pressure between the two compartments for better gasifier bed level control with the slot valve.

Gas Scrubbing

The suction lines of the three circulating water pumps to the venturi scrubber and raw gas scrubber were manifolded to allow switching of the pumps between the two services.

The Benfield chemical injection pumps were repiped to inject caustic and antifoam plus flocculating chemicals to the gas scrubbing water. Caustic injection was used to control pH of the scrubber water to minimize equipment failures caused by corrosion. The antifoam and flocculating agent injection helped to settle and separate solids in the scrubber surge tank and thereby improve performance of the circulating pumps. Two waste water exchangers were added to

VI. EQUIPMENT MODIFICATIONS - cont'd

Gas Scrubbing - cont'd

cool the blowdown from the scrubber surge tank. These exchangers were required to meet additional cooling load due to process changes.

As a trial, one of the scrubber pumps was modified to reduce its speed from 3500 rpm to 1750 rpm to minimize pump failures due to casing erosion. A larger diameter impeller was installed to get the head required for the venturi scrubber loop circulation. The trial was discontinued since the pump failed to meet the required hydraulic performance.

The carbon steel packing in the raw gas scrubber replaced with stainless steel pall rings to resist deterioration caused by corrosion. Later, the packing plugged with fina char and was removed. The tower operated as an empty spray tower with no adverse effect.

High Pressure Char Slurry System and Char Filtration

The piping at the outlet of high pressure slurry tank was modified. The slurry transfer lines were connected to two separate nozzles on the conical bottom instead of a single outlet at the apex of the cone which plugged frequently

VI. EQUIPMENT MODIFICATIONS - cont'd

High Pressure Char Slurry System and Char Filtration - cont'd

due to slugs of char settling in the bottom. The carbon steel piping was replaced with stainless steel to minimize corrosion. The plug type valves were replaced by ball valves with line size bores to reduce erosion of the valves.

A sonic flow meter was installed on the char slurry line from high pressure slurry tank to measure slurry flow rate for material balance.

A char sampling system was installed on the slurry line just beneath the high pressure slurry tank for evaluating the carbon conversion based on char analysis.

The filter cloth on the char slurry filter was replaced by a heavy duty nylon cloth to reduce the number of failures due to tearing of the cloth.

The filter cake conveyor housing was steam traced to prevent mechanical problems caused by freezing of wet filter cake.

Thermal Oxidizer

Deterioration of the refractory lining of the firebox was a major problem after the new burner was installed with twice the heat release.

VI. EQUIPMENT MODIFICATIONS - cont'd

Thermal Oxidizer - cont'd

The firebox was relined with high alumina plastic refractory and later with high chrome alumina plastic refractory to withstand high temperature and slagging conditions due to calcium and magnesium in the waste water.

The tar burner was removed since it was not used.

Utilities

A condensate collection system was installed to return condensate from the steam tracers in the gas scrubbing area, methanation area, and the char filtration area.

A propane fired heater was installed to superheat high pressure steam to 1100°F required for pretreater operation. The heater burners were modified to burn propane instead of natural gas. Propane pilots and flame safeguard controls were added for safe operation.

A higher capacity propane storage tank and vaporizing facility was installed. An activated carbon filter was installed for upstream of the inert gas generators for sulphur removal. The old smaller propane tank was decommissioned and all users were supplied from new facility.

VI. EQUIPMENT MODIFICATIONS - cont'd

Utilities - cont'd

The inert gas generators were converted from #2 fuel oil to propane firing to generate inert gas free of SO₂. Also, catalytic converters were added to remove NO_x. A refrigerant dryer was added to reduce moisture content of the inert gas down to plus 40°F dewpoint.

The inline burner was converted from #2 fuel oil to propane firing to minimize piping failures caused by sour gas during gasifier/pretreater initial heating before steam injection.

The carbon dioxide system was modified to reduce the number of failures caused by corrosion due to wet gas. The knockout drum downstream of the compressor after cooler was modified to achieve better disengagement of entrained moisture.

The carbon steel CO₂ header was replaced with stainless steel piping to prevent the piping failures due to corrosion.

The carbon steel CO₂ heat exchanger was taken out of service after the nozzles, shell and tubes were severely corroded. Another exchanger with stainless steel tubes was used to cool the gas before it enters the knockout drum.

VI. EQUIPMENT MODIFICATIONS - cont'd

Pollution Control

Plant influent and effluent sampling systems were installed to monitor the quality of surface drainage water at the plant inlet and at the outlet.

The sewage treatment plant was modified by adding an automatic chlorine injection system.

A concrete salt storage facility was constructed to prevent salt water runoff to the storm sewer system.

A concrete pad was constructed to contain any oil spillage from the underground fuel oil tank.

An automatic shut off valve was added to the fuel oil transfer line to prevent siphoning of the fuel oil when the fuel oil transfer pump is turned off. An additional level switch was installed in the underground fuel oil tank to turn off the transfer pump on a high level signal.

A concrete pad with dikes was constructed at the fuel oil unloading station to contain the oil spillage. The fuel oil pump suction and discharge piping was modified to prevent accidental oil spills from the fuel oil storage tank.

The boiler blowdowns were piped to the plant deionizing equipment neutralizing pit to help to control the pH of plant effluent.

VII. EQUIPMENT FAILURE ANALYSIS

Major equipment and material failures during the Run Series 2-DB are discussed below along with the corrective actions taken. The failures are arranged by plant sections.

Coal Preparation and Feed System

The vibrating screen wire cloth in coal grinding and drying facilities developed a hole due to lack of proper support. Metal clamping strips with rubber cushions were added to support the screen. The rubber wedge inserts on the screen support deteriorated because of heat. New inserts of silicon rubber were installed.

The coal grinding drying system fan blades eroded resulting in excessive vibration and bearing failures. The fan blades and rotor were rebuilt, balanced and re-installed.

The weigh hopper ball valves in the Petrocarb Unit failed resulting in excessive gas leakage. The valve stems sheared because of the ball binding in the seats. This failure was caused by plugging of the ball seat springs with fine coal dust.

One of the ball valves in the superheated steam line to the coal feeding system leaked at the bonnet. The valve was repacked with high temperature packings.

VII. EQUIPMENT FAILURE ANALYSIS - cont'd

Pretreater and Gasifier

The pretreater overflow line to the gasifier eroded through at an elbow and wall thinning occurred at other points. The line was modified to include a capped tee fitting in place of the failed elbow.

The deep bed injection line inside the gasifier failed because of erosion. The 2-inch line was replaced with a 3-inch line to reduce the velocity.

The internal Inconel-600 purge piping in the gasifier failed because of corrosive environment inside the gasifier. The piping was replaced with Incoloy-800 material.

A section of the gasifier internal cyclone dipleg with its trickle valve became detached and was found lying in the distributor cone. An analysis showed that the failure was caused by severe sulfidation of the Inconel-600 dipleg. The dipleg was replaced with Incoloy-800 material.

The internal gasifier shroud was found buckled after the run with the new secondary oxygen distributor. The failure was caused by channeling of hot gases towards the shroud. The oxygen distributor nozzles were bent inward to keep oxygen away from the shroud.

VII. EQUIPMENT FAILURE ANALYSIS - cont'd

Pretreater and Gasifier - cont'd

There were several failures of the stainless steel type 304 material in the rupture disc and heatup piping connected to the gasifier. The failures were caused by stress corrosion cracking due to chloride or sulfur contamination. The piping components were replaced with stainless steel type 316 material and the configuration was revised to reduce the thermal stresses.

The stainless steel type 304 oxygen line to the gasifier was found pitted. The pitting was caused by contamination which migrated back from the gasifier because of a leaking check valve. Also there was one failure of the oxygen line caused by stress corrosion cracking. The failed piping was replaced.

Gas Scrubbing System

The scrubber circulating pumps had failures caused by corrosion and erosion of the casings. Also one of the pump shafts failed because of corrosion and erosion where the impeller joins the shaft. All the pump shafts were changed to stainless steel type 304 for better corrosion resistance.

VII. EQUIPMENT FAILURE ANALYSIS - cont'd

Gas Scrubbing System - cont'd

Adding antifoam and flocculating chemicals to the scrubber water helped to settle and separate the solids and thus minimize the pump corrosion problems caused by excessive amounts of circulating solids.

There were three failures in the scrubbing water piping caused by combination of corrosion and erosion. The failure occurred at the point of high velocity and change in direction. The entire piping system in scrubber water circulating service was surveyed with an ultrasonic thickness measuring instrument to check the wear. The failed piping was revised so as to reduce the velocity of the erosive fluid.

The caustic injection to the scrubbing system particularly a start up minimized the pump and piping failures caused by corrosion.

The scrubbing water heat exchanger tubes were corroded. The tube bundle material was changed from carbon steel to stainless steel type 304 for better corrosion resistance.

Char Slurry System

The char transfer line from the char cooler to the high pressure slurry tank had a failure at the steam/char mixing cross caused by erosion initiated at the gap in the socket weld fittings.

VII. EQUIPMENT FAILURE ANALYSIS - cont'd

Thermal Oxidizer

The high alumina plastic refractory Blu-Ram-HS used to repair the firebox lining failed due to combination of high temperature and slagging conditions. The failed section of the firebox was relined with high chrome alumina plastic refractory, Taylor Shamrock-888. Later the entire firebox was relined with C.E. Emerald Ram-HS refractory with similar composition to the Taylor Shamrock material. These high alumina refractories have better resistance to the slagging conditions in the thermal oxidizer. The unit was not operated at full capacity for a long enough period to evaluate performance of the new refractory material.

Utilities

The majority of equipment and piping failures in the CO₂/inert gas system were caused by corrosion of the carbon steel components. The moisture in the inert gas formed carbonic acid with CO₂ and dilute nitric and nitrous acids with NO_x. The failures caused by corrosion were: (1) the tubes, shell and nozzles of the CO₂ reheater exchanger EA-308: (2) the body of the CO₂ pressure let down control

VII. EQUIPMENT FAILURE ANALYSIS - cont'd

Utilities - cont'd

valve PCV-345: (3) the piping at PCV-345 and CO₂ supply header piping. The failed components were replaced by stainless steel type 304 material. The exchanger EA-308 was taken out of service.

The CO₂ compressors had failures of the carbon steel unloader valve internals caused by corrosion and erosion. The material of the valve parts was changed to stainless steel type 304 material. The gaskets on the unloader valves of the 3rd and 4th stage failed. The soft steel asbestos filled gaskets were changed to stainless steel type 304 asbestos filled gaskets.

One of the low pressure boilers developed leaks at the tube sheet after its operation with untreated city water. The leaks were repaired by rerolling the tubes in the tube sheets.

Concrete Failures

The concrete wall of the stilling well of the char pond collapsed. The analysis showed that the failure of the concrete wall was caused by a combination of overstress due

VII. EQUIPMENT FAILURES ANALYSIS - cont'd

Concrete Failures - cont'd

to freezing of water during previous winter, thermal shrinkage cracks due to pouring of concrete in hot weather, and lack of air entrainment in the concrete.

The stilling well was bypassed by piping its pump suction lines to the nozzles of the main pond.

Other concrete failures caused by lack of air entrainment were the foundation of low pressure CO₂ holder, the piers of the pipe bridge columns, and the drainage trench walls. The deteriorated concrete was repaired with a sealing compound.

VIII. DATA EVALUATION TECHNIQUES AND PROBLEMS

DATA PRESENTATION

The Test Directives 1 and 1-DB contained a list of parameters to be measured and/or calculated. This list applied to Test Directive No. 2-DB as well. It required accumulation of data on the operating conditions (temperatures, pressures, feed rates) of the coal feed system, pretreater, gasifier, and char cooler as well as calculations on the various gasifier and char cooler fluid bed properties. Rates and compositions of gas, liquid, and solids effluents plus carbon conversions and material balances were also required. These data were collected either directly by means of instruments or indirectly from samples which were analyzed in the laboratory.

A statistical analysis of ground and dried Illinois No. 6 coal used for the Run Series 2-DB is presented in Appendix I. Coal analysis was performed by the laboratory according to ASTM D-3176. The resultant data has been used to calculate carbon conversions and other information of significance in the evaluation of the pilot plant operation.

Figures 4 and 5 at the end of this section illustrate the locations of the key instruments used for gathering process data. The instruments used for measuring were standard commercially available units with at least a 0.5 to 1% accuracy. Reliable commercial instruments for measuring

VIII. DATA EVALUATION TECHNIQUES AND PROBLEMS

DATA PRESENTATION - cont'd

the solids flows were not available during the period of Run Series 2-DB. Efforts were made to acquire devices that measure solids flow continuously and to improve the performance and reliability of other instruments which were operated under extremely severe conditions.

Process data are presented in Appendix II and are identified by run number and corresponding steady state periods. The results of all calculations, graphical representation of the data, material balances, and other important information required to evaluate the performance of the runs are also included in Appendix II.

Figure 6 at the end of this section shows the locations from which samples were taken for laboratory analyses. The type of samples obtained from these points, the sampling methods used, and the sample point symbols are listed on Table 2.

The laboratory analyses of the samples are presented in Appendix III. The data are subdivided into groups and identified by run number and sample point symbol. It should be noted that there are two sets of data for some of the gas scrubbing area water samples. In these cases the solids contained in liquid samples were separated from the liquid by filtration and then analyzed.

VIII. DATA EVALUATION TECHNIQUES AND PROBLEMS - cont'd

DATA PRESENTATION - cont'd

Table 2

Samples for Laboratory Analysis - Runs Series 2-DB

<u>Sample Point Symbol</u>	<u>Material</u>	<u>Procedure</u>
C1	Raw Coal	Grab Sample
C1A	Raw Coal	C-1 Composite
C7	Ground Coal	Automatic Sampler
C7A	Ground Coal	C-7 Composite
G2 (2 points)	Spent Char	Grab Sample
S1	Product Gas	Bomb Sample
SC2	Product Gas	Bomb Sample
S2U	Scrubber Surge Tank Water	Grab Sample
S3	Venturi Scrubber Recycle Water	Grab Sample
S4	Raw Gas Scrubber Recycle Water	Grab Sample
S5	Blowdown, Scrubber Surge Drum	Grab Sample
P1	Pretreater Gas	Bomb Sample

Note: See Figure - 6 for location of sample points

VIII. DATA EVALUATION TECHNIQUES AND PROBLEMS - cont'd

CALCULATION PROCEDURES

A total of 7 steady state periods ranging from 1 hour and 30 minutes to 8 hours and 50 minutes were selected out of the 2-DB Run series for data analyses. The criterion used for defining steady state periods was that the gasifier temperature remains steady within $\pm 30^{\circ}\text{F}$. The following was the range of other variables during the selected steady state periods.

Fluidizing steam flow	$\pm$	5%
Oxygen flow to gasifier	$\pm$	7%

Even though the temperature criterion for the selection of steady state periods was set to be $\pm 30^{\circ}\text{F}$, some temperature spikes beyond the specified limit were accepted to increase the length of the steady state period. These spikes occurred due to a momentary variation in some other process variable. Their durations were short and their values were eliminated from the steady state calculations.

Bed height and bed density were excluded in the definition of steady state periods in order to achieve a unified definition of steady state for all runs. Fluctuations in bed

VIII. DATA EVALUATION TECHNIQUES AND PROBLEMS - cont'd

CALCULATION PROCEDURES - cont'd

height and density are discussed in other sections of this report.

Tables 3 and 4 list all 7 steady state periods, their duration, and corresponding 2-DB Run Number, together with the values of the three key variables for both the pretreater and the gasifier. A complete set of calculated values and other important data are presented in Appendix II for each steady state period.

The values shown on the process data sheets and on the graphical representations in Appendix II represent the average gasifier operating conditions for the entire duration of a steady state period. The only exception as discussed above, was the temperature, where temperature spikes were excluded.

The calculations were performed by the computer from direct instrument readings. The computer recorded data were supplemented with information from control room charts and log sheets as required.

VIII. DATA EVALUATION TECHNIQUES AND PROBLEMS - cont'd

CALCULATION PROCEDURES - cont'd

TABLE - 3

GASIFIER STEADY PERIODS OF RUN SERIES 2-DB

<u>Steady State Period No.</u>	<u>Run No. 2-DB</u>	<u>Steady State Duration (Hours)</u>	<u>Coal Feed PPH</u>	<u>Fluidizing Steam PPH</u>	<u>Oxygen Feed SCFH</u>	<u>Gasifier Bed Temperature °F</u>
1	M-1	1.7	3200	7410	12500	1484
2	M-2	1.8	3500	6640	13000	1473
3	M-2	2.7	3500	6620	10670	1480
4	O-1	7.6	4100	7130	11710	1471
5	O-1	2.0	4450	7160	11260	1455
6	O-2C	8.9	4160	6400	9390	1413
7	O-3	2.5	3740	5900	9230	1483

VIII. DATA EVALUATION TECHNIQUES AND PROBLEMS

CALCULATION PROCEDURES - cont'd

TABLE 4

PRETREATER VALUES DURING STEADY STATE PERIODS OF RUN 2-DB

<u>Steady State Period No.</u>	<u>Run No. 2-DB</u>	<u>Steady State Duration Hrs.</u>	<u>Coal Feed PPH</u>	<u>Pretreater lower Vessel Temp. OF</u>	<u>Fluidizing Steam PPH</u>	<u>← Transport Line → Steam Flow PPH</u>	<u>O₂ flow SCFH</u>
1	M-1	1.7	3200	795	1930	3080	2300
2	M-2	1.8	3500	802	3030	2720	2660
3	M-2	2.7	3500	798	2970	2700	2510
4	O-1	7.6	4100	834	2800	2540	2830
5	O-1	2.0	4450	822	2820	2550	2570
6	O-2C	8.9	4160	830	2330	2590	3090
7	O-3	2.5	3740	881	2470	2220	3120

VIII. DATA EVALUATION TECHNIQUES AND PROBLEMS

CALCULATION PROCEDURES - cont'd

Since no devices were available for the continuous measurement of solids flows, special procedures were used to calculate the coal feed rate to the gasifier and the char removal rate as accurately as possible. The unique design which combines the gasifier and char cooler in one vessel requires certain calculations which are specific to the Synthane Pilot Plant. A discussion of these calculations and the definition of some of the terms follow:

Coal Feed

The coal feed rate to the pretreater is one of the most important variables. The accuracy of its measurement affects many of the calculations which are made to evaluate the coal gasification operation. Since no device was available for measurement of the instantaneous coal feed rate, other methods were used to calculate the average rate as accurately as possible.

The coal feed rate was determined by monitoring the weight of individual coal batches over a finite period of time. The estimated error of this method is $\pm 10\%$ provided the run is of significant duration. In order to improve the accuracy, weights of the coal batches were averaged over

VIII. DATA EVALUATION TECHNIQUES AND PROBLEMS - cont'd

CALCULATION PROCEDURES - cont'd

Coal Feed - cont'd

the longest period of time during which the coal feed rate remained steady. The steadiness of the feed rate could be monitored by pressure drop readings in the coal transport line.

Attempts were also made to determine the coal feed rate by correlating some of the process variables which could be monitored accurately. One approach was based on correlating the pressure drop measured between the primary injector and the gasifier. This method was unreliable due mainly to pressure fluctuations in the system and unreliable pressure drop readings. It was, therefore, used as a guide only.

Another approach consisted of arriving at the coal feed rate by carrying out a heat balance calculation based on the mix temperature of coal, oxygen, and steam feeds. The calculations were performed by the computer and the coal feed rate was available instantaneously. However, this approach needs to be improved further, before it can be relied upon. Various sources of error in this calculation were: 1) variation in the specific heat of coal with the change in temperature, 2) variations in the composition

VIII. DATA EVALUATION TECHNIQUES AND PROBLEMS - cont'd

CALCULATION PROCEDURES - cont'd

Coal Feed - cont'd

of inert gas, 3) heat losses from the system. A complete discussion of the various techniques used for measuring the coal feed rate will be found in Section X under the Petrocarb Coal Feed System.

Char Removal from Char Cooler

The char removal rate, as presented in the process data summaries in Appendix II, was calculated from an ash balance around the gasifier. It was assumed that all of the ash entering the system with the coal feed left the system with the char which is recovered in the filtration area. This would normally be a valid representation of the combined amount of char removed in the filter area and the scrubber system, if the ash content of char and solids carried overhead were roughly equal. Operating experience has shown that at times the solids carried over to the gas scrubbing area from the gasifier had an ash content different from that of the char removed from the filters. Since the carryover rate was not measured, the calculated char removal rate for these cases may be in error. Attempts to estimate the char removal rate and the char carryover rate separately have produced inconclusive results.

VIII. DATA EVALUATION TECHNIQUES AND PROBLEMS - cont'd

CALCULATION PROCEDURES - cont'd

Standpipe Steam

Standpipe steam to the gasifier was calculated from a steam balance around the char cooler. The difference between the feed steam and the steam leaving the char cooler to the thermal oxidizer was assumed to be flowing up or down the char cooler standpipe. It was assumed in the calculations that steam neither flows into the char cooler from the char downcomer nor leaves with the char via the same downcomer to the filtration area. This assumption may, however, not be completely valid.

Superficial Velocities

The superficial velocity at the bottom of the gasifier was calculated from the total steam and gas flows which in turn were obtained by adding up, before the start of reactions, the feed steam and oxygen via the plenum and secondary oxygen distributor, the various purge and aeration flows above and below the gasifier cone line, and the standpipe steam. The gasifier bottom bed temperature was used to calculate gas densities.

The velocities at the top of the gasifier bed and at the gasifier outlet were obtained by back calculating the gasifier overhead gas and steam flow rates at the appropriate

VIII. DATA EVALUATION TECHNIQUES AND PROBLEMS - cont'd

CALCULATION PROCEDURES - cont'd

Superficial Velocities - cont'd

temperature and vessel geometry from the product gas and the waste water flow rates leaving the gas scrubbing area. The mid-bed velocity is the average of the top and bottom bed velocities.

Carbon Conversions

Carbon conversions were calculated by two different methods. The first method is based on an ash balance between the coal feed and char produced and assumes that all of the ash entering the gasifier with the coal feed undergoes no change and is removed completely with the char in the filtration area.

The second method is based on a carbon balance between the various gasifier inlet streams and the product gas make.

A third method is based on a nitrogen balance between the inlet and outlet gas analyses. This balance became possible after April 1978 when inert gas was employed as the coal transport gas instead of pure carbon dioxide. Since nitrogen is not a product of the reaction it can be used as a tracer. However, due to variation in the inert gas composition and the relatively low concentration of nitrogen in the

VIII. DATA EVALUATION TECHNIQUES AND PROBLEMS - cont'd

CALCULATION PROCEDURES - cont'd

Carbon Conversions - cont'd

product gas a good nitrogen balance could not be achieved. Hence the procedure was not adopted.

Equivalent Methane

The equivalent methane production rates were calculated by assuming that all of the hydrocarbons higher than methane found in the product gas are in theory hydrogenated and converted into methane. The theoretical amount of methane was then added to the actual amount of methane produced in the gasifier. The sum is the equivalent methane production rate.

Ultimate Methane

The ultimate methane production rate is the equivalent methane production rate plus the theoretical amount of methane which can be produced from the remaining carbon monoxide and hydrogen after shift conversion.

Useful Gas

Useful gas is defined as the sum of all constituents of the product gas with a heating value.

VIII. DATA EVALUATION TECHNIQUES AND PROBLEMS

EVALUATION PROBLEMS

In Section IX the Run Series 2-DB is evaluated technically. The effect of the operating conditions in the gasifier on coal conversion, product gas composition, and yields is analyzed. In order to discuss these effects in proper perspective, it is necessary to review the methods which were used in the technical evaluation process and to point out the limitations of the measurements which were made with the available instrumentation.

Waste Water Flow

The flow meter which measures the recovered waste water in the gas scrubbing area performed poorly during the entire Run Series. In addition, frequent unmeasured blowdowns from the gas scrubber system to prevent solids accumulation made accurate measurements of waste water flow rates even more difficult. The pump seal water flow rate in the gas scrubbing area was erratic and often not measured. These inaccuracies adversely affected water balance calculations. Therefore, steam decompositions calculated from water balances were not very reliable. The waste water flow measurements also affect the calculation of gas flows in the gasifier, and thereby the superficial velocities at the mid-bed and the top of the gasifier.

VIII. DATA EVALUATION TECHNIQUES AND PROBLEMS - cont'd

EVALUATION PROBLEMS - cont'd

Char Cooler Steam Flow

The operation of the flow meter which measures the steam leaving the char cooler improved over Run Series 2-DB, but was still erratic at times. Readings of this flow meter affect the amount of steam calculated to be flowing up or down the gasifier/char cooler standpipe. This, in turn, affects the calculated superficial velocity at the bottom of the gasifier. It is estimated that the standpipe steam can alter the superficial velocity by as much as 15%. The char cooler steam flow measurements also affect calculations of steam to coal ratios and steam decomposition.

No procedure could be developed to determine the quantity of steam leaving the char cooler through the char withdrawal line. This remained a potential source of error in the calculations involving char cooler steam.

Product Gas Flow

The flow meters which measure the raw gas flow from the gas scrubbing area fluctuated approximately $\pm 15\%$. It has been difficult to estimate quantitatively the effect of the fluctuations on the accuracy of such calculations as carbon conversion on a gas basis, equivalent methane produced, and

VIII. DATA EVALUATION TECHNIQUES AND PROBLEMS - cont'd

EVALUATION PROBLEMS - cont'd

Product Gas Flow - cont'd

useful gas yield.

In addition, at times, the actual temperature of the product gas flowing through this instrument was considerably different from that at which it was calibrated.

However, the readings of this meter were compensated based on the actual temperature indication. The computer employed these corrected values for making other calculations

Bed Height and Bed Density

The gasifier bed height and bed density were obtained by measuring the pressure drop through the entire bed and a section of the bed. The reliability of the instruments for these measurements was greatly improved during the latter part of the Run Series 1-DB and subsequently functioned well.

Carbon Conversions

The carbon conversions which were calculated from gas analysis data were corrected for inert gas entering the gasifier via the Petrocarb primary injector, coal transport line, and various purges and aeration taps. While the gas

VIII. DATA EVALUATION TECHNIQUES AND PROBLEMS - cont'd

EVALUATION PROBLEMS - cont'd

Carbon Conversions - cont'd

entering the coal transport line is directly measured by an orifice meter, the gasifier purge and aeration gas flows are measured by rotameters that are less accurate. The gas entering the gasifier via the Petrocarb primary injector has probably the greatest influence of all inert gas streams entering the gasifier on the accuracy of carbon conversion calculations. This quantity is not measured directly. It is assumed for calculation purposes that all the gas entering the primary injector, as measured by an orifice meter, minus the gas leaving the primary injector through the vent measured by another orifice meter, ultimately flows into the gasifier. Neglecting to correct for this quantity can increase the calculated carbon conversion from gas analysis by as much as 10 percent.

In calculating the carbon conversion from the char sample analyses, the assumption was made that no char or ash is entrained from the gasifier to the scrubbing area. However, during all of the Run Series 2-DB entrainment of solids to the scrubbing area persisted to some degree. Under these conditions, the carbon conversions calculated for those steady state periods for which the ultimate analysis

VIII. DATA EVALUATION TECHNIQUES AND PROBLEMS - cont'd

EVALUATION PROBLEMS - cont'd

Carbon Conversions - cont'd

of the char and the entrained solids are identical or about identical are valid.

The previous practice of taking char samples from the char filters was discontinued during later part of Run series 2-DB. Instead, samples were taken from the new sampling point installed at the bottom of char slurry tank. Now char samples taken at a specific time more correctly represent the current conditions in the gasifier.

Steam Decomposition

Both water balance and hydrogen balance methods were used for determining the percentage of the combined steam feed to the gasifier and pretreater converted to gas. The results are included in Appendix II.

The inaccuracy introduced in the water balance due to difficulties in measuring the waste water flow was discussed earlier in this section. When compared to the Montana Rosebud Coal Run Series 1-DB, the hydrogen balance method also turned out to be unreliable for the Run series 2-DB. This may be attributed to the entrainment of fines with low

VIII. DATA EVALUATION TECHNIQUES AND PROBLEMS - cont'd

EVALUATION PROBLEMS - cont'd

Steam Decomposition - cont'd

carbon conversion from the gasifier. The quantity of fines carried over to the gas scrubbing system is not measured and therefore, the amount of hydrogen removed from the gasifier with the fines is not taken into account in the steam decomposition calculation by a hydrogen balance. Most of the Rosebud coal runs exhibited very little difference in carbon conversion between the char removed from the filter area and the fines removed from the scrubbers. On the other hand, during Run Series 2-DB the fines from the scrubbing system had low carbon conversion while the char had high conversion. Thus, not taking the hydrogen content of the fines into account in the calculation, resulted in low and sometimes negative calculated steam decompositions.

Figure 4 Synthane Pilot Plant Instrumentation - RUN SERIES 2-DB

Figure 5. Location of Thermocouples in Synthane Gasifier - RUN SERIES 2-DB

Figure 6. LOCATION OF SAMPLE POINTS - RUN SERIES 2-DB

IX. DISCUSSION OF OPERATING RESULTS

EFFECT OF PROCESS CONDITIONS ON OPERATING RESULTS

This section discusses the effect of such process operating conditions as bed height, space velocity, steam to feed coal ratio, and temperature on carbon conversion, steam decomposition, product gas composition, product gas yields, and waste water analysis.

Attempts are made to correlate the operating variables in a meaningful way. The quantity of the available data were insufficient for the development of definitive correlations between the key variables to construct a mathematical model with statistical significance and reliability.

The effects of selected process conditions on important operating results are shown in Figures 7 to 15 located at the end of this section. In the absence of established functional relationships between the various parameters, no lines have been drawn through the data points.

Effect of Bed Height and Space Velocity

The height of the fluidized bed in the gasifier is proportional to the contact time between gaseous reactants and coal. However, as discussed later in this report, specific bed heights were not always obtainable or controllable.

IX. DISCUSSION OF OPERATING RESULTS - cont'd

EFFECT OF PROCESS CONDITIONS ON OPERATING RESULTS - cont'd

Effect of Bed Height and Space Velocity - cont'd

Therefore, it was decided to attempt to correlate the space velocity, which is also a function of the contact time between the gas and carbon in the fluid bed, to the effluent gas composition. The results for Run Series 2-DB with Illinois No. 6 coal for carbon monoxide and methane are shown on Figure-7 and are similar to the results obtained with Montana Rosebud Coal (See Figure-7 Run Report No. 1-DB). The figure suggests that under the operating conditions prevailing when the data were taken chemical equilibrium is being approached in the reactions taking place in the gasifier.

If the system is controlled by the rate of chemical reaction a variation in the gas composition, steam decomposition, and carbon conversion with space velocity should be expected. Study of the variation of the hydrogen concentration, the steam decomposition, and the carbon conversion with space velocity was inconclusive. Therefore it is not reported here. The discussions in this section will be based on the assumption that equilibrium is reached, realizing it may be a pseudo condition only.

IX. DISCUSSION OF OPERATING RESULTS - cont'd

EFFECT OF PROCESS CONDITIONS ON OPERATING RESULTS - cont'd

Effect of Feed Steam to Feed Coal Ratio

All the steam entering the gasifier was considered to take part in gasification reactions. This includes the steam entering the gasifier plenum, the pretreater, various purges, and steam calculated as standpipe steam. Figures-8 to 13 show the effect of varying the steam to feed coal ratio on such operating results as gas composition, gas yield, and carbon conversion for the steady state periods. The gasifier bed temperatures for these steady state periods varied between 1413°F and 1484°F. This condition is shown on the Figures as $1450 \pm 40^\circ\text{F}$.

The Figures indicate that the hydrogen and the carbon monoxide concentrations (Figures-8 & 9) in the product gas increase with the steam to feed coal ratio, whereas the hydrogen to carbon monoxide ratio (Figure-10) may be interpreted as decreasing. This trend is different from that observed in Montana Rosebud Coal Run Series 1-DB where the hydrogen to carbon monoxide ratio increased and the carbon monoxide

IX. DISCUSSION OF OPERATING RESULTS - cont'd

EFFECT OF PROCESS CONDITIONS ON OPERATING RESULTS - cont'd

Effect of Feed Steam to Feed Coal Ratio - cont'd

concentration decreased with increasing steam to feed coal ratio.

Figure-9 shows the methane concentration as essentially constant with increasing steam to feed coal ratio. However, as discussed in Run Report 1-DB, the methane concentration in the product gas for Rosebud Coal, when plotted versus temperature, goes through a maximum at about 1,400°F. It is, therefore, probable that the real trend for Figure-9 is towards decreasing methane concentration as observed with Montana Rosebud Coal.

Total raw gas yield, useful gas yield, ultimate methane yield, equivalent methane yield, and carbon conversion by char analysis and gas analysis are found to increase with increasing steam to feed coal ratio (Figures-11, 12 and 13) in the range of data collected. The trends, except for carbon conversions (Figure-13), appear to be exponential rather than linear. The suggested exponential trends are also supported by the data from the Rosebud Coal Runs as shown in the following excerpt from Run Report 1-DB, page 82.

IX. DISCUSSION OF OPERATING RESULTS - cont'd

EFFECT OF PROCESS CONDITIONS ON OPERATING RESULTS - cont'd

Effect of Feed Steam to Feed Coal Ratio - cont'd

"Equivalent methane yield is the summation of all hydrocarbons in the raw gas expressed in terms of methane. Considering that hydrocarbons other than methane are only a very small percentage of the gas, equivalent methane yield in essence represents the product of the methane concentration and the raw gas yield. Examination of Figures-11 and 12 shows that these two variables have opposite trends with increasing steam to coal ratio. Moreover, it is expected that the actual dependence of raw gas yield on the steam to coal ratio is exponential even though straight lines have been drawn in the figures. Thus, initially, the raw gas yield increases rapidly with increasing steam to coal ratio but at higher steam to coal ratios, the effect is less pronounced to insignificant. The methane concentration may be expected to behave in a similar manner but with an opposite (negative) slope. The product of these two variables is, therefore, dependent on the relative slopes of the plots of these variables against the steam to coal ratio and may exhibit an inflection point which is anticipated to be a maximum. In fact, the data points in Figure-17 appear to fit a curve with a maximum better than a straight line or any other type of curve."

From the quoted material above one would expect the equivalent methane yield (Figure-12) to show a maximum. Since the variation in methane concentration is small in the range of the data collected, the inflection point is not obvious and the trend appears to be exponential.

The variation in bed temperatures during the steady state periods were small and within the error limits of the individual steady state temperatures themselves. Therefore

IX. DISCUSSION OF OPERATING RESULTS - cont'd

EFFECT OF PROCESS CONDITIONS ON OPERATING RESULTS - cont'd

Effect of Feed Steam to Feed Coal Ratio - cont'd

no attempts to correlate the operating results with temperature were made as was done in Run Report No. 1-DB on Figures-19 to 30.

Effect of Deep Bed Coal Feed Injection

During Run Series 1-DB with Montana Rosebud Coal, the advantages of "deep bed" injection of the coal into the gasifier were found to be considerably lower phenol content and chemical oxygen demand (COD) in the gas scrubber area waste water. Data for the direct comparison of the advantages of "deep bed" injection coal feed over "free fall" injection of coal feed with Illinois No. 6 coal do not exist. However, comparison of the gas scrubber area waste water analysis from run 2-DB-O with data from Run Series No. 1 and No. 1-DB indicates that the same advantages exist for Illinois No. 6 coal. Such a comparison is shown in Figures-14 and 15. It is expected that as the gasifier operating temperature increases further decreases in phenol and COD contents will be found.

IX. DISCUSSION OF OPERATING RESULTS - cont'd

MATERIAL BALANCE

Elemental and overall material balances are presented in Appendix II for each of the defined steady state periods during Run Series 2-DB. Closure of the balances is satisfactory in many cases. The overall closure of 4 of the 7 steady state periods is within 82 to 90 percent. The results, however, must be interpreted carefully. Insufficient and, in some instances, inadequate instrumentation made certain assumptions and estimations necessary in determining many of the flow rates. The following areas are sources of potential errors:

- 1) Coal Feed Rate - No direct measurement of instantaneous coal feed rate.
- 2) Steam and CO₂ Purges - Measurement by rotameters for the earlier runs made estimation of average flow rates necessary. Although flow transmitters were installed later, flow rates in excess of the transmitter ranges again required average flow rates to be estimated.
- 3) CO₂ from the Primary Injector - No direct measurement is possible in existing plant. It is assumed that any CO₂ fed to the primary injector and not vented directly to atmosphere is transferred to the

IX. DISCUSSION OF OPERATING RESULTS - cont'd

MATERIAL BALANCE - cont'd

- 3) CO₂ from the primary Injector - cont'd
gasifier with the coal feed. However, it is certain some of the pressurizing gas to the Primary Injector is vented via the Storage Injectors.
- 4) Boiler Feed Water Instrument and Pump Seal Purges -
Measurement by rotameters only required estimation of average flows for the material balances.
- 5) Carry-over - No direct measurement is possible in the existing plant. Carry-over to the gas scrubbing area is assumed to be zero. This may be a single largest source of error for the Run Series 2-DB with Illinois No. 6 coal. The greatest impact is on the carbon balance.
- 6) Char Removal Rate - No direct measurement is possible in the existing plant. The flow is calculated based on an ash balance assuming no carry-over to the gas scrubbing area.
- 7) Steam Flow from Char Cooler - Readings of the flow recorder have continued to be highly erratic and unreliable.

IX. DISCUSSION OF OPERATING RESULTS - cont'd

MATERIAL BALANCES - cont'd

- 8) Waste Water Flow - Large fluctuations in readings of the flow indicator and unmeasured blowdowns from the scrubber surge tank have made the waste water flow measurement a significant source of error in both process calculations and material balances.
- 9) Raw Gas Scrubber Effluent - Occasional problems with the flow recorder and its compensating instruments, such as excessive water content of the raw gas or malfunctioning thermocouples, have resulted in a source of error for some of the steady state period calculations.

The relative contribution of errors to the material balance of each of the above areas varied from one steady state period to another. In some cases, unreliable measurements may have compensated each other to yield a satisfactory overall closure. The validity of the material balance may be judged by examining the individual components of the balances. In many cases the balances are satisfactory.

FIG. 7 EFFECT OF SPACE VELOCITY ON METHANE & CO CONCENTRATION
AT 1450° ± 40° F

FIG.8 EFFECT OF STEAM/COAL RATIO ON H₂ CONCENTRATION
AT 1450° ± 40°F

FIG. 9 EFFECT OF STEAM / COAL RATIO ON CO AND CH₄

CONCENTRATION AT 1450° ± 40° F

FIG.10 EFFECT OF STEAM/COAL RATIO ON H_2/CO RATIO AT $1450^\circ \pm 40^\circ F$

FIG.11 EFFECT OF STEAM/COAL RATIO ON GAS YIELDS AT $1450^\circ \pm 40^\circ F$

FIG.12 EFFECT OF STEAM / COAL RATIO ON METHANE YIELDS AT $1450^{\circ} \pm 40^{\circ} \text{F}$

FIG.13 EFFECT OF STEAM / COAL RATIO ON CARBON CONVERSION

PHENOL, mg/liter

COD, mg/liter

Figure 15 Effect of Operating Mode on Chemical Oxygen Demand for Scrubber Surge Tank Water

X. DISCUSSION OF OPERATING CHARACTERISTICS

INTRODUCTION

Run Series 2-DB consisted of forty-seven runs most of which were terminated by agglomeration in the Pretreater. The longest run was 2-DB-O which lasted for a total of 202 hours. This run served to demonstrate that on-line pretreatment and gasification of Illinois No. 6 coal at high pressure is feasible. The general operability of the Synthane Pilot Plant is good and has been improved significantly since Run Series 1 and 1-DB with Montana Rosebud Coal. Specifically, it has been demonstrated that "deep bed injection" of pretreated Illinois #6 coal into a hot fluidized bed without agglomeration in and plugging of the deep bed injection pipe is possible. Control of the gasifier bed height has also improved.

Despite the success of run 2-DB-O, certain operating problems have persisted. The main causes of these problems can be attributed to the following:

- 1) Erratic operation of the Petrocarb coal feed system.
- 2) Difficulty in controlling the gasifier/char cooler standpipe operating mode due to the unique design of combining the gasifier and char cooler in one vessel.

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

INTRODUCTION - cont'd

- 3) Excessive carryover of fines from the gasifier to the gas scrubbing system.
- 4) Clinker formation in the gasifier.
- 5) Agglomeration of coal in the pretreater. This agglomerating tendency significantly decreased during Run Series 2-DB-O.

In order to find solutions to the above five problems, C-E Lummus undertook systematic studies of the process and the design of the Synthane Pilot Plant. The results of these studies are summarized in this section.

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

PETROCARB COAL FEED SYSTEM

In a little more than two years operation of the Synthane Pilot Plant, two different coals were fed to the gasifier. The first coal was Montana Rosebud non-caking coal. The second coal was mildly caking Illinois No. 6 coal.

During the first phase of the operation (Run Series 1 and 1-DB) cold CO₂ was used to transport coal to the gasifier through a 1-inch Sch. 80 stainless steel line. The pretreater was bypassed. Reasonably steady coal flows and long operating periods were frequently observed. The coal feed rate was measured by time averaging the weight of the coal batches. Although steady coal feed rates were maintained, good control of changes in the coal feed rate was difficult to achieve.

During the second phase of operation, changes were made in the transport line in an effort to reduce agglomeration in the pretreater. In the final feed line configuration coal from the primary injector was transported by hot inert gas only through a 3/4-inch Sch. 160 horizontal line, and by hot inert gas, superheated steam, and oxygen in a 3-inch Sch. 80 line at a right angle to the 3/4-inch line.

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

PETROCARB COAL FEED SYSTEM - cont'd

The Illinois No. 6 coal runs were generally of short duration with the exception of Run 2-DB-0. As a result, estimating the coal feed rate became a major problem throughout this run series. There were five different methods used in estimating the coal feed rate. They are: 1) time averaging the weight of the coal dumps from the Petrocarb weigh feed hopper; 2) transport line pressure drop, 3) pressure drop across a venturi in the coal feed line exiting the Petrocarb Primary Injector; 4) a heat balance on the transport line; and 5) O₂ consumption in the pretreater. All these methods appear to be applicable but additional data will be required to establish the accuracy of as well as the reliability of each method.

Perhaps the major operating problem with the Petrocarb coal feed system has been due to the plugging of the transport line with wet coal lumps, unground coal, or foreign objects. The performance of the system will be greatly improved if plugging can be avoided.

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

GASIFIER-CHAR COOLER STANDPIPE OPERATION

Control of the gasifier fluid bed height during Run Series 2-DB was maintained by manipulating the gasifier/char cooler differential pressure and the standpipe slot valve. This method of operation showed considerable improvement over the method of varying the gasifier/char cooler differential pressure and the char cooler bed height which was used during Run Series 1 and 1-DB.

One of the reasons for the improved control on the gasifier bed height was the deliberate attempt to operate the gasifier/char cooler standpipe essentially free of externally imposed aeration. Aeration of the standpipe due to the flow of steam from the char cooler to the gasifier (because of higher pressure in the char cooler) was minimized by carefully balancing the steam flow into and out of the char cooler. Strategic positioning of the slot valve and close control of the gasifier/char cooler differential pressure were required.

As a result of the change in the operating procedure, the gasifier bed density remained around 7 to 10 pounds per cubic feet with minus 50 U.S. mesh coal feed particle size. In comparison, during the run series 1-DB with Montana

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

GASIFIER CHAR COOLER STANDPIPE OPERATION - cont'd

Rosebud coal, densities as low as 4 pounds per cubic foot with minus 20 U.S. mesh coal feed particle size were experienced.

Despite the improved operation of the standpipe, the plant was unable to achieve gasifier bed level control over the range desired. The tendency of the gasifier was to find its own level (15 to 20 feet) and remain fixed.

Attempts were made to determine the flow pattern (fluidized or moving bed flow) of the solids in the standpipe by pressure drop measurements along the standpipe. Figure-16 at the end of this section exhibits the observed pressure profile for Run 2 DB-O. The results were inconclusive insofar as being able to determine the solids flow pattern.

In general gas and solids flow concurrently in a standpipe in a downward direction. A valve or constriction is usually located at the bottom of the standpipe. The pressure at the top of the standpipe and below the valve are fixed so that the valve is less than 30 to 40% open for controllability.

In the Synthane Pilot Plant cooling steam is admitted to the bottom of the char cooler and exits via the gasifier/char cooler differential pressure control valve.

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

GASIFIER CHAR COOLER STANDPIPE OPERATION - cont'd

In addition steam is used to convey the char discharging from the bottom of the char cooler through a slide valve to the high pressure slurry tank. The slide valve was originally designed to control the char cooler level. Slide valve operation proved faulty and it was left in a fully open position without causing any char cooling problems. The differential pressure between the high pressure slurry tank and the char cooler is also a controlled variable.

It is postulated that using two differential pressure controllers (gasifier/char cooler and char cooler/high pressure slurry tank) plus the slot valve to control the gasifier bed level was too complicated, and the system could not be tuned fine enough to prevent gas movement up and down the standpipe. Indeed, flow meters on the char cooler inlet and exit steam did give indications of gas flow up the standpipe.

Gas flow up the standpipe would certainly change the solids flow pattern and rate leading to bed level fluctuations and an inability to control the gasifier bed levels. This meant that meaningful gasifier reaction rate data could not

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

GASIFIER CHAR COOLER STANDPIPE OPERATION - cont'd

be obtained, and approach to thermodynamic equilibrium studies could not proceed.

Further study of the standpipe is necessary as well as study on whether the existing char cooler is required in a Synthane Plant.

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

SOLIDS ENTRAINMENT FROM GASIFIER

The Run Series 2-DB was characterized by carry-over of fines from the gasifier to the gas scrubbing system. The effect of the fines on the operation of the scrubbing system is discussed later in this section.

The reasons for the occasional heavy carry-over of solids was attributed to inadequate operation of the internal cyclone. A review of available literature (API-Report Reference 5 in Appendix I) on cyclone design suggests that there is essentially no upper limit to a cyclone's solids handling capacity. The inference made from this literature survey is that the limiting factor on the cyclone solids handling capacity is the design and operation of the cyclone dipleg.

Differential pressure instruments were installed on the cyclone dipleg and across the cyclone itself. Data from runs 2-DB-J, K, M, and O were used in the analyses. Data were selected based on two principles: (1) steadiness of the gasifier operation and (2) at least 2 hours of relatively stable gasifier and cyclone dipleg operation. The results are summarized on Table-5 at the end of this discussion. Based on this data it is concluded that means for increasing the cyclone dipleg density should be found.

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

SOLIDS ENTRAINMENT FROM GASIFIER - cont'd

The dipleg differential pressure was recorded on PDR-2256 which covers the bottom 17 foot section of the dipleg (the dipleg length is about 56 feet). The dipleg density calculation and subsequent evaluation was done by assuming the density is homogeneous throughout the leg. This may not be true. However, there are insufficient differential pressure cells to give enough information at this time.

The cyclone can return fines only when the static head of solids in the dipleg can overcome the cyclone differential pressure plus the static head due to the submergence of the dipleg in the gasifier fluid bed. The dipleg height required is calculated based on this required static head and the density calculated from PDR-2256.

Two out of the seven selected run periods appeared to have the required dipleg height to return fines. They are the earliest runs, namely J-3 and K-2. They had considerably higher dipleg density than other runs. The reason for the higher density is not known. There are many factors such as the purge gas rate, the proper sealing of the trickle valve at the bottom of the cyclone dipleg, the standpipe operation, etc., that effect the cyclone dipleg operation. Sufficient information is not available at this time to delineate the

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

SOLIDS ENTRAINMENT FROM GASIFIER - cont'd

effect of these variables on the dipleg operation.

No correlation between the gasifier bed density and dipleg density could be found. The data presented on Table-5 show that the gasifier bed density can be higher or lower than the dipleg density. Before means can be found to control the dipleg density, such that it is always high enough to overcome the cyclone differential pressure plus the submergence of the dipleg in the gasifier fluid bed, extension of the dipleg deeper into the gasifier fluid bed will not resolve the cyclone operational problem. Extension of the cyclone dipleg into the gasifier fluid bed merely increases its submergence causing an increase in the required dipleg height above the top of the fluid bed to overcome the increased submergence.

A careful systematic study of the effect of dipleg purge rates, and the influence of the leakage of steam and gas from the gasifier past the dipleg trickle valve on the dipleg density, and re-entrainment of solids from the dipleg should be undertaken.

Installation of an ejector for positive discharge of solids from the cyclone should be explored.

TABLE-5
CYCLONE DIPLEG OPERATING CONDITIONS

Operating Variable Run	Gasifier Height FT (1)	Gasifier Bed Density LB/FT ³ (2)	Cyclone Δ P PDR-2220 PSI	Dipleg Δ P PDR-2256 PSI (3)	Dipleg Density LB/FT ³	S.P.R. in Dipleg PSI (4)	Dipleg Height Required FT	Dipleg Height Available FT
2-DB-J-3	15.3	6.43	3.28	1.58	12.99	3.96	43.9	56.0
2-DB-K-2	10.0	10.00	2.07	1.37	11.60	2.77	34.4	56.0
2-DB-M-1	23.6	6.91	2.72	0.90	7.59	3.85	73.1	56.0
2-DB-O-1	14.5	8.70	2.88	0.92	7.79	3.76	69.5	56.0
2-DB-O-2B	17.0	8.95	2.12	0.86	7.25	3.17	63.0	56.0
2-DB-O-2C	15.8	10.33	2.65	0.95	8.07	3.78	67.4	56.0
2-DB-O-3	18.1	7.68	2.11	0.84	7.13	3.07	62.0	56.0

Notes:

1. Bed height above dipleg trickle valve which is 4 feet above the cone line.
2. Bed density is calculated based on PDR-2237 (gasifier bottom 12 feet P).
3. Dipleg P is calculated based on PDR-2256 which records the bottom 17 foot section of the dipleg.
4. S.P.R. = Static Pressure Head Required; this is the algebraic sum of the cyclone P and the gasifier bed static head.

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

FINES IN THE GAS SCRUBBING AREA

Depending upon the superficial velocity in the gasifier, at any particular moment, certain size coal/char particles are entrained and carried out of the gasifier with the raw gas. An analysis of the solids accumulated in the scrubber surge tank indicated that these particles were relatively less converted when compared to the char particles obtained from the char cooler. This implies that the carbon conversion calculated on the basis of a char analysis was slightly higher than the actual conversion. It was assumed in these calculations that the analysis of the char recovered from the filters was representative of the total char leaving the system.

The entrainment of char fines from the gasifier created several problems in the gas scrubbing area primarily in the form of plugged lines, cavitation of the area circulating water pumps, and fouling of heat exchange equipment. Frequent blowdown and flushing of the scrubber surge tank (the principle area of fines accumulations) failed to improve the situation. Observation of the system indicated that it contained particles some of which were floating on, while others were sinking in, the scrubber water. The scrubber surge tank water was also suspected to be foaming.

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

FINES IN THE GAS SCRUBBING AREA - cont'd

Addition of a flocculant and an antifoam agent maintained the solids in a more uniform suspension in the circulating water. It was then possible to blow down the accumulated solids from the system. The performance of the circulating water pumps improved considerably. Erosion of the pump impellers and shaft seals experienced earlier was also reduced significantly.

Fouling of the heat exchange equipment was in areas of low liquid velocity. It was manifested by a gradual fouling of heat transfer surface followed by a gradual rise in the raw gas scrubber effluent temperature and an increase of water condensation in downstream equipment.

GAS SCRUBBING WASTE WATER FLOW MEASUREMENTS

The flow meter (FI-255) which measured the recovered waste water in the scrubber surge tank continued to perform poorly during the Run Series 2-DB. The problem was caused by the excessive fluctuations in the flow of waste water from the scrubber surge tank. Frequent unmeasured blowdowns from the surge tank to prevent solids accumulations complicated the matter further.

The fluctuations in the water flow from the scrubber

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

GAS SCRUBBING WASTE WATER FLOW MEASUREMENTS - cont'd

surge tank were due to difficulties in fine tuning the tank level controller plus solids plugging of instrument. When the level control valve was fully open, the waste water coolers had to perform a much higher duty than design. These exchangers were replaced with larger units. The smaller units were then used for cooling the blow down thereby avoiding steam flashing in the waste water receiver.

To account for the unmeasured quantity of blowdown it was necessary to rely on the flow indication on the waste water discharge line from the waste water receiver. A level controller to maintain a constant waste water receiver level was installed. However, due to the nature of the system, the controller operated as an on-off controller. Improvements in the form of a flow override on the level controller were designed but were not installed when the 2-DB Run Series was terminated.

In summary it may be said the problems with gasifier fines carry-over to the gas scrubbing area was tolerated. Improvement in the gasifier internal cyclone must be addressed. High liquid level operation in all three

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

GAS SCRUBBING WASTE WATER FLOW MEASUREMENTS - cont'd

compartments of the scrubber surge tank helped to alleviate pump cavitation. Higher scrubber surge drum elevation is required on the circulating pumps to increase their NPSH and potential degassing in the pump suction.

Low tar and oil production from the gasifier indicates little need for the existing decanter which was blinded off after Run 2 DB-O.

The pall ring packed section of the raw gas scrubber was removed, and the oil wash trays at the top of the scrubber were not required. These two factors plus decanter removal will be a capital cost saving on the entire gas scrubbing area.

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

GASIFIER OPERATION AND CLINKER FORMATION

Clinker formation is the fusion of coal/char particles at high temperatures. This implies a lack of heat transfer from a hot oxygen rich zone to a cooler oxygen poor zone at rates sufficient to prevent temperatures above that of clinker formation in the oxygen zone. Heat transfer in fluidized beds is a function of the factors discussed below.

1) Oxygen concentration in the distribution nozzle

Assuming a combustion zone in the bed, the temperature of this zone is determined by the rate of transfer of solids, steam, and other gases into and out of this zone. Increasing the solids circulation through this zone will obviously permit lowering the steam rate. This is shown schematically on Figures-17 and 18 at the end of this section for an equilibrium temperature of 2000°F in the combustion zone and 1700°F for the solids outside the combustion zone.

2) Superficial Velocity

Increasing the gas and/or steam superficial velocity increases the solids circulation in a fluidized bed. It can be shown by calculation that the solids flow across a horizontal plane in the

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

GASIFIER OPERATION AND CLINKER FORMATION - cont'd

2) Superficial Velocity - cont'd

36-inch diameter Synthane Pilot Plant gasifier increases from about 1000 lbs/hr to about 2000 lbs/hr when the superficial velocity is raised from 0.5 FPS to 1 FPS. However, this circulation rate does not represent the solids interchange rate between the combustion zone and the cooler oxygen-poor region. This latter rate depends on the geometry of oxygen injection into the bed and is discussed in Item Number 6 below. More importantly, higher superficial velocities have a dilution effect on the system in the sense that the voidage increases with increasing superficial velocity. In other words, injecting oxygen into a highly dispersed bed will minimize the chances of the hot particles colliding with each other to form a clinker. This will be most effective in the pneumatic transport velocity regions.

3) Solids flow rate

Increasing the solids flow rate through the

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

GASIFIER OPERATION AND CLINKER FORMATION - cont'd

3) Solids flow rate - cont'd

combustion zone will decrease the equilibrium temperature in this zone. This will in turn allow operation with a higher oxygen concentration in this zone as discussed under Item Number 1 above. The solids circulation rate depends on the geometry of the oxygen distribution system.

4) Bed Temperature

When oxygen is injected into the fluidized bed or the cone distributor area of the gasifier, the temperature of the solids and gas entering the combustion zone increases with increasing gasifier bed temperature. In order to maintain the combustion zone below the clinkering temperature, the mass transfer into and out of the combustion zone must be increased. Higher bed temperature promotes steam-carbon reactions and increases carbon conversion.

5) Heat Flux

The temperature of the combustion zone increases with increasing heat release within the zone. It decreases with increasing steam flow and solids

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

GASIFIER OPERATION AND CLINKER FORMATION - cont'd

5) Heat Flux - cont'd

circulation rates. When the solids circulation rate is constant, lowering the heat release in the combustion zone will permit a higher oxygen to steam ratio. Thus the heat release in each combustion zone (or the heat flux) should be minimized. In other words, the oxygen should be distributed over a large volume of the bed to maximize the oxygen to steam ratio.

6) Geometry of oxygen injection nozzles

The oxygen must be injected into the gasifier so as to permit high oxygen to steam ratios yet low steam to coal ratios (for economics) while maintaining 1700°F to 1800°F average temperature in the gasifier. From the foregoing discussion, it is evident that the oxygen system should be designed to provide maximum flow of solids through the combustion zone. Four different geometries are considered below.

a) Oxygen injection into "deep bed" coal injection pipe

In this case the solids are in a highly

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

GASIFIER OPERATION AND CLINKER FORMATION - cont'd

6) Geometry of oxygen injection nozzles - cont'd

a) Oxygen injection into "deep bed" coal injection pipe - cont'd

dispersed phase. Due to the high velocity of the solid particles and the high order of voidage, the average particle temperature may be permitted to rise above the clinkering temperature. This geometry provides for the flow of a large quantity of solids, equivalent to the coal feed rate, through the combustion zone. Therefore, maximum oxygen to steam ratio and minimum steam to coal ratio may be used. The bulk of the oxygen may be expected to react in the feed line itself thereby preventing further temperature rise in the gasifier bed.

b) Cone distributor

The existing distributor cone is used to promote fluidization of the gasifier bed. While it is conceivable that "dead" spots exist in any type of distributor used for initiating fluidization, the distributor

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

GASIFIER OPERATION AND CLINKER FORMATION - cont'd

6) Geometry of oxygen injection nozzles - cont'd

b) Cone distributor - cont'd

cone used in this case for initiating fluidization is believed to have "dead" spots. The two dimensional transparent model operated by PETC conclusively demonstrated the existence of "dead" spots in our distributor cone. The heat is transferred by the flow of steam and the products of combustion around the "dead" spots. Therefore, the allowable oxygen concentration in the cone area should be a minimum for the system. If all the oxygen required in the gasifier is injected via the cone, the fluidizing steam flow should be proportionately increased to maintain minimum oxygen to steam ratios. Higher oxygen flow requires greater steam dilution. The net result will be unacceptably high steam superficial velocities in the gasifier. Alternately, the steam flow can be maintained constant and the required oxygen flow may be reduced by lowering the coal throughput.

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

GASIFIER OPERATION AND CLINKER FORMATION - cont'd

6) Geometry of oxygen injection nozzles - cont'd

b) Cone distributor - cont'd

In either case, the steam to feed coal ratio will increase above 3 lbs/per lb (as received) as demonstrated during run 2-DB-G, I, and J. Also, increasing gasifier temperature will require increasing the steam to feed coal ratio to maintain the required low oxygen concentration in the steam. A typical set of operating conditions are shown on Figure-20 and Tables 6, 7, and 8 at the end of this section.

c) High velocity jet injection of oxygen into a fluidized bed

Oxygen diluted with steam may be injected as a high velocity jet into a fluidized bed. The axis of the jet may be vertical (as was the case during run 2-DB-M and 2-DB-O) or horizontal. In either case, the existence of a jet implies limited exchange of solids and steam between the bed and the interior of the jet (considered to be the combustion zone). Even though a "dead" spot is not present in

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

GASIFIER OPERATION AND CLINKER FORMATION - cont'd

6) Geometry of oxygen injection nozzles - cont'd

c) High velocity jet injection of oxygen into a fluidized bed - cont'd

this case, the lack of influx of solids into the jet restricts the oxygen to steam ratio in the injector nozzles to a value only marginally higher than that in the case of a simple cone distributor. Therefore, the discussions under Cone Distributor (item b above) are also applicable for this case. Increasing the oxygen flow through the nozzle requires increased flow of steam, and a higher steam to coal ratio. Supporting evidence for this theory can be obtained from IGT-Hygas operation. A study of their data shows that by increasing the superficial velocity in the gasifier, the Hygas gasifier (SOG bed) is able to operate at 1700°F without forming clinkers. However, when the oxygen to steam ratio in the sparger ring is higher than about 9% by volume, clinkers do form.

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

GASIFIER OPERATION AND CLINKER FORMATION - cont'd

6) Geometry of oxygen injection nozzles - cont'd

d) Low velocity injection of oxygen into a fluidized bed

When oxygen diluted with steam enters a fluidized bed at a low velocity, the eddy currents and the resulting turbulence in the bed may be expected to distribute the oxygen into the bed rapidly. In this case the oxygen stream will be further diluted by the steam and other gases already present in the bed. The heat released from the reaction of oxygen with carbon will be absorbed by a large mass of steam, gas, and char particles. Thus a distinct combustion zone may not be present. The entire bed will be at a temperature well below that for clinker formation. In order to promote mixing of the oxygen stream it should be released as small bubbles over a large volume. This will automatically minimize the heat release per unit volume and thereby reduce chances of clinker formation.

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

PRETREATMENT OPERATION

The pretreater operation is discussed in a separate report issued on January 26, 1979. Briefly, the conclusions arrived at are as follows:

- 1) Good pretreatment requires a minimum coal residence time of 4.1 minutes in a fluidized bed pretreater operating near 800°F.
- 2) Approximately 98% of the oxygen fed to the fluidized bed pretreater is consumed.
- 3) Approximately 2 to 5% of the methane formed in the gasifier is formed in the fluidized bed pretreater.
- 4) The extent of pretreatment in the transport line to the pretreater increases with increasing initial transport line oxygen concentration. This is for the range of oxygen concentrations observed.
- 5) The rate of approach to complete pretreatment in the transport line increases as the initial transport line oxygen concentration increases. This is for the range of oxygen concentrations observed.

The pretreater operation was plagued primarily by agglomeration and erratic coal feed. Although the coal feed could never be called steady, a number of mechanical and procedural changes were introduced which eventually minimized

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

PRETREATMENT OPERATION - cont'd

the problem of agglomeration in the pretreater. These changes were:

1. Increased superficial velocity in the pretreater.
2. Oxygen addition to the bottom of the transport line and removing it from the pretreater plenum zone.
3. Maintaining a temperature of about 800°F at the top of the transport line.
4. Installation of a fired heater to superheat the coal transport steam.
5. Reducing the maximum coal particle size from minus 20 U.S. mesh to minus 50 U.S. mesh.
6. Startup of the pretreater without an initial coal inventory.
7. The coal feed was introduced at the bottom of the pretreater in a vertically upward direction.

The above observations suggest that pretreatment of coal should be done primarily in the transport line. The fluidized pretreater, if necessary at all, would serve to complete the pretreatment reactions.

The following discussion of pretreating principles support the observations and suggestions above.

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

PRETREATMENT OPERATION - cont'd

1) Oxidation

The agglomerating tendencies of a caking coal can be removed by reacting the coal particles with oxygen. The minimum required contact time between the coal particle and the oxygen is a function of the temperature, the oxygen concentration, and the particle size distribution. The rate of oxidation at temperatures below the initial softening point of coal is too slow for industrial applications. Therefore, the pretreatment process must be carried out in the caking temperature range. It is difficult to operate such a system since the tolerance for fluctuations in operating conditions is small. The slightest operating error will cause agglomeration and plugging of the pretreater.

2) Pyrolysis

When a caking coal is heated from a low temperature, the particles start softening and swelling before agglomerating and solidifying. The softening and swelling characteristics increase to a maximum

X. DISCUSSION OF OPERATING CHARACTERISTICS - cont'd

PRETREATER OPERATION - cont'd

2) Pyrolysis - cont'd

with increasing temperature. On further increase of the particle temperature, the coal will resolidify. This is an irreversible process. Once a particle is heated above the resolidification point it is rendered non-caking and repeated heating and cooling will not cause the caking property to reappear. The resolidification process is extremely fast. A discussion of this phenomenon can be found in "Chemistry of Coal Utilization" edited by H. H. Lowry where on page 171 where it is stated "A better relation is found between the resolidification point and the volatile matter content. The resolidification point decreases almost linearly from 510°C to 450°C".

Specific recommendations for pretreater operation as well as mechanical changes will be found in Section XI.

FIG.16 PRESSURE PROFILE IN GASIFIER-CHAR COOLER STANDPIPE DURING RUN 2-DB-0

FIG.17 EFFECT OF OXY. TO STEAM RATIO ON CLINKERING

FIG. 18 EFFECT OF OXY TO STEAM RATIO ON CLINKERING

LEGEND

TEMPERATURE, °F

SUPERFICIAL VELOCITY, FPS

OXYGEN CONCENTRATION %

DESIGN FLOWS

FIGURE 19. LEGEND FOR FIGURES 20, 21, 22, 23 AND 24

TABLE 6 DESIGN FLOWS FOR FIGURES 20 (Section X), 21, 22, 23, and 24 (Section XI)

1) PRETREATER IN SERVICE FIG.-21, 23, & 24

STREAM	1	2	3	3	4	5	6	7	8	
MATERIAL	STEAM	O ₂	COAL	CO ₂	O ₂	STEAM	O ₂	STEAM	STEAM	
UNIT	LBS/HR	SCFH	LBS/HR	SCFH	SCFH	LBS/HR	SCFH	LBS/HR	LBS/HR	Sc
QUANTITY	2500	3302	4000	16350	6527	3560	5523	1061	0	
PSIG	610	700	610	610	610	700	700	700	700	7
TEMP. °F	1000	77	150	150	77	725	77	725	725	5

2) PRETREATER BYPASSED FIG.-22

STREAM	1	2	3	3	4	5	6	7
MATERIAL	STEAM	O ₂	COAL	CO ₂	O ₂	STEAM	O ₂	STEAM
UNIT	LBS/HR	SCFH	LBS/HR	SCFH	SCFH	LBS/HR	SCFH	LBS/HR
QUANTITY	2500	4987	4000	16350	6527	3560	3838	1061
PSIG	610	700	610	610	700	700	700	700
TEMP. °F	1000	77	150	150	77	725	77	725

3) NO MODIFICATION FIG.-20

STREAM	1	2	3	3	4	5	8	9
MATERIAL	STEAM	O ₂	COAL	CO ₂	O ₂	STEAM	STEAM	CO ₂
UNIT	LBS/HR	SCFH	LBS/HR	SCFH	SCFH	LBS/HR	LBS/HR	SCFH
QUANTITY	2500	3302	4000	16350	12050	7121	0	0
PSIG	610	700	610	610	700	700	700	750
TEMP. °F	1000	77	150	150	77	725	725	550

4) SEE TABLE-8 For Assumptions.

TABLE 7. OTHER DESIGN CONDITIONS FOR FIGURES 20 (Section X), 21, 22, 23, and 24 (Section XI)

1) SUPERFICIAL VELOCITY FPS

LOCATION	1*	2*	3	4*	5	6	7	8*
WITH PRETREATER FIG. 21	0.25	0.5	51	0.5	26	0.6	23	0.5
FIG. 23 & 24	0.5	**	51	0.5	26	0.6	23	0.5
WITH BYPASS-FIG. 22	0.25	0.25	51	0.5	31	-	-	0.5
NO MODIFICATION (MECHANICAL)-FIG. 20	0.5	0.5	-	0.5	26	0.6	23	0.6

* DUE TO STEAM ONLY

** DEGASSING ZONE FIG.-23 & 24 ONLY

2) TEMPERATURE °F

LOCATION	1+	2	3+	4	5+	
WITH PRETREATER -FIG. 21, 23 & 24	1550	1450	1550	900+	800	+ SAME WITH NO MODIFICATION PER FIG 20
WITH BYPASS-FIG. 22	1550	1450	1550	1200	-	

3) OXYGEN CONCENTRATION MOL. %

LOCATION	1	2	3	4	5	6
WITH PRETREATER -FIG. 21, 23 & 24	5.9	4.5	19.8	5.8	0	8
WITH BYPASS-FIG. 22	8.6	6.7	14.6	3.7-513	0-2.4	8
NO MODIFICATION (MECHANICAL) FIG. 20	5.9	4.5	0	0	0	7.3

4) STEAM/COAL LBS/HR (AS FED)

FULL MODIFICATION	1.78
NO MODIFICATION (MECHANICAL)	2.4
PAST OPERATION	3.1

5) SEE TABLE-8 For Assumptions.

TABLE 8 - ASSUMPTION FOR FIGURES 20,21,22,23, AND 24

Pretreater in Service FIG-21, 23, & 24

- 1) Maximum temperature 900°F in pretreater
- 2) No steam-carbon (endothermic) reactions in overflow line.
- 3) 446 Btu/SCF O₂ in overflow line (due to $C + O_2 = CO_2$)
- 4) 527 Btu/SCF O₂ for Pretreatment reaction.
- 5) Total O₂ required 15352 SCFH for 1550°F bed.
- 6) Superficial velocity in gasifier
 - a) due to plenum steam 0.25 FPS
 - b) due to total steam 0.5 FPS
- 7) Steam/coal (as received) = 1.78 lbs/lb.
- 8) O₂/Coal = 3.8 SCF/lb (as received)
- 9) O₂/steam (Total) = 0.102 mol/mol. or 9.3 mol% O₂ in total mixture
- 10) O₂/Coal in Pretreater = 0.825 SCF/lb (as received)
- 11) No steam and CO₂ flow to pretreater plenum.

Pretreater Bypassed FIG-22

- 1) Maximum temperature in entrainment line 1200°F.
- 2) No steam-carbon (endothermic) reactions in overflow line.
- 3) 446 Btu/SCF O₂ in overflow line ($C + O_2 = CO_2$)
- 4) 527 Btu/SCF O₂ for pretreatment reaction.
- 5) Total O₂ required 15352 SCFH for 1550°F bed.
- 6) Superficial velocity in gasifier
 - a) due to plenum steam 0.25 FPS
 - b) due to total steam 0.5 FPS
- 7) steam/coal = 3.8 SCF/lb (as received)
- 8) O₂/coal = 3.8 SCF/lb (as received)
- 9) O₂/steam (Total) = 0.102 mol./mol or 9.3 mol% O₂ in total mixture
- 10) O₂/Coal in entrainment line = 1.25 SCF/lb (as received)

No Modifications FIG-20

- 1) Maximum temperature in pretreater 900°F.
- 2) 446 Btu/SCF O₂ in distributor cone (due to $C + O_2$)
- 3) 527 Btu/SCF O₂ for pretreatment reaction.
- 4) Total oxygen required 15352 SCFH for 1550°F bed.
- 5) Superficial velocity at gasifier cone line 0.5 FPS.
- 6) No steam flow and CO₂ flow to pretreater plenum.

XI. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

1. Run Series 2-DB has demonstrated that the Synthane Process is a viable route to coal gasification for Illinois No. 6 coal. Run Report 1-DB demonstrated the Synthane Process for Montana Rosebud coal. The general operability of the system is good and has been improved significantly since Run Series No. 1 and 1-DB.

2. It has been demonstrated that the Synthane Process is capable of producing a raw gas of satisfactory quality for extended periods of time. The cleaner raw gas (compared to Run Series No. 1) leaving the gas scrubbing area will result in lower cost scrubbing and heat recovery equipment.

3. The important advantage of "deep bed" injection over the "free fall" method of the coal feed for both Montana Rosebud and Illinois No. 6 coals is the significant reduction of tars, phenols, and other pollutants in the gasifier waste water effluent. The cleaner waste water leaving the gas scrubbing area will result in much simpler effluent treatment equipment. This advantage must be offset, in part, by the higher oxygen requirement associated with the "deep bed" injection of the coal feed.

XI. CONCLUSIONS AND RECOMMENDATIONS - cont'd

CONCLUSIONS - cont'd

4. Run Series 2-DB was characterized by considerably higher gasifier fluid bed densities than in Run Series 1 and 1-DB. The cause of this phenomenon is attributed to improved control on the char removal system and standpipe operation.

5. In view of the progress made in Run Series 1, and 1-DB additional time and effort should be expended towards the solution of the few remaining operating problems.

XI. CONCLUSIONS AND RECOMMENDATIONS - cont'd

OPERATING PROBLEMS

1. Operating problems which have persisted into Run Series 2-DB include control of the gasifier bed height, clinker formation in the gasifier, and high solids carry-over from the gasifier to the gas scrubbing system.

2. Bed height control has improved over the runs conducted under Run Series No. 1 and 1-DB to the extent that steady control may now be maintained for extended periods of time. Control, however, in the sense that changes in the bed height can be made at will, is yet to be attained.

3. Clinker formation continued to be the major cause of run termination during the Run Series 2-DB. Recommended steps toward correcting this problem are detailed later in this section under RECOMMENDED EQUIPMENT MODIFICATIONS.

4. Solids carry over from the gasifier into the gas scrubbing system continued to create equipment operating problems.

5. The Petrocarb system had operating problems with feeding of coal. Certain modifications, previously explained, were made to the coal feed line.

XI. CONCLUSIONS AND RECOMMENDATIONS - cont'd

RECOMMENDATIONS FOR FURTHER STUDY

Additional studies of the Synthane Process on other eastern caking coals should be done in order to improve the process further.

These studies should include a determination of the economic advantage of various gas scrubbing and effluent treating systems. These studies should compare oxygen consumption penalties arising from "deep bed" injection versus "free fall" injection of the coal feed versus the cost savings arising from a cleaner gasifier effluent.

Investigations of whether a char cooler is actually needed or whether it is possible to cool the char directly from the gasifier in transfer line. Elimination of the char cooler would result in economic benefits to the Synthane Process. C-E Lummus under Contract No. EY-76-C-02-0058.000 with DOE developed such a let down system eliminating the char cooler.

A suitable waste heat recovery system should be studied to efficiently utilize the high temperature gasifier effluents associated with "deep bed" injection of the coal feed.

XI. CONCLUSIONS AND RECOMMENDATIONS - cont'd

RECOMMENDED EQUIPMENT MODIFICATIONS

Gasifier/Pretreater

The major problem in the operation of the Synthane gasifier has been clinker formation. Based on the analyses of the runs conducted with Montana Rosebud and Illinois No. 6 coals, a conclusion has been reached that an oxygen/steam ratio in excess of 10 mol.% invariably has resulted in clinker formation.

Changes in the gasifier and the pretreater are recommended to be made to reduce the oxygen/steam ratio, while at the same time allowing sufficient oxygen to be added to the gasification system to achieve the desired carbon conversion. The discussions in Section X on "GASIFIER OPERATION AND CLINKER FORMATION", plus "PRETREATER OPERATION" lead to the following specific recommendations.

- 1) Provide a steam and oxygen feed connection to the existing "deep bed" coal feed pipe inside the gasifier.
- 2) Extend the "deep bed" feed pipe in the gasifier to the cone line.
- 3) Extend the gasifier/char cooler standpipe to a point above the coal feed line inside the gasifier.

XI. CONCLUSIONS AND RECOMMENDATIONS - cont'd

RECOMMENDED EQUIPMENT MODIFICATIONS - cont'd

Gasifier/Pretreater - cont'd

The existing pretreater affords little flexibility in operation. The following modification is expected to improve the operability of this system and to increase its tolerance for operational upsets and errors.

- 4) Install a separate 3-inch line connecting the existing 3/4-inch horizontal coal transport line to the gasifier. This new line will bypass the existing pretreater and its existing 3-inch transport line. This new 3-inch line is to function as an alternate pretreater. Steam-oxygen injection points are to be provided on this line at its start as well as inside the gasifier similar to item 1 above. The "deep bed" feed pipe connected to this new 3-inch line will be extended inside the gasifier to the cone line. Figure-22 illustrates this recommendatic

The recommended equipment modifications are shown in Figures 21 through 25. The anticipated operating conditions are summarized on Tables 6, 7, and 8 at the end of this section. The flow rates are set to ensure that the oxygen concentration in the steam-oxygen mixture that contacts coal is kept at about 8 mol%.

XI. CONCLUSIONS AND RECOMMENDATIONS - cont'd

RECOMMENDED EQUIPMENT MODIFICATIONS - cont'd

Gasifier/Pretreater - cont'd

Figure-21 exhibits a scheme whereby supplemental steam-oxygen injection is added to the pretreater overflow line inside the gasifier. The "deep bed" injection line is extended and the gasifier/char cooler standpipe is raised above the "deep bed" line. Two alternate ways of raising the standpipe are shown.

Figure-22 shows the existing pretreater bypassed. The bypass can be mechanically erected around the existing pretreater. Acceptance of one of the standpipe alternates of Figure-21 is assumed. Extension of the "deep bed" feed pipe is assumed. Supplemental steam-oxygen as shown is required. Figure-22 is an entrained bed pretreater.

Figure-23 exhibits the installation of a baffle to provide a quiet zone for the prevention of cyclone fines removal re-entrainment. The pretreated coal is injected vertically upward through the apex of the distributor cone. Vertically upward coal injection applies equally well to Figure-22 the entrained pretreater Char cooler steam and plenum zone steam go through the distributor cone.

XI. CONCLUSIONS AND RECOMMENDATIONS - cont'd

RECOMMENDED EQUIPMENT MODIFICATIONS - cont'd

Gasifier/Pretreater - cont'd

Figure-24 is an alternate to Figure-23. Char cooler steam and plenum zone steam are not mixed.

The preferred modification is Figure-23 using an entrained pretreater.

The addition of oxygen into the 3-inch line makes use of the steam that is introduced into these lines for gasification which is not possible with the existing arrangement. This will mean that the overall steam/coal ratio for pretreatment and gasification will be about 1.75-1.8 lb/lb compared to a ratio of 3.1 lb/lb employed during previous operations. The savings in steam consumption will overcome the potential loss of methane that may occur during the oxygen coal reactions that will take place in the 3-inch line located inside the gasifier.

XI. CONCLUSIONS AND RECOMMENDATIONS - cont'd

RECOMMENDED EQUIPMENT MODIFICATIONS - cont'd

Char Cooler

Under ERDA Contract No. E (36-2)-0058 C-E Lummus prepared in October 1975 Phase O of a report on a "Hot and Dry Char Let-Down System for the Synthane Pilot Plant. Phase II and Phase III reports on the same subject were issued in April and December 1978 under DOE Contract No. EY-76-C-02-0058.000.

The merit of the proposal is the letting down of hot char directly from the gasifier at its operating pressure. The char can be fed hot to combustors or cooled in steam generating equipment.

Examination of Section X of this report reveals the difficulties of maintaining gasifier fluid beds with the existing gasifier/char cooler standpipe. Char cooler/gasifier differential pressures and problems with standpipe purging contributed to the plant operating upsets. The hot char let down system will overcome these problems as well as represent a saving in gasifier capital costs.

Should it prove undesirable at this time to install a hot char let down system, an alternate proposal is recommended.

XI. CONCLUSIONS AND RECOMMENDATIONS - cont'd

RECOMMENDED EQUIPMENT MODIFICATIONS - cont'd

Char Cooler - cont'd

This recommendation is to adapt one of the char lock hoppers to a char slurry vessel. As discussed in Section X, operating difficulties with the high pressure slurry tank were experienced principally in the tank having inadequate surge capacity to take care of erratic char of flows. Additional difficulty arose in transporting char from the char cooler to the slurry tank.

Appendix IV has two memoranda outlining the basic concepts to effect a char lock hopper conversion to a char slurrying system.

Petrocarb Unit

As reported in Section X a major Petrocarb operating problem was plugging of the 3/4-inch transport line with wet coal lumps, unground coal, or foreign objects.

A separate report (8530-EOC-05-79 issued February 2, 1979) discussed the process aspects of the operation of the Petrocarb pressurized coal feed system. This report concludes that the mechanical and process changes made to the system, in general, improved the operability of the system.

XI. CONCLUSIONS AND RECOMMENDATIONS - cont'd

RECOMMENDED EQUIPMENT MODIFICATIONS - cont'd

Petrocarb Unit - cont'd

Specifically, the report recommended that the Petrocarb primary injector be designed with a continuous flow of dry fluffing gas and a back pressure controller on the primary injector vent gas. The transport line should be designed for a sufficient pressure drop to overcome pressure fluctuations in downstream equipment. The design should also take into account means for avoiding plugging due to oversize material and wet lumps of coal. This has been our most serious operating problem.

A separate report (8530-EOC-04-79 issued January 18, 1979) detailed proposals and made recommendations for the installation of an inert gas/CO₂ drying system to supply dry fluffing gas. The objective is to obtain minus 40°F water dewpoint gas.

Gas Scrubbing Area

Section X discussed operating problems in the gas scrubbing area. The following recommendations are made:

- 1) Remove the scrubber surge tank baffles and operate the tank at a high liquid level to minimize pump cavitation.

XI. CONCLUSIONS AND RECOMMENDATIONS - cont'd

RECOMMENDED EQUIPMENT MODIFICATIONS - cont'd

Gas Scrubbing Area - cont'd

- 2) Continue the addition of anti-foam and flocculating agents.
- 3) Add caustic during initial plant start-up to keep the pH of the circulating water in the range of 7.5 to 8.5.
- 4) Do not operate the decanter. It is presently blinded off.
- 5) Maintain high liquid circulations of heat exchange equipment to minimize solid deposition.

LEGEND

TEMPERATURE, °F

SUPERFICIAL VELOCITY, FPS

OXYGEN CONCENTRATION %

DESIGN FLOWS

LEGEND FOR FIGURES 20, 21, 22, 23 AND 24

FIG. 21 SUPPLEMENTAL OXYGEN ADDITION TO GASIFIER-ALTERNATE NO 1
 LEGEND - IN FIGURE 19

FIG. 23 SUPPLEMENTAL OXYGEN ADDITION TO GASIFIER-ALTERNATE NO 2
LEGEND - IN FIGURE 19

FIG. 23A OXYGEN DISTRIBUTOR ARRANGEMENT FOR ALTERNATE Nº 2

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FIG. 24 SUPPLEMENT OXYGEN ADDITION TO GASIFIER ALTERNATE NO 3
 LEGEND - IN FIGURE 19

FIG. 24A OXYGEN DISTRIBUTOR ARRANGEMENT FOR ALTERNATE Nº 3

- 32 NOZZLES ON 33" P.D.
- 24 NOZZLES ON 29½" P.D.
- 24 NOZZLES ON 24¾" P.D.
- 16 NOZZLES ON 20¼" P.D.
- 16 NOZZLES ON 16¼" P.D.
- 8 NOZZLES ON 11¾" P.D.
- 8 NOZZLES ON 8¼" P.D.

37" SHROUD

NEW SHROUD 12"

3" CHAR STANDPIPE
& CYCLONE DIPLEG

ALTERNATE-1

ALTERNATE-2

FIG. 25 DETAIL FOR SUPPLEMENTAL OXYGEN ADDITION

TABLE 6 DESIGN FLOWS FOR FIGURES 20 (Section X), 21, 22, 23, and 24 (Section XI)

1) PRETREATER IN SERVICE FIG.-21, 23, & 24

STREAM	1	2	3	3	4	5	6	7	8	9
MATERIAL	STEAM	O ₂	COAL	CO ₂	O ₂	STEAM	O ₂	STEAM	STEAM	CO ₂
UNIT	LBS/HR	SCFH	LBS/HR	SCFH	SCFH	LBS/HR	SCFH	LBS/HR	LBS/HR	SCFH
QUANTITY	2500	3302	4000	16350	6527	3560	5523	1061	0	0
PSIG	610	700	610	610	610	700	700	700	700	750
TEMP. °F	1000	77	150	150	77	725	77	725	725	550

2) PRETREATER BYPASSED FIG.-22

STREAM	1	2	3	3	4	5	6	7
MATERIAL	STEAM	O ₂	COAL	CO ₂	O ₂	STEAM	O ₂	STEAM
UNIT	LBS/HR	SCFH	LBS/HR	SCFH	SCFH	LBS/HR	SCFH	LBS/HR
QUANTITY	2500	4987	4000	16350	6527	3560	3838	1061
PSIG	610	700	610	610	700	700	700	700
TEMP. °F	1000	77	150	150	77	725	77	725

3) NO MODIFICATION FIG.-20

STREAM	1	2	3	3	4	5	8	9
MATERIAL	STEAM	O ₂	COAL	CO ₂	O ₂	STEAM	STEAM	CO ₂
UNIT	LBS/HR	SCFH	LBS/HR	SCFH	SCFH	LBS/HR	LBS/HR	SCFH
QUANTITY	2500	3302	4000	16350	12050	7121	0	0
PSIG	610	700	610	610	700	700	700	750
TEMP. °F	1000	77	150	150	77	725	725	550

4) SEE TABLE-8 For Assumptions.

TABLE 7. OTHER DESIGN CONDITIONS FOR FIGURES 20 (Section X), 21, 22, 23, and 24 (Section XI)

1)	<u>SUPERFICIAL VELOCITY</u> FPS								
	LOCATION	1*	2*	3	4*	5	6	7	8*
	WITH PRETREATER FIG. 21	0.25	0.5	51	0.5	26	0.6	23	0.5
	FIG. 23 & 24	0.5	**	51	0.5	26	0.6	23	0.5
	WITH BYPASS-FIG. 22	0.25	0.25	51	0.5	31	-	-	0.5
	NO MODIFICATION (MECHANICAL)-FIG. 20	0.5	0.5	-	0.5	26	0.6	23	0.6
	* DUE TO STEAM ONLY								
	** DEGASSING ZONE FIG.-23 & 24 ONLY								
2)	<u>TEMPERATURE °F</u>								
	LOCATION	1+	2	3+	4	5+			
	WITH PRETREATER	1550	1450	1550	900+	800			
	-FIG. 21, 23 & 24								+ SAME WITH NO MODIFICATION
	WITH BYPASS-FIG. 22	1550	1450	1550	1200	-			PER FIG 20
3)	<u>OXYGEN CONCENTRATION MOL. %</u>								
	LOCATION	1	2	3	4	5	6		
	WITH PRETREATER	5.9	4.5	19.8	5.8	0	8		
	-FIG. 21, 23 & 24								
	WITH BYPASS-FIG. 22	8.6	6.7	14.6	3.7-513	0-2.4	8		
	NO MODIFICATION (MECHANICAL) FIG. 20	5.9	4.5	0	0	0	7.3		
4)	<u>STEAM/COAL LBS/HR (AS FED)</u>								
	FULL MODIFICATION	1.78							
	NO MODIFICATION (MECHANICAL)	2.4							
	[OPERATION	3.1							
5)	SEE TABLE-8 For Assumptions.								

TABLE 8 - ASSUMPTION FOR FIGURES 20,21,22,23, AND 24

Pretreater in Service FIG-21, 23, & 24

- 1) Maximum temperature 900°F in pretreater
- 2) No steam-carbon (endothermic) reactions in overflow line.
- 3) 446 Btu/SCF O₂ in overflow line (due to $C + O_2 = CO_2$)
- 4) 527 Btu/SCF O₂ for Pretreatment reaction.
- 5) Total O₂ required 15352 SCFH for 1550°F bed.
- 6) Superficial velocity in gasifier
 - a) due to plenum steam 0.25 FPS
 - b) due to total steam 0.5 FPS
- 7) Steam/coal (as received) = 1.78 lbs/lb.
- 8) O₂/Coal = 3.8 SCF/lb (as received)
- 9) O₂/steam (Total) = 0.102 mol/mol. or 9.3 mol% O₂ in total mixture
- 10) O₂/Coal in Pretreater = 0.825 SCF/lb (as received)
- 11) No steam and CO₂ flow to pretreater plenum.

Pretreater Bypassed FIG-22

- 1) Maximum temperature in entrainment line 1200°F.
- 2) No steam-carbon (endothermic) reactions in overflow line.
- 3) 446 Btu/SCF O₂ in overflow line ($C + O_2 = CO_2$)
- 4) 527 Btu/SCF O₂ for pretreatment reaction.
- 5) Total O₂ required 15352 SCFH for 1550°F bed.
- 6) Superficial velocity in gasifier
 - a) due to plenum steam 0.25 FPS
 - b) due to total steam 0.5 FPS
- 7) steam/coal = 3.8 SCF/lb (as received)
- 8) O₂/coal = 3.8 SCF/lb (as received)
- 9) O₂/steam (Total) = 0.102 mol./mol or 9.3 mol% O₂ in total mixture.
- 10) O₂/Coal in entrainment line = 1.25 SCF/lb (as received)

No Modifications FIG-20

- 1) Maximum temperature in pretreater 900°F.
- 2) 446 Btu/SCF O₂ in distributor cone (due to $C + O_2$)
- 3) 527 Btu/SCF O₂ for pretreatment reaction.
- 4) Total oxygen required 15352 SCFH for 1550°F bed.
- 5) Superficial velocity at gasifier cone line 0.5 FPS.
- 6) No steam flow and CO₂ flow to pretreater plenum.

APPENDIX I

Table of Contents

Glossary	I-2
Test Directive	I-4
Coal Analysis	I-8
References	I-9

GLOSSARY OF TERMS

BFW	Boiler feed water
Carbon Conversion	Percentage of carbon in coal feed converted to gaseous and liquid products.
Clinker	Rock-like material, primarily organic in nature, formed from the ash in coal by fusion under gasification conditions.
COD	Chemical Oxygen Demand - the amount of oxygen consumed under specific conditions in the oxidation of the organic and oxidizable inorganic matter contained in industrial waste water.
Deep Bed Injection	The process of introducing the fresh coal feed to the gasifier at a point submerged deep in the fluidized bed.
Dip Leg	A 3" pipe which allows the solids separated in the gasifier internal cyclone to drain into the fluidized bed.
DOE	Department of Energy
Downcomer	Pipe below char cooler used to remove char.
Equivalent Methane	Total hydrocarbon produced expressed as Methane = $(CH_4 + 2C_2H_6 + 3C_3H_8 + \dots \text{etc.})$
ERDA	Energy Research and Development Administration
Free Fall	The process of introducing fresh coal feed at a point above the gasifier fluidized bed and allowing the coal to free fall through the vapor space before reaching the bed.
MAF Coal	Moisture and ash free coal.
PETC	Pittsburgh Energy Technology Center
Slot Valve	A modified trickle valve used to control the rate of char removal from the gasifier.
Space Velocity	Number of bed volumes of gaseous reactants fed to the gasifier via plenum per minute.

GLOSSARY OF TERMS - cont'd

Standpipe	A two-inch pipe that allows solids to drain from the gasifier to the char cooler.
Steady State Period	The criteria used for defining steady state periods were that the fluidizing steam flow, oxygen flow to gasifier and gasifier bed temperature remain steady within specified limits.
Superficial Velocity	Velocity of gases as if flowing through an empty vessel under prevailing condition at the location of interest.
Ultimate Methane	The theoretical amount of methane that can be obtained by converting all the hydrocarbons, carbon monoxide and hydrogen to methane after shift conversion, if necessary.
Useful Gas	Represents the total quantity of product gas with all components having a heating value.

Instrument Codes

<u>Variable</u>	<u>Indicator</u>	<u>Recorder</u>	<u>Indicating Controller</u>	<u>Recording Controller</u>	<u>Switch</u>
Differential Pressure	PDI	PDR	PDIC	PDRC	PDS
Flow	FI	FR	FIC	FRC	FS
Level	LI	LR	LIC	LRC	LS
Pressure	PI	PR	PIC	PRC	PS
Temperature	TI	TR	TIC	TRC	TS

UNITED STATES
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
SYNTHANE PILOT PLANT
4800 FORBES AVENUE
PITTSBURGH, PENNSYLVANIA 15213

August 29, 1977

Mr. S. E. Carson
Plant Manager
The Lummus Company
P. O. Box 18076
Pittsburgh, PA 15236

Subject: Test Directive No. 2-DB

Dear Mr. Carson:

This letter will serve to officially transmit to you
Test Directive No. 2-DB dated 8/29/77 for the operation
of the SYNTHANE Coal Gasification Pilot Plant.

Very truly yours,

Robert Lewis
Project Manager
SYNTHANE Pilot Plant

Attachment
TD #2-DB (30 copies)

cc: E. L. Clark w/att.
W. P. Haynes w/att.
A. J. Forney w/att.
J. P. Strakey w/att.
J. Greenwood w/o att.
File

RL:djl

RECEIVED

AUG 30 1977

S. E. CARSON

E.R.D.A. SYNTHANE PILOT PLANT
TEST DIRECTIVE: RUN NO. 2-DB
DATE: 8/29/77

OBJECTIVE

- A. Conduct a gasification feasibility run of five (5) to seven (7) days operation at 600 psig and at least 67% carbon conversion with Illinois No. 6 bituminous coal at a feed rate of 1.8 tons per hour. The run should be terminated by a voluntary shutdown and then the gasifier should be inspected for signs of slag, erosion, corrosion, refractory deterioration and cyclone plugs.
- B. Obtain steady state data at the desired operating conditions to determine product compositions and yields, gasifier throughput and heat and material balances. Steady state duration preferably should be several days; 24 hours is the minimum. During this run, coal will be injected below the bed surface through a dip tube to reduce tar production and fines carryover.

TEST CONDITIONS

1. Coal Handling

Illinois No. 6 coal should be ground to 20 by 0 mesh with not more than 30% through 200 mesh. Ground coal should be dried to below 8% moisture (ASTM Method) and preferably as low a moisture content as possible to reduce oxygen consumption.

2. Pretreatment

The pretreater is needed to eliminate the caking properties of the Illinois No. 6 coal. The pretreater temperature should be held at 800° F. It is expected that oxygen usage will be 0.8 to 1.0 cu. ft. O₂/lb. of coal. The allowable range for the pretreater temperature is from 770° F to 840° F. Fluidizing velocity, using steam or a mixture of steam and CO₂, should be 0.25 to 0.4 ft/sec. Satisfactory pretreater operation should be established before a char bed is built in the gasifier. A maximum free-swelling index of one (1) is recommended (ASTM-D-720).

3. Coal Injection in Gasifier

During this run, coal should be injected below the gasifier bed surface with a dip tube using the latest configuration.

4. Petrocarb

Ground coal should be transported from the storage injector to the gasifier using CO₂. However, if separate tests with steam transport of coal prove successful, steam will be substituted for the CO₂ transport gas. Induced transport velocity in the lift line should be below 20 ft/sec. The coal feed rate should be 1.8 tons per hour.

5. Gasification

Bed height should be controlled at approximately 20 ft. Every effort should be made to maintain a stable bed height (± 1 ft) to allow kinetic analyses of the gasifier performance to be made. Fluidizing steam velocity should be 0.5 ft/sec. Due to the relatively lower reactivity of Illinois No. 6 coal, the bed temperature should initially be brought to 1600° F and maintained until carbon conversion is determined. The temperature should then be raised in reasonable increments until the desired conversion is obtained. Final temperature should not exceed 1800° F.

6. Char Removal

The char removal system should be operated as in Run 1-DB.

7. Raw Gas Scrubbing

The venturi and water wash section of the raw gas scrubber should be operated as revised.

8. Downstream Processing

During this run, the Benfield and Stretford units will be brought on line as soon as possible. When these units have been operated satisfactorily, product gas should be burned either in the thermal oxidizer or the boilers, as appropriate.

9. Analytical

After reaching 1600° F, coal, char and gas samples are to be taken every two (2) hours and analyzed to establish carbon conversion. Condensate should also be sampled to determine suspended solids. Samples of waste water from the scrubber surge tank should be taken every four (4) hours and saved for analysis of pollutants. If possible, tar samples should also be obtained every four (4) hours and saved for analysis.

10. Parameters To Be Reported

The list of gasifier calculations transmitted with Test Directive No. 1 should be made and reported to the extent possible. Normal operating data should be collected to establish satisfactory operation of the Benfield and Stretford units.

11. Operating Procedure

This should follow the detailed Operating Manual.

12. Alteration of Conditions

Carbon conversion should be determined as soon as possible through at least two (2) samples and then a meeting should be held with representatives of the ERDA SYNTHANE Operating Committee to determine changes to be made to achieve the desired carbon conversion of +67%.

Statistical Analysis of Ground Illinois No. 6 Coal

As per ASTM D-3176, the hydrogen and oxygen, on an as received basis, contain hydrogen and oxygen present in moisture. On a moisture free basis, the hydrogen and oxygen have been adjusted to eliminate the hydrogen and oxygen present in moisture.

A. As Received Basis - 18 samples

<u>Component</u>	<u>Mean</u>	<u>Standard Deviation</u>
Moisture	1.4	± 0.28
Volatile	35.5	± 1.29
Ash	13.0	± 0.66
Hydrogen	5.0	± 0.09
Carbon	67.1	± 0.60
Nitrogen	1.2	± 0.07
Sulfur	3.9	± 0.10
Heat of Combustion (BTU/#)	12180	± 140
F.S.I.	4.5	± 0.5

B. Mositure Free Basis - 18 samples

<u>Component</u>	<u>Mean</u>	<u>Standard Deviation</u>
Volatiles	35.9	± 1.33
Ash	13.2	± 0.66
Hydrogen	4.9	± 0.09
Carbon	68.1	± 0.60
Nitrogen	1.2	± 0.07
Sulfur	4.0	± 0.10
Heat of Combustion (BTU/#)	12350	± 155

REFERENCES

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APPENDIX II - PROCESS DATA

Table of Contents

A. Graphic Representation of Material Balances	Steady States 1-7
B. Material Balance Tables	Steady States 1-7
C. Average Calculation Values	Steady States 1-5
D. Average Calculation Values	Steady States 6,7

RUN 2 - DB
STEADY STATE PERIOD NO. 1.

GAS STREAMS						
	2	3	9	10	11	14
SCFH		76800.9	156193.7	12498.2	0.0	57115.3
MM		26.33	18	32	18	18
LB/HR	7203.1	5328.7	7408.4	1053.9	0.0	2709.0

LIQUID STREAMS			
LB/HR	4	5	6
H2O	6268.6		
OIL		0.0	
TAR			0.0

SOLID STREAMS		
	1	15
LB/HR (AS RECEIVED)	3200.	0.
PERCENT MOISTURE	1.5	
LB/HR (MOISTURE FREE)	3152.	1003.

STREAM NO. 3	
AVERAGE GAS COMPOSITION	
MOLE PERCENT - WET BASIS	
MOL PCT-H2	17.25
MOL PCT-CO	4.50
MOL PCT-CO2	38.43
MOL PCT-CH4	7.99
MOL PCT-C2H6	0.30
MOL PCT-H2	3.34
MOL PCT-NH3	0.00
MOL PCT-H2S	0.86
MOL PCT-H2O	27.29
MOL PCT-O2	0.04

RUN 2 - DB
STEADY STATE PERIOD NO. 2.

GAS STREAMS

	2	3	9	10	11	14
SCFH		86842.0	140005.4	13001.0	6054.2	61744.2
MW		25.44	18	32	18	18
LB/HR	7734.0	5822.1	6640.6	1096.3	287.2	2928.0

LIQUID STREAMS

LB/HR	4	5	6	13
H ₂ O	11524.6			0.0
OIL		0.0		
TAR			0.0	

SOLID STREAMS

	1	7	15
LB/HR (AS RECEIVED)	3500.	0.	
PERCENT MOISTURE	1.5		
LB/HR (MOISTURE FREE)	3447.		1506.

LB TOTAL STEAM/LB MF COAL	3.59
LB TOTAL OXYGEN/LB MF COAL	0.38
SCF ULTIMATE CH ₄ /LB MF COAL	3.62
AVERAGE CARBON CONV WEIGHT PCT	
CHAR BASIS	57.51
GAS BASIS	44.75
GASIFIER TOP SURFCL VEL, FPS	0.955
VOL PCT O ₂ IN TOTAL FEED GAS	8.50
STREAM NOS. 8 AND 12 LB/HR	1139.7

STREAM NO. 15
CHAR ANALYSIS WT PCT - DRY BASIS

H	1.0
C	66.8
N	0.6
O	1.6
S	1.5
ASH	28.6

STREAM NO. 3
AVERAGE GAS COMPOSITION
MOLE PERCENT - WET BASIS

MOL PCT-H ₂	18.88
MOL PCT-CO	5.44
MOL PCT-CO ₂	34.18
MOL PCT-CH ₄	8.12
MOL PCT-C ₂ H ₆	0.41
MOL PCT-N ₂	6.93
MOL PCT-NH ₃	0.00
MOL PCT-H ₂ S	0.89
MOL PCT-H ₂ O	25.12
MOL PCT-O ₂	0.04

RUN 2 - DB

STEADY STATE PERIOD NO. 3.

	GAS STREAMS					
	2	3	9	10	11	14
SCFH		94488.0	139628.2	10671.1	5004.8	61016.2
MW		24.14	18	32	18	18
LB/HR	7613.1	6010.9	6622.7	899.8	237.4	2894.0

	LIQUID STREAMS			
LB/HR	4	5	6	13
H ₂ O	11922.9			0.0
OIL		0.0		
TAR			0.0	

	SOLID STREAMS		
LB/HR (AS RECEIVED)	1	7	15
PERCENT MOISTURE	1.5		
LB/HR (MOISTURE FREE)	3447		1504.

STREAM NO. 3		STREAM NO. 15	
LB TOTAL STEAM/LB MF COAL		CHAR ANALYSIS WT PCT - DRY BASIS	
LB TOTAL OXYGEN/LB MF COAL		H	1.1
SCF ULTIMATE CH ₄ /LB MF COAL		C	66.8
AVERAGE CARBON CONV WEIGHT PCT		N	0.7
CHAR BASIS		O	1.8
GAS BASIS		S	1.1
GASIFIER TOP SUPRFCL VEL, FPS		ASH	28.6
VOL PCT O ₂ IN TOTAL FEED GAS		AVERAGE GAS COMPOSITION	
STREAM NOS. 8 AND 12 LB/HR		MOLE PERCENT - WET BASIS	
1103.0		MOL PCT-H ₂	13.46
		MOL PCT-CO	3.39
		MOL PCT-CO ₂	27.21
		MOL PCT-CH ₄	6.67
		MOL PCT-C ₂ H ₆	0.38
		MOL PCT-N ₂	5.43
		MOL PCT-NH ₃	0.00
		MOL PCT-H ₂ S	0.83
		MOL PCT-H ₂ O	42.53
		MOL PCT-O ₂	0.06

RUN 2 - DB
STEADY STATE PERIOD NO. 4.

	2	3	9	10	11	14
SCFH		87134.3	150305.7	11708.0	43142.3	77273.7
MW		24.66	18	32	18	18
LB/HR	8128.5	5662.3	7129.1	987.2	2046.3	3665.2

	4	5	6	13
LB/HR				
H ₂ O	11810.8			0.0
OIL		0.0		
TAR			0.0	

	1	7	15
LB/HR (AS RECEIVED)	4100.	0.	
PERCENT MOISTURE	1.5		
LB/HR (MOISTURE FREE)	4038.		2057.

STREAM NO. 3		AVERAGE GAS COMPOSITION	
LB TOTAL STEAM/LB MF COAL		MOLE PERCENT - WET BASIS	
3.09			
LB TOTAL OXYGEN/LB MF COAL			
0.30			
SCF ULTIMATE CH ₄ /LB MF COAL			
3.11			
AVERAGE CARBON CONV WEIGHT PCT			
CHAR BASIS		MOL PCT-H ₂	20.40
31.76		MOL PCT-CO	4.82
GAS BASIS		MOL PCT-CO ₂	29.85
GASIFIER TOP SUPERF. VEL, FPS		MOL PCT-CH ₄	8.58
0.951		MOL PCT-C ₂ H ₆	0.38
VOL PCT O ₂ IN TOTAL FEED GAS		MOL PCT-N ₂	13.88
7.23		MOL PCT-NH ₃	0.00
STREAM NOS. 8 AND 12 LB/HR		MOL PCT-H ₂ S	0.73
1078.6		MOL PCT-H ₂ O	21.09
STREAM NO. 15		MOL PCT-O ₂	0.08
CHAR ANALYSIS WT. PCT - DRY BASIS			
H	1.1		
C	70.8		
N	0.7		
O	1.2		
S	1.8		
ASH	24.5

RUN 2 - DB

STEADY STATE PERIOD NO. 5.

GAS STREAMS

	2	3	9	10	11	14
SCFH		89438.9	151003.0	11263.1	37796.8	76583.5
MW		24.08	18	32	18	18
LB/HR	8479.6	5674.8	7162.2	949.7	1792.7	3632.4

LIQUID STREAMS

LB/HR	4	5	6	13
H ₂ O	5083.2			0.0
OIL		0.0		
TAR			0.0	

SOLID STREAMS

LB/HR (AS RECEIVED)	1	7	15
PERCENT MOISTURE	1.5		
LB/HR (MOISTURE FREE)	4383.		2476.

LB TOTAL STEAM/LB MF COAL	2.86
LB TOTAL OXYGEN/LB MF COAL	0.27
SCF ULTIMATE CH ₄ /LB MF COAL	2.50
AVERAGE CARBON CONV WEIGHT PCT	
CHAR BASIS	40.70
GAS BASIS	21.55
GASIFIER TOP SURFCL VEL, FPS	0.437
VOL PCT O ₂ IN TOTAL FEED GAS	6.34
STREAM NOS. 8 AND 12 LB/HR	1018.4

STREAM NO. 15

CHAR ANALYSIS WT PCT - DRY BASIS

H	1.3
C	72.1
N	0.7
O	2.1
S	1.8
ASH	22.1

STREAM NO. 3

AVERAGE GAS COMPOSITION

MOLE PERCENT - WET BASIS

MOL PCT-H ₂	16.38
MOL PCT-CO	3.57
MOL PCT-CO ₂	25.34
MOL PCT-CH ₄	7.84
MOL PCT-C ₂ H ₆	0.35
MOL PCT-N ₂	12.81
MOL PCT-NH ₃	0.00
MOL PCT-H ₂ S	1.12
MOL PCT-H ₂ O	22.37
MOL PCT-O ₂	0.14

RUN 2 - DB STEADY STATE PERIOD NO. 6.

GAS STREAMS

	2	3	9	10	11	14
SCFH	153969.0	134839.9	9389.9	61814.8	46921.6	
MW	22.35	18	32	18	18	
LB/HR	6150.7	9067.7	6395.6	791.8	2931.9	2225.5

LIQUID STREAMS

LB/HR	4	5	6	13
H2O	6256.7			0.0
OIL		0.0		
TAR			0.0	

SOLID STREAMS

LB/HR (AS RECEIVED)	1	7	15
PERCENT MOISTURE	1.5		
LB/HR (MOISTURE FREE)	4097.		2107.

LB TOTAL STEAM/LB MF COAL	2.76
LB TOTAL OXYGEN/LB MF COAL	0.26
SCF ULTIMATE CH4/LB MF COAL	2.17
AVERAGE CARBON CONV WEIGHT PCT	
CHAR BASIS	47.89
GAS BASIS	28.93
GASIFIER TOP SURFCL VEL, FPS	0.734
VOL PCT O2 IN TOTAL FEED GAS	6.51
STREAM NOS. 8 AND 12 LB/HR	1114.4

STREAM NO. 15 CHAR ANALYSIS WT PCT - DRY BASIS

H	1.4
C	69.5
N	0.8
O	2.1
S	1.9
ASH	24.3

STREAM NO. 3 AVERAGE GAS COMPOSITION MOLE PERCENT - WET BASIS

MOL PCT-H2	5.67
MOL PCT-CO	1.49
MOL PCT-CO2	16.37
MOL PCT-CH4	3.63
MOL PCT-C2H6	0.30
MOL PCT-N2	5.38
MOL PCT-NH3	0.00
MOL PCT-H2S	0.56
MOL PCT-H2O	65.93
MOL PCT-O2	0.04

RUN 2 - DB

STEADY STATE PERIOD NO. 7.

GAS STREAMS

	2	3	9	10	11	14
SCFH	88317.0	124669.0	3233.0	32903.7	46270.2	
MM	24.93	18	32	18	18	
LB/HR	7145.3	5800.9	5913.2	778.5	1560.6	2223.1

LIQUID STREAMS

	4	5	6	13
LB/HR	7131.7			0.0
H2O				
OIL		0.0		
TAR			0.0	

SOLID STREAMS

	1	7	15
LB/HR (AS RECEIVED)	3740.	0.	
PERCENT MOISTURE	1.5		
LB/HR (MOISTURE FREE)	3684.		2079.

LB TOTAL STEAM/LB MF COAL	2.88
LB TOTAL OXYGEN/LB MF COAL	0.28
SCF ULTIMATE CH4/LB MF COAL	2.62
AVERAGE CARBON CONV WEIGHT PCT	
CHAR BASIS	41.16
GAS BASIS	27.77
GASIFIER TOP SUPRFL VEL, FPS	0.613
VOL PCT O2 IN TOTAL FEED GAS	6.90
STREAM NOS. 8 AND 12 LB/HR	1281.1

STREAM NO. 15	
CHAR ANALYSIS WT PCT - DRY BASIS	
H	1.1
C	71.6
N	0.7
O	2.9
S	1.5
ASH	22.1

STREAM NO. 3	
AVERAGE GAS COMPOSITION	
MOLE PERCENT - WET BASIS	
MOL PCT-H2	11.32
MOL PCT-CO	3.29
MOL PCT-CO2	28.47
MOL PCT-CH4	6.57
MOL PCT-C2H6	0.47
MOL PCT-N2	8.10
MOL PCT-NH3	0.00
MOL PCT-H2S	0.70
MOL PCT-H2O	40.36
MOL PCT-O2	0.06

MATERIAL BALANCES								
ELEMENTAL AND OVERALL								
RUN 2 - DB		STEADY STATE NO. 1						
FEED FLOW RATES (LB/HR)		CARBON	HYDROGEN	OXYGEN	NITROGEN	SULFUR	ASH	TOTAL
MF COAL FEED RATE		2163.2	154.7	277.3	38.4	124.8	393.6	3152.0
COAL MOISTURE CONTENT		0.0	5.3	42.7	0.0	0.0	0.0	48.0
COAL FEED RATE		2163.2	160.0	320.0	38.4	124.8	393.6	3200.0
STEAM FLOW								
FLDZNG STM TO PRTR	F284	0.0	214.3	1714.7	0.0	0.0	0.0	1929.0
GSFR STM FEED RATE	F293	0.0	823.2	6585.2	0.0	0.0	0.0	7408.4
CHR CLR STM FEED	F205	0.0	301.0	2408.0	0.0	0.0	0.0	2709.0
HP STM TO CHAR CLR	F253	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GASF STEAM PURGES	F278	0.0	26.6	213.0	0.0	0.0	0.0	239.6
CC STEAM PURGES	F279	0.0	0.5	3.7	0.0	0.0	0.0	4.2
STM TRANSPORT FLOW	F1	0.0	342.1	2736.7	0.0	0.0	0.0	3078.8
OXYGEN FLOW								
OXYGEN TO PRTR	F285	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GSFR O2 FEED RATE	F292	0.0	0.0	1053.9	0.0	0.0	0.0	1053.9
TRANSPORT LINE O2	F289	0.0	0.0	193.9	0.0	0.0	0.0	193.9
INERT GAS FLOW								
TRANSPORT LINE FLOW	F6	79.8	0.0	212.8	186.2	0.0	0.0	478.7
FLOW TO FE-105	F7	126.2	0.0	336.6	294.5	0.0	0.0	757.3
PRETREATER FLOW	F283	66.9	0.0	178.4	156.1	0.0	0.0	401.5
INST PURGE FLOW	F274	116.3	0.0	310.3	271.5	0.0	0.0	698.1
PR GAS TO PRIMARY INJECTOR		46.0	0.0	122.7	107.4	0.0	0.0	276.1
SEAL WATER AND BFW PURGES		0.0	166.7	1333.3	0.0	0.0	0.0	1500.0
H2O FLW TO CHAR CLR	F230	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL FEED FLOW RATES (LB/HR)		2598.5	2034.3	17723.2	1054.0	124.8	393.6	23928.4
EFFLUENT FLOW RATES (LB/HR)								
CARRY OVER	CARRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CHAR REMOVAL RATE	CFRPPH	568.1	8.5	14.3	5.2	13.5	393.6	1003.2
WASTE WATER FLOW	F255	0.0	696.5	5572.1	0.0	0.0	0.0	6268.6
STM FLW FR CHAR CLR	F254	0.0	0.0	0.0	0.0	0.0	0.0	0.0
INRT GS FRM PRM INJ	F9	63.3	0.0	168.9	147.8	0.0	0.0	379.9
RW GS SCRBR EF	F209	1251.7	252.1	3520.6	189.1	55.8	0.0	5328.7
TAR FLOW THRML OXDZR	F221	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL EFFLUENT FLOW RATE (LB/HR)		1883.1	957.2	9275.9	342.1	69.3	393.6	12980.4
% CLOSURE (OUT/IN)(100)		72.5	47.1	52.3	32.5	55.6	100.0	54.2

MATERIAL BALANCES

ELEMENTAL AND OVERALL

RUN 2 - 08		STEADY STATE NO. 2						TOTAL
FEED FLOW RATES (LB/HR)		CARBON	HYDROGEN	OXYGEN	NITROGEN	SULFUR	ASH	
MF COAL FEED RATE		2366.0	169.2	303.3	42.0	136.5	430.5	3447.5
COAL MOISTURE CONTENT		0.0	5.8	46.7	0.0	0.0	0.0	52.5
COAL FEED RATE		2366.0	175.0	350.0	42.0	136.5	430.5	3500.0
STEAM FLOW								
FLDZNG STM TO PRTR	F284	0.0	337.2	2697.4	0.0	0.0	0.0	3034.6
GSFR STM FEED RATE	F293	0.0	737.8	5902.7	0.0	0.0	0.0	6640.6
CHR CLR STM FEED	F205	0.0	325.4	2603.2	0.0	0.0	0.0	2928.6
HP STM TO CHAR CLR	F253	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GASF STEAM PURGES	F278	0.0	26.2	209.4	0.0	0.0	0.0	235.6
CC STEAM PURGES	F279	0.0	4.2	33.5	0.0	0.0	0.0	37.7
STM TRANSPORT FLOW	F1	0.0	301.9	2415.2	0.0	0.0	0.0	2717.1
OXYGEN FLOW								
OXYGEN TO PRTR	F285	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GSFR O2 FEED RATE	F292	0.0	0.0	1096.3	0.0	0.0	0.0	1096.3
TRANSPORT LINE O2	F289	0.0	0.0	224.5	0.0	0.0	0.0	224.5
INERT GAS FLOW								
TRANSPORT LINE FLOW	F6	73.6	0.0	196.2	171.7	0.0	0.0	441.5
FLOW TO FE-105	F7	94.5	0.0	251.9	220.5	0.0	0.0	566.9
PRETREATER FLOW	F283	71.6	0.0	191.1	167.2	0.0	0.0	429.9
INST PURGE FLOW	F274	118.1	0.0	315.1	275.7	0.0	0.0	708.9
PR GAS TO PRIMARY INJECTOR		44.2	0.0	117.9	103.2	0.0	0.0	265.3
SEAL WATER AND BFW PURGES		0.0	166.7	1333.3	0.0	0.0	0.0	1500.0
H2O FLW TO CHAR CLR	F230	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL FEED FLOW RATES (LB/HR)		2768.1	2074.3	17937.7	980.1	136.5	430.5	24327.2
EFFLUENT FLOW RATES (LB/HR)								
CARRY OVER	CARRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CHAR REMOVAL RATE	CFRPPH	1005.3	14.4	23.4	9.3	23.1	430.5	1506.0
WASTE WATER FLOW	F255	0.0	1280.5	10244.1	0.0	0.0	0.0	11524.6
STM FLW FR CHAR CLR	F254	0.0	31.9	255.3	0.0	0.0	0.0	287.2
INRT GS FRM PRM INJ	F9	55.7	0.0	148.6	130.1	0.0	0.0	334.4
RW GS SCRBR EF	F209	1333.7	285.5	3624.3	443.8	65.4	0.0	5822.1
TAR FLOW THRLM OXDZR	F221	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL EFFLUENT FLOW RATE (LB/HR)		2394.7	1612.2	14295.6	583.1	88.6	430.5	19474.3
% CLOSURE (OUT/IN)(100)		86.5	77.7	79.7	59.5	64.9	100.0	80.1

MATERIAL BALANCES

ELEMENTAL AND OVERALL

FEED FLOW RATES (LB/HR)		RUN 2 - DB		STEADY STATE NO. 3			TOTAL	
		CARBON	HYDROGEN	OXYGEN	NITROGEN	SULFUR	ASH	
MF COAL FEED RATE		2366.0	169.2	303.3	42.0	136.5	430.5	3447.5
COAL MOISTURE CONTENT		0.0	5.8	46.7	0.0	0.0	0.0	52.5
COAL FEED RATE		2366.0	175.0	350.0	42.0	136.5	430.5	3500.0
STEAM FLOW								
FLDZNG STM TO PRTR	F284	0.0	329.8	2638.8	0.0	0.0	0.0	2968.6
GSFR STM FEED RATE	F293	0.0	735.9	5886.8	0.0	0.0	0.0	6622.7
CHR CLR STM FEED	F205	0.0	321.6	2572.5	0.0	0.0	0.0	2894.0
HP STM TO CHAR CLR	F253	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GASF STEAM PURGES	F278	0.0	26.1	209.0	0.0	0.0	0.0	235.1
CC STEAM PURGES	F279	0.0	4.5	36.1	0.0	0.0	0.0	40.6
STM TRANSPORT FLOW	F1	0.0	300.0	2399.9	0.0	0.0	0.0	2699.8
OXYGEN FLOW								
OXYGEN TO PRTR	F285	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GSFR O2 FEED RATE	F292	0.0	0.0	899.8	0.0	0.0	0.0	899.8
TRANSPORT LINE O2	F289	0.0	0.0	211.6	0.0	0.0	0.0	211.6
INERT GAS FLOW								
TRANSPORT LINE FLOW	F6	71.9	0.0	191.7	167.7	0.0	0.0	431.3
FLOW TO FE-105	F7	93.6	0.0	249.7	218.5	0.0	0.0	561.8
PRETREATER FLOW	F283	70.8	0.0	188.8	165.2	0.0	0.0	424.8
INST PURGE FLOW	F274	112.8	0.0	300.8	263.2	0.0	0.0	676.9
PR GAS TO PRIMARY INJECTOR		49.5	0.0	132.1	115.6	0.0	0.0	297.2
SEAL WATER AND BFW PURGES		0.0	166.7	1333.3	0.0	0.0	0.0	1500.0
H2O FLW TO CHAR CLR	F230	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL FEED FLOW RATES (LB/HR)		2764.7	2059.5	17600.8	972.3	136.5	430.5	23964.3
EFFLUENT FLOW RATES (LB/HR)								
CARRY OVER	CARRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CHAR REMOVAL RATE	CFRPPH	1004.2	16.1	26.8	10.0	16.9	430.5	1504.5
WASTE WATER FLOW	F255	0.0	1324.8	10598.2	0.0	0.0	0.0	11922.9
STM FLW FR CHAR CLR	F254	0.0	26.4	211.0	0.0	0.0	0.0	237.4
INRT GS FRM PRM INJ	F9	76.7	0.0	204.4	178.9	0.0	0.0	460.0
RW GS SCRBR EF	F209	1138.7	355.5	4002.4	378.7	65.8	0.0	6010.9
TAR FLOW THRLM OXDZR	F221	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL EFFLUENT FLOW RATE (LB/HR)		2219.6	1722.7	15042.8	567.5	82.7	430.5	20135.7
% CLOSURE (OUT/IN)(100)		80.3	83.6	85.5	58.4	60.6	100.0	84.0

MATERIAL BALANCES								
ELEMENTAL AND OVERALL								
RUN 2 - DB			STEADY STATE NO. 4					
FEED FLOW RATES (LB/HR)		CARBON	HYDROGEN	OXYGEN	NITROGEN	SULFUR	ASH	TOTAL
MF COAL FEED RATE		2771.6	198.2	355.3	49.2	159.9	504.3	4038.5
COAL MOISTURE CONTENT		0.0	6.8	54.7	0.0	0.0	0.0	61.5
COAL FEED RATE		2771.6	205.0	410.0	49.2	159.9	504.3	4100.0
STEAM FLOW								
FLOZNG STM TO PRTR	F284	0.0	311.2	2489.4	0.0	0.0	0.0	2800.6
GSFR STM FEED RATE	F293	0.0	792.1	6337.0	0.0	0.0	0.0	7129.1
CHR CLR STM FEED	F205	0.0	407.2	3257.9	0.0	0.0	0.0	3665.2
HP STM TO CHAR CLR	F253	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GASF STEAM PURGES	F278	0.0	23.8	190.8	0.0	0.0	0.0	214.6
CC STEAM PURGES	F279	0.0	18.4	147.5	0.0	0.0	0.0	166.0
STM TRANSPORT FLOW	F1	0.0	281.8	2254.1	0.0	0.0	0.0	2535.9
OXYGEN FLOW								
OXYGEN TO PRTR	F285	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GSFR O2 FEED RATE	F292	0.0	0.0	987.2	0.0	0.0	0.0	987.2
TRANSPORT LINE O2	F289	0.0	0.0	238.4	0.0	0.0	0.0	238.4
INERT GAS FLOW								
TRANSPORT LINE FLOW	F6	157.1	0.0	418.9	366.5	0.0	0.0	942.4
FLOW TO FE-105	F7	77.9	0.0	207.7	181.7	0.0	0.0	467.3
PRETREATER FLOW	F283	113.3	0.0	302.1	264.3	0.0	0.0	679.7
INST PURGE FLOW	F274	95.2	0.0	253.8	222.1	0.0	0.0	571.1
PR GAS TO PRIMARY INJECTOR		67.2	0.0	179.1	156.8	0.0	0.0	403.1
SEAL WATER AND BFW PURGES		0.0	166.7	1333.3	0.0	0.0	0.0	1500.0
H2O FLW TO CHAR CLR	F230	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL FEED FLOW RATES (LB/HR)		3282.2	2206.3	19007.2	1240.6	159.9	504.3	26400.4
EFFLUENT FLOW RATES (LB/HR)								
CARRY OVER	CARRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CHAR REMOVAL RATE	CFRPPH	1456.1	22.2	24.1	14.2	36.3	504.3	2057.2
WASTE WATER FLOW	F255	0.0	1312.3	10498.5	0.0	0.0	0.0	11810.8
STM FLW FR CHAR CLR	F254	0.0	227.4	1818.9	0.0	0.0	0.0	2046.3
INRT GS FRM PRM INJ	F9	58.0	0.0	154.6	135.2	0.0	0.0	347.8
RW GS SCRBR EF	F209	1219.9	279.5	3150.8	892.5	58.0	0.0	5662.2
TAR FLOW THRLM OXDZR	F221	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL EFFLUENT FLOW RATE (LB/HR)		2734.0	1841.3	15646.8	1042.0	94.3	504.3	21924.2
% CLOSURE (OUT/IN)(100)		83.3	83.5	82.3	84.0	59.0	100.0	83.0

MATERIAL BALANCES								
ELEMENTAL AND OVERALL								
RUN 2 - DB			STEADY STATE NO. 5					
FEED FLOW RATES (LB/HR)		CARBON	HYDROGEN	OXYGEN	NITROGEN	SULFUR	ASH	TOTAL
MF COAL FEED RATE		3008.2	215.1	385.7	53.4	173.5	547.3	4383.2
COAL MOISTURE CONTENT		0.0	7.4	59.3	0.0	0.0	0.0	66.7
COAL FEED RATE		3008.2	222.5	445.0	53.4	173.5	547.3	4450.0
STEAM FLOW								
FLOZNG STM TO PRTR	F284	0.0	313.3	2506.2	0.0	0.0	0.0	2819.4
GSFR STM FEED RATE	F293	0.0	795.8	6366.4	0.0	0.0	0.0	7162.2
CHR CLR STM FEED	F205	0.0	403.6	3228.8	0.0	0.0	0.0	3632.4
HP STM TO CHAR CLR	F253	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GASF STEAM PURGES	F278	0.0	23.6	188.7	0.0	0.0	0.0	212.3
CC STEAM PURGES	F279	0.0	18.0	144.2	0.0	0.0	0.0	162.3
STM TRANSPORT FLOW	F1	0.0	283.5	2267.8	0.0	0.0	0.0	2551.3
OXYGEN FLOW								
OXYGEN TO PRTR	F285	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GSFR O2 FEED RATE	F292	0.0	0.0	949.7	0.0	0.0	0.0	949.7
TRANSPORT LINE O2	F289	0.0	0.0	217.1	0.0	0.0	0.0	217.1
INERT GAS FLOW								
TRANSPORT LINE FLOW	F6	158.8	0.0	423.5	370.6	0.0	0.0	952.9
FLOW TO FE-105	F7	130.6	0.0	348.4	304.8	0.0	0.0	783.9
PRETREATER FLOW	F283	104.9	0.0	279.7	244.7	0.0	0.0	629.2
INST PURGE FLOW	F274	87.8	0.0	234.1	204.8	0.0	0.0	526.7
PR GAS TO PRIMARY INJECTOR		74.6	0.0	198.8	174.0	0.0	0.0	447.4
SEAL WATER AND BFW PURGES		0.0	166.7	1333.3	0.0	0.0	0.0	1500.0
H2O FLW TO CHAR CLR	F230	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL FEED FLOW RATES (LB/HR)		3564.9	2226.9	19131.8	1352.3	173.5	547.3	26996.9
EFFLUENT FLOW RATES (LB/HR)								
CARRY OVER	CARRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CHAR REMOVAL RATE	CFRPPH	1783.9	31.0	51.2	17.4	44.8	547.3	2475.5
WASTE WATER FLOW	F255	0.0	564.8	4518.4	0.0	0.0	0.0	5083.2
STM FLW FR CHAR CLR	F254	0.0	199.2	1593.5	0.0	0.0	0.0	1792.7
INRT GS FRM PRM INJ	F9	37.0	0.0	98.7	86.4	0.0	0.0	222.1
RW GS SCRBR EF	F209	1063.5	314.7	3277.1	845.5	84.5	0.0	5674.8
TAR FLOW THRLM OXDZR	F221	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL EFFLUENT FLOW RATE (LB/HR)		2884.3	1109.6	9538.9	949.2	129.3	547.3	15248.4
% CLOSURE (OUT/IN)(100)		80.9	49.8	49.9	70.2	74.5	100.0	56.5

MATERIAL BALANCES

ELEMENTAL AND OVERALL

RUN 2 - DE		STEADY STATE NO. 6						
FEED FLOW RATES (LB/HR)		CARBON	HYDROGEN	OXYGEN	NITROGEN	SULFUR	ASH	TOTAL
MF COAL FEED RATE		2811.5	281.0	360.4	49.9	162.2	511.6	4896.6
COAL MOISTURE CONTENT		0.0	6.9	55.5	0.0	0.0	0.0	62.4
COAL FEED RATE		2811.5	287.9	415.9	49.9	162.2	511.6	4159.0
STEAM FLOW								
FLDZNG STM TO PRTR	F284	0.0	258.9	2071.5	0.0	0.0	0.0	2330.4
GSFR STM FEED RATE	F293	0.0	710.6	5685.0	0.0	0.0	0.0	6395.6
CHR CLR STM FEED	F205	0.0	247.3	1978.2	0.0	0.0	0.0	2225.5
HP STM TO CHAR CLR	F253	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GASF STEAM PURGES	F278	0.0	23.4	187.2	0.0	0.0	0.0	210.6
CC STEAM PURGES	F279	0.0	18.2	145.5	0.0	0.0	0.0	163.7
STM TRANSPORT FLOW	F1	0.0	287.2	2297.8	0.0	0.0	0.0	2585.1
OXYGEN FLOW								
OXYGEN TO PRTR	F285	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GSFR O2 FEED RATE	F292	0.0	0.0	791.8	0.0	0.0	0.0	791.8
TRANSPORT LINE O2	F289	0.0	0.0	260.6	0.0	0.0	0.0	260.6
INERT GAS FLOW								
TRANSPORT LINE FLOW	F6	128.8	0.0	343.4	300.4	0.0	0.0	772.5
FLOW TO FE-105	F7	4.1	0.0	11.0	9.7	0.0	0.0	24.8
PRETREATER FLOW	F283	0.0	0.0	0.0	0.0	0.0	0.0	0.0
INST PURGE FLOW	F274	100.9	0.0	269.1	235.5	0.0	0.0	605.5
PR GAS TO PRIMARY INJECTOR		61.4	0.0	163.8	143.3	0.0	0.0	368.6
SEAL WATER AND BFW PURGES		0.0	166.7	1333.3	0.0	0.0	0.0	1500.0
H2O FLW TO CHAR CLR	F230	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL FEED FLOW RATES (LB/HR)		3106.7	1920.3	15954.1	738.8	162.2	511.6	22393.7

EFFLUENT FLOW RATES (LB/HR)								
CARRY OVER		CARRY	0.0	0.0	0.0	0.0	0.0	0.0
CHAR REMOVAL RATE	CFRPPH	1465.0	29.0	45.0	17.2	39.7	511.6	2187.4
WASTE WATER FLOW	F255	0.0	695.2	5561.5	0.0	0.0	0.0	6256.7
STM FLW FR CHAR CLR	F254	0.0	325.8	2606.2	0.0	0.0	0.0	2931.9
INRT GS FRM PRM INJ	F9	30.1	0.0	80.3	70.3	0.0	0.0	180.8
RW GS SCRBR EF	F209	1078.7	652.3	6507.4	679.4	72.7	0.0	9067.7
TAR FLOW THRLM OXDZR	F221	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL EFFLUENT FLOW RATE (LB/HR)		2573.8	1702.3	14800.3	766.9	112.4	511.6	20544.4

% CLOSURE (OUT/IN)(100)		82.8	88.6	92.8	103.8	69.3	100.0	91.7

MATERIAL BALANCES								
ELEMENTAL AND OVERALL								
FEED FLOW RATES (LB/HR)		RUN 2 - DB	CARBON	HYDROGEN	OXYGEN	NITROGEN	SULFUR	ASH
								TOTAL
MF COAL FEED RATE			2528.2	180.8	324.1	44.9	145.9	460.0
COAL MOISTURE CONTENT			0.0	6.2	49.9	0.0	0.0	56.1
COAL FEED RATE			2528.2	187.0	374.0	44.9	145.9	460.0
STEAM FLOW								
FLOZNG STM TO PRTR	F284		0.0	274.6	2196.9	0.0	0.0	2471.5
GSFR STM FEED RATE	F293		0.0	657.0	5256.1	0.0	0.0	5913.2
CHR CLR STM FEED	F205		0.0	247.0	1976.1	0.0	0.0	2223.1
HP STM TO CHAR CLR	F253		0.0	0.0	0.0	0.0	0.0	0.0
GASF STEAM PURGES	F278		0.0	23.8	190.7	0.0	0.0	214.6
CC STEAM PURGES	F279		0.0	19.0	151.6	0.0	0.0	170.6
STM TRANSPORT FLOW	F1		0.0	247.0	1976.0	0.0	0.0	2223.0
OXYGEN FLOW								
OXYGEN TO PRTR	F285		0.0	0.0	0.0	0.0	0.0	0.0
GSFR O2 FEED RATE	F292		0.0	0.0	778.5	0.0	0.0	778.5
TRANSPORT LINE O2	F289		0.0	0.0	263.5	0.0	0.0	263.5
INERT GAS FLOW								
TRANSPORT LINE FLOW	F6		138.6	0.0	369.5	323.4	0.0	831.5
FLOW TO FE-105	F7		159.7	0.0	425.8	372.6	0.0	958.1
PRETREATER FLOW	F283		0.0	0.0	0.0	0.0	0.0	0.0
INST PURGE FLOW	F274		122.2	0.0	325.8	285.1	0.0	733.0
PR GAS TO PRIMARY INJECTOR			48.2	0.0	107.2	93.8	0.0	241.1
SEAL WATER AND BFW PURGES			0.0	166.7	1333.3	0.0	0.0	1500.0
H2O FLW TO CHAR CLR	F230		0.0	0.0	0.0	0.0	0.0	0.0
TOTAL FEED FLOW RATES (LB/HR)			2988.9	1822.1	15725.2	1119.7	145.9	460.0
EFFLUENT FLOW RATES (LB/HR)								
CARRY OVER	CARRY		0.0	0.0	0.0	0.0	0.0	0.0
CHAR REMOVAL RATE	CHARPPH		1487.7	23.9	60.5	14.8	31.7	460.0
WASTE WATER FLOW	F255		0.0	792.4	6339.3	0.0	0.0	7131.7
STM FLW FR CHAR CLR	F254		0.0	173.4	1387.2	0.0	0.0	1560.6
INRT GS FRM PRM INJ	F9		62.7	0.0	167.3	146.4	0.0	376.4
RW GS SCRBR EF	F209		1100.2	314.9	3749.6	527.9	52.5	5800.9
TAR FLOW THRLM OXDZR	F221		0.0	0.0	0.0	0.0	0.0	0.0
TOTAL EFFLUENT FLOW RATE (LB/HR)			2650.6	1304.6	11704.0	689.1	84.1	460.0
% CLOSURE (OUT/IN)(100)			88.7	71.6	74.4	61.5	57.7	100.0

AVERAGE CALCULATION VALUES

RUN 2 - DB

M-1

M-2

M-2

O-I

O-I

STEADY STATE PERIOD

PTID NAME DESCRIPTION

1

2

3

4

5

PRETREATMENT CALCULATIONS

84	X0001	COAL FEED RATE	PPH	3200.00	3500.00	3500.00	4100.00	4450.00
557	CTSTP	TOTAL STM TO PRTR	PPH	5007.83	5751.64	5668.48	5336.44	5370.77
214	F1	STM TRANSPORT FLOW	PPH	3078.81	2717.07	2699.84	2535.86	2551.33
364	F285	OXYGEN TO PRTR	SCFH	0.000	0.000	0.000	0.000	0.000
374	F289	TRANSPORT LINE O2	SCFH	2300.06	2662.94	2509.42	2827.03	2574.34
47	T203	PRTRTR LWR BED TEMP	DEGF	795.340	801.794	798.369	834.215	822.257
366	T290	PRTR BED AT 9.75 FT	DEGF	813.368	818.380	812.556	847.889	836.533
367	T291	PRTR BED AT 5.45 FT	DEGF	811.849	819.490	816.406	848.488	837.835
276	T2208	PRTR INLET TEMP	DEGF	681.024	583.400	585.843	773.753	764.259
365	D2223	PRTR GAS DELTA P	"H2O	44.9363	50.6855	52.3854	52.7399	53.1032
215	P267	PRTRTR VESSEL PRESS	PSIG	615.278	626.110	628.683	632.163	634.673
402	C2FBDF	PRT FLD BED DNSTY	LB/FT3	13.760			14.536	14.880
403	C2FBHP	PRT FLD BED HEIGHT	FT	7.28072			9.70388	9.54711
539	CPBVOL	PRT FLUID BED VOL	FT3	13.6350	3.78804	3.78804	17.9168	17.6397
405	C2SIP	PRT SOLIDS INVENTORY	LB	187.615			260.439	262.474
404	C2SRTP	PRT SOLIDS RES TIME	MIN	3.571			3.869	3.593
407	C2SCP2	PRT COAL FEED	PPH/FT2	1810.98	1980.76	1980.76	2320.32	2518.39
406	C2SCP1	PRT COAL FEED	PPH/FT3	234.690			228.836	252.271
535	C2PPD	PRT PR DRP	"H2O/FTBD	2.646			2.795	2.861
401	C2SVP2	PRT FD GAS SUP VEL	FPS	1.08909	1.20791	1.18962	1.19353	1.22299
409	C2SCP4	PRT O2/RAW COAL	SCF/LB	0.718769	0.760839	0.716978	0.689519	0.578503

AVERAGE CALCULATION VALUES

RUN 2 - DB

M-1 M-2 M-2 O-1 O-1
STEADY STATE PERIOD

PTID	NAME	DESCRIPTION		1	2	3	4	5
411	C2SOP2	PRT O2/MF COAL	SCF/LB	0.729714	0.772426	0.727896	0.700020	0.587313
413	C2SOP4	PRT O2/MAF COAL	SCF/LB	0.833838	0.882644	0.831761	0.799906	0.671118
408	C2SCP3	PRT O2/RAW COAL	LB/LB	0.061	0.064	0.060	0.058	0.049
410	C2SOP1	PRT O2/MF COAL	LB/LB	0.062	0.065	0.061	0.059	0.050
412	C2SOP3	PRT O2/MAF COAL	LB/LB	0.070	0.074	0.070	0.067	0.057
538	CPSRC2	PRT STM/RAW COAL	SCF/LB	32.9650	34.6160	34.1155	27.4171	25.4232
415	C2SSP2	PRT STM/MF COAL	SCF/LB	33.4670	35.1431	34.6350	27.8346	25.8103
417	C2SSP5	PRT STM/MAF COAL	SCF/LB	38.2424	40.1577	39.5771	31.8064	29.4932
537	CPSRC1	PRT STM/RAW COAL	LB/LB	1.56495	1.64332	1.61956	1.30157	1.20691
414	C2SSP1	PRT STM/MF COAL	LB/LB	1.58878	1.66835	1.64423	1.32139	1.22529
416	C2SSP4	PRT STM/MAF COAL	LB/LB	1.81548	1.90641	1.87885	1.50994	1.40013
554	CP02ST	PRT O2/STEAM	SCF/SCF	0.022	0.022	0.021	0.025	0.023
797	CP05S	PRT O2/STM RATIO	SCF/LB	0.459293	0.462988	0.442698	0.529759	0.479324
796	CP05LB	PRT O2/STM RATIO	LB/LB	0.039	0.039	0.037	0.045	0.040

AVERAGE CALCULATION VALUES

RUN 2 - DB

M-1

M-2

M-2

O-1

O-1

STEADY STATE PERIOD

PTID	NAME	DESCRIPTION		1	2	3	4	5
GASIFICATION CALCULATIONS								
84	X0001	COAL FEED RATE	PPH	3200.00	3500.00	3500.00	4100.00	4450.00
226	F293	GSFR STM FEED RATE	PPH	7408.40	6640.57	6622.69	7129.13	7162.20
137	F204	GASF PLENM STM FEED	PPH	3774.72	3767.65	3773.14	3778.97	3856.13
108	CDISST	GASF DIST STM FEED	PPH	3633.46	2873.45	2846.82	3349.76	3309.20
227	F292	GSFR O2 FEED RATE	SCFH	12498.2	13001.0	10671.1	11708.0	11263.1
136	F203	GASF PLENM O2 FEED	SCFH	3219.20	3175.89	3211.43	2207.42	2433.48
107	CDISO2	GASF DIST O2 FEED	SCFH	9281.42	9834.46	7467.47	9501.36	8833.78
581	CNSFCC	NET STM FROM CC	PPH	2709.03	2641.42	2656.67	1618.88	1839.69
345	T205	GASIFIER BED AT 18"	DEGF	1483.71	1472.97	1480.13	1471.50	1455.25
220	P256	GASIFIER PRESSURE	PSIG	601.135	600.190	600.645	605.321	605.641
235	P295	GASIFIER PRESSURE	PSIG	608.194	609.050	609.277	609.273	609.446
526	C2GPD	GSF PRESS DROP "H2O/FTBD		1.08706	1.08280	0.660408	1.67770	1.55672
424	C2FBDG	GSF FLD BED DNSTY LB/FT3		6.15830	6.13414	3.74128	8.72400	8.09493
565	CUGFBD	GASF UPR FL BD DEN LB/CF		6.164			7.215	7.347
566	CGOFBD	GASF OVRL FL BD DN LB/CF		7.07849	7.59489	5.42894	8.46375	8.39514
425	C2FBHG	GSF FLD BED HEIGHT	FT	26.0770	23.5848	38.5733	18.3594	21.2635
572	CGBV	GASIFIER BED VOLUME	FT3	191.908	172.538	278.055	137.895	158.992
427	C2SIG	GSF SOLIDS INVENTORY	LB	1193.79	1032.67	1031.76	1199.77	1287.18
426	C2SRTG	GSF SOLIDS RES TIME	MIN	22.7243	17.9724	17.9566	17.8250	17.6195
429	C2SCG2	GASF COAL FEED	PPH/FT2	452.617	495.049	495.049	579.915	629.420
428	C2SCG1	GASF COAL FEED	PPH/FT3	16.6747	20.2854	12.5874	29.7329	27.9887

AVERAGE CALCULATION VALUES

RUN 2 - DB

M-1

M-2

M-2

O-1

O-1

STEADY STATE PERIOD

PTID	NAME	DESCRIPTION	1	2	3	4	5
420	C2SVBG	GSF SUP VEL-BOT BED FPS	0.568393	0.513500	0.506031	0.538893	0.534426
423	C2SV0G	GSF SUP VEL-OUTLET FPS	0.230982	0.427375	0.441718	0.693816	0.375064
421	C2SVTG	GSF SUP VEL-TOP BED FPS	0.550973	0.955849	0.934058	0.951263	0.497862
422	C2SVMG	GSF SUP VEL-MEAN BED FPS	0.559683	0.734674	0.720044	0.745078	0.516144
584	CGSF02	GSF O2/RAW COAL SCF/LB	3.90570	3.71458	3.04887	2.85562	2.53102
433	C2S0G2	GASF O2/MF COAL SCF/LB	3.96518	3.77115	3.09530	2.89911	2.56957
435	C2S0G4	GASF O2/MAF COAL SCF/LB	4.53097	4.30926	3.53698	3.31278	2.93622
585	CGSF03	GASF O2/RAW COAL LB/LB	0.329334	0.313219	0.257085	0.240790	0.213420
432	C2S0G1	GASF O2/MF COAL LB/LB	0.334350	0.317989	0.261001	0.244457	0.216670
434	C2S0G3	GASF O2/MAF COAL LB/LB	0.382059	0.363363	0.298243	0.279339	0.247587
586	CGSM5M	GASF STM/RAW COAL SCF/LB	48.7672	39.9660	39.8584	36.6274	33.9031
437	C2SSG2	GASF STM/MF COAL SCF/LB	49.5099	40.5746	40.4654	37.1852	34.4194
439	C2SSG4	GASF STM/MAF COAL SCF/LB	56.5745	46.3643	46.2394	42.4912	39.3308
587	CGSSTM	GASF STM/RAW COAL LB/LB	2.31512	1.89731	1.89220	1.73881	1.60948
436	C2SSG1	GASF STM/MF COAL LB/LB	2.35038	1.92620	1.92101	1.76529	1.63399
438	C2SSG3	GASF STM/MAF COAL LB/LB	2.68576	2.20105	2.19512	2.01718	1.86715
555	CG02ST	GSF O2/STEAM SCF/SCF	0.080	0.093	0.076	0.078	0.075
564	C02ST2	GASF O2/STM RATIO SCF/LB	1.68704	1.95782	1.61129	1.64228	1.57257
563	C02ST1	GASF O2/STM RATIO LB/LB	0.142253	0.165086	0.135866	0.138480	0.132601
790	CDSVP	PLENUM O2 VOL PERCENT %	3.89111	3.84770	3.88365	2.69823	2.90873
791	CDOVP	DIST O2 VOL PERCENT %	10.8151	13.9768	11.0737	11.8674	11.2474

AVERAGE CALCULATION VALUES

RUN 2 - DB

M-1

M-2

M-2

O-1

O-1

STEADY STATE PERIOD

PTID	NAME	DESCRIPTION	1	2	3	4	5
342	F255	WASTE WATER FLOW GPM	12.5371	23.0491	23.8459	23.6216	10.1665
243	F221	TAR FLOW THRL OXDZR GPM	0.000	0.000	0.000	0.000	0.000
245	F209	RW GS SCRBR EF 1000-SCFH	76.8009	86.8420	94.4880	87.1343	89.4389
574	CNRGG	RAW GAS FROM GASF SCFH	176748.	297504.	313542.	303826.	164417.
575	CTGFB	TOTAL GAS FROM BED SCFH	167450.	288207.	304245.	294528.	155120.
475	C2C1	GASF CARBON INVENTORY LB	675.984	689.324	688.712	849.224	927.544
551	CCGPPH	CARBON GASIFIED PPH	1595.13	1360.73	1361.76	1315.49	1224.34
594	C2GR4	GASF RATE LB-C/HR-FT3	8.31194	7.88656	4.89743	9.53984	7.70060
595	C2GR3	GASF RATE LB-C/HR-LB-C	2.35971	1.97400	1.97725	1.54905	1.31998
455	C2MRG2	CH4 PROD GAS SCFH/FT3	31.9596	40.8527	22.6663	54.2181	44.1069
454	C2MRG1	CH4 IN RAW GAS LB-C/LB-C	0.286893	0.323328	0.289358	0.278376	0.239062
451	C2CG1	CARBON CONVRSN (CHAR) %	73.7393	57.5118	57.5552	47.4633	40.7000
593	C2CG12	CARBON CONVRSN (GAS) %	43.7489	44.7475	37.4975	31.7605	21.5537
559	CH2COR	RAW GAS H2/CO RATIO	3.83333	3.47260	3.96522	4.23529	4.58824
596	CUGYM	USEFL GAS YLD SCF/LB-MAF	17.9547	20.3743	16.5446	17.5004	13.982
592	CECH4R	EQ CH4/RAW COAL SCF/LB	2.06423	2.21898	2.02380	2.04026	1.74471
591	CECH4M	EQ CH4/MF COAL SCF/LB	2.09566	2.25277	2.05462	2.07133	1.77131
579	CECH4C	EQ CH4/MAF COAL SCF/LB	2.39470	2.57422	2.34780	2.36689	2.02404
532	C2MYG5	CH4YLD/RW COAL SCF/HR-LB	1.91666	2.01389	1.80071	1.82351	1.57588
464	C2MYG2	CH4YLD/MF COAL SCF/HR-LB	1.94584	2.04456	1.82813	1.85128	1.59988
466	C2MYG4	CH4YLD/MAF COAL CF/HR-LB	2.22350	2.33630	2.08899	2.11544	1.8281

AVERAGE CALCULATION VALUES

RUN 2 - DB

M-1

M-2

M-2

O-1

O-1

STEADY STATE PERIOD

PTID	NAME	DESCRIPTION	1	2	3	4	5
577	CTUCH4	TOTAL ULTIMATE CH4 SCFH	10069.0	12496.1	10298.1	12571.6	10966.1
560	CUCH4R	ULT CH4/RAW COAL SCF/LB	3.14655	3.57032	2.94232	3.06625	2.46428
561	CUCH4M	ULT CH4/MF COAL SCF/LB	3.19447	3.62469	2.98713	3.11294	2.50181
562	CUCH4A	ULT CH4/MAF COAL SCF/LB	3.65030	4.14190	3.41337	3.55713	2.85880
450	C2SCG	STM CONV - H2O BALANCE %	58.1807	15.5532	4.56740	15.1262	65.0255
598	CSCH2	STM CONV - H2 BALANCE %	-0.456884	0.988041	-0.859433	0.220210	-1.81299
552	CSPV	SPACE VELOCITY 1/MIN	2.05870	2.27625	1.40507	2.83929	2.45124
553	CSPT	SPACE TIME MIN	0.485744	0.439318	0.711708	0.352201	0.407957

AVERAGE CALCULATION VALUES

RUN 2 - DB

M-1

M-2

M-2

O-1

O-1

STEADY STATE PERIOD

PTID	NAME	DESCRIPTION	1	2	3	4	5
CHAR COOLER CALCULATIONS							
234	F230	H2O FLW TO CHAR CLR GPH	0.000	0.000	0.000	0.000	0.000
230	F205	CHR CLR STM FEED PPH	2709.03	2928.58	2894.05	3665.16	3632.42
341	F254	STM FLW FR CHAR CLR PPH	0.000	287.157	237.380	2046.275	1792.734
372	F229	CHAR TRANSPORT STEAM PPH	323.995	234.787	276.249	339.150	283.619
599	CFRPPH	CHAR REMOVAL RATE PPH	1003.21	1505.98	1504.45	2057.17	2475.51
346	T202	CHR CLR UPPR BD TMP DEGF	663.455	724.404	736.858	770.536	818.787
89	T20004	C.C. BD AT 19FT-2IN DEGF	648.768	687.483	704.530	755.862	803.085
224	P258	CHAR COOLER PRESS PSIG	592.822	594.639	595.176	595.801	596.427
534	C2CPD	CC PRESS DROP "H2O/FTBD	2.046			0.341	0.945
487	C2FBD0	CC FLD BED DNSTY LB/FT3	10.624			1.771	4.907
488	C2FBHC	CC FLD BED HEIGHT FT	11.2071			22.0681	8.91201
573	CCCBV	CHAR CLR BED VOLUME FT3	31.2203			59.7429	25.0054
490	C2SIC	CC SOLIDS INVENTORY LB	331.676			105.812	122.690
489	C2SRTC	CC SOLIDS RES TIME MIN	19.837			3.086	2.974
520	C2SCC2	CC MF CHAR FD LB/HR-FT2	380.005	570.446	569.868	779.229	937.695
499	C2SCC1	CC MF CHAR FD LB/HR-FT3	32.1333			34.4337	98.9990
484	C2SSV	CC STEAM SUP VEL FPS	0.313694	0.355106	0.356020	0.463832	0.477013
485	C2WSV	CC VAP H2O SUP VEL FPS	0.000	0.000	0.000	0.000	0.000
486	C2TSV	CC TOT STM SUP VEL FPS	0.313694	0.354272	0.356276	0.463780	0.477576
521	C2SCC3	CC MF CHR/RAW COAL LB/LB	0.318278	0.436832	0.436389	0.509389	0.564767
493	C2SSC3	CC STM/MF CHAR LB/LB	2.70035	1.94463	1.92366	1.78165	1.46734

AVERAGE CALCULATION VALUES

RUN 2 - DB

M-1

M-2

M-2

O-1

O-1

STEADY STATE PERIOD

PTID	NAME	DESCRIPTION		1	2	3	4	5
588	CCCSTM	CC STM/RAW COAL	LB/LB	0.846571	0.836736	0.826871	0.893941	0.816274
494	C2SSC4	CC STM/MF COAL	LB/LB	0.859463	0.849479	0.839463	0.907554	0.828705
589	CCSTM	CC STM/MAF COAL	LB/LB	0.982101	0.970692	0.959247	1.03705	0.946954
497	C2SWC3	CC H2O/MF CHAR	LB/LB	0.000	0.000	0.000	0.000	0.000
498	C2SWC4	CC H2O/RAW COAL	LB/LB	0.000	0.000	0.000	0.000	0.000

AVERAGE CALCULATION VALUES

RUN 2 - DB

M-1

M-2

M-2

O-1

O-1

STEADY STATE PERIOD

PTID NAME DESCRIPTION

1

2

3

4

5

PRETREATER, GASIFIER COMBINED CALCULATIONS

570	CMFFR	MF COAL FEED RATE	PPH	3152.00	3447.50	3447.50	4038.50	4383.25
571	CMAFFR	MAF COAL FEED RATE	PPH	2758.40	3017.00	3017.00	3534.20	3835.90
798	CMFRC	MF COAL/ RAW COAL	LB/LB	0.985000	0.985000	0.985000	0.985000	0.984999
799	CMAFRC	MAF COAL/ RAW COAL	LB/LB	0.862000	0.862000	0.862000	0.862000	0.862000
800	CTOTC1	TOTAL O2/RAW COAL	SCF/LB	4.62447	4.47542	3.76585	3.54514	3.10953
801	CTOTC2	TOTAL O2/MF COAL	SCF/LB	4.69489	4.54358	3.82320	3.59912	3.15688
802	CTOTC3	TOTAL O2/MAF COAL	SCF/LB	5.36481	5.19190	4.36874	4.11269	3.60734
803	CTOTC4	TOTAL O2/RAW COAL	LB/LB	0.389941	0.377373	0.317541	0.298930	0.262199
804	CTOTC5	TOTAL O2/MF COAL	LB/LB	0.395879	0.383120	0.322377	0.303483	0.266192
805	CTOTC6	TOTAL O2/MAF COAL	LB/LB	0.452368	0.437788	0.368377	0.346787	0.304175
806	CTSTC1	TTL STM/RAW COAL	SCF/LB	81.7321	74.5820	73.9738	64.0444	59.3263
807	CTSTC2	TTL STM/MF COAL	SCF/LB	82.9768	75.7177	75.1004	65.0197	60.2298
808	CTSTC3	TTL STM/MAF COAL	SCF/LB	94.8169	86.5220	85.8165	74.2975	68.8240
809	CTSTC4	TTL STM/RAW COAL	LB/LB	3.88007	3.54063	3.51176	3.04038	2.81640
810	CTSTC5	TTL STM/MF COAL	LB/LB	3.93916	3.59455	3.56524	3.08668	2.85929
811	CTSTC6	TTL STM/MAF COAL	LB/LB	4.50124	4.10746	4.07397	3.52713	3.26728
556	CTO2ST	TTL O2/STEAM	SCF/SCF	0.057	0.060	0.051	0.055	0.052
793	CTO5S	TTL O2/STM RATIO	SCF/LB	1.19185	1.26402	1.07235	1.16602	1.10408
792	CTO5LB	TTL O2/STM RATIO	LB/LB	0.100	0.107	0.090	0.098	0.093

UPDATED AVERAGE GAS SAMPLE COMPOSITIONS

RUN 2 - DB M-1 M-2 M-2 O-1 O-1

STEADY STATE PERIOD

COMPONENT	1		2		3		4		5	
	DRY	WET	DRY	WET	DRY	WET	DRY	WET	DRY	WET
MOLX-H2	23.72	17.25	25.21	18.88	23.42	13.46	25.85	20.40	24.22	16.38
MOLX-CO	6.19	4.50	7.26	5.44	5.91	3.39	6.10	4.82	5.28	3.57
MOLX-CO2	52.85	38.43	45.64	34.18	47.35	27.21	37.83	29.85	37.47	25.34
MOLX-CH4	10.98	7.99	10.84	8.12	11.61	6.67	10.87	8.58	11.59	7.84
MOLX-C2H6	0.41	0.30	0.55	0.41	0.67	0.38	0.49	0.38	0.52	0.35
MOLX-N2	4.59	3.34	9.25	6.93	9.45	5.43	17.59	13.88	18.94	12.81
MOLX-NH3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOLX-H2S	1.19	0.86	1.19	0.89	1.44	0.83	1.00	0.79	1.66	1.12
MOLX-H2O	0.00	27.29	0.00	25.12	0.00	42.53	0.00	21.09	0.00	32.37
MOLX-O2	0.06	0.04	0.05	0.04	0.10	0.06	0.10	0.08	0.21	0.14
MOLX-C2H4	0.01	0.01	0.00	0.00	0.05	0.03	0.16	0.13	0.10	0.07
MOLX-C3H6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOLX-C3H8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOLX-C4H8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOLX-C4H10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

UPSTR PRESS-(P227) PSIG	558.38	570.88	565.88	572.00	573.01
FLOW TEMP-(TI20010) DEGF	362.17	357.38	399.81	344.14	377.91
MOL WT. (WET)	26.04	25.14	23.86	24.39	23.70
DRY GAS MAKE,1000-SCFH	55.84	65.03	54.30	68.76	60.49
WET GAS MAKE,1000-SCFH	76.80	86.84	94.49	87.13	89.44
H2/CO MOL RATIO	3.83	3.47	3.97	4.24	4.59

AVERAGED CHAR ANALYSIS
MOISTURE - FREE BASIS

RUN 2 - DB	M-1	M-2	M-2	O-1	O-1
	1	STEADY 2	STATE 3	PERIOD 4	5
PROXIMATE ANALYSIS					

VOLATILE MATTER	5.5	6.0	5.6	4.3	4.3
FIXED CARBON	55.3	65.4	65.8	71.2	71.2
ASH	39.2	28.6	28.6	24.5	24.5
ULTIMATE ANALYSIS					

HYDROGEN	0.8	1.0	1.1	1.1	1.1
CARBON	56.6	66.8	66.8	70.8	70.8
NITROGEN	0.5	0.6	0.7	0.7	0.7
OXYGEN	1.4	1.6	1.8	1.2	1.2
SULFUR	1.3	1.5	1.1	1.8	1.8
ASH	39.2	28.6	28.6	24.5	24.5
HEAT OF COMBUSTION					

HHV - BTU/LB	8313.0	9909.0	10037.0	10681.7	10681.7

AVERAGE CALCULATION VALUES

RUN 2 - DB 0-20 0-3

STEADY STATE PERIOD

PTID	NAME	DESCRIPTION		6	7
PRETREATER CALCULATIONS					
84	XQ001	COAL FEED RATE	PPH	4159.00	3740.00
557	CTSTP	TOTAL STM TO PRTR	PPH	4915.45	4694.52
214	F1	STM TRANSPORT FLOW	PPH	2585.07	2223.00
364	F285	OXYGEN TO PRTR	SCFH	0.000	0.000
374	F289	TRANSPORT LINE O2	SCFH	3090.92	3124.89
47	T203	PRTRTR LWR BED TEMP	DEGF	829.575	880.906
366	T290	PRTR BED AT 9.75 FT	DEGF	850.435	898.377
367	T291	PRTR BED AT 5.45 FT	DEGF	852.619	901.322
276	T2208	PRTR INLET TEMP	DEGF	763.768	771.983
365	D2223	PRTR GAS DELTA P	"H2O	65.8722	57.9676
215	P267	PRTRTR VESSEL PRESS	PSIG	638.246	630.649
402	C2FBDP	PRT FLD BED DNSTY	LB/FT3	8.67416	11.6165
403	C2FBHP	PRT FLD BED HEIGHT	FT	13.7325	11.9254
539	CPBVOL	PRT FLUID BED VOL	FT3	25.0353	21.8423
405	C2SIP	PRT SOLIDS INVENTORY	LB	217.160	253.730
404	C2SRTP	PRT SOLIDS RES TIME	MIN	3.18058	4.13253
407	C2SCP2	PRT COAL FEED	PPH/FT2	2353.71	2116.58
406	C2SCP1	PRT COAL FEED	PPH/FT3	166.125	171.228
535	C2PPD	PRT PR DRP	"H2O/FTBD	1.66811	2.23394
401	C2SVR2	PRT FD GAS SUP VEL	FPS	0.992659	1.05188
409	C2SCP4	PRT O2/RAW COAL	SCF/LB	0.743187	0.835531

AVERAGE CALCULATION VALUES

RUN 2 - DB

0-20

0-3

STEADY STATE PERIOD

PTID	NAME	DESCRIPTION		6	7
411	C2SOP2	PRT 02/MF COAL	SCF/LB	0.754505	0.848255
413	C2SOP4	PRT 02/MAF COAL	SCF/LB	0.862166	0.969293
408	C2SCP3	PRT 02/RAW COAL	LB/LB	0.063	0.070
410	C2SOP1	PRT 02/MF COAL	LB/LB	0.064	0.072
412	C2SOP3	PRT 02/MAF COAL	LB/LB	0.073	0.082
538	CPSRC2	PRT STM/RAW COAL	SCF/LB	24.8959	26.4407
415	C2SSP2	PRT STM/MF COAL	SCF/LB	25.2750	26.8433
417	C2SSP5	PRT STM/MAF COAL	SCF/LB	28.8815	30.6736
537	CPSRC1	PRT STM/RAW COAL	LB/LB	1.18188	1.25522
414	C2SSP1	PRT STM/MF COAL	LB/LB	1.19988	1.27433
416	C2SSP4	PRT STM/MAF COAL	LB/LB	1.37109	1.45617
554	CP02ST	PRT 02/STEAM	SCF/SCF	0.030	0.032
797	CP05S	PRT 02/STM RATIO	SCF/LB	0.628817	0.665645
796	CP05LB	PRT 02/STM RATIO	LB/LB	0.053	0.056

AVERAGE CALCULATION VALUES

RUN 2 - DB

0-20

0-3

STEADY STATE PERIOD

PTID NAME DESCRIPTION

6

7

GASIFICATION CALCULATIONS

84	XQ001	COAL FEED RATE	PPH	4159.00	3740.00
226	F293	GSFR STM FEED RATE	PPH	6395.57	5913.16
137	F204	GASF PLENM STM FEED	PPH	3557.46	3601.38
108	CDISST	GASF DIST STM FEED	PPH	2837.03	2314.12
227	F292	GSFR O2 FEED RATE	SCFH	9389.87	9233.02
136	F203	GASF PLENM O2 FEED	SCFH	4358.40	3163.78
107	CDIS02	GASF DIST O2 FEED	SCFH	5031.31	6071.39
581	CNSFCC	NET STM FROM CC	PPH	-706.397	662.444
345	T205	GASIFIER BED AT 18"	DEGF	1413.20	1483.10
220	P256	GASIFIER PRESSURE	PSIG	605.980	605.136
235	P295	GASIFIER PRESSURE	PSIG	612.053	610.030
526	C2GPD	GSF PRESS DROP "H2O/FTBD		1.72478	1.76315
424	C2FBDG	GSF FLD BED DNSTY LB/FT3		8.96885	9.16838
565	CUGFBD	GASF UPR FL BD DEN LB/CF		7.32391	6.31507
566	CGOFBD	GASF OVRL FL BD DN LB/CF		8.14218	7.84766
425	C2FBHG	GSF FLD BED HEIGHT	FT	21.3971	16.2261
572	CGBV	GASIFIER BED VOLUME	FT3	158.916	120.474
427	C2SIG	GSF SOLIDS INVENTORY	LB	1408.24	1128.04
426	C2SRTG	GSF SOLIDS RES TIME	MIN	20.6254	18.3725
429	C2SCG2	GASF COAL FEED	PPH/FT2	588.260	528.996
428	C2SCG1	GASF COAL FEED	PPH/FT3	26.1710	31.0440

AVERAGE CALCULATION VALUES

RUN 2 - DB

0-20

0-3

STEADY STATE PERIOD

PTID	NAME	DESCRIPTION	6	7
420	C2SVBG	GSF SUP VEL-BOT BED FPS	0.464330	0.448565
423	C2SV0G	GSF SUP VEL-OUTLET FPS	0.547843	0.452590
421	C2SVTG	GSF SUP VEL-TOP BED FPS	0.734445	0.613996
422	C2SVMG	GSF SUP VEL-MEAN BED FPS	0.599387	0.531280
584	CGSF02	GSF O2/RAW COAL SCF/LB	2.25772	2.46872
433	C2S0G2	GASF O2/MF COAL SCF/LB	2.29211	2.50632
435	C2S0G4	GASF O2/MAF COAL SCF/LB	2.61917	2.86395
585	CGSF03	GASF O2/RAW COAL LB/LB	0.190374	0.208166
432	C2S0G1	GASF O2/MF COAL LB/LB	0.193274	0.211336
434	C2S0G3	GASF O2/MAF COAL LB/LB	0.220852	0.241492
586	CGSMSM	GASF STM/RAW COAL SCF/LB	32.3924	33.3044
437	C2SSG2	GASF STM/MF COAL SCF/LB	32.8858	33.8115
439	C2SSG4	GASF STM/MAF COAL SCF/LB	37.5782	38.6362
587	CGSSTM	GASF STM/RAW COAL LB/LB	1.53777	1.58106
436	C2SSG1	GASF STM/MF COAL LB/LB	1.56118	1.60514
438	C2SSG3	GASF STM/MAF COAL LB/LB	1.78395	1.83417
555	CG02ST	GSF O2/STEAM SCF/SCF	0.070	0.074
564	C02ST2	GASF O2/STM RATIO SCF/LB	1.46818	1.56144
563	C02ST1	GASF O2/STM RATIO LB/LB	0.123799	0.131663
790	CDSVP	PLENUM O2 VOL PERCENT %	5.49645	4.00349
791	CDOVP	DIST O2 VOL PERCENT %	7.76530	11.0756

AVERAGE CALCULATION VALUES

RUN 2 - DB

0-20

0-3

STEADY STATE PERIOD

PTID	NAME	DESCRIPTION		6	7
342	F255	WASTE WATER FLOW	GPM	12.5133	14.2635
243	F221	TAR FLOW THRLM OXDZR	GPM	0.000	0.000
245	F209	RW GS SCRBR EF 1000-SCFH		153.969	88.3170
574	CNRGG	RAW GAS FROM GASF	SCFH	253665.	206446.
575	CTGFB	TOTAL GAS FROM BED	SCFH	244368.	197149.
475	C2CI	GASF CARBON INVENTORY	LB	978.959	807.378
551	CCGPPH	CARBON GASIFIED	PPH	1346.52	1040.56
594	C2GR4	GASF RATE	LB-C/HR-FT3	8.47317	8.63723
595	C2GR3	GASF RATE	LB-C/HR-LB-C	1.37546	1.28882
455	C2MRG2	CH4 PROD GAS	SCFH/FT3	35.1678	48.1975
454	C2MRG1	CH4 IN RAW GAS	LB-C/LB-C	0.180514	0.227407
451	C2CG1	CARBON CONVRSN (CHAR)	%	47.8937	41.1575
593	C2CG12	CARBON CONVRSN (GAS)	%	28.9284	27.7710
559	CH2COR	RAW GAS H2/CO RATIO		3.80000	3.62500
596	CUGYM	USEFL GAS YLD	SCF/LB-MAF	11.5575	14.1521
592	CECH4R	EQ CH4/RAW COAL	SCF/LB	1.58667	1.80207
591	CECH4M	EQ CH4/MF COAL	SCF/LB	1.61083	1.82951
579	CECH4C	EQ CH4/MAF COAL	SCF/LB	1.84068	2.09057
532	C2MYG5	CH4YLD/RW COAL	SCF/HR-LB	1.34377	1.55255
464	C2MYG2	CH4YLD/MF COAL	SCF/HR-LB	1.36423	1.57620
466	C2MYG4	CH4YLD/MAF COAL	CF/HR-LB	1.55890	1.80110

AVERAGE CALCULATION VALUES

RUN 2 - DB

0-20

0-3

STEADY STATE PERIOD

PTID	NAME	DESCRIPTION		6	7
577	CTUCH4	TOTAL ULTIMATE CH4 SCFH		8902.77	9650.27
560	CUCH4R	ULT CH4/RAW COAL SCF/LB		2.14060	2.58028
561	CUCH4M	ULT CH4/MF COAL SCF/LB		2.17320	2.61958
562	CUCH4A	ULT CH4/MAF COAL SCF/LB		2.48330	2.99337
450	C2SCG	STM CONV - H2O BALANCE %		20.6485	36.4884
598	CSCH2	STM CONV - H2 BALANCE %		-4.56992	-2.74792
552	CSPV	SPACE VELOCITY 1/MIN		2.16280	2.78401
553	CSPT	SPACE TIME MIN		0.462363	0.359194

AVERAGE CALCULATION VALUES

RUN 2 - DB

0-20

0-3

STEADY STATE PERIOD

PTID NAME DESCRIPTION

6

7

CHAR COOLER CALCULATIONS

234	F230	H2O FLW TO CHAR CLR	GPH	0.000	0.000
230	F205	CHR CLR STM FEED	PPH	2225.53	2223.09
341	F254	STM FLW FR CHAR CLR	PPH	2931.93	1560.65
372	F229	CHAR TRANSPORT STEAM	PPH	307.477	263.423
599	CFRPPH	CHAR REMOVAL RATE	PPH	2107.36	2078.53
346	T202	CHR CLR UPPR BD TMP	DEGF	880.114	909.766
89	T20004	C. C. BD AT 19FT-2IN	DEGF	866.581	841.040
224	P258	CHAR COOLER PRESS	PSIG	597.369	596.072
534	C2CPD	CC PRESS DROP "H2O/FTBD		1.62824	2.76139
487	C2FBDC	CC FLO BED DNSTY	LB/FT3	8.45472	14.3387
488	C2FBHC	CC FLO BED HEIGHT	FT	11.6680	6.80721
573	CCCBV	CHAR CLR BED VOLUME	FT3	32.2824	19.4592
490	C2SIC	CC SOLIDS INVENTORY	LB	272.939	279.019
489	C2SRTO	CC SOLIDS RES TIME	MIN	7.77102	8.05431
520	C2SCC2	CC MF CHAR FD	LB/HR-FT2	798.241	787.322
499	C2SCC1	CC MF CHAR FD	LB/HR-FT3	65.2788	106.815
484	C2SSV	CC STEAM SUP VEL	FPS	0.305449	0.312430
485	C2WSV	CC VAP H2O SUP VEL	FPS	0.000	0.000
486	C2TSV	CC TOT STM SUP VEL	FPS	0.305500	0.312993
521	C2SCC3	CC MF CHR/RAW COAL	LB/LB	0.514414	0.564220
493	C2SSC3	CC STM/MF CHAR	LB/LB	1.05608	1.06955

AVERAGE CALCULATION VALUES

RUN 2 - DB

0-20

0-3

STEADY STATE PERIOD

PTID	NAME	DESCRIPTION		6	7
588	CCSTM	CC STM/RAW COAL	LB/LB	0.535111	0.594410
494	C2SSC4	CC STM/MF COAL	LB/LB	0.543261	0.603462
589	CCSTM	CC STM/MAF COAL	LB/LB	0.620779	0.689570
497	C2SNC3	CC H2O/MF CHAR	LB/LB	0.000	0.000
498	C2SNC4	CC H2O/RAW COAL	LB/LB	0.000	0.000

AVERAGE CALCULATION VALUES

RUN 2 - DB

0-20

0-3

STEADY STATE PERIOD

FTID	NAME	DESCRIPTION		6	7
PRETREATER, GASIFIER COMBINED CALCULATIONS					

570	CMFFR	MF COAL FEED RATE	PPH	4096.61	3683.90
571	CMAFFR	MAF COAL FEED RATE	PPH	3585.06	3223.88
798	CMFRC	MF COAL/ RAW COAL	LB/LB	0.984999	0.985000
799	CMAFRC	MAF COAL/ RAW COAL	LB/LB	0.862000	0.862000
800	CTOTC1	TOTAL O2/RAW COAL	SCF/LB	3.00091	3.30425
801	CTOTC2	TOTAL O2/MF COAL	SCF/LB	3.04661	3.35457
802	CTOTC3	TOTAL O2/MAF COAL	SCF/LB	3.48133	3.83324
803	CTOTC4	TOTAL O2/RAW COAL	LB/LB	0.253040	0.278618
804	CTOTC5	TOTAL O2/MF COAL	LB/LB	0.256894	0.282861
805	CTOTC6	TOTAL O2/MAF COAL	LB/LB	0.293550	0.323223
806	CTSTC1	TTL STM/RAW COAL	SCF/LB	57.2883	59.7450
807	CTSTC2	TTL STM/MF COAL	SCF/LB	58.1608	60.6549
808	CTSTC3	TTL STM/MAF COAL	SCF/LB	66.4597	69.3098
809	CTSTC4	TTL STM/RAW COAL	LB/LB	2.71965	2.83628
810	CTSTC5	TTL STM/MF COAL	LB/LB	2.76107	2.87947
811	CTSTC6	TTL STM/MAF COAL	LB/LB	3.15504	3.29034
556	CTO2ST	TTL O2/STEAM	SCF/SCF	0.052	0.055
793	CTOSS	TTL O2/STM RATIO	SCF/LB	1.10342	1.16500
792	CTOSLB	TTL O2/STM RATIO	LB/LB	0.093	0.098

UPDATED AVERAGE GAS SAMPLE COMPOSITIONS

RUN 2 - DB

0-20

03

STEADY STATE PERIOD

COMPONENT	6		7		DRY	WET	DRY	WET	DRY	WET	DRY	WET
	DRY	WET	DRY	WET								
MOL%-H2	16.63	5.67	19.98	11.92								
MOL%-CO	4.38	1.49	5.51	3.29								
MOL%-CO2	48.06	16.37	47.73	28.47								
MOL%-CH4	10.65	3.63	11.02	6.57								
MOL%-C2H6	0.88	0.30	0.79	0.47								
MOL%-N2	17.55	5.98	13.58	8.10								
MOL%-NH3	0.00	0.00	0.00	0.00								
MOL%-H2S	1.64	0.56	1.18	0.70								
MOL%-H2O	0.00	65.93	0.00	40.36								
MOL%-O2	0.11	0.04	0.10	0.06								
MOL%-C2H4	0.09	0.03	0.10	0.06								
MOL%-C3H6	0.00	0.00	0.00	0.00								
MOL%-C3H8	0.00	0.00	0.00	0.00								
MOL%-C4H8	0.00	0.00	0.00	0.00								
MOL%-C4H10	0.00	0.00	0.00	0.00								

UPSTR PRESS-(P227) PSIG	581.63	569.07
FLOW TEMP-(TI20010) DEGF	441.83	395.77
MOL. WT. (WET)	22.16	24.69
DRY GAS MAKE, 1000-SCFH	52.45	52.68
WET GAS MAKE, 1000-SCFH	153.97	88.32
H2/CO MOL RATIO	3.80	3.62

AVERAGED CHAR ANALYSIS
MOISTURE - FREE BASIS

RUN 2 - DB	0-20	0-3
	6	STEADY STATE PERIOD 7
PROXIMATE ANALYSIS		

VOLATILE MATTER	7.1	5.7
FIXED CARBON	68.6	72.2
ASH	24.3	22.1
ULTIMATE ANALYSIS		

HYDROGEN	1.4	1.1
CARBON	69.5	71.6
NITROGEN	0.8	0.7
OXYGEN	2.1	2.9
SULFUR	1.9	1.5
ASH	24.3	22.1
HEAT OF COMBUSTION		

HHV - BTU/LB	10718.0	11046.0

APPENDIX III - LABORATORY DATA

Table of Contents

A	Sample Point	C1
B	Sample Point	C1A
C	Sample Point	C7
D	Sample Point	C7A
E	Sample Point	G2
F	Sample Point	IG
G	Sample Point	P1
H	Sample Point	SC2
I	Sample Point	S3
J	Sample Point	S4
K	Sample Point	S5

C1 - RAW COAL
CHEMICAL ANALYSIS AND
PARTICLE SIZE DISTRIBUTION

BASIS: WET WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	C1-154	C1-155	C1-156	C1-157	C1-158	C1-159	C1-160
TIME	11: 0	15: 0	11: 0	11: 0	10:30	10:30	10:30
DATE	9/22/77	10/ 7/77	10/21/77	11/ 4/77	11/ 8/77	11/ 8/77	11/ 8/77
PROXIMATE ANALYSIS							
MOISTURE	6.3	6.1	6.6	6.3	5.3	7.4	7.3
VOLATILE MATTER	37.5	36.5	35.6	38.1	35.6	35.9	36.6
FIXED CARBON	45.2	45.1	45.7	43.5	44.1	43.4	43.8
ASH	11.0	12.3	12.1	12.1	15.1	13.3	12.3
TOTAL	100.0	100.0	100.0	100.0	100.1	100.0	100.0
AIR DRY MOISTURE	4.8	3.9	5.0	2.6	5.4	8.9	6.9
TOTAL MOISTURE	10.8	9.8	11.3	8.7	10.4	15.6	13.7
ULTIMATE ANALYSIS							
HYDROGEN	5.5	5.3	5.4	5.5	5.2	5.4	5.5
CARBON	64.5	63.6	64.3	63.5	62.0	62.1	61.8
NITROGEN	1.1	1.0	1.2	1.1	0.9	1.0	1.0
OXYGEN	14.5	14.4	13.9	14.6	13.0	14.6	16.0
SULFUR	3.4	3.4	3.1	3.2	3.8	3.6	3.4
ASH	11.0	12.3	12.1	12.1	15.1	13.3	12.3
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	11700.	11500.	11500.	11400.	11200.	11100.	11100.
F. S. I.	1.0	3.0	2.5	5.0	3.5	4.0	4.0
U. S. SIEVE SIZE	CUMULATIVE WEIGHT PERCENT						
+3/4 MESH	30.4	46.5	46.6	33.7	20.1	37.4	20.4
+1/4 MESH	59.4	71.9	68.3	54.8	42.0	58.0	44.2
-1/4 MESH (WT %)	40.6	28.1	31.7	45.2	58.0	42.0	55.8

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

C1 - RAW COAL
CHEMICAL ANALYSIS AND
PARTICLE SIZE DISTRIBUTION

BASIS: WET WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	C1-161	C1-162	C1-163	C1-164	C1-165	C1-166	C1-167
TIME	10: 0	10: 0	10: 0	15: 0	15: 0	15: 0	16: 0
DATE	11/15/77	11/15/77	11/15/77	11/17/77	11/17/77	11/17/77	11/22/77
PROXIMATE ANALYSIS							
MOISTURE	6.5	6.0	6.9	6.9	8.3	8.7	6.2
VOLATILE MATTER	38.7	37.8	37.1	35.5	35.7	34.5	35.2
FIXED CARBON	45.1	45.6	43.5	45.2	45.4	45.3	46.2
ASH	9.7	10.6	12.5	12.4	10.6	11.5	12.4
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	6.1	5.7	6.4	8.2	9.3	6.4	6.5
TOTAL MOISTURE	12.2	11.4	12.9	14.5	16.8	14.5	12.3
ULTIMATE ANALYSIS							
HYDROGEN	5.5	5.4	5.3	5.4	5.5	5.5	5.3
CARBON	65.5	65.3	63.0	63.1	63.5	62.8	63.6
NITROGEN	1.2	1.2	1.2	1.1	1.1	1.1	1.3
OXYGEN	14.7	13.9	14.4	14.0	15.7	15.7	13.8
SULFUR	3.4	3.6	3.6	4.0	3.6	3.4	3.6
ASH	9.7	10.6	12.5	12.4	10.6	11.5	12.4
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	11900.	11800.	11400.	11400.	11500.	11300.	11500.
F. S. I.	3.0	3.5	3.5	3.5	2.5	3.0	4.0
U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT						
+3/4 MESH	8.2	8.6	10.8	10.7	14.5	20.4	9.7
+1/4 MESH	44.8	48.8	51.7	48.0	46.3	54.9	50.9
-1/4 MESH (WT %)	55.2	51.2	48.3	52.0	53.7	45.1	49.1

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

C1 - RAW COAL
CHEMICAL ANALYSIS AND
PARTICLE SIZE DISTRIBUTION

BASIS: WET WEIGHT PERCENT - ASTM D3188-74

SAMPLE NUMBER	C1-168	C1-169	C1-170	C1-171	C1-172	C1-173	C1-174
TIME	9: 0	9: 0	15: 0	15: 0	12:30	12:30	12:45
DATE	11/23/77	11/23/77	11/28/77	11/28/77	12/14/77	12/14/77	12/20/77
PROXIMATE ANALYSIS							
MOISTURE	8.5	9.0	6.3	7.5	7.8	9.2	4.7
VOLATILE MATTER	33.2	33.1	36.1	34.2	33.9	32.7	34.8
FIXED CARBON	45.1	44.3	47.4	44.3	45.6	44.7	46.0
ASH	13.2	13.6	10.2	14.0	12.7	13.4	14.5
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	4.7	4.9	8.5	4.6	9.2	8.6	10.7
TOTAL MOISTURE	12.8	13.5	14.2	11.7	16.3	17.0	14.9
ULTIMATE ANALYSIS							
HYDROGEN	5.4	5.4	5.4	5.3	5.4	5.4	5.0
CARBON	60.6	59.9	65.7	61.4	62.8	60.5	63.2
NITROGEN	1.2	1.1	1.2	1.1	1.1	1.1	1.2
OXYGEN	15.9	16.4	14.6	14.6	14.6	15.9	12.4
SULFUR	3.7	3.6	2.9	3.6	3.4	3.7	3.7
ASH	13.2	13.6	10.2	14.0	12.7	13.4	14.5
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	11100.	10900.	11800.	11100.	11300.	10900.	11500.
F. S. I.	5.0	5.5	4.0	4.0	5.0	3.5	4.5
U. S. SIEVE SIZE							
+3/4 MESH	14.7	22.4	28.6	18.5	12.1	5.6	24.0
+1/4 MESH	41.8	43.9	49.6	41.2	36.2	28.9	51.4
-1/4 MESH (WT %)	58.2	56.1	50.4	58.8	63.8	71.1	48.6
CUMULATIVE WEIGHT PERCENT							
+3/4 MESH	14.7	22.4	28.6	18.5	12.1	5.6	24.0
+1/4 MESH	41.8	43.9	49.6	41.2	36.2	28.9	51.4
-1/4 MESH (WT %)	58.2	56.1	50.4	58.8	63.8	71.1	48.6
+	= NO ANALYSIS DONE						
*	= TRACE						
**	= SUSPECT ANALYSIS						

C1 - RAW COAL
CHEMICAL ANALYSIS AND
PARTICLE SIZE DISTRIBUTION

BASIS: WET WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	C1-175	C1-176	C1-177	C1-178	C1-179	C1-180	C1-181
TIME	12:45	17:0	17:0	17:0	12:0	12:0	12:0
DATE	12/20/77	12/20/77	12/20/77	12/20/77	12/22/77	12/22/77	12/22/77

PROXIMATE ANALYSIS

MOISTURE	7.1	7.6	7.8	8.3	8.0	7.5	8.5
VOLATILE MATTER	33.2	33.4	33.5	33.4	34.0	34.0	33.7
FIXED CARBON	46.1	44.3	44.4	43.9	45.9	44.6	44.2
ASH	13.6	14.7	14.3	14.4	12.1	13.9	13.6
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0

AIR DRY MOISTURE	8.5	7.7	7.6	7.1	7.6	6.8	6.7
TOTAL MOISTURE	15.0	14.7	14.8	14.8	15.0	13.8	14.6

ULTIMATE ANALYSIS

HYDROGEN	5.2	5.2	5.2	5.2	5.3	5.2	5.3
CARBON	62.6	61.4	60.8	61.3	62.8	61.6	61.1
NITROGEN	1.1	1.1	1.0	1.1	1.1	1.3	1.1
OXYGEN	13.7	14.0	15.2	14.4	15.2	14.5	15.2
SULFUR	3.8	3.6	3.5	3.6	3.5	3.5	3.7
ASH	13.6	14.7	14.3	14.4	12.1	13.9	13.6
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0

HEAT OF COMBUSTION (BTU/LB)	11300.	11000.	11000.	11000.	11300.	11100.	11100.
F. S. I.	4.0	5.0	5.0	4.5	3.0	4.0	4.0

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+3/4 MESH	23.1	17.1	20.4	12.3	14.0	9.4	5.7
+1/4 MESH	51.4	39.0	45.1	37.0	39.0	33.3	29.8
-1/4 MESH (WT %)	48.6	61.0	54.9	63.0	61.0	66.7	70.2

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

C1 - RAW COAL
CHEMICAL ANALYSIS AND
PARTICLE SIZE DISTRIBUTION

BASIS: WET WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	C1-182	C1-183	C1-184	C1-185	C1-186	C1-187	C1-188
TIME	12: 0	13:30	12: 0	20: 0	15: 0	13: 0	13:25
DATE	1/19/78	1/19/78	1/25/78	1/25/78	1/25/78	3/31/78	3/31/78
PROXIMATE ANALYSIS							
MOISTURE	6.1	3.3	7.8	8.2	7.6	0.0+	0.0+
VOLATILE MATTER	35.0	22.3	34.4	33.3	33.4	0.0+	0.0+
FIXED CARBON	41.6	33.5	44.7	45.4	46.4	0.0+	0.0+
ASH	17.3	40.9	13.1	13.1	12.6	0.0+	0.0+
TOTAL	100.0	100.0	100.0	100.0	100.0	0.0	0.0
AIR DRY MOISTURE	17.7	13.3	13.4	11.0	11.4	9.3	9.6
TOTAL MOISTURE	22.8	16.2	20.2	18.3	18.1	0.0+	0.0+
ULTIMATE ANALYSIS							
HYDROGEN	5.0	3.3	5.3	5.4	5.2	0.0+	0.0+
CARBON	60.6	42.7	62.3	61.8	63.2	0.0+	0.0+
NITROGEN	1.1	0.8	1.1	1.1	1.0	0.0+	0.0+
OXYGEN	12.5	10.0	14.7	15.1	14.4	0.0	0.0
SULFUR	3.5	2.3	3.5	3.5	3.6	0.0+	0.0+
ASH	17.3	40.9	13.1	13.1	12.6	0.0+	0.0+
TOTAL	100.0	100.0	100.0	100.0	100.0	0.0	0.0
HEAT OF COMBUSTION (BTU/LB)	10900.	7740.	11300.	11200.	11300.	0. +	0. +
F. S. I.	4. 0	3. 0	4. 0	3. 5	3. 5	0.0+	0.0+
U. S. SIEVE SIZE							
+3/4 MESH	31.0	27.2	16.8	23.2	24.0	25.1	21.4
+1/4 MESH	56.8	56.6	42.1	48.7	50.6	51.1	50.0
-1/4 MESH (WT %)	43.2	43.4	57.9	51.3	49.4	48.9	50.0

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

CL - RAW COAL
CHEMICAL ANALYSIS AND
PARTICLE SIZE DISTRIBUTION

BASIS: WET WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	TIME	DATE	PROXIMATE ANALYSIS						
CL-189	13:45	3/31/78	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
CL-190	14:15	3/31/78	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
CL-191	15:30	3/31/78	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
CL-192	12:30	4/ 3/78	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
CL-193	10:45	4/ 3/78	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
CL-194	12:30	4/ 3/78	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
CL-195	13: 0	4/ 3/78	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
<hr/>									
MOISTURE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
VOLATILE MATTER	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
FIXED CARBON	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
ASH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AIR DRY MOISTURE	8.9	6.7	7.8	11.3	9.2	11.3	8.1		
TOTAL MOISTURE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+		
<hr/>									
HYDROGEN	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
CARBON	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
NITROGEN	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
OXYGEN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SULFUR	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
ASH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HEAT OF COMBUSTION (BTU/LB)	0. +	0. +	0. +	0. +	0. +	0. +	0. +	0. +	0. +
F.S.I.	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
U.S. SIEVE SIZE	CUMULATIVE WEIGHT PERCENT								
+3/4 MESH	15.5	23.3	30.9	27.7	19.9	27.7	29.6		
+1/4 MESH	44.7	51.0	55.2	51.9	45.4	51.9	55.0		
-1/4 MESH (MT %)	55.3	49.0	44.8	48.1	54.6	48.1	45.0		

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

C1 - RAW COAL
CHEMICAL ANALYSIS AND
PARTICLE SIZE DISTRIBUTION

BASIS. WET WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	C1-196	C1-197	C1-198	C1-199	C1-200	C1-201	C1-202
TIME	13:30	14:30	16:00	10:30	10:45	11:30	12:30
DATE	4/ 3/78	4/ 3/78	4/ 3/78	4/ 4/78	4/ 4/78	4/ 4/78	4/ 4/78
PROXIMATE ANALYSIS							
MOISTURE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
VOLATILE MATTER	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
FIXED CARBON	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
ASH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AIR DRY MOISTURE	5.6	5.9	8.5	13.3	12.0	10.3	12.1
TOTAL MOISTURE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
ULTIMATE ANALYSIS							
HYDROGEN	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
CARBON	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
NITROGEN	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
OXYGEN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SULFUR	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
ASH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HEAT OF COMBUSTION (BTU/LB) F. S. I.	0. + 0.0+	0. + 0.0+	0. + 0.0+	0. + 0.0+	0. + 0.0+	0. + 0.0+	0. + 0.0+
U. S. SIEVE SIZE	CUMULATIVE WEIGHT PERCENT						
+3/4 MESH	31.1	27.1	19.7	24.3	20.7	24.3	35.3
+1/4 MESH	56.5	55.8	45.1	50.8	46.9	49.6	49.1
-1/4 MESH (WT %)	43.5	44.2	54.9	49.2	53.1	50.4	50.9

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

C1 - RAW COAL
CHEMICAL ANALYSIS AND
PARTICLE SIZE DISTRIBUTION

BASIS: WET WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	C1-203	C1-204	C1-205	C1-206	C1-207	C1-208	C1-209
TIME	14: 0	14:45	8:30	9: 0	10: 0	11:45	17: 0
DATE	4/ 4/78	4/ 4/78	4/ 5/78	4/ 5/78	4/ 5/78	4/ 5/78	6/22/78
PROXIMATE ANALYSIS							
MOISTURE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	7.1
VOLATILE MATTER	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	33.2
FIXED CARBON	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	42.9
ASH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	16.8
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0	100.0
AIR DRY MOISTURE	6.5	10.5	14.0	14.2	15.8	15.4	4.9
TOTAL MOISTURE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	11.7
ULTIMATE ANALYSIS							
HYDROGEN	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	5.1
CARBON	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	60.1
NITROGEN	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	1.1
OXYGEN	0.0	0.0	0.0	0.0	0.0	0.0	13.6
SULFUR	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	3.3
ASH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	16.8
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0	100.0
HEAT OF COMBUSTION (BTU/LB)							
F. S. I.	0. +	0. +	0. +	0. +	0. +	0. +	10800.
	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	3.5
U. S. SIEVE SIZE							
+3/4 MESH	22.8	30.4	22.0	22.9	21.1	25.3	21.8
+1/4 MESH	47.6	56.6	47.8	47.0	46.6	50.0	48.2
-1/4 MESH (WT %)	52.4	43.4	52.2	53.0	53.4	50.0	51.8

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

C1 - RAW COAL
CHEMICAL ANALYSIS AND
PARTICLE SIZE DISTRIBUTION

BASIS: WET WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	C1-210	C1-211	C1-212	C1-213	C1-214	C1-215	C1-216
TIME	17:30	11: 0	13: 0	14:30	16:30	14: 0	16: 0
DATE	6/23/78	6/27/78	6/27/78	6/28/78	6/28/78	6/29/78	6/29/78
PROXIMATE ANALYSIS							
MOISTURE	6.5	8.0	7.8	0.0+	0.0+	0.0+	0.0+
VOLATILE MATTER	35.6	33.4	34.7	0.0+	0.0+	0.0+	0.0+
FIXED CARBON	44.8	46.0	44.6	0.0+	0.0+	0.0+	0.0+
ASH	13.1	12.6	12.9	0.0+	0.0+	0.0+	0.0+
TOTAL	100.0	100.0	100.0	0.0	0.0	0.0	0.0
AIR DRY MOISTURE	8.5	8.5	9.9	11.5	8.3	9.8	8.9
TOTAL MOISTURE	14.4	15.8	16.9	0.0+	0.0+	0.0+	0.0+
ULTIMATE ANALYSIS							
HYDROGEN	5.3	5.4	5.4	0.0+	0.0+	0.0+	0.0+
CARBON	63.1	62.0	62.3	0.0+	0.0+	0.0+	0.0+
NITROGEN	1.1	1.2	1.2	0.0+	0.0+	0.0+	0.0+
OXYGEN	13.8	15.2	14.6	0.0	0.0	0.0	0.0
SULFUR	3.6	3.6	3.6	0.0+	0.0+	0.0+	0.0+
ASH	13.1	12.6	12.9	0.0+	0.0+	0.0+	0.0+
TOTAL	100.0	100.0	100.0	0.0	0.0	0.0	0.0
HEAT OF COMBUSTION (BTU/LB)	11400.	11200.	11200.	0. +	0. +	0. +	0. +
F. S. I.	4.0	4.4	5.0	5.0	4.5	4.0	4.0
U. S. SIEVE SIZE							
				CUMMULATIVE WEIGHT PERCENT			
+3/4 MESH	30.7	30.9	27.6	22.4	29.3	17.5	18.9
+1/4 MESH	56.1	52.6	51.5	49.4	53.7	45.2	46.7
-1/4 MESH (WT %)	43.9	47.4	48.5	50.6	46.3	54.8	53.3

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C1 - RAW COAL
CHEMICAL ANALYSIS AND
PARTICLE SIZE DISTRIBUTION

BASIS: WET WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	C1-217	C1-218	C1-219	C1-220	C1-221	C1-222	C1-223
TIME	21: 0	9:45	12:15	15: 0	20: 0	9:30	12: 0
DATE	6/29/78	7/ 7/78	7/ 7/78	7/ 7/78	7/ 7/78	8/ 3/78	8/ 3/78
PROXIMATE ANALYSIS							

MOISTURE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
VOLATILE MATTER	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
FIXED CARBON	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
ASH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AIR DRY MOISTURE	7.6	9.1	7.8	8.2	9.2	6.7	5.9
TOTAL MOISTURE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
ULTIMATE ANALYSIS							

HYDROGEN	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
CARBON	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
NITROGEN	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
OXYGEN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SULFUR	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
ASH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HEAT OF COMBUSTION (BTU/LB)							
F. S. I.	0. +	0. +	0. +	0. +	0. +	0. +	0. +
	4.5	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
U. S. SIEVE SIZE							

			CUMMULATIVE WEIGHT PERCENT				
+3/4 MESH	28.6	20.5	17.6	15.4	24.4	30.3	20.9
+1/4 MESH	55.0	48.0	44.7	42.6	52.6	57.1	48.9
-1/4 MESH (WT %)	45.0	52.0	55.3	57.4	47.4	42.9	51.1

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C1 - RAW COAL
CHEMICAL ANALYSIS AND
PARTICLE SIZE DISTRIBUTION

BASIS: WET WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	C1-224	C1-225	C1-226	C1-227	C1-228	C1-229	C1-230
TIME	14:30	17:30	9:00	11:00	17:00	17:30	15:30
DATE	8/3/78	8/3/78	8/4/78	8/4/78	8/16/78	8/16/78	8/18/78
PROXIMATE ANALYSIS							
MOISTURE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	6.9
VOLATILE MATTER	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	34.0
FIXED CARBON	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	47.5
ASH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	11.6
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0	100.0
AIR DRY MOISTURE	6.1	3.9	5.0	8.3	8.2	4.4	5.5
TOTAL MOISTURE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	12.0
ULTIMATE ANALYSIS							
HYDROGEN	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	5.4
CARBON	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	62.5
NITROGEN	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	1.1
OXYGEN	0.0	0.0	0.0	0.0	0.0	0.0	15.5
SULFUR	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	3.9
ASH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	11.6
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0	100.0
HEAT OF COMBUSTION (BTU/LB)	0. +	0. +	0. +	0. +	0. +	0. +	11400.
F. S. I.	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	5.0
U. S. SIEVE SIZE							
	CUMMULATIVE WEIGHT PERCENT						
+3/4 MESH	25.5	35.6	30.5	24.4	33.0	40.6	35.3
+1/4 MESH	50.5	60.0	58.2	51.6	57.1	60.9	61.6
-1/4 MESH (WT %)	49.5	40.0	41.8	48.4	42.9	39.1	38.4

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C1 - RAW COAL
CHEMICAL ANALYSIS AND
PARTICLE SIZE DISTRIBUTION

BASIS: WET WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	C1-231	C1-232	C1-233	C1-234	C1-235	C1-236	C1-237
TIME	17: 0	12: 0	14:30	17:30	11:30	14: 0	16: 0
DATE	8/21/78	8/22/78	8/22/78	8/22/78	8/24/78	8/24/78	8/24/78

PROXIMATE ANALYSIS							
MOISTURE	7.6	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
VOLATILE MATTER	34.0	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
FIXED CARBON	46.9	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
ASH	11.5	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
TOTAL	100.0	0.0	0.0	0.0	0.0	0.0	0.0
AIR DRY MOISTURE	4.4	6.6	7.2	3.5	6.8	7.9	4.9
TOTAL MOISTURE	11.6	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+

ULTIMATE ANALYSIS							
HYDROGEN	5.3	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
CARBON	62.4	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
NITROGEN	1.1	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
OXYGEN	16.1	0.0	0.0	0.0	0.0	0.0	0.0
SULFUR	3.6	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
ASH	11.5	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
TOTAL	100.0	0.0	0.0	0.0	0.0	0.0	0.0
HEAT OF COMBUSTION (BTU/LB)	11200.	0 +	0 +	0 +	0 +	0 +	0 +
F. S. I.	3.0	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
U. S. SIEVE SIZE							

+3/4 MESH	26.6	17.8	42.5	21.3	21.7	30.3	30.3
+1/4 MESH	52.9	45.1	64.2	44.5	47.5	56.9	52.4
-1/4 MESH (WT %)	47.1	54.9	35.8	55.5	52.5	43.1	47.6.

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C1 - RAW COAL
CHEMICAL ANALYSIS AND
PARTICLE SIZE DISTRIBUTION

BASIS: WET WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	C1-238	C1-239	C1-240	C1-241	C1-242
TIME	8: 0	16:30	18: 0	19:15	21: 0
DATE	8/25/78	8/31/78	8/31/78	8/31/78	8/31/78
PROXIMATE ANALYSIS					
MOISTURE	7.5	0.0+	0.0+	0.0+	0.0+
VOLATILE MATTER	33.9	0.0+	0.0+	0.0+	0.0+
FIXED CARBON	46.7	0.0+	0.0+	0.0+	0.0+
ASH	11.9	0.0+	0.0+	0.0+	0.0+
TOTAL	100.0	0.0	0.0	0.0	0.0
AIR DRY MOISTURE	4.7	3.7	9.2	8.5	6.7
TOTAL MOISTURE	11.8	0.0+	0.0+	0.0+	0.0+
ULTIMATE ANALYSIS					
HYDROGEN	5.2	0.0+	0.0+	0.0+	0.0+
CARBON	63.1	0.0+	0.0+	0.0+	0.0+
NITROGEN	1.0	0.0+	0.0+	0.0+	0.0+
OXYGEN	15.4	0.0	0.0	0.0	0.0
SULFUR	3.4	0.0+	0.0+	0.0+	0.0+
ASH	11.9	0.0+	0.0+	0.0+	0.0+
TOTAL	100.0	0.0	0.0	0.0	0.0
HEAT OF COMBUSTION (BTU/LB)	11300.	0. +	0. +	0. +	0. +
F. S. I.	3.0	0.0+	0.0+	0.0+	0.0+
U. S. SIEVE SIZE					
+3/4 MESH	20.9	29.9	23.4	29.9	21.2
+1/4 MESH	50.5	59.8	49.5	55.4	66.5
-1/4 MESH (WT %)	49.5	40.2	50.5	44.6	33.5

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

C1A - RAW COAL COMPOSITE

CHEMICAL ANALYSIS

BASIS: WET WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	C1A- 33	C1A- 34	C1A- 35	C1A- 36	C1A- 37	C1A- 38	C1A- 39
TIME	5:30	6: 0	5:30	6: 0	5:30	6: 0	11: 0
DATE	4/ 1/78	4/ 1/78	4/ 4/78	4/ 4/78	4/ 5/78	4/ 5/78	4/ 6/78
PROXIMATE ANALYSIS							
MOISTURE	6.3	7.6	6.7	8.8	6.9	7.9	7.4
VOLATILE MATTER	34.8	34.5	35.1	34.9	34.8	34.4	34.6
FIXED CARBON	43.7	45.6	45.7	44.4	45.5	45.8	45.8
ASH	15.2	12.3	12.5	11.9	12.8	11.9	12.2
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
ULTIMATE ANALYSIS							
HYDROGEN	5.1	5.4	5.4	5.5	5.3	5.4	5.4
CARBON	61.9	63.2	63.5	62.4	63.1	63.2	63.6
NITROGEN	1.0	1.1	1.1	1.0	1.1	1.1	1.0
OXYGEN	13.2	14.4	13.7	15.6	14.3	15.0	14.3
SULFUR	3.6	3.6	3.8	3.6	3.4	3.4	3.5
ASH	15.2	12.3	12.5	11.9	12.8	11.9	12.2
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	11000.	11200.	11400.	11200.	11300.	11400.	11400.
F. S. I.	4.5	5.0	5.0	4.5	4.5	4.5	4.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

C1A - RAW COAL COMPOSITE

CHEMICAL ANALYSIS

BASIS: WET WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	C1A- 40	C1A- 41	C1A- 42	C1A- 43	C1A- 44	C1A- 45	C1A- 46
TIME	16:30	21: 0	14:30	3:30	14:30	16: 0	23:45
DATE	6/28/78	6/29/78	7/ 8/78	8/ 5/78	8/ 5/78	8/17/78	8/22/78
PROXIMATE ANALYSIS							
MOISTURE	6.8	7.1	7.4	8.0	9.0	6.7	7.2
VOLATILE MATTER	35.0	33.8	33.9	37.1	36.2	34.5	34.4
FIXED CARBON	45.9	46.6	46.4	43.7	43.3	47.6	46.7
ASH	12.3	12.5	12.3	11.2	11.5	11.2	11.7
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
ULTIMATE ANALYSIS							
HYDROGEN	5.3	5.2	5.3	5.5	5.5	5.3	5.4
CARBON	63.3	63.1	61.5	63.5	62.4	64.1	62.7
NITROGEN	1.1	1.2	1.2	1.1	1.1	1.1	0.9
OXYGEN	14.1	14.4	15.9	15.0	16.0	14.8	15.9
SULFUR	3.9	3.6	3.8	3.7	3.5	3.5	3.4
ASH	12.3	12.5	12.3	11.2	11.5	11.2	11.7
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	11500.	11300.	11400.	11500.	11200.	11400.	11300.
F. S. I.	5.0	4.0	3.5	4.5	4.5	4.5	2.5

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

C1A - RAW COAL COMPOSITE

CHEMICAL ANALYSIS

BASIS: WET WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER C1A- 47

TIME 16: 0

DATE 8/24/78

PROXIMATE ANALYSIS

MOISTURE	6.6
VOLATILE MATTER	33.9
FIXED CARBON	46.1
ASH	13.4
TOTAL	100.0

AIR DRY MOISTURE 0.0+

ULTIMATE ANALYSIS

HYDROGEN	5.2
CARBON	62.2
NITROGEN	1.0
OXYGEN	14.6
SULFUR	3.6
ASH	13.4
TOTAL	100.0

HEAT OF COMBUSTION (BTU/LB) 11200.

F. S. I. 3.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

\$ASS LO A02

C7 - GROUND COAL

CHEMICAL ANALYSIS

BASIS: WET WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	C7-194	C7-195	C7-196	C7-197	C7-198	C7-199	C7-200
TIME	6:30	0:5	3:45	14:0	22:0	14:30	0:0
DATE	11/19/77	12/25/77	12/25/77	12/25/77	3/27/78	3/28/78	3/29/78
PROXIMATE ANALYSIS							
MOISTURE	2.2	2.4	2.2	4.0	1.8	2.2	2.6
VOLATILE MATTER	36.2	36.6	37.1	34.5	36.3	37.3	37.3
FIXED CARBON	48.9	48.1	48.3	47.4	48.8	46.3	46.5
ASH	12.7	12.9	12.4	14.1	13.1	14.2	13.6
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
ULTIMATE ANALYSIS							
HYDROGEN	5.0	5.1	5.1	5.0	4.8	5.0	5.1
CARBON	66.7	66.9	66.9	64.9	66.4	65.8	65.9
NITROGEN	1.2	1.1	1.2	1.1	0.0	1.2	1.2
OXYGEN	10.4	10.2	10.5	11.5	11.8	10.1	10.4
SULFUR	4.0	3.8	3.9	3.4	3.9	3.7	3.8
ASH	12.7	12.9	12.4	14.1	13.1	14.2	13.6
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	12100.	12100.	12200.	11700.	11900.	11900.	11900.
F. S. I.	3.5	4.5	3.5	5.0	4.5	4.5	3.5

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

C7 - GROUND COAL

CHEMICAL ANALYSIS

BASIS: WET WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	C7-201	C7-206	C7-207	C7-210	C7-214	C7-215	C7-216
TIME	8:30	21:10	20:30	5:30	3:0	21:0	11:0
DATE	3/29/78	4/18/78	4/20/78	4/22/78	4/26/78	4/26/78	6/15/78
PROXIMATE ANALYSIS							
MOISTURE	2.2	3.1	2.3	2.6	2.6	2.9	1.5
VOLATILE MATTER	37.7	35.8	35.4	36.8	34.8	34.6	36.0
FIXED CARBON	47.1	47.8	47.0	46.8	48.5	48.6	49.7
ASH	13.0	13.3	15.3	13.8	14.1	13.9	12.8
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
ULTIMATE ANALYSIS							
HYDROGEN	5.1	5.0	4.8	4.9	5.0	4.9	5.0
CARBON	66.9	65.7	64.8	65.8	65.4	65.6	67.5
NITROGEN	1.2	1.2	1.1	1.2	1.2	1.2	1.1
OXYGEN	9.9	10.8	10.2	10.3	10.5	10.5	9.7
SULFUR	3.9	4.0	3.8	4.0	3.8	3.9	3.9
ASH	13.0	13.3	15.3	13.8	14.1	13.9	12.8
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	12100.	11800.	11700.	11900.	11700.	11800.	12200.
F. S. I.	5.0	2.5	5.0	5.0	5.0	4.5	5.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

C7 - GROUND COAL

CHEMICAL ANALYSIS

BASIS: WET WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	C7-217	C7-223	C7-224	C7-225	C7-234	C7-235	C7-236
TIME	16: 0	11: 0	15:30	20:30	10:15	14: 0	18: 0
DATE	6/15/78	6/19/78	6/19/78	6/19/78	6/30/78	6/30/78	6/30/78
PROXIMATE ANALYSIS							
MOISTURE	1.5	1.8	1.6	1.1	1.2	0.9	1.3
VOLATILE MATTER	36.5	35.6	35.6	34.8	35.2	36.1	35.8
FIXED CARBON	50.0	50.3	50.5	52.1	49.9	49.3	49.1
ASH	12.0	12.3	12.3	12.0	13.7	13.7	13.8
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
ULTIMATE ANALYSIS							
HYDROGEN	5.1	5.1	5.1	4.9	4.8	4.9	5.0
CARBON	68.1	66.6	67.5	68.3	66.8	66.8	66.2
NITROGEN	1.3	1.1	1.2	1.1	1.2	1.2	1.2
OXYGEN	9.7	11.1	10.0	9.8	9.5	9.5	9.8
SULFUR	3.8	3.8	3.9	3.9	4.0	3.9	4.0
ASH	12.0	12.3	12.3	12.0	13.7	13.7	13.8
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	12300.	12200.	12200.	12300.	11900.	12000.	12000.
F. S. I.	5.0	4.0	3.5	5.5	4.0	4.5	5.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

C7 - GROUND COAL

CHEMICAL ANALYSIS

BASIS: WET WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	C7-237	C7-238	C7-239	C7-240	C7-241	C7-242	C7-243
TIME	14: 0	3: 0	10:45	14:35	18:35	0:30	10: 0
DATE	7/ 1/78	7/ 2/78	7/ 2/78	7/ 2/78	7/ 2/78	7/ 3/78	7/ 3/78
PROXIMATE ANALYSIS							
MOISTURE	1.9	1.2	1.6	1.2	1.2	1.7	1.4
VOLATILE MATTER	35.1	30.7	35.9	35.6	35.3	35.7	36.0
FIXED CARBON	49.5	54.2	49.1	49.7	50.0	49.4	50.0
ASH	13.5	13.9	13.4	13.5	13.5	13.2	12.6
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
ULTIMATE ANALYSIS							
HYDROGEN	4.9	4.9	5.0	4.9	5.0	5.0	5.0
CARBON	66.2	66.6	66.7	66.7	67.1	66.8	67.6
NITROGEN	1.2	1.0	1.2	1.2	1.2	1.1	1.2
OXYGEN	10.2	9.8	9.7	9.7	9.1	9.9	9.6
SULFUR	4.0	3.8	4.0	4.0	4.1	4.0	4.0
ASH	13.5	13.9	13.4	13.5	13.5	13.2	12.6
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	12000.	12000.	12000.	12000.	12100.	12000.	12300.
F. S. I.	5.0	4.5	4.5	4.5	4.0	5.0	4.5

+ = NO ANALYSIS DONE

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** = SUSPECT ANALYSIS

C7 - GROUND COAL

CHEMICAL ANALYSIS

BASIS: WET WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	C7-244	C7-245	C7-246	C7-247	C7-254	C7-276	C7-278
TIME	11: 0	1: 0	2: 0	8: 0	8:30	3: 0	18: 0
DATE	7/ 3/78	7/ 9/78	7/12/78	8/ 1/78	8/10/78	8/27/78	8/29/78
PROXIMATE ANALYSIS							
MOISTURE	1.4	1.7	1.1	1.4	1.3	2.4	1.4
VOLATILE MATTER	36.4	36.5	34.9	34.2	36.0	36.2	35.5
FIXED CARBON	49.8	49.5	50.7	50.6	49.9	48.5	49.4
ASH	12.4	12.3	13.3	13.8	12.8	12.9	13.7
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
ULTIMATE ANALYSIS							
HYDROGEN	5.1	5.1	4.9	4.8	5.0	4.9	4.8
CARBON	67.4	67.4	67.4	66.5	67.3	65.9	65.6
NITROGEN	1.1	1.2	1.1	1.2	1.2	1.0	1.1
OXYGEN	10.1	9.9	9.5	10.1	10.0	11.6	11.2
SULFUR	3.9	4.1	3.8	3.6	3.7	3.7	3.6
ASH	12.4	12.3	13.3	13.8	12.8	12.9	13.7
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	12200.	12400.	12100.	11900.	12100.	11800.	11700.
F. S. I.	4.5	4.0	4.5	5.0	5.5	3.0	2.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

C7 - GROUND COAL

PARTICLE SIZE DISTRIBUTION

SAMPLE NUMBER	C7-194	C7-195	C7-196	C7-197	C7-198	C7-199	C7-200
TIME	6:30	0:5	3:45	14:0	22:0	14:30	0:0
DATE	11/19/77	12/25/77	12/25/77	12/25/77	3/27/78	3/28/78	3/29/78
U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT						
+8 MESH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
+20 MESH	0.0	0.3	0.3	0.7	0.6	0.4	0.7
+30 MESH	5.2	4.6	4.3	2.6	6.8	5.8	9.0
+50 MESH	27.7	29.3	29.0	14.1	32.1	32.4	36.3
+60 MESH	33.3	34.7	34.5	16.2	37.8	37.9	43.0
+100 MESH	53.0	55.3	54.4	25.5	56.3	55.6	62.9
+140 MESH	63.7	65.8	64.2	31.1	66.2	64.6	72.8
+200 MESH	71.7	68.2	70.2	37.9	75.5	73.1	82.5
+325 MESH	82.7	83.6	82.2	63.0	83.8	81.7	90.2
-325 MESH<WEIGHT PERCENT>	17.3	16.4	17.8	37.0	16.3	18.3	9.8

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

SAMPLE NUMBER	C7-201	C7-202	C7-203	C7-204	C7-205	C7-206	C7-207
TIME	8:30	11:30	20:45	13:0	14:0	21:0	20:30
DATE	3/29/78	4/11/78	4/17/78	4/18/78	4/18/78	4/18/78	4/20/78
U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT						
+8 MESH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
+20 MESH	0.2	0.1	0.1	0.3	0.4	0.1	0.3
+30 MESH	5.2	0.4	0.3	0.6	0.7	0.1	5.0
+50 MESH	35.1	10.3	16.5	15.9	17.9	16.2	25.0
+60 MESH	40.6	15.6	24.3	24.4	26.1	24.0	28.8
+100 MESH	60.5	34.9	47.4	51.3	54.3	51.2	42.6
+140 MESH	69.6	47.0	60.0	64.3	67.6	64.6	50.3
+200 MESH	78.6	59.4	71.3	73.9	78.7	75.9	58.4
+325 MESH	89.5	80.9	87.2	83.6	88.3	86.2	70.4
-325 MESH<WEIGHT PERCENT>	10.5	19.1	12.8	16.4	11.7	13.8	29.6

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

C7 - GROUND COAL

PARTICLE SIZE DISTRIBUTION

SAMPLE NUMBER	C7-208	C7-209	C7-210	C7-211	C7-212	C7-213	C7-214
TIME	6:15	15:45	5:30	5:30	16:30	18:30	3:0
DATE	4/21/78	4/21/78	4/22/78	4/25/78	4/25/78	4/25/78	4/26/78
U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT						
+8 MESH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
+20 MESH	0.8	1.0	1.1	0.8	1.3	0.7	0.8
+30 MESH	8.2	9.2	10.5	9.8	9.7	7.8	9.5
+50 MESH	35.8	39.2	42.1	40.5	42.8	40.6	39.0
+60 MESH	41.7	45.0	47.6	46.4	47.9	46.7	44.8
+100 MESH	61.1	63.6	65.2	65.9	67.2	67.0	64.3
+140 MESH	70.5	72.6	74.5	74.9	76.2	76.8	73.3
+200 MESH	77.5	80.8	82.4	82.1	83.8	84.8	81.0
+325 MESH	86.0	88.4	89.4	88.8	90.5	91.4	88.1
-325 MESH<WEIGHT PERCENT>	14.0	11.6	10.6	11.2	9.5	8.7	11.9

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

SAMPLE NUMBER	C7-215	C7-216	C7-217	C7-218	C7-219	C7-220	C7-221
TIME	0:4	11:0	16:0	15:15	18:15	20:10	20:30
DATE	26/78/0	6/15/78	6/15/78	6/16/78	6/16/78	6/16/78	6/18/78
U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT						
+8 MESH	0.0	0.5	0.0	0.0	0.0	0.0	0.0
+20 MESH	0.5	1.2	0.8	0.2	0.1	0.0*	0.0*
+30 MESH	8.1	1.7	1.1	0.4	0.1	0.2	0.2
+50 MESH	39.9	8.7	4.6	8.7	6.9	3.8	6.2
+60 MESH	45.4	16.4	9.1	16.5	15.7	10.0	12.8
+100 MESH	65.0	43.4	29.9	46.1	43.2	37.7	39.8
+140 MESH	74.1	57.3	42.8	60.9	56.9	53.3	54.8
+200 MESH	81.8	69.9	55.1	73.0	69.5	67.2	67.1
+325 MESH	88.9	83.7	77.4	85.0	85.0	82.0	83.2
-325 MESH<WEIGHT PERCENT>	11.1	16.3	22.6	14.2	15.0	18.0	16.8

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

C7 - GROUND COAL

PARTICLE SIZE DISTRIBUTION

SAMPLE NUMBER	C7-222	C7-223	C7-224	C7-225	C7-226	C7-227	C7-228
TIME	6:30	11:0	15:30	20:30	13:0	13:45	14:55
DATE	6/19/78	6/19/78	6/19/78	6/19/78	6/29/78	6/29/78	6/29/78
U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT						
+8 MESH	0.0	0.0	0.0	0.0	0.0	0.0*	0.0
+20 MESH	0.4	0.1	0.0*	0.0*	0.7	0.2	0.0
+30 MESH	0.7	0.1	0.1	0.1	0.9	0.2	0.0
+50 MESH	6.0	2.5	2.2	2.6	4.2	4.7	4.3
+60 MESH	13.0	8.2	7.6	7.6	0.0+	0.0+	0.0+
+100 MESH	39.0	34.1	32.9	32.1	38.6	39.9	41.7
+140 MESH	53.8	48.4	47.2	47.6	53.1	54.6	57.1
+200 MESH	67.0	62.5	61.4	61.2	67.1	66.5	70.9
+325 MESH	81.4	81.2	83.9	83.0	81.5	76.4	86.7
-325 MESH(WEIGHT PERCENT)	18.6	18.8	16.1	17.0	18.6	23.6	13.3

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

SAMPLE NUMBER	C7-229	C7-230	C7-231	C7-232	C7-233	C7-234	C7-235
TIME	15:35	16:10	16:25	17:15	17:45	10:15	14:0
DATE	6/29/78	6/29/78	6/29/78	6/29/78	6/29/78	6/30/78	6/30/78
U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT						
+8 MESH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
+20 MESH	0.0	0.0	0.0*	0.2	0.0	0.0	0.0
+30 MESH	0.0	0.0	0.0*	0.3	0.0*	0.0	0.0
+50 MESH	5.0	2.0	2.6	1.4	2.9	3.0	2.6
+60 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+100 MESH	40.7	33.3	33.7	26.2	27.6	38.6	37.7
+140 MESH	56.2	47.7	50.1	40.3	41.8	55.3	53.1
+200 MESH	70.5	61.4	68.1	53.9	54.6	68.5	67.3
+325 MESH	85.5	83.5	92.3	70.0	75.1	82.4	81.2
-325 MESH(WEIGHT PERCENT)	14.5	16.5	7.7	29.9	24.9	17.6	18.8

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

C7 - GROUND COAL

PARTICLE SIZE DISTRIBUTION

SAMPLE NUMBER	C7-236	C7-237	C7-238	C7-239	C7-240	C7-241	C7-242
TIME	18: 0	14: 0	3: 0	10:45	14:35	18:35	0:30
DATE	6/30/78	7/ 1/78	7/ 2/78	7/ 2/78	7/ 2/78	7/ 2/78	7/ 3/78
U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT						
+8 MESH	0.0	0.0	0.0	0.0	0.1	0.0	0.0*
+20 MESH	0.0	0.0	0.0	0.0	0.1	0.0	0.1
+30 MESH	0.0	0.0	0.1	0.0	0.3	0.0	0.4
+50 MESH	2.5	4.2	3.5	3.1	3.4	3.2	3.3
+60 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+100 MESH	37.1	39.6	37.9	36.7	38.4	38.9	37.6
+140 MESH	53.8	55.9	52.7	52.4	54.5	55.2	53.8
+200 MESH	68.4	70.5	65.5	66.3	68.1	67.4	67.6
+325 MESH	84.7	83.3	78.4	79.0	79.1	81.3	79.6
-325 MESH(WEIGHT PERCENT)	15.3	16.7	21.6	21.0	20.9	18.7	20.4

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

SAMPLE NUMBER	C7-243	C7-244	C7-245	C7-246	C7-255	C7-256	C7-257
TIME	10: 0	11: 0	1: 0	2: 0	21:40	22:30	23:30
DATE	7/ 3/78	7/ 3/78	7/ 9/78	7/12/78	8/16/78	8/16/78	8/16/78
U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT						
+8 MESH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
+20 MESH	0.0	0.0	0.0*	0.0*	0.0	0.0	0.0
+30 MESH	0.1	0.0	0.1	0.2	0.0*	0.1	0.0*
+50 MESH	3.7	4.9	2.3	4.9	0.2	0.2	0.3
+60 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+100 MESH	40.5	43.6	35.8	40.4	16.7	15.3	20.9
+140 MESH	55.6	58.5	51.1	56.8	25.9	23.8	31.6
+200 MESH	69.1	71.1	64.9	72.3	35.5	32.6	40.7
+325 MESH	82.0	81.2	66.3	88.0	46.4	38.0	73.4
-325 MESH(WEIGHT PERCENT)	18.1	18.8	33.7	12.0	53.6	62.0	26.6

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

C7 - GROUND COAL

PARTICLE SIZE DISTRIBUTION

SAMPLE NUMBER	C7-258	C7-259	C7-260	C7-261	C7-262	C7-263	C7-264
TIME	0:30	1:30	2:30	20:0	22:30	1:0	4:0
DATE	8/17/78	8/17/78	8/17/78	8/21/78	8/21/78	8/22/78	8/22/78
U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT						
+8 MESH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
+20 MESH	0.0	0.0	0.0	0.0*	0.0	0.1	0.0
+30 MESH	0.1	0.1	0.2	0.1	0.0	0.2	0.0*
+50 MESH	0.5	0.5	0.7	0.4	0.4	1.4	1.1
+60 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+100 MESH	25.1	16.8	18.0	19.8	10.5	19.0	25.4
+140 MESH	36.6	25.6	17.2	29.2	17.1	28.8	38.1
+200 MESH	47.7	34.7	36.4	39.0	24.7	38.5	50.0
+325 MESH	51.6	50.1	65.6	52.1	46.1	72.5	67.5
-325 MESH<WEIGHT PERCENT>	48.4	49.9	34.4	47.9	53.9	27.5	32.4

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

SAMPLE NUMBER	C7-265	C7-266	C7-267	C7-268	C7-269	C7-270	C7-271
TIME	7:30	9:30	10:30	13:0	15:30	17:0	19:0
DATE	8/22/78	8/22/78	8/23/78	8/23/78	8/23/78	8/23/78	8/23/78
U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT						
+8 MESH	0.0	0.2	0.0	0.0	0.0+	0.0	0.0
+20 MESH	0.0*	0.2	0.1	0.0	0.0	0.0	0.0*
+30 MESH	0.1	0.3	0.3	0.1	0.2	0.2	0.1
+50 MESH	0.6	0.7	0.8	0.5	0.3	0.5	0.4
+60 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+100 MESH	23.3	17.8	18.6	4.3	4.2	8.3	9.9
+140 MESH	35.8	27.7	29.6	9.9	9.4	15.1	16.8
+200 MESH	47.6	37.1	41.5	17.5	17.8	25.1	37.3
+325 MESH	67.0	66.5	69.6	59.5	61.1	74.9	84.6
-325 MESH<WEIGHT PERCENT>	33.0	33.5	30.4	40.5	38.9	25.8	15.3

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

C7 - GROUND COAL

PARTICLE SIZE DISTRIBUTION

SAMPLE NUMBER	C7-272	C7-273	C7-274	C7-275	C7-276	C7-277	C7-278
TIME	21: 0	23: 0	5: 0	9: 0	3: 0	6:15	18: 0
DATE	8/23/78	8/23/78	8/24/78	8/24/78	8/27/78	8/28/78	8/29/78
U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT						
-----	-----						
+8 MESH	0.0	0.0	1.7	0.0	0.0	0.0	0.0
+20 MESH	0.0	0.1	1.7	0.1	0.0	0.0	0.0
+30 MESH	0.0	0.3	1.8	0.2	0.2	0.1	0.1
+50 MESH	0.3	0.6	2.2	0.2	0.7	0.3	0.1
+60 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+100 MESH	7.6	6.5	11.6	4.4	15.5	10.8	4.4
+140 MESH	12.6	10.6	18.0	9.4	25.1	20.3	11.0
+200 MESH	20.1	16.2	25.5	15.9	34.3	30.4	20.4
+325 MESH	61.0	35.2	41.8	33.8	62.6	62.0	44.3
-325 MESH(WEIGHT PERCENT)	39.0	64.8	58.2	66.2	37.4	38.0	55.7

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

C7A - GROUND COAL COMPOSITE

CHEMICAL ANALYSIS

BASIS: WET WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	C7A- 47	C7A- 48	C7A- 49	C7A- 50	C7A- 51	C7A- 52	C7A- 53
TIME	14: 0	15:45	18:30	20:10	6:30	13:45	15:35
DATE	4/18/78	4/21/78	4/25/78	6/16/78	6/19/78	6/29/78	6/29/78
PROXIMATE ANALYSIS							
MOISTURE	1.9	2.4	2.7	1.6	2.3	2.0	1.5
VOLATILE MATTER	35.5	37.0	35.0	35.8	34.6	35.3	35.2
FIXED CARBON	46.4	46.7	48.3	50.4	50.9	49.8	49.3
ASH	16.2	14.0	14.0	12.2	12.2	12.9	14.0
TOTAL	100.0	100.1	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
ULTIMATE ANALYSIS							
HYDROGEN	4.9	5.0	5.0	5.1	5.1	5.0	4.9
CARBON	64.7	66.0	65.7	67.5	67.1	66.9	66.4
NITROGEN	1.2	1.1	1.2	1.0	1.1	1.2	1.2
OXYGEN	9.1	10.0	10.2	10.1	10.8	10.2	9.5
SULFUR	3.9	3.9	3.9	4.1	3.7	3.8	4.0
ASH	16.2	14.0	14.0	12.2	12.2	12.9	14.0
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	11700.	11800.	11900.	12200.	12200.	12100.	11900.
F. S. I.	4.0	4.5	4.5	4.0	4.5	4.5	4.5

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

C7A - GROUND COAL COMPOSITE

CHEMICAL ANALYSIS

BASIS: WET WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	C7A- 54	C7A- 55	C7A- 56	C7A- 57	C7A- 58	C7A- 59	C7A- 60
TIME	16:25	9: 0	4:30	3:25	24:30	0:30	4:30
DATE	6/29/78	6/30/78	8/ 9/78	8/10/78	8/16/78	8/22/78	8/22/78
PROXIMATE ANALYSIS							

MOISTURE	1.9	2.0	2.4	3.0	2.3	1.1	2.6
VOLATILE MATTER	34.7	34.9	37.6	35.5	36.0	35.2	35.1
FIXED CARBON	49.0	49.1	47.4	47.7	48.6	50.8	50.0
ASH	14.4	14.0	12.6	13.8	13.1	12.9	12.3
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
ULTIMATE ANALYSIS							

HYDROGEN	4.9	4.8	5.0	4.8	4.9	4.9	4.9
CARBON	65.9	66.4	67.0	65.3	66.3	67.2	66.6
NITROGEN	1.2	1.1	1.1	1.1	1.1	1.1	1.1
OXYGEN	9.6	9.8	10.5	11.4	11.0	10.2	10.6
SULFUR	4.0	3.9	3.8	3.6	3.6	3.7	4.5
ASH	14.4	14.0	12.6	13.8	13.1	12.9	12.3
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	11800.	11800.	12100.	11700.	12000.	12000.	11900.
F. S. I.	4.5	4.5	4.5	4.0	4.5	3.5	4.5

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

C7A - GROUND COAL COMPOSITE

CHEMICAL ANALYSIS

BASIS: WET WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	C7A- 61	C7A- 62	C7A- 63	C7A- 64
TIME	9:30	17: 0	1:30	9: 0
DATE	8/22/78	8/23/78	8/24/78	8/24/78
PROXIMATE ANALYSIS				
MOISTURE	1.7	2.0	1.9	2.4
VOLATILE MATTER	35.0	35.0	34.6	34.6
FIXED CARBON	50.0	50.7	50.0	50.5
ASH	13.3	12.3	13.5	12.5
TOTAL	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	0.0+	0.0+	0.0+	0.0+

ULTIMATE ANALYSIS

HYDROGEN	4.9	4.9	4.9	4.9
CARBON	66.1	66.8	65.6	66.6
NITROGEN	1.1	1.0	1.0	1.1
OXYGEN	10.9	11.5	11.4	11.3
SULFUR	3.7	3.5	3.6	3.6
ASH	13.3	12.3	13.5	12.5
TOTAL	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	11700.	11900.	11600.	11900.
F. S. I.	3.0	3.0	1.0	3.5

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-A-4

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-263	G2-264	G2-265	G2-266	G2-267
TIME	8: 0	17:30	18:15	19:15	21:15
DATE	9/29/77	9/30/77	9/30/77	9/30/77	9/30/77
PROXIMATE ANALYSIS					
<hr/>					
VOLATILE MATTER	0.0+	26.9	32.5	33.7	34.7
FIXED CARBON	0.0+	59.7	56.7	55.4	53.5
ASH	0.0+	13.5	10.7	10.8	11.8
TOTAL	0.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	0.0+	18.0	34.9	31.1	35.2
ULTIMATE ANALYSIS					
<hr/>					
HYDROGEN	0.0+	3.8	4.1	4.3	4.4
CARBON	0.0+	69.2	68.2	68.3	68.1
NITROGEN	0.0+	1.2	1.2	1.2	1.0
OXYGEN	0.0	10.7	13.4	12.8	12.1
SULFUR	1.6	1.6	2.4	2.5	2.5
ASH	0.0+	13.5	10.7	10.8	11.8
TOTAL	0.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	0. +	11700.	11600.	11800.	11800.
F. S. I.	0.0	0.0	1.5	1.5	1.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-B-1

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-268	G2-269	G2-270	G2-271	G2-272	G2-273
TIME	13:30	14: 5	14:50	16:15	17: 0	18: 5
DATE	10/25/77	10/25/77	10/25/77	10/25/77	10/25/77	10/25/77
PROXIMATE ANALYSIS						
VOLATILE MATTER	33.7	34.6	32.1	33.2	32.3	32.4
FIXED CARBON	55.6	54.5	56.1	54.2	53.5	52.9
ASH	10.7	10.9	11.8	12.6	14.2	14.8
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	26.8	29.3	30.1	26.2	32.2	33.1
ULTIMATE ANALYSIS						
HYDROGEN	4.8	4.8	4.6	4.6	4.3	4.2
CARBON	69.5	69.6	67.6	67.0	65.7	64.9
NITROGEN	1.3	1.3	1.3	1.2	1.2	1.2
OXYGEN	10.2	9.8	11.2	10.9	10.6	11.1
SULFUR	3.5	3.6	3.5	3.8	3.9	3.8
ASH	10.7	10.9	11.8	12.6	14.2	14.8
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	12400.	12400.	12100.	11900.	11500.	11400.
F. S. I.	1.5	1.5	0.0	0.5	0.0	0.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

CHEMICAL ANALYSIS

RUN 2-DB-B-2

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-274	G2-275
TIME	13: 0	14: 0
DATE	10/29/77	10/29/77
PROXIMATE ANALYSIS		

VOLATILE MATTER	31.7	29.7
FIXED CARBON	52.3	53.3
ASH	16.0	17.0
TOTAL	100.0	100.0

AIR DRY MOISTURE	26.3	27.0
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ULTIMATE ANALYSIS

HYDROGEN	4.3	4.1
CARBON	65.2	64.1
NITROGEN	1.3	1.3
OXYGEN	8.8	9.0
SULFUR	4.3	4.5
ASH	16.0	17.0
TOTAL	100.0	100.0

HEAT OF COMBUSTION (BTU/LB)	11600.	11300.
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F. S. I.	1.0	1.0
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+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-B-3

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-276	G2-277
TIME	19: 0	20: 0
DATE	10/31/77	10/31/77
PROXIMATE ANALYSIS		

VOLATILE MATTER	32.8	33.3
FIXED CARBON	55.8	54.4
ASH	11.4	12.3
TOTAL	100.0	100.0

AIR DRY MOISTURE	23.8	19.2
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ULTIMATE ANALYSIS

HYDROGEN	4.5	4.5
CARBON	68.3	67.5
NITROGEN	1.2	1.2
OXYGEN	10.9	10.7
SULFUR	3.7	3.8
ASH	11.4	12.3
TOTAL	100.0	100.0

HEAT OF COMBUSTION (BTU/LB)	12100.	12000.
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F. S. I.	1.0	0.5
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+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-D-1

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-278	G2-279	G2-280	G2-281	G2-282	G2-283
TIME	13: 0	14: 0	16: 0	18: 0	19: 0	20:30
DATE	12/ 3/77	12/ 3/77	12/ 3/77	12/ 3/77	12/ 3/77	12/ 3/77
PROXIMATE ANALYSIS						
VOLATILE MATTER	27.8	28.2	28.8	29.5	27.1	26.9
FIXED CARBON	59.4	56.0	55.5	55.0	56.8	56.7
ASH	12.8	15.8	15.7	15.5	16.1	16.4
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	33.2	28.3	26.1	24.7	19.4	34.9
ULTIMATE ANALYSIS						
HYDROGEN	4.3	4.3	4.3	4.3	4.1	4.0
CARBON	69.2	66.6	66.7	66.4	66.3	66.1
NITROGEN	1.3	1.3	1.3	1.2	1.3	1.3
OXYGEN	9.1	8.2	8.2	8.7	8.1	8.0
SULFUR	3.3	3.9	3.9	3.9	4.1	4.1
ASH	12.8	15.8	15.7	15.5	16.1	16.4
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	12100	11700	11800	11800	11600	11500
F. S. I.	1.0	1.0	1.0	1.5	1.0	1.5

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-D-2

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER G2-284

TIME 13.15

DATE 12/ 9/77

PROXIMATE ANALYSIS

VOLATILE MATTER 27.7

FIXED CARBON 56.0

ASH 16.3

TOTAL 100.0

AIR DRY MOISTURE 34.4

ULTIMATE ANALYSIS

HYDROGEN 4.1

CARBON 65.9

NITROGEN 1.3

OXYGEN 8.2

SULFUR 4.2

ASH 16.3

TOTAL 100.0

HEAT OF COMBUSTION (BTU/LB) 11600.

F. S. I. 1.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-D-3

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-285	G2-286	G2-287	G2-288	G2-289	G2-290	G2-291
TIME	17: 0	19:30	22:15	23:40	1: 0	3: 0	5:20
DATE	12/13/77	12/13/77	12/13/77	12/13/77	12/14/77	12/14/77	12/14/77
PROXIMATE ANALYSIS							

VOLATILE MATTER	25.8	26.0	27.8	28.7	29.8	30.5	28.7
FIXED CARBON	59.1	58.9	57.4	56.2	55.8	56.4	57.6
ASH	15.1	15.1	14.8	15.1	14.4	13.1	13.7
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	25.2	21.6	20.6	25.2	28.2	29.5	29.2
ULTIMATE ANALYSIS							

HYDROGEN	4.1	4.2	4.3	4.2	4.3	4.4	4.0
CARBON	66.9	67.1	66.8	65.8	66.5	67.7	66.1
NITROGEN	1.3	1.3	1.3	1.3	1.2	0.8	0.8
OXYGEN	8.7	8.2	8.8	9.5	9.6	10.0	11.3
SULFUR	3.8	4.1	4.0	4.2	4.0	4.0	4.0
ASH	15.1	15.1	14.8	15.1	14.4	13.1	13.7
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	11800.	11800.	11700.	11500.	11700.	11900.	11500.
F. S. I.	0.5	0.5	0.5	0.0	0.5	0.5	0.5

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-D-3

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-292	G2-293	G2-294	G2-295	G2-296	G2-297	G2-298
TIME	9: 0	9:30	11: 0	12:30	4: 0	6: 0	7:45
DATE	12/14/77	12/14/77	12/14/77	12/14/77	12/15/77	12/15/77	12/15/77
PROXIMATE ANALYSIS							

VOLATILE MATTER	28.6	28.8	29.9	29.3	29.5	27.7	26.3
FIXED CARBON	56.5	57.3	56.3	56.7	56.6	58.3	59.4
ASH	14.9	13.9	13.8	14.0	13.9	14.0	14.3
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	21.2	26.4	22.8	25.0	33.2	37.7	40.9
ULTIMATE ANALYSIS							

HYDROGEN	4.1	4.2	4.3	4.2	4.3	4.2	3.9
CARBON	65.6	66.6	66.3	66.1	67.0	67.0	67.0
NITROGEN	0.9	1.0	1.2	1.3	1.3	1.3	1.3
OXYGEN	10.0	10.1	10.1	10.1	9.6	9.6	9.6
SULFUR	4.6	4.2	4.2	4.2	3.9	3.9	3.9
ASH	14.9	13.9	13.8	14.0	13.9	14.0	14.3
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	11600.	11800.	11700.	11700.	11800.	11700.	11600.
F. S. I.	0.5	0.5	1.0	2.0	1.0	1.5	0.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-D-3

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-299	G2-300
TIME	10: 0	12: 0
DATE	12/15/77	12/15/77
PROXIMATE ANALYSIS		

VOLATILE MATTER	20.6	21.7
FIXED CARBON	65.5	64.4
ASH	13.9	13.8
TOTAL	100.0	100.0

AIR DRY MOISTURE	44.8	38.9
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ULTIMATE ANALYSIS

HYDROGEN	3.3	3.4
CARBON	70.6	70.5
NITROGEN	1.1	1.2
OXYGEN	7.4	7.4
SULFUR	3.6	3.6
ASH	13.9	13.8
TOTAL	100.0	100.0

HEAT OF COMBUSTION (BTU/LB)	12000.	12000.
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F. S. I.	0.0	0.0
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+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-E-1

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-301	G2-302
TIME	12:30	14: 0
DATE	12/30/77	12/30/77

PROXIMATE ANALYSIS

VOLATILE MATTER	24.2	23.5
FIXED CARBON	61.3	63.1
ASH	14.4	13.4
TOTAL	100.0	100.0

AIR DRY MOISTURE	34.1	31.9
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ULTIMATE ANALYSIS

HYDROGEN	3.9	3.9
CARBON	69.2	67.9
NITROGEN	1.3	1.3
OXYGEN	7.5	10.1
SULFUR	3.6	3.4
ASH	14.4	13.4
TOTAL	100.0	100.0

HEAT OF COMBUSTION (BTU/LB)	11800	11800
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F. S. I.	0.0	0.0
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+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-F-3

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-303	G2-304	G2-305	G2-306	G2-307	G2-308	G2-309
TIME	21:50	23:50	1:50	3:50	6:15	8:0	10:30
DATE	2/ 5/78	2/ 5/78	2/ 6/78	2/ 6/78	2/ 6/78	2/ 6/78	2/ 6/78
PROXIMATE ANALYSIS	-----						
VOLATILE MATTER	28.2	24.7	24.4	24.2	24.0	24.2	22.9
FIXED CARBON	59.0	59.9	60.4	60.8	59.1	61.2	62.4
ASH	12.8	15.3	15.2	14.9	16.9	14.6	14.7
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	45.3	46.9	48.7	46.1	46.4	0.0	27.9
ULTIMATE ANALYSIS	-----						
HYDROGEN	4.2	3.9	3.6	3.8	3.7	3.9	3.7
CARBON	69.3	66.8	67.2	67.8	65.4	68.0	67.6
NITROGEN	1.3	1.3	1.3	1.3	1.3	1.3	1.3
OXYGEN	9.0	8.9	9.1	8.3	8.9	8.3	8.9
SULFUR	3.4	3.7	3.6	3.8	3.8	3.9	3.8
ASH	12.8	15.3	15.2	14.9	16.9	14.6	14.7
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	12000.	11500.	11300.	11700.	11300.	11700.	11600.
F. S. I.	0.0	0.0	0.0	0.0	0.0	0.0	0.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-08-G-1

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-310	G2-311
TIME	13.30	15.30
DATE	3/26/78	3/26/78
PROXIMATE ANALYSIS		

VOLATILE MATTER	26.8	29.7
FIXED CARBON	56.4	56.6
ASH	16.8	13.7
TOTAL	100.0	100.0

AIR DRY MOISTURE	36.6	66.8
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ULTIMATE ANALYSIS

HYDROGEN	3.9	4.2
CARBON	66.0	68.1
NITROGEN	1.1	1.1
OXYGEN	8.4	9.2
SULFUR	3.8	3.6
ASH	16.8	13.7
TOTAL	100.0	100.0

HEAT OF COMBUSTION (BTU/LB)	11400.	11900.
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F. S. I.	0.0	0.5
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+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-G-2

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-312	G2-313
TIME	22: 0	0: 0
DATE	3/26/78	3/27/78
PROXIMATE ANALYSIS		

VOLATILE MATTER	28.5	26.3
FIXED CARBON	54.3	60.5
ASH	17.1	13.1
TOTAL	100.0	100.0

AIR DRY MOISTURE	65.1	65.1
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ULTIMATE ANALYSIS

HYDROGEN	3.8	3.9
CARBON	65.4	69.2
NITROGEN	1.2	1.3
OXYGEN	8.6	9.1
SULFUR	3.8	3.4
ASH	17.1	13.1
TOTAL	100.0	100.0

HEAT OF COMBUSTION (BTU/LB)	11400.	11800.
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F. S. I.	0.5	0.5
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+ = NO ANALYSIS DONE
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G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-G-3

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER G2-314

TIME 14:30

DATE 3/27/78

PROXIMATE ANALYSIS

VOLATILE MATTER	28.4
FIXED CARBON	58.3
ASH	13.3
TOTAL	100.0

AIR DRY MOISTURE 35.5

ULTIMATE ANALYSIS

HYDROGEN	4.1
CARBON	68.8
NITROGEN	1.3
OXYGEN	9.2
SULFUR	3.2
ASH	13.3
TOTAL	100.0

HEAT OF COMBUSTION (BTU/LB) 12000.

F. S. I. 0.5

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-G-4

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-315	G2-316
TIME	2: 0	4:20
DATE	4/ 2/78	4/ 2/78
PROXIMATE ANALYSIS		

VOLATILE MATTER	25.5	27.0
FIXED CARBON	58.7	58.6
ASH	15.8	14.5
TOTAL	100.0	100.0

AIR DRY MOISTURE	37.5	38.0
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ULTIMATE ANALYSIS

HYDROGEN	4.0	4.1
CARBON	66.3	68.0
NITROGEN	1.2	1.3
OXYGEN	8.9	8.5
SULFUR	3.7	3.6
ASH	15.8	14.5
TOTAL	100.0	100.0

HEAT OF COMBUSTION (BTU/LB)	11600.	11800.
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F. S. I.	0.0	0.0
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+ = NO ANALYSIS DONE
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** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-G-5

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-317	G2-318	G2-319	G2-320	G2-321	G2-322
TIME	20: 0	21: 0	22: 0	0: 1	2: 0	4: 0
DATE	4/ 6/78	4/ 6/78	4/ 6/78	4/ 7/78	4/ 7/78	4/ 7/78
PROXIMATE ANALYSIS						
VOLATILE MATTER	30.4	28.3	27.8	25.3	24.6	23.0
FIXED CARBON	55.3	57.8	57.5	55.6	56.5	58.4
ASH	14.3	13.9	14.7	19.1	18.9	18.6
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	36.9	0.0+	41.9	37.6	37.9	42.8
ULTIMATE ANALYSIS						
HYDROGEN	4.4	4.3	4.2	3.7	3.6	3.4
CARBON	67.7	68.1	67.7	63.8	63.6	63.8
NITROGEN	1.2	1.3	1.2	1.2	1.2	1.2
OXYGEN	8.7	8.7	8.4	7.7	8.4	8.9
SULFUR	3.7	3.7	3.7	4.3	4.4	4.2
ASH	14.3	13.9	14.7	19.1	18.9	18.6
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	11900.	11900.	11700.	11100.	10900.	10700.
F. S. I.	1.0	9.4	1.0	1.0	0.0	0.0

+ = NO ANALYSIS DONE

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** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-G-5

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-323	G2-324	G2-325
TIME	6: 0	8: 0	10: 0
DATE	4/ 7/78	4/ 7/78	4/ 7/78
PROXIMATE ANALYSIS			

VOLATILE MATTER	21. 9	12. 7	5. 0
FIXED CARBON	60. 2	40. 3	65. 6
ASH	17. 9	47. 1	29. 3
TOTAL	100. 0	100. 0	100. 0
AIR DRY MOISTURE	39. 6	38. 3	60. 7
ULTIMATE ANALYSIS			

HYDROGEN	3. 6	1. 8	1. 4
CARBON	65. 5	41. 5	64. 1
NITROGEN	1. 3	0. 7	0. 8
OXYGEN	7. 6	0. 1	1. 8
SULFUR	4. 1	8. 8	2. 6
ASH	17. 9	47. 1	29. 3
TOTAL	100. 0	100. 0	100. 0
HEAT OF COMBUSTION (BTU/LB)	11200.	6990.	10100.
F. S. I.	0. 0	0. 0	0. 0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-G-6

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-326	G2-327
TIME	18:30	19:30
DATE	4/ 8/78	4/ 8/78
PROXIMATE ANALYSIS		

VOLATILE MATTER	24.8	24.8
FIXED CARBON	65.0	58.5
ASH	10.2	16.7
TOTAL	100.0	100.0

AIR DRY MOISTURE	42.5	25.8
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ULTIMATE ANALYSIS

HYDROGEN	4.0	3.8
CARBON	73.4	66.8
NITROGEN	1.3	1.3
OXYGEN	8.4	8.1
SULFUR	2.7	3.4
ASH	10.2	16.7
TOTAL	100.0	100.0

HEAT OF COMBUSTION (BTU/LB)	12600.	11500.
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F. S. I.	0.5	0.5
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+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-G-6

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-328	G2-329	G2-330
TIME	21:45	0:30	2:40
DATE	4/ 8/78	4/ 9/78	4/ 9/78
PROXIMATE ANALYSIS			
<hr/>			
VOLATILE MATTER	20.9	14.4	14.3
FIXED CARBON	61.7	64.2	65.0
ASH	17.5	21.4	20.7
TOTAL	100.0	100.0	100.0
AIR DRY MOISTURE	38.2	45.5	45.6

ULTIMATE ANALYSIS

HYDROGEN	3.5	2.6	2.6
CARBON	67.7	66.9	67.6
NITROGEN	1.3	1.2	1.1
OXYGEN	6.8	5.1	5.1
SULFUR	3.2	2.8	2.8
ASH	17.5	21.4	20.7
TOTAL	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	11500.	11000.	11100.
F. S. I.	0.0	0.0	0.0

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-08-H

BASIS. MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-331	G2-332	G2-333	G2-334	G2-335	G2-336	G2-337
TIME	11: 0	13: 0	15:45	17: 0	19: 0	21: 0	0: 1
DATE	4/26/78	4/26/78	4/26/78	4/26/78	4/26/78	4/26/78	4/27/78
PROXIMATE ANALYSIS							
VOLATILE MATTER	28.8	26.7	15.4	23.5	27.5	26.3	16.4
FIXED CARBON	56.5	57.2	61.1	57.6	57.7	55.5	61.4
ASH	14.7	16.1	23.5	18.9	14.8	18.2	22.2
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	28.5	29.7	47.9	34.3	44.8	42.0	41.2
ULTIMATE ANALYSIS							
HYDROGEN	4.2	4.0	2.7	3.4	4.0	3.9	2.7
CARBON	67.1	66.3	64.7	65.1	67.3	65.1	66.1
NITROGEN	1.3	1.1	1.3	1.2	1.3	1.3	1.2
OXYGEN	9.0	8.8	4.2	7.6	8.6	7.6	4.4
SULFUR	3.7	3.7	3.5	3.8	3.9	3.9	3.4
ASH	14.7	16.1	23.5	18.9	14.8	18.2	22.2
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	11800.	11600.	10800.	11200.	11700.	11300.	10900.
F. S. I.	0.0	0.5	0.0	1.0	1.0	1.5	0.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-I-2

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-338	G2-339	G2-340
TIME	11:15	13:00	15:30
DATE	5/17/78	5/17/78	5/17/78
PROXIMATE ANALYSIS			

VOLATILE MATTER	26.9	25.8	24.9
FIXED CARBON	60.6	56.4	58.0
ASH	12.5	17.7	17.1
TOTAL	100.0	100.0	100.0

AIR DRY MOISTURE	27.7	33.5	36.6
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ULTIMATE ANALYSIS

HYDROGEN	4.2	3.8	3.7
CARBON	69.5	65.2	65.8
NITROGEN	1.2	1.2	1.2
OXYGEN	9.0	8.2	8.2
SULFUR	3.6	3.9	3.9
ASH	12.5	17.7	17.1
TOTAL	100.0	100.0	100.0

HEAT OF COMBUSTION (BTU/LB)	12100.	11300.	11400.
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F. S. I.	0.5	0.5	0.5
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+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-I-3

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-341	G2-342	G2-343	G2-344
TIME	2: 0	4: 0	6: 0	8: 0
DATE	5/19/78	5/19/78	5/19/78	5/19/78
PROXIMATE ANALYSIS				
<hr/>				
VOLATILE MATTER	27.3	26.4	25.3	31.1
FIXED CARBON	61.7	56.8	57.2	54.7
ASH	10.9	16.8	17.5	14.2
TOTAL	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	41.0	37.9	33.4	32.8
ULTIMATE ANALYSIS				
<hr/>				
HYDROGEN	4.1	3.8	3.7	4.4
CARBON	71.2	65.7	65.6	67.3
NITROGEN	1.4	1.3	1.3	1.3
OXYGEN	9.2	8.5	8.2	9.2
SULFUR	3.1	3.8	3.6	3.6
ASH	10.9	16.8	17.5	14.2
TOTAL	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	12500.	11500.	11300.	11900.
F. S. I.	0.5	0.5	0.5	1.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-I-4

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER G2-345

TIME 21:30
DATE 5/21/78
PROXIMATE ANALYSIS

VOLATILE MATTER	26.3
FIXED CARBON	56.1
ASH	17.7
TOTAL	100.0

AIR DRY MOISTURE 42.6

ULTIMATE ANALYSIS

HYDROGEN	3.9
CARBON	65.6
NITROGEN	1.2
OXYGEN	7.8
SULFUR	3.8
ASH	17.7
TOTAL	100.0

HEAT OF COMBUSTION (BTU/LB) 11500.

F. S. I. 0.5

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-I-5

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-346	G2-347
TIME	19: 0	21: 0
DATE	5/23/78	5/23/78
PROXIMATE ANALYSIS		

VOLATILE MATTER	26.9	24.6
FIXED CARBON	58.0	60.0
ASH	15.1	15.4
TOTAL	100.0	100.0

AIR DRY MOISTURE	38.0	47.1
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ULTIMATE ANALYSIS

HYDROGEN	4.1	4.0
CARBON	67.6	67.4
NITROGEN	1.3	1.3
OXYGEN	8.2	8.1
SULFUR	3.7	3.8
ASH	15.1	15.4
TOTAL	100.0	100.0

HEAT OF COMBUSTION (BTU/LB)	11800.	11700.
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F. S. I.	1.0	0.0
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+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-I-6

BASIS. MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-348	G2-349	G2-350	G2-351	G2-352
TIME	3: 0	5: 0	7: 0	9: 0	10: 0
DATE	5/28/78	5/28/78	5/28/78	5/28/78	5/28/78
PROXIMATE ANALYSIS					
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VOLATILE MATTER	26.8	27.8	28.0	29.6	29.6
FIXED CARBON	57.4	57.3	56.0	59.3	58.6
ASH	15.8	14.9	16.1	11.1	11.8
TOTAL	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	32.9	37.0	35.2	42.7	42.0
ULTIMATE ANALYSIS					
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HYDROGEN	3.9	4.0	3.9	4.2	4.3
CARBON	67.1	66.9	66.2	69.8	69.0
NITROGEN	1.2	1.3	1.2	1.3	1.2
OXYGEN	8.3	9.1	8.9	10.0	10.4
SULFUR	3.6	3.8	3.7	3.5	3.4
ASH	15.8	14.9	16.1	11.1	11.8
TOTAL	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	11600.	11600.	11400.	12100.	12000.
F. S. I.	0.5	1.0	1.0	1.0	1.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-J-1

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-353	G2-354
TIME	12:30	13:30
DATE	6/12/78	6/12/78

PROXIMATE ANALYSIS

VOLATILE MATTER	22.6	23.6
FIXED CARBON	62.7	60.1
ASH	14.7	16.3
TOTAL	100.0	100.0
AIR DRY MOISTURE	55.8	39.7

ULTIMATE ANALYSIS

HYDROGEN	3.8	3.7
CARBON	68.2	65.7
NITROGEN	1.3	1.1
OXYGEN	8.8	9.9
SULFUR	3.2	3.3
ASH	14.7	16.3
TOTAL	100.0	100.0

HEAT OF COMBUSTION (BTU/LB)	11700.	11200.
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F. S. I.	0.0	0.0
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+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-J-2

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-355	G2-356	G2-357	G2-358	G2-359	G2-360	G2-361
TIME	6: 0	7: 0	8: 0	9: 0	10: 0	11: 0	12: 0
DATE	6/17/78	6/17/78	6/17/78	6/17/78	6/17/78	6/17/78	6/17/78
PROXIMATE ANALYSIS							
VOLATILE MATTER	26.2	26.2	0.0+	24.4	24.3	24.2	23.4
FIXED CARBON	62.4	61.5	0.0+	61.4	61.2	62.7	59.6
ASH	11.4	12.3	0.0+	14.2	14.6	13.1	17.0
TOTAL	100.0	100.0	0.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	45.4	41.6	0.0+	37.9	34.4	35.7	40.7
ULTIMATE ANALYSIS							
HYDROGEN	4.2	4.2	0.0+	3.9	3.9	3.8	3.8
CARBON	70.6	69.8	0.0+	67.7	67.6	68.5	65.6
NITROGEN	1.3	1.2	0.0+	1.2	1.2	1.2	1.2
OXYGEN	10.1	9.3	0.0	9.2	9.1	10.0	8.4
SULFUR	2.4	3.2	0.0+	3.7	3.5	3.3	4.0
ASH	11.4	12.3	0.0+	14.2	14.6	13.1	17.0
TOTAL	100.0	100.0	0.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	12300.	12200.	0. +	11700.	11700.	11800.	11300.
F. S. I.	0.5	0.0	0.0+	0.0	0.0	0.0	0.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-J-2

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-362	G2-363	G2-364
TIME	13: 0	14: 0	15: 0
DATE	6/17/78	6/17/78	6/17/78
PROXIMATE ANALYSIS			
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VOLATILE MATTER	23.8	24.7	24.3
FIXED CARBON	61.5	60.7	59.8
ASH	14.7	14.5	15.8
TOTAL	100.0	100.0	100.0
AIR DRY MOISTURE	39.1	36.7	39.7
ULTIMATE ANALYSIS			
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HYDROGEN	3.7	3.8	3.7
CARBON	67.2	67.4	66.4
NITROGEN	1.2	1.3	1.3
OXYGEN	9.4	9.2	9.2
SULFUR	3.8	3.7	3.5
ASH	14.7	14.5	15.8
TOTAL	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	11400.	11600.	11400.
F. S. I.	0.0	0.0	0.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-J-3

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-365	G2-366	G2-367	G2-368	G2-369	G2-370
TIME	16:20	17:30	18:50	22:00	0:1	2:0
DATE	6/19/78	6/19/78	6/19/78	6/19/78	6/20/78	6/20/78
PROXIMATE ANALYSIS						
VOLATILE MATTER	24.5	22.9	23.2	6.0	5.4	4.9
FIXED CARBON	62.1	65.8	64.7	67.5	94.6	62.5
ASH	13.4	11.3	12.1	26.5	0.0	32.7
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	37.3	0.0	34.6	55.0	73.2	47.3
ULTIMATE ANALYSIS						
HYDROGEN	4.1	4.0	4.0	1.4	1.3	1.1
CARBON	62.1	70.4	69.8	67.5	64.1	61.9
NITROGEN	1.3	1.4	1.3	0.9	0.7	0.6
OXYGEN	15.6	9.5	9.3	1.4	31.5	1.9
SULFUR	3.6	3.4	3.5	2.3	2.4	1.8
ASH	13.4	11.3	12.1	26.5	0.0	32.7
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	12000.	12100.	12000.	10500.	9960.	9480.
F. S. I.	0.5	0.0	0.0	0.0	0.0	0.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-K-2

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-371	G2-372	G2-373	G2-374	G2-375	G2-376	G2-377
TIME	11: 0	13: 0	15: 0	18:45	21: 0	23: 0	1: 0
DATE	7/11/78	7/11/78	7/11/78	7/11/78	7/11/78	7/11/78	7/12/78
PROXIMATE ANALYSIS							
VOLATILE MATTER	21.9	22.4	13.6	5.1	4.1	4.9	10.0
FIXED CARBON	58.9	62.4	63.9	67.2	61.2	57.7	52.0
ASH	19.2	15.2	22.5	27.8	34.7	37.4	38.0
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	27.9	53.1	52.5	62.6	49.8	62.2	58.3
ULTIMATE ANALYSIS							
HYDROGEN	3.6	3.7	2.4	1.2	1.0	0.8	1.6
CARBON	64.8	68.0	67.2	65.7	61.9	58.1	55.3
NITROGEN	1.2	1.3	1.2	0.5	0.5	0.5	0.7
OXYGEN	6.9	8.1	3.6	3.3	0.3	1.8	2.6
SULFUR	4.3	3.6	3.0	1.6	1.5	1.3	1.8
ASH	19.2	15.2	22.5	27.8	34.7	37.4	38.0
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	11100.	11700.	11100.	10000.	9410.	8830.	8710.
F. S. I.	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-L-2

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-378	G2-379
TIME	23: 0	3:30
DATE	7/21/78	7/22/78
PROXIMATE ANALYSIS		

VOLATILE MATTER	24.3	24.0
FIXED CARBON	49.2	58.3
ASH	26.4	17.7
TOTAL	100.0	100.0

AIR DRY MOISTURE	26.4	36.1
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ULTIMATE ANALYSIS

HYDROGEN	3.3	3.5
CARBON	58.5	61.8
NITROGEN	1.1	1.3
OXYGEN	4.7	11.7
SULFUR	6.0	3.9
ASH	26.4	17.7
TOTAL	100.0	100.0

HEAT OF COMBUSTION (BTU/LB)	10100.	11300.
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F. S. I.	0.0	0.0
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+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-L-3

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-380	G2-381	G2-382	G2-383
TIME	16:30	16:30	20:10	21:45
DATE	7/23/78	7/23/78	7/23/78	7/23/78
PROXIMATE ANALYSIS				

VOLATILE MATTER	26.9	30.5	30.5	32.5
FIXED CARBON	54.7	59.2	52.9	54.7
ASH	18.4	10.3	16.6	12.7
TOTAL	100.0	100.0	100.0	100.0

AIR DRY MOISTURE	28.4	28.3	24.5	23.4
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ULTIMATE ANALYSIS

HYDROGEN	3.7	4.3	4.1	4.4
CARBON	64.6	70.8	64.8	68.1
NITROGEN	1.2	1.3	1.2	1.3
OXYGEN	7.5	9.8	8.5	9.6
SULFUR	4.5	3.4	4.7	3.8
ASH	18.4	10.3	16.6	12.7
TOTAL	100.0	100.0	100.0	100.0

HEAT OF COMBUSTION (BTU/LB)	11200.	12400.	11400.	11900.
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F. S. I.	0.0	1.0	0.0	1.0
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+ = NO ANALYSIS DONE
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G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-M-1

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-384	G2-385	G2-386	G2-387	G2-388	G2-389	G2-390
TIME	10:30	12:30	14:30	18:50	20:30	10:30	12:30
DATE	7/27/78	7/27/78	7/27/78	7/27/78	7/27/78	7/27/78	7/27/78
PROXIMATE ANALYSIS							
VOLATILE MATTER	26.3	16.0	8.7	5.3	5.5	20.0	11.8
FIXED CARBON	57.9	65.9	69.8	67.5	55.3	60.7	68.6
ASH	15.8	18.1	21.5	27.2	39.2	19.2	19.6
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	34.2	43.8	50.7	57.3	55.2	51.1	63.2
ULTIMATE ANALYSIS							
HYDROGEN	3.9	3.0	1.8	0.6	0.8	3.1	2.2
CARBON	67.0	68.7	69.3	70.2	56.6	66.1	69.9
NITROGEN	1.3	1.3	0.9	0.8	0.5	1.2	1.1
OXYGEN	8.4	5.8	4.4	-2.0	1.4	6.4	3.7
SULFUR	3.6	3.1	2.1	3.1	1.3	3.9	3.5
ASH	15.8	18.1	21.5	27.2	39.2	19.2	19.6
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	11700.	11400.	11100.	10100.	8600.	11000.	11200.
F. S. I.	0.5	0.0	0.0	0.0	0.0	0.0	0.0

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** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-M-1

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-391	G2-392	G2-393	G2-394
TIME	14:30	18:45	20:30	22:30
DATE	7/27/78	7/27/78	7/27/78	7/27/78
PROXIMATE ANALYSIS				
VOLATILE MATTER	11.4	7.2	7.0	7.6
FIXED CARBON	70.3	67.0	65.4	62.0
ASH	18.2	25.8	27.6	30.4
TOTAL	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	61.4	57.8	66.3	67.8
ULTIMATE ANALYSIS				
HYDROGEN	2.1	1.2	1.0	1.1
CARBON	70.6	68.5	66.9	64.5
NITROGEN	1.1	0.8	0.7	0.6
OXYGEN	5.6	2.0	2.0	2.1
SULFUR	2.3	1.6	1.7	1.3
ASH	18.2	25.8	27.6	30.4
TOTAL	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	11300.	10600.	10200.	9790.
F. S. I.	0.0	0.0	0.0	0.0

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** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-M-2

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-395	G2-396	G2-397	G2-398	G2-399	G2-400	G2-401
TIME	19: 0	21: 0	23: 0	1: 0	3: 0	5: 0	7: 0
DATE	7/31/78	7/31/78	7/31/78	8/ 1/78	8/ 1/78	8/ 1/78	8/ 1/78
PROXIMATE ANALYSIS							
VOLATILE MATTER	25.2	17.5	17.4	6.4	5.6	6.0	5.2
FIXED CARBON	53.9	61.8	54.1	64.7	66.1	62.2	69.4
ASH	20.9	20.7	28.6	28.9	28.3	31.8	25.4
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	26.4	47.3	28.0	43.1	27.7	48.2	61.5
ULTIMATE ANALYSIS							
HYDROGEN	3.5	2.8	2.3	1.0	0.9	1.0	1.1
CARBON	62.5	64.4	57.2	66.4	67.1	64.0	69.5
NITROGEN	1.1	1.1	1.0	0.6	0.6	0.6	0.7
OXYGEN	7.0	6.8	5.7	1.4	1.8	1.4	2.2
SULFUR	4.9	4.1	5.2	1.7	1.3	1.1	1.1
ASH	20.9	20.7	28.6	28.9	28.3	31.8	25.4
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	10700.	10700.	9550.	10000.	10200.	9770.	10600.
F. S. I.	0.0	0.0	0.0	0.0	0.0	0.0	0.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-N-1

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-402	G2-403	G2-404	G2-405	G2-406
TIME	20:15	23: 0	1:45	3:45	5:35
DATE	8/ 9/78	8/ 9/78	8/10/78	8/10/78	8/10/78
PROXIMATE ANALYSIS					
VOLATILE MATTER	26.8	24.5	25.4	26.4	22.3
FIXED CARBON	59.4	55.5	57.2	58.6	56.8
ASH	13.7	20.0	17.4	15.0	20.8
TOTAL	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	25.8	21.4	22.6	23.2	24.8
ULTIMATE ANALYSIS					
HYDROGEN	4.0	3.6	3.8	3.9	3.4
CARBON	67.8	63.8	65.6	67.2	63.3
NITROGEN	1.1	1.1	1.1	1.2	1.2
OXYGEN	10.2	7.6	8.4	9.1	7.4
SULFUR	3.1	3.8	3.6	3.5	3.8
ASH	13.7	20.0	17.4	15.0	20.8
TOTAL	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	12000.	11000.	11300.	11600.	10900.
F. S. I.	0.5	0.0	0.0	0.5	0.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-N-2

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-407	G2-408	G2-409	G2-410	G2-411	G2-412	G2-413
TIME	13:0	16:15	18:15	20:15	22:30	0:15	2:45
DATE	8/12/78	8/12/78	8/12/78	8/12/78	8/12/78	8/13/78	8/13/78
PROXIMATE ANALYSIS							
VOLATILE MATTER	25.4	25.4	24.7	25.0	24.8	24.8	28.2
FIXED CARBON	60.7	61.2	61.7	59.7	60.4	60.1	58.4
ASH	13.9	13.5	13.6	15.3	14.7	15.1	13.4
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	27.2	30.0	37.2	28.9	42.1	33.3	30.8
ULTIMATE ANALYSIS							
HYDROGEN	3.9	4.0	3.9	3.9	3.8	3.8	4.0
CARBON	68.6	69.1	69.5	68.0	68.4	68.0	67.6
NITROGEN	1.2	1.3	1.3	1.3	1.3	1.3	1.3
OXYGEN	8.9	8.4	8.2	7.7	8.1	7.7	9.8
SULFUR	3.5	3.7	3.5	3.8	3.6	4.0	3.8
ASH	13.9	13.5	13.6	15.3	14.7	15.1	13.4
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	11800.	12000.	12100.	11700.	11900.	11700.	11700.
F. S. I.	0.5	0.5	0.5	0.5	0.5	0.5	1.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-N-2

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-414	G2-415	G2-416	G2-417	G2-418	G2-419	G2-420
TIME	4: 0	4:45	6: 0	8:30	9:30	11:30	12:30
DATE	8/13/78	8/13/78	8/13/78	8/13/78	8/13/78	8/13/78	8/13/78
PROXIMATE ANALYSIS							
VOLATILE MATTER	29.5	30.8	0.0+	31.3	30.5	31.0	30.1
FIXED CARBON	59.8	58.3	100.0	55.1	56.3	52.2	52.9
ASH	10.7	10.8	0.0+	13.6	13.2	16.8	17.0
TOTAL	100.0	100.0	0.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	0.0+	36.5	0.0+	24.5	23.2	28.7	29.0
ULTIMATE ANALYSIS							
HYDROGEN	4.3	4.4	0.0+	4.4	4.3	4.2	4.2
CARBON	70.6	70.0	0.0+	67.6	67.9	64.8	64.6
NITROGEN	1.2	1.3	0.0+	1.3	1.3	1.2	1.2
OXYGEN	9.8	10.1	0.0	9.3	9.8	9.0	8.8
SULFUR	3.3	3.4	0.0+	3.9	3.5	4.1	4.1
ASH	10.7	10.8	0.0+	13.6	13.2	16.8	17.0
TOTAL	100.0	100.0	0.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	12300.	12100.	0.	11900.	12000.	11400.	11300.
F. S. I.	1.0	1.0	1.0	1.0	1.0	1.0	1.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-N-3

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-421	G2-422	G2-423	G2-424
TIME	2:15	4:30	6:15	8:45
DATE	8/15/78	8/15/78	8/15/78	8/15/78
PROXIMATE ANALYSIS				

VOLATILE MATTER	28.2	32.4	30.9	29.8
FIXED CARBON	57.1	58.3	57.5	56.4
ASH	14.7	9.3	11.7	13.8

TOTAL	100.0	100.0	100.0	100.0
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AIR DRY MOISTURE	34.7	28.0	28.8	32.0
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ULTIMATE ANALYSIS

HYDROGEN	4.1	4.5	4.4	4.2
CARBON	67.6	71.4	69.5	67.6
NITROGEN	1.1	1.2	1.2	1.1
OXYGEN	8.4	10.3	9.8	9.6
SULFUR	4.0	3.2	3.4	3.6
ASH	14.7	9.3	11.7	13.8

TOTAL	100.0	100.0	100.0	100.0
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HEAT OF COMBUSTION (BTU/LB)	11800.	12600.	12300.	11900.
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F. S. I.	1.0	1.0	1.0	1.0
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+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-0-1

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-425	G2-426	G2-427	G2-428	G2-429	G2-430	G2-431
TIME	15:30	17:30	0:15	2:0	4:15	6:0	8:0
DATE	8/22/78	8/22/78	8/23/78	8/23/78	8/23/78	8/23/78	8/23/78
PROXIMATE ANALYSIS							

VOLATILE MATTER	20.3	19.8	5.8	4.3	5.1	3.9	4.0
FIXED CARBON	59.9	63.8	63.5	71.2	68.6	69.5	75.3
ASH	19.9	16.3	30.7	24.5	26.3	26.6	20.7
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	33.4	33.1	42.3	47.6	47.2	43.6	23.9
ULTIMATE ANALYSIS							

HYDROGEN	3.3	3.4	1.2	1.1	1.1	1.0	1.1
CARBON	65.3	67.9	65.2	71.2	69.3	69.0	73.7
NITROGEN	1.2	1.2	0.6	0.7	0.7	0.6	0.7
OXYGEN	6.6	7.7	0.5	0.9	0.9	1.0	2.0
SULFUR	3.8	3.4	1.8	1.6	1.8	1.7	1.9
ASH	19.9	16.3	30.7	24.5	26.3	26.6	20.7
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	11100.	11500.	10000.	10900.	10600.	10600.	11400.
F. S. I.	0.0	0.0	0.0	0.0	0.0	0.0	0.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-0-1

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-432	G2-433	G2-434	G2-435	G2-436	G2-437	G2-438
TIME	10:15	12:0	14:15	16:0	18:0	20:0	22:30
DATE	8/23/78	8/23/78	8/23/78	8/23/78	8/23/78	8/23/78	8/23/78
PROXIMATE ANALYSIS							
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VOLATILE MATTER	5.4	5.5	4.9	7.4	6.4	5.4	5.4
FIXED CARBON	69.0	67.4	72.1	67.7	68.7	68.1	69.2
ASH	25.6	27.1	22.9	24.9	24.9	26.5	25.4
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	48.5	54.5	76.6	38.9	43.1	40.3	45.0
ULTIMATE ANALYSIS							
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HYDROGEN	1.2	1.1	1.1	1.4	1.3	1.1	1.1
CARBON	69.5	68.4	71.9	68.5	69.4	68.6	69.2
NITROGEN	0.6	0.6	0.7	0.7	0.6	0.6	0.0
OXYGEN	1.5	1.0	1.5	2.6	2.1	1.6	2.6
SULFUR	1.7	1.8	1.9	1.8	1.8	1.5	1.6
ASH	25.6	27.1	22.9	24.9	24.9	26.5	25.4
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	10600.	10500.	11100.	10700.	10600.	10500.	10700.
F. S. I.	0.0	0.0	0.0	0.0	0.0	0.0	0.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-0-1

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-439	G2-440	G2-441	G2-442	G2-443	G2-444	G2-445
TIME	0: 1	2: 0	4: 0	6: 0	8: 0	12: 0	16: 0
DATE	8/24/78	8/24/78	8/24/78	8/24/78	8/24/78	8/24/78	8/24/78
PROXIMATE ANALYSIS							
VOLATILE MATTER	5.8	5.7	6.5	6.2	4.8	3.6	5.0
FIXED CARBON	69.7	68.7	70.0	71.7	73.0	74.8	67.5
ASH	24.4	25.6	23.5	22.1	22.2	21.7	27.5
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	44.0	40.4	45.7	45.9	52.0	42.1	45.8
ULTIMATE ANALYSIS							
HYDROGEN	1.3	1.2	1.3	1.3	1.3	1.2	1.1
CARBON	70.1	68.9	70.8	72.1	72.2	73.5	68.2
NITROGEN	0.7	0.7	0.7	0.7	0.7	0.6	0.5
OXYGEN	1.8	1.7	1.9	2.1	1.8	1.6	1.3
SULFUR	1.8	1.9	1.8	1.8	1.7	1.4	1.4
ASH	24.4	25.6	23.5	22.1	22.2	21.7	27.5
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	10800	10700	10900	11100	11200	11300	10400
F. S. I.	0.0	0.0	0.0	0.0	0.0	0.0	0.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-0-1

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER G2-446

TIME 20: 0
DATE 8/24/78

PROXIMATE ANALYSIS

VOLATILE MATTER	3.8
FIXED CARBON	70.0
ASH	26.2
TOTAL	100.0

AIR DRY MOISTURE 40.7

ULTIMATE ANALYSIS

HYDROGEN	1.1
CARBON	69.7
NITROGEN	0.5
OXYGEN	1.1
SULFUR	1.4
ASH	26.2
TOTAL	100.0

HEAT OF COMBUSTION (BTU/LB) 10700.

F. S. I. 0.0

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-0-2A

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER G2-447

TIME 22: 0

DATE 8/25/78

PROXIMATE ANALYSIS

VOLATILE MATTER	6.9
FIXED CARBON	67.8
ASH	25.3
TOTAL	100.0

AIR DRY MOISTURE 45.4

ULTIMATE ANALYSIS

HYDROGEN	1.3
CARBON	68.3
NITROGEN	0.7
OXYGEN	2.5
SULFUR	1.9
ASH	25.3
TOTAL	100.0

HEAT OF COMBUSTION (BTU/LB) 10600.

F. S. I. 0.5

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

** = SUSPECT ANALYSIS

* = TRACE

+ = NO ANALYSIS DONE

CHEMICAL ANALYSIS

RUN 2-DB-0-2B

0.7

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-448	G2-449	G2-450	G2-451	G2-452	G2-453
TIME	6:30	12:0	16:30	18:0	4:0	8:0
DATE	8/26/78	8/26/78	8/26/78	8/26/78	8/27/78	8/27/78
PROXIMATE ANALYSIS						
<hr/>						
VOLATILE MATTER	18.0	19.7	6.5	4.6	6.0	6.7
FIXED CARBON	66.1	62.7	68.1	70.7	73.9	68.6
ASH	15.8	17.6	25.4	24.7	20.2	24.7
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0
AIR DRY MOISTURE	53.0	32.1	0.0	44.5	56.7	56.4
<hr/>						
ULTIMATE ANALYSIS						
<hr/>						
HYDROGEN	3.0	3.3	1.4	1.0	1.2	1.3
CARBON	70.1	66.5	68.2	70.6	75.1	69.5
NITROGEN	1.1	1.1	0.7	0.6	0.8	0.7
OXYGEN	6.9	7.5	2.6	1.6	0.9	2.1
SULFUR	3.0	4.0	1.7	1.5	1.8	1.7
ASH	15.8	17.6	25.4	24.7	20.2	24.7
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0
HEAT OF COMBUSTION (BTU/LB)	11700.	11400.	10700.	10800.	12700.	11000.
F. S. I.	0.0	0.0	0.0	0.0	0.0	0.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

2000 212V JAMES ON = 4
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52 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

02-0-80-21 NUN

BASIS MOISTURE-FREE WEIGHT PERCENT - ASTM D380-74

SAMPLE NUMBER	DATE	TIME	TOTAL	PROXIMATE ANALYSIS	MOISTURE	ASH	FIXED CARBON	VOLATILE MATTER	NITROGEN	OXYGEN	SULFUR	PERCENT ANALYSIS	DATE	TIME	TOTAL	SAMPLE NUMBER
62-454	8/27/78	17:45	17:45	8/27/78	42.2	26.5	66.4	67.1	0.8	2.2	2.0	26.5	8/27/78	17:45	17:45	62-454
62-455	8/27/78	21:45	21:45	8/27/78	51.3	21.9	70.6	71.6	0.9	2.0	2.0	21.9	8/27/78	21:45	21:45	62-455
62-456	8/28/78	2:0	2:0	8/28/78	45.6	23.6	69.3	70.0	0.8	2.2	2.0	23.6	8/28/78	2:0	2:0	62-456
62-457	8/28/78	6:0	6:0	8/28/78	49.3	24.9	67.9	69.1	0.8	2.1	2.1	24.9	8/28/78	6:0	6:0	62-457
62-458	8/28/78	10:0	10:0	8/28/78	49.2	22.5	70.6	71.3	0.8	2.0	2.0	22.5	8/28/78	10:0	10:0	62-458
62-459	8/28/78	14:0	14:0	8/28/78	49.1	27.1	65.0	66.4	0.6	3.0	3.0	27.1	8/28/78	14:0	14:0	62-459
62-460	8/28/78	19:0	19:0	8/28/78	51.6	25.5	67.9	68.7	0.7	2.0	2.0	25.5	8/28/78	19:0	19:0	62-460

RM 5-DB-0-SC

HEAT OF COMBUSTION (BTU/LB)	WATER FREE WEIGHT PERCENT	ASTM D3182-74
10500	10500	10500
11500	11500	11500
12500	12500	12500
13500	13500	13500
14500	14500	14500
15500	15500	15500
16500	16500	16500
17500	17500	17500
18500	18500	18500
19500	19500	19500
20500	20500	20500
21500	21500	21500
22500	22500	22500
23500	23500	23500
24500	24500	24500
25500	25500	25500
26500	26500	26500
27500	27500	27500
28500	28500	28500
29500	29500	29500
30500	30500	30500
31500	31500	31500
32500	32500	32500
33500	33500	33500
34500	34500	34500
35500	35500	35500
36500	36500	36500
37500	37500	37500
38500	38500	38500
39500	39500	39500
40500	40500	40500
41500	41500	41500
42500	42500	42500
43500	43500	43500
44500	44500	44500
45500	45500	45500
46500	46500	46500
47500	47500	47500
48500	48500	48500
49500	49500	49500
50500	50500	50500
51500	51500	51500
52500	52500	52500
53500	53500	53500
54500	54500	54500
55500	55500	55500
56500	56500	56500
57500	57500	57500
58500	58500	58500
59500	59500	59500
60500	60500	60500
61500	61500	61500
62500	62500	62500
63500	63500	63500
64500	64500	64500
65500	65500	65500
66500	66500	66500
67500	67500	67500
68500	68500	68500
69500	69500	69500
70500	70500	70500
71500	71500	71500
72500	72500	72500
73500	73500	73500
74500	74500	74500
75500	75500	75500
76500	76500	76500
77500	77500	77500
78500	78500	78500
79500	79500	79500
80500	80500	80500
81500	81500	81500
82500	82500	82500
83500	83500	83500
84500	84500	84500
85500	85500	85500
86500	86500	86500
87500	87500	87500
88500	88500	88500
89500	89500	89500
90500	90500	90500
91500	91500	91500
92500	92500	92500
93500	93500	93500
94500	94500	94500
95500	95500	95500
96500	96500	96500
97500	97500	97500
98500	98500	98500
99500	99500	99500
100500	100500	100500

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G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-0-20

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER G2-461

TIME 0: 0

DATE 8/28/78

PROXIMATE ANALYSIS

VOLATILE MATTER	6.0
FIXED CARBON	75.9
ASH	18.1
TOTAL	100.0

276 AIR DRY MOISTURE 59.5

ULTIMATE ANALYSIS

HYDROGEN	1.3
CARBON	75.4
NITROGEN	0.8
OXYGEN	2.6
SULFUR	1.7
ASH	18.1
TOTAL	100.0

HEAT OF COMBUSTION (BTU/LB) 11700.

F. S. I. 0.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

CHEMICAL ANALYSIS

RUN 2-DB-0-3

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	G2-462	G2-463	G2-464	G2-465
TIME	17:20	21:30	5:30	7:30
DATE	8/29/78	8/29/78	8/31/78	8/31/78

PROXIMATE ANALYSIS

VOLATILE MATTER	6.0	5.7	8.1	7.1
FIXED CARBON	72.2	72.2	70.4	70.8
ASH	21.8	22.1	21.5	22.1
TOTAL	100.0	100.0	100.0	100.0

AIR DRY MOISTURE	53.8	53.4	37.9	41.6
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ULTIMATE ANALYSIS

HYDROGEN	1.3	1.1	1.5	1.4
CARBON	72.1	71.6	70.5	71.2
NITROGEN	0.8	0.7	0.8	0.7
OXYGEN	1.9	2.9	3.4	2.8
SULFUR	2.0	1.5	2.2	1.8
ASH	21.8	22.1	21.5	22.1
TOTAL	100.0	100.0	100.0	100.0

HEAT OF COMBUSTION (BTU/LB)	11200.	11200.	11000.	11000.
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F. S. I.	0.0	0.0	0.0	0.0
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+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-A-4

SAMPLE NUMBER	G2-263	G2-264	G2-265	G2-266	G2-267
TIME	8: 0	17:30	18:15	19:15	21:15
DATE	9/29/77	9/30/77	9/30/77	9/30/77	9/30/77

U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT				
-----	-----				

+8 MESH	0.0+	0.0+	0.0+	0.0+	0.0+
+20 MESH	0.0+	0.0+	0.0+	0.0+	0.0+
+30 MESH	0.0+	0.0+	0.0+	0.0+	0.0+
+50 MESH	0.0+	65.0	40.3	41.8	52.3
+60 MESH	0.0+	74.2	47.8	50.8	60.6
+100 MESH	0.0+	91.8	69.6	77.0	81.4
+140 MESH	0.0+	95.8	79.1	86.0	89.4
+200 MESH	0.0+	95.9	86.2	87.9	93.8
+325 MESH	0.0+	99.5	93.3	95.6	98.1
-325 MESH(WEIGHT PERCENT)	0.0+	0.5	6.7	4.4	1.9

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-B-1

SAMPLE NUMBER	G2-268	G2-269	G2-270	G2-271	G2-272	G2-273
TIME	13:30	14: 5	14:50	16:15	17: 0	18: 5
DATE	10/25/77	10/25/77	10/25/77	10/25/77	10/25/77	10/25/77

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+20 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+30 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+50 MESH	18.0	27.2	16.7	28.3	19.3	20.7
+60 MESH	23.9	34.9	21.0	35.6	25.1	26.8
+100 MESH	50.2	63.3	38.7	60.6	47.4	50.6
+140 MESH	64.1	75.8	51.1	72.5	59.3	63.5
+200 MESH	66.5	83.4	58.0	78.9	65.7	69.1
+325 MESH	84.8	90.0	75.0	90.2	81.6	88.5
-325 MESH(WEIGHT PERCENT)	15.2	10.0	25.0	9.8	18.4	11.5

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-B-2

SAMPLE NUMBER

G2-274 G2-275

TIME

13: 0 14: 0

DATE

10/29/77 10/29/77

U. S. SIEVE SIZE

CUMULATIVE WEIGHT PERCENT

+8 MESH	0.0+	0.0+
+20 MESH	0.0+	0.0+
+30 MESH	0.0+	0.0+
+50 MESH	39.4	37.1
+60 MESH	47.1	45.1
+100 MESH	69.8	71.5
+140 MESH	80.4	82.5
+200 MESH	87.8	82.5
+325 MESH	94.1	94.5
-325 MESH<WEIGHT PERCENT>	5.9	5.5

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-B-3

SAMPLE NUMBER

G2-276 G2-277

TIME

19: 0 20: 0

DATE

10/31/77 10/31/77

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0. 0+	0. 0+
+20 MESH	0. 0+	0. 0+
+30 MESH	0. 0+	0. 0+
+50 MESH	25. 2	33. 3
+60 MESH	33. 3	41. 8
+100 MESH	62. 5	70. 5
+140 MESH	75. 8	81. 6
+200 MESH	81. 6	88. 9
+325 MESH	93. 4	95. 9
-325 MESH(WEIGHT PERCENT)	6. 6	4. 1

+ = NO ANALYSIS DONE
 * = TRACE
 * = TRACE
 ** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-D-2

SAMPLE NUMBER

G2-284

TIME

13:15

DATE

12/ 9/77

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0+
+20 MESH	0.0+
+30 MESH	0.0+
+50 MESH	38.2
+60 MESH	46.3
+100 MESH	75.1
+140 MESH	86.6
+200 MESH	87.2
+325 MESH	97.4
-325 MESH<WEIGHT PERCENT>	2.6

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-D-3

SAMPLE NUMBER	G2-285	G2-286	G2-287	G2-288	G2-289	G2-290	G2-291
TIME	17: 0	19:30	22:15	23:40	1: 0	3: 0	5:20
DATE	12/13/77	12/13/77	12/13/77	12/13/77	12/14/77	12/14/77	12/14/77

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+20 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+30 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+50 MESH	22.7	16.2	32.1	30.4	24.0	28.4	20.2
+60 MESH	28.4	23.2	39.6	37.9	31.0	36.5	26.7
+100 MESH	51.7	56.4	63.6	63.9	57.9	68.2	54.7
+140 MESH	65.4	72.2	74.9	76.5	71.5	81.5	70.2
+200 MESH	77.1	81.8	82.9	85.1	80.6	86.8	81.6
+325 MESH	88.9	91.8	91.3	92.8	89.1	95.4	91.3
-325 MESH(WEIGHT PERCENT)	11.1	8.2	8.7	7.2	10.9	4.6	8.7

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

SAMPLE NUMBER	G2-292	G2-293	G2-294	G2-295	G2-296	G2-297	G2-298
TIME	7: 0	9:30	11: 0	13: 0	4: 0	6: 0	7:45
DATE	12/14/77	12/14/77	12/14/77	12/14/77	12/15/77	12/15/77	12/15/77

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+20 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+30 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+50 MESH	25.0	30.5	26.6	16.1	31.7	20.4	19.3
+60 MESH	32.6	39.9	34.5	22.3	39.4	26.2	24.0
+100 MESH	63.3	71.0	61.7	47.9	65.0	54.0	51.0
+140 MESH	76.8	84.4	74.7	63.2	76.7	69.3	64.1
+200 MESH	87.0	92.4	85.3	70.0	85.3	81.9	76.6
+325 MESH	93.6	96.5	93.0	85.5	91.7	91.9	88.7
-325 MESH(WEIGHT PERCENT)	6.4	3.5	7.0	14.5	8.3	8.1	11.3

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-D-3

SAMPLE NUMBER	G2-299	G2-300
TIME	10:10	12: 0
DATE	12/15/77	12/15/77

U. S. SIEVE SIZE		CUMMULATIVE WEIGHT PERCENT
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+8 MESH	0. 0+	0. 0+
+20 MESH	0. 0+	0. 0+
+30 MESH	0. 0+	0. 0+
+50 MESH	12. 4	12. 1
+60 MESH	16. 0	16. 4
+100 MESH	40. 5	43. 3
+140 MESH	55. 2	58. 5
+200 MESH	70. 1	73. 3
+325 MESH	85. 4	87. 4
-325 MESH(WEIGHT PERCENT)	14. 6	12. 6

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-E-1

SAMPLE NUMBER

G2-301 G2-302

TIME

12:30 14: 0

DATE

12/30/77 12/30/77

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0. 0+	0. 0+
+20 MESH	0. 0+	0. 0+
+30 MESH	0. 0+	0. 0+
+50 MESH	0. 9	9. 5
+60 MESH	1. 5	14. 6
+100 MESH	11. 4	40. 8
+140 MESH	25. 3	58. 9
+200 MESH	45. 8	74. 6
+325 MESH	64. 4	85. 8
-325 MESH(WEIGHT PERCENT)	35. 6	14. 2

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-F-3

SAMPLE NUMBER

G2-303 G2-304 G2-305 G2-306 G2-307 G2-308 G2-309

TIME

21:50 23:50 1:50 3:50 6:15 8:0 10:30

DATE

2/ 5/78 2/ 5/78 2/ 6/78 2/ 6/78 2/ 6/78 2/ 6/78 2/ 6/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
+20 MESH	0.1	0.1	0.1	0.3	0.0*	0.0	0.1
+30 MESH	0.7	0.5	0.7	1.1	0.7	0.4	0.8
+50 MESH	8.4	11.0	11.2	9.8	11.5	7.3	14.9
+60 MESH	11.1	14.7	15.2	13.4	15.8	10.0	19.9
+100 MESH	28.5	37.5	35.2	32.3	35.4	26.8	43.4
+140 MESH	44.9	53.3	48.9	48.1	50.1	40.9	56.5
+200 MESH	61.2	69.6	63.3	64.4	65.7	56.6	70.1
+325 MESH	82.0	85.5	77.6	78.4	80.1	74.5	81.8
-325 MESH(WEIGHT PERCENT)	18.1	14.5	22.4	21.6	19.8	25.5	18.2

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-G-1

SAMPLE NUMBER	G2-310	G2-311
TIME	13:30	15:30
DATE	3/26/78	3/26/78

U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT	

+8 MESH	0.0	0.0
+20 MESH	0.0	0.2
+30 MESH	0.0	0.9
+50 MESH	3.3	8.5
+60 MESH	5.0	11.9
+100 MESH	16.2	30.5
+140 MESH	28.6	45.8
+200 MESH	51.6	66.0
+325 MESH	69.3	80.0
-325 MESH<WEIGHT PERCENT>	30.7	20.1

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-G-2

SAMPLE NUMBER

G2-312 G2-313

TIME

22: 0 0: 0

DATE

3/26/78 3/27/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0	0.0
+20 MESH	0.2	0.0
+30 MESH	0.0	0.3
+50 MESH	12.5	3.6
+60 MESH	17.9	5.9
+100 MESH	40.9	22.5
+140 MESH	55.2	36.0
+200 MESH	73.8	55.9
+325 MESH	84.4	72.3
-325 MESH(WEIGHT PERCENT)	15.6	27.7

* = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-G-3

SAMPLE NUMBER

G2-314

TIME

14:30

DATE

3/27/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0
+20 MESH	0.0
+30 MESH	0.2
+50 MESH	5.2
+60 MESH	7.6
+100 MESH	21.1
+140 MESH	32.3
+200 MESH	51.0
+325 MESH	70.9
-325 MESH(WEIGHT PERCENT)	29.1

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-G-4

SAMPLE NUMBER

G2-315

G2-316

TIME

2: 0

4:20

DATE

4/ 2/78

4/ 2/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0	0.0
+20 MESH	0.0*	0.1
+30 MESH	0.2	0.3
+50 MESH	4.1	5.5
+60 MESH	6.0	7.9
+100 MESH	24.3	23.1
+140 MESH	42.9	35.6
+200 MESH	71.2	52.3
+325 MESH	86.4	68.3
-325 MESH<WEIGHT PERCENT>	13.6	31.8

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-G-5

SAMPLE NUMBER	G2-317	G2-318	G2-319	G2-320	G2-321	G2-322
TIME	20: 0	21: 0	22: 0	0: 1	2: 0	4: 0
DATE	4/ 6/78	4/ 6/78	4/ 6/78	4/ 7/78	4/ 7/78	4/ 7/78

U. S. SIEVE SIZE

CUMULATIVE WEIGHT PERCENT

+8 MESH	0.0	0.0	0.0*	0.0	0.0	0.0
+20 MESH	0.1	0.1	0.0	0.1	0.0*	0.4
+30 MESH	1.7	0.8	0.8	1.0	0.5	1.3
+50 MESH	20.6	11.8	12.4	13.8	9.7	12.1
+60 MESH	26.0	15.5	15.9	17.9	13.0	16.5
+100 MESH	50.9	36.5	36.2	39.0	32.8	36.2
+140 MESH	64.5	51.2	50.9	53.8	48.2	51.2
+200 MESH	78.6	68.6	68.9	72.0	68.0	70.7
+325 MESH	90.6	85.2	85.7	87.9	87.4	84.6
-325 MESH(WEIGHT PERCENT)	9.4	14.8	14.3	12.1	12.6	15.4

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-G-5

SAMPLE NUMBER

G2-323

G2-324

G2-325

TIME

6: 0

8: 0

10: 0

DATE

4/ 7/78

4/ 7/78

4/ 7/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0	0.0	0.0
+20 MESH	0.0	0.4	0.4
+30 MESH	0.2	6.0	2.6
+50 MESH	0.2	46.7	26.3
+60 MESH	11.4	53.4	33.0
+100 MESH	28.7	77.5	54.4
+140 MESH	42.5	86.6	64.0
+200 MESH	60.1	93.0	72.3
+325 MESH	78.2	97.3	80.4
-325 MESH(WEIGHT PERCENT)	21.8	2.7	19.6

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-G-6

SAMPLE NUMBER

G2-326

G2-327

TIME

18:30

19:30

DATE

4/ 8/78

4/ 8/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0	0.0
+20 MESH	0.1	0.1
+30 MESH	0.3	1.6
+50 MESH	1.3	13.2
+60 MESH	1.9	16.4
+100 MESH	11.5	32.7
+140 MESH	27.8	46.6
+200 MESH	54.9	66.2
+325 MESH	73.6	81.0
-325 MESH(WEIGHT PERCENT)	26.4	19.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-G-6

SAMPLE NUMBER

G2-328

G2-329

G2-330

TIME

21:45

0:30

2:40

DATE

4/ 8/78

4/ 9/78

4/ 9/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0	0.0	0.0
+20 MESH	0.3	0.2	0.0
+30 MESH	2.0	2.0	0.9
+50 MESH	15.9	17.6	15.7
+60 MESH	20.3	22.1	20.2
+100 MESH	40.1	41.8	39.1
+140 MESH	56.2	54.3	50.3
+200 MESH	75.0	69.5	63.7
+325 MESH	87.1	79.5	76.5
-325 MESH<WEIGHT PERCENT>	12.9	20.6	23.5

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-H

SAMPLE NUMBER	G2-331	G2-332	G2-333	G2-334	G2-335	G2-336	G2-337
TIME	11: 0	13: 0	15:45	17: 0	19: 0	21: 0	0: 1
DATE	4/26/78	4/26/78	4/26/78	4/26/78	4/26/78	4/26/78	4/27/78
U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT						
-----	-----						
+8 MESH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
+20 MESH	0.2	0.1	1.5	1.1	0.3	0.3	0.5
+30 MESH	1.0	1.6	9.1	5.8	1.5	1.5	3.4
+50 MESH	14.3	14.3	42.1	32.2	17.0	21.4	23.8
+60 MESH	19.6	18.5	48.9	39.2	23.0	28.6	29.8
+100 MESH	46.3	38.4	68.4	61.6	48.2	58.1	53.7
+140 MESH	61.4	53.1	77.5	72.9	62.1	73.7	67.1
+200 MESH	75.3	69.0	85.7	83.9	76.6	85.4	82.1
+325 MESH	86.6	81.5	92.5	91.7	85.1	93.3	92.0
-325 MESH(WEIGHT PERCENT)	13.4	18.3	7.5	8.3	14.9	6.7	8.0

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-08-1-2

SAMPLE NUMBER	G2-338	G2-339	G2-340
TIME	11:15	13:0	15:30
DATE	5/17/78	5/17/78	5/17/78

U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT		

+8 MESH	0.0	0.0	0.0
+20 MESH	0.3	0.1	0.3
+30 MESH	0.8	1.0	1.3
+50 MESH	3.5	17.5	12.5
+60 MESH	5.6	24.7	17.5
+100 MESH	20.1	65.6	41.4
+140 MESH	36.8	78.3	58.6
+200 MESH	62.2	89.2	76.1
+325 MESH	79.4	97.2	89.7
-325 MESH(WEIGHT PERCENT)	20.6	2.8	10.3

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-06-I-3

SAMPLE NUMBER	G2-341	G2-342	G2-343	G2-344
TIME	2: 0	4: 0	6: 0	8: 0
DATE	5/19/78	5/19/78	5/19/78	5/19/78

U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT			

+8 MESH	0.0	0.0	0.0	0.0
+20 MESH	0.1	0.1	0.6	0.7
+30 MESH	0.9	1.2	3.8	5.7
+50 MESH	8.6	13.2	21.9	34.5
+60 MESH	11.5	17.4	27.5	41.9
+100 MESH	27.0	37.5	48.2	64.3
+140 MESH	40.2	51.9	62.4	75.4
+200 MESH	58.8	69.4	76.6	85.1
+325 MESH	77.5	83.1	90.8	92.9
-325 MESH(WEIGHT PERCENT)	22.5	16.9	9.2	7.1

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-I-4

SAMPLE NUMBER G2-345

TIME 21:30

DATE 5/21/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0
+20 MESH	0.3
+30 MESH	2.9
+50 MESH	26.9
+60 MESH	33.4
+100 MESH	57.9
+140 MESH	72.0
+200 MESH	85.0
+325 MESH	93.9

-325 MESH(WEIGHT PERCENT)	6.1
---------------------------	-----

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES
PARTICLE SIZE DISTRIBUTION

RUN 2-DB-I-5

SAMPLE NUMBER	G2-346	G2-347
TIME	19: 0	21: 0
DATE	5/23/78	5/23/78

U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT	
-----		-----
+8 MESH	0.0	0.0
+20 MESH	0.1	0.1
+30 MESH	1.1	0.8
+50 MESH	16.0	25.3
+60 MESH	21.6	21.7
+100 MESH	45.0	48.1
+140 MESH	60.0	64.4
+200 MESH	75.6	79.4
+325 MESH	89.0	90.9
-325 MESH(WEIGHT PERCENT)	11.0	9.1

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-08-I-6

SAMPLE NUMBER	G2-343	G2-349	G2-350	G2-351	G2-352
TIME	3: 0	5: 0	7: 0	9: 0	10: 0
DATE	5/28/78	5/29/78	5/28/78	5/28/78	5/28/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0	0.0	0.0	0.0	0.0
+20 MESH	0.4	0.6	0.7	0.4	0.7
+30 MESH	3.4	4.7	4.1	1.3	2.9
+50 MESH	18.8	24.6	21.4	11.2	13.8
+60 MESH	23.1	29.9	26.3	16.1	17.6
+100 MESH	41.3	51.4	46.7	35.5	41.2
+140 MESH	54.6	64.7	61.0	51.5	56.2
+200 MESH	67.5	77.3	75.1	67.5	70.0
+325 MESH	81.8	87.9	86.9	82.1	84.1
-325 MESH(WEIGHT PERCENT)	18.3	12.1	13.1	17.9	15.9

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-J-1

SAMPLE NUMBER

G2-353

G2-354

TIME

12:30

13:30

DATE

6/12/78

6/12/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.7	0.2
+20 MESH	1.8	1.0
+30 MESH	5.8	2.4
+50 MESH	19.8	6.6
+60 MESH	22.7	8.5
+100 MESH	36.6	21.7
+140 MESH	46.1	35.2
+200 MESH	56.3	50.2
+325 MESH	73.3	78.4
-325 MESH(WEIGHT PERCENT)	26.7	21.6

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-J-2

SAMPLE NUMBER	G2-356	G2-357	G2-358	G2-359	G2-360	G2-361	G2-363
TIME	7: 0	8: 0	9: 0	10: 0	11: 0	12: 0	14: 0
DATE	6/17/78	6/17/78	6/17/78	6/17/78	6/17/78	6/17/78	6/17/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
+20 MESH	0.0	0.0	0.0	0.0	0.2	0.2	0.1
+30 MESH	0.1	0.1	0.3	0.3	0.4	0.4	0.3
+50 MESH	7.3	7.3	5.4	6.7	10.7	8.8	7.7
+60 MESH	10.7	10.7	7.0	10.6	15.6	13.7	11.5
+100 MESH	27.7	27.7	23.0	26.0	32.9	33.2	28.9
+140 MESH	40.9	40.9	34.0	37.4	44.8	46.4	41.3
+200 MESH	56.7	56.7	49.0	51.5	58.8	59.9	55.8
+325 MESH	74.3	74.3	65.1	67.8	72.0	76.1	72.8
-325 MESH(WEIGHT PERCENT)	25.7	25.7	35.0	32.2	28.0	23.9	27.3

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

SAMPLE NUMBER	G2-364
TIME	15: 0
DATE	6/17/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0
+20 MESH	0.1
+30 MESH	0.2
+50 MESH	7.4
+60 MESH	11.7
+100 MESH	31.6
+140 MESH	44.4
+200 MESH	58.7
+325 MESH	75.0
-325 MESH(WEIGHT PERCENT)	25.1

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-J-3

SAMPLE NUMBER	G2-365	G2-366	G2-367	G2-368	G2-369	G2-370
TIME	17:30	17:30	18:50	22: 0	0: 1	2: 0
DATE	6/19/78	6/19/78	6/19/78	6/19/78	6/20/78	6/20/78
U. S. SIEVE SIZE	CUMULATIVE WEIGHT PERCENT					
-----	-----					
+8 MESH	0.0	0.0	0.0	0.0	0.0	0.0
+20 MESH	0.1	0.1	0.1	0.1	0.0	0.1
+30 MESH	0.3	0.2	0.3	0.1	0.0	0.1
+50 MESH	7.6	16.8	15.4	13.3	5.5	6.9
+60 MESH	11.3	22.7	22.8	21.4	10.0	13.2
+100 MESH	32.5	50.8	47.7	44.3	30.3	35.4
+140 MESH	46.5	62.7	59.4	54.3	42.6	46.5
+200 MESH	62.6	75.0	70.7	63.5	55.6	55.3
+325 MESH	81.6	87.6	79.8	81.0	0.0	72.7
-325 MESH(WEIGHT PERCENT)	18.4	12.4	20.2	18.9	26.8	27.3

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-K-2

SAMPLE NUMBER	G2-371	G2-372	G2-373	G2-374	G2-375	G2-376	G2-377
TIME	11: 0	13: 0	15: 0	18.45	21: 0	23: 0	1: 0
DATE	7/11/78	7/11/78	7/11/78	7/11/78	7/11/78	7/11/78	7/12/78
U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT						
-----	-----						
+8 MESH	0.0	0.0	0.0	0.0	0.3	0.0	0.0
+20 MESH	0.0*	0.0	0.0	0.0	0.5	0.1	0.0
+30 MESH	0.2	0.3	0.0	0.9	0.8	0.3	0.0
+50 MESH	5.5	5.9	9.7	27.7	11.7	8.9	5.6
+60 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+100 MESH	25.1	29.9	52.2	72.4	47.7	47.3	36.4
+140 MESH	35.7	44.2	67.5	82.9	60.7	63.1	52.6
+200 MESH	48.0	59.8	78.8	89.8	70.2	74.6	67.6
+325 MESH	79.1	75.2	87.5	93.4	72.7	85.3	81.6
-325 MESH(WEIGHT PERCENT)	20.9	24.8	12.5	6.6	27.3	14.7	18.4

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-L-2

SAMPLE NUMBER	G2-378	G2-379
TIME	23: 0	3.30
DATE	7/21/78	7/22/78

U. S. SIEVE SIZE

CUMULATIVE WEIGHT PERCENT

+8 MESH	0.0	0.0
+20 MESH	0.4	0.0*
+30 MESH	0.5	0.0*
+50 MESH	8.5	6.5
+60 MESH	0.0+	0.0+
+100 MESH	42.3	38.8
+140 MESH	58.4	55.6
+200 MESH	73.2	72.2
+325 MESH	87.3	88.1
-325 MESH(WEIGHT PERCENT)	12.7	11.9

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-L-3

SAMPLE NUMBER	G2-380	G2-381	G2-382	G2-383
TIME	16:30	16:30	20:10	21:45
DATE	7/23/78	7/23/78	7/23/78	7/23/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0	0.0	0.0	0.0*
+20 MESH	0.0	0.0	0.2	0.0*
+30 MESH	0.0	0.0	0.2	0.0
+50 MESH	3.1	1.3	3.1	2.4
+60 MESH	0.0+	0.0+	0.0+	0.0+
+100 MESH	30.0	19.7	34.4	36.8
+140 MESH	45.7	35.6	53.8	56.7
+200 MESH	61.7	55.1	71.6	74.6
+325 MESH	72.9	69.0	84.9	89.1
-325 MESH(WEIGHT PERCENT)	27.1	31.0	15.2	10.8

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-M-1

SAMPLE NUMBER	G2-384	G2-385	G2-386	G2-387	G2-388	G2-389	G2-390
TIME	10:30	12:30	14:30	18:50	20:30	10:30	12:30
DATE	7/27/78	7/27/78	7/27/78	7/27/78	7/27/78	7/27/78	7/27/78
U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT						
+8 MESH	0.0	0.0	0.0	0.9	0.0	0.0	0.0
+20 MESH	0.0	0.0	0.3	1.4	0.1	0.0	0.3
+30 MESH	0.0*	0.1	0.8	2.6	0.6	0.3	0.6
+50 MESH	6.5	20.5	15.9	46.2	24.2	24.0	25.5
+60 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+100 MESH	31.6	57.9	44.5	82.6	37.8	66.0	58.6
+140 MESH	44.7	69.4	55.2	88.8	53.9	77.6	68.1
+200 MESH	59.0	78.0	65.5	93.0	68.2	87.1	77.0
+325 MESH	74.2	85.8	76.7	97.2	78.5	94.7	85.0
-325 MESH(WEIGHT PERCENT)	25.8	14.3	23.3	2.8	21.5	5.3	15.0

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

SAMPLE NUMBER	G2-391	G2-392	G2-393	G2-394
TIME	14:30	18:45	20:30	22:30
DATE	7/27/78	7/27/78	7/27/78	7/27/78
U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT			
+8 MESH	0.0	0.0	0.0	0.1
+20 MESH	0.0	0.1	0.1	0.2
+30 MESH	0.0*	0.3	0.6	0.5
+50 MESH	17.8	17.3	32.4	16.8
+60 MESH	0.0+	0.0+	0.0+	0.0+
+100 MESH	48.5	47.8	70.2	45.4
+140 MESH	58.3	56.4	77.0	55.1
+200 MESH	67.6	63.4	82.4	63.8
+325 MESH	73.9	69.5	87.5	71.6
-325 MESH(WEIGHT PERCENT)	26.1	30.4	12.5	28.4

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-M-2

SAMPLE NUMBER	G2-395	G2-396	G2-397	G2-398	G2-399	G2-400	G2-401
TIME	19: 0	21: 0	23: 0	1: 0	3: 0	5: 0	7: 0
DATE	7/31/78	7/31/78	7/31/78	8/ 1/78	8/ 1/78	8/ 1/78	8/ 1/78
U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT						
+8 MESH	0.0	0.0	0.0	0.0+	0.0	0.0	0.0
+20 MESH	0.0	0.1	0.0*	0.0+	0.0	0.0	0.0
+30 MESH	0.1	0.3	0.3	0.0+	0.0*	0.1	0.3
+50 MESH	7.5	20.0	11.3	0.0+	13.0	13.6	14.1
+60 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+100 MESH	35.2	64.2	51.7	0.0+	42.1	43.8	41.3
+140 MESH	48.4	78.2	67.0	0.0+	50.0	52.8	49.2
+200 MESH	62.4	88.3	80.1	0.0+	57.1	60.5	56.1
+325 MESH	76.5	94.7	89.1	0.0+	64.8	68.3	66.6
-325 MESH<WEIGHT PERCENT>	23.5	5.3	10.9	0.0+	35.2	31.7	33.4

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-N-1

SAMPLE NUMBER	G2-402	G2-403	G2-404	G2-405	G2-406
TIME	20:15	23:0	1:45	3:45	5:35
DATE	8/ 9/78	8/ 9/78	8/10/78	8/10/78	8/10/78
U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT				
+8 MESH	0.0	0.0	0.0	0.0	0.0*
+20 MESH	0.0*	0.8	0.5	0.4	1.0
+30 MESH	0.2	4.2	2.1	2.3	4.9
+50 MESH	3.4	17.4	11.1	14.1	27.1
+60 MESH	0.0+	0.0+	0.0+	0.0+	0.0+
+100 MESH	16.1	32.3	21.1	35.2	51.9
+140 MESH	27.5	41.8	34.6	48.8	63.9
+200 MESH	40.6	53.7	47.2	63.0	75.9
+325 MESH	54.3	76.6	60.6	77.1	86.2
-325 MESH(WEIGHT PERCENT)	45.7	23.3	39.4	22.9	13.8

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-N-2

SAMPLE NUMBER	G2-407	G2-408	G2-409	G2-410	G2-411	G2-412	G2-413
TIME	13:0	16:15	18:15	20:15	22:30	0:15	2:45
DATE	8/12/78	8/12/78	8/12/78	8/12/78	8/12/78	8/13/78	8/13/78
U. S. SIEVE SIZE	CUMULATIVE WEIGHT PERCENT						
+8 MESH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
+20 MESH	0.9	0.5	0.5	1.5	0.1	0.8	0.1
+30 MESH	3.9	1.9	1.9	5.5	0.8	3.3	1.3
+50 MESH	21.0	13.7	10.8	25.3	15.4	20.0	13.9
+60 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+100 MESH	42.5	36.4	33.3	48.6	39.0	44.8	39.1
+140 MESH	54.0	50.4	48.7	60.2	52.7	52.9	53.0
+200 MESH	66.5	65.6	65.3	72.3	65.7	64.8	65.8
+325 MESH	80.9	76.5	80.3	82.9	79.3	80.4	82.9
-325 MESH(WEIGHT PERCENT)	19.1	23.5	19.7	17.1	20.8	19.6	17.1

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

SAMPLE NUMBER	G2-414	G2-415	G2-416	G2-417	G2-418	G2-419	G2-420
TIME	4:0	4:45	6:0	8:30	9:30	11:30	12:30
DATE	8/13/78	8/13/78	8/13/78	8/13/78	8/13/78	8/13/78	8/13/78
U. S. SIEVE SIZE	CUMULATIVE WEIGHT PERCENT						
+8 MESH	0.0+	0.0	0.0+	0.0	0.0	0.0	0.0
+20 MESH	0.0+	0.1	0.0+	0.2	0.1	0.3	0.2
+30 MESH	0.0+	0.9	0.0+	1.9	1.6	3.2	2.2
+50 MESH	0.0+	12.3	0.0+	18.2	15.0	25.8	20.6
+60 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+100 MESH	0.0+	38.4	0.0+	50.3	41.2	60.3	50.3
+140 MESH	0.0+	52.1	0.0+	67.3	56.8	75.1	65.4
+200 MESH	0.0+	67.1	0.0+	79.4	71.3	85.5	77.6
+325 MESH	0.0+	71.8	0.0+	83.9	83.1	91.2	88.0
-325 MESH(WEIGHT PERCENT)	0.0+	28.2	0.0+	16.1	16.9	8.8	12.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES
PARTICLE SIZE DISTRIBUTION

RUN 2-DB-N-3

SAMPLE NUMBER	G2-421	G2-422	G2-423	G2-424
TIME	2:15	4:30	6:15	8:45
DATE	8/15/78	8/15/78	8/15/78	8/15/78

U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT			
-----	-----			
+8 MESH	0.0*	0.0	0.0	0.0
+20 MESH	0.0	0.2	0.0	0.4
+30 MESH	0.8	2.0	1.2	3.1
+50 MESH	9.7	16.4	15.7	22.1
+60 MESH	0.0+	0.0+	0.0+	0.0+
+100 MESH	32.5	38.1	39.9	45.1
+140 MESH	48.1	52.0	54.6	58.2
+200 MESH	64.2	65.0	68.7	70.7
+325 MESH	77.7	65.5	70.5	83.5
-325 MESH(WEIGHT PERCENT)	22.3	34.5	29.5	16.5

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-0-1

SAMPLE NUMBER	G2-425	G2-426	G2-427	G2-428	G2-429	G2-430	G2-431
TIME	15:30	17:30	0:15	2: 0	4:15	6: 0	8: 0
DATE	8/22/78	8/22/78	8/23/78	8/23/78	8/23/78	8/23/78	8/23/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0*	0.2	0.0	0.0	0.0	0.0*	0.0
+20 MESH	2.3	0.6	0.2	0.3	0.3	0.4	0.1
+30 MESH	4.9	1.4	0.6	0.9	0.3	0.9	0.4
+50 MESH	21.0	12.0	23.9	23.2	21.3	22.5	18.5
+60 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+100 MESH	46.8	34.9	59.7	55.9	55.9	56.4	59.4
+140 MESH	57.5	45.6	69.1	64.0	65.0	66.7	69.8
+200 MESH	67.3	56.0	76.0	70.6	70.9	72.6	77.1
+325 MESH	87.1	83.4	88.0	76.0	80.5	76.5	84.9
-325 MESH(WEIGHT PERCENT)	12.9	16.6	12.0	24.1	19.5	23.5	15.1

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

SAMPLE NUMBER	G2-432	G2-433	G2-434	G2-435	G2-436	G2-437	G2-438
TIME	10:15	12:15	14:15	16: 0	18: 0	20: 0	22:30
DATE	8/23/78	8/23/78	8/23/78	8/13/78	8/23/78	8/23/78	8/23/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0	0.0	0.1	0.0	0.0	0.0	0.0
+20 MESH	0.0	0.1	0.2	0.1	0.0*	0.0	0.1
+30 MESH	0.2	0.5	0.2	0.4	0.5	0.2	0.5
+50 MESH	11.8	13.3	5.5	11.8	11.3	13.0	18.8
+60 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+100 MESH	50.3	55.1	46.7	48.6	49.1	50.5	56.0
+140 MESH	62.4	66.4	59.1	59.3	59.5	60.9	62.3
+200 MESH	70.0	73.2	67.9	70.2	66.9	68.4	68.3
+325 MESH	81.6	80.4	76.6	78.6	78.6	80.8	78.7
-325 MESH(WEIGHT PERCENT)	18.4	19.6	23.4	21.4	21.4	19.2	21.3

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-0-1

SAMPLE NUMBER	G2-439	G2-440	G2-441	G2-442	G2-443	G2-444	G2-445
TIME	0: 1	2: 0	0: 8	6: 0	8: 0	12: 0	16: 0
DATE	8/24/78	8/24/78	24/78/ 0	8/24/78	8/24/78	8/24/78	8/24/78
U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT						
+8 MESH	0.0	0.0	0.4	0.0	0.0	0.1	0.1
+20 MESH	0.3	0.2	0.9	0.1	0.6	0.2	0.8
+30 MESH	0.9	0.8	1.3	0.5	0.9	0.2	1.3
+50 MESH	16.7	19.3	22.2	18.3	19.3	5.5	20.5
+60 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+100 MESH	51.6	53.7	55.5	46.1	48.4	26.4	61.4
+140 MESH	62.0	63.2	64.5	54.1	57.1	35.6	70.2
+200 MESH	69.7	70.2	70.8	71.4	65.1	44.4	76.2
+325 MESH	82.6	77.5	79.3	87.1	76.5	67.7	80.6
-325 MESH(WEIGHT PERCENT)	17.4	22.5	20.7	12.9	23.5	32.3	19.4

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

SAMPLE NUMBER G2-446

TIME 20: 0

DATE 8/24/78

U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT
+8 MESH	0.0+
+20 MESH	0.0+
+30 MESH	0.0+
+50 MESH	0.0+
+60 MESH	0.0+
+100 MESH	0.0+
+140 MESH	0.0+
+200 MESH	0.0+
+325 MESH	0.0+
-325 MESH(WEIGHT PERCENT)	0.0+

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-08-0-2A

SAMPLE NUMBER

G2-447

TIME

22: 0

DATE

8/25/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0
+20 MESH	0.3
+30 MESH	0.9
+50 MESH	15.0
+60 MESH	0.0+
+100 MESH	48.1
+140 MESH	59.8
+200 MESH	64.2
+325 MESH	82.9
-325 MESH(WEIGHT PERCENT)	17.2

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-0-2B

SAMPLE NUMBER	G2-448	G2-449	G2-450	G2-451	G2-452	G2-453
TIME	6:30	12:0	16:30	18:0	4:0	8:0
DATE	8/26/78	8/26/78	8/26/78	8/26/78	8/27/78	8/27/78
U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT					
+8 MESH	0.0	0.0	0.0	0.0	0.0	0.0
+20 MESH	0.0	0.0	0.0	0.0	0.0	0.0*
+30 MESH	1.9	2.2	0.5	0.6	1.3	0.4
+50 MESH	17.3	18.1	10.4	15.7	7.4	3.2
+60 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+100 MESH	47.3	40.6	43.7	54.9	8.1	29.8
+140 MESH	58.5	49.6	56.7	67.7	30.6	48.7
+200 MESH	68.5	57.3	69.0	76.5	49.4	62.4
+325 MESH	78.0	69.0	82.0	82.6	78.9	77.3
-325 MESH(WEIGHT PERCENT)	22.0	31.0	18.0	18.4	21.1	22.7

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-0-2C

SAMPLE NUMBER	G2-454	G2-455	G2-456	G2-457	G2-458	G2-459	G2-460
TIME	17:45	21:45	2: 0	6: 0	10: 0	14: 0	19: 0
DATE	8/27/78	8/27/78	8/28/78	8/28/78	8/28/78	8/28/78	8/28/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0	0.0	0.0	0.0	0.5	0.0	0.0
+20 MESH	1.0	0.2	0.0	0.0	1.2	0.3	0.5
+30 MESH	2.5	0.7	0.0	0.3	1.3	1.7	1.2
+50 MESH	15.7	14.2	11.6	6.2	14.6	6.6	8.4
+60 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+100 MESH	43.5	36.4	44.1	33.9	52.6	33.9	33.9
+140 MESH	57.9	44.2	56.9	46.9	69.4	52.0	47.6
+200 MESH	69.3	75.0	66.2	57.8	78.1	65.5	59.5
+325 MESH	82.4	82.2	74.4	72.0	94.6	78.9	75.2
-325 MESH(WEIGHT PERCENT)	17.6	17.8	25.7	27.9	5.4	21.1	24.8

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

SAMPLE NUMBER	G2-461
TIME	0: 0
DATE	8/28/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0
+20 MESH	0.1
+30 MESH	0.3
+50 MESH	8.9
+60 MESH	0.0+
+100 MESH	33.6
+140 MESH	42.9
+200 MESH	52.4
+325 MESH	55.1
-325 MESH(WEIGHT PERCENT)	44.9

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-0-3

SAMPLE NUMBER	G2-462	G2-463	G2-464	G2-465
TIME	17:20	21:30	5:30	7:30
DATE	8/29/78	8/29/78	8/31/78	8/31/78
U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT			
-----	-----	-----	-----	-----
+8 MESH	0.0	0.0		0.0
+20 MESH	0.0	0.0	2	0.2
+30 MESH	0.1	0.0	2	0.4
+50 MESH	8.4	1.9	6	9.1
+60 MESH	0.0*	0.0*	0.0*	
+100 MESH	50.3	30.1	32.3	39.1
+140 MESH	65.2	47.0	47.6	52.4
+200 MESH	74.9	60.2	60.6	63.5
+325 MESH	82.6	77.5	79.7	74.4
-325 MESH(WEIGHT PERCENT)	17.4	22.5	20.3	25.5

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES
COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-G-1

SAMPLE NUMBER	G2-310	G2-311
TIME	13:30	15:30
DATE	3/26/78	3/62/67

U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT	
-----		-----
+80 MICRONS	0.0	0.0
+64 MICRONS	5.8	8000.0
+51 MICRONS	9.5	7.8
+40 MICRONS	16.1	21.7
+32 MICRONS	25.4	41.9
+25 MICRONS	34.8	58.2
+20 MICRONS	43.9	71.0
+16 MICRONS	53.8	80.5
+13 MICRONS	60.9	85.6
+10 MICRONS	69.3	90.2
+8.0 MICRONS	81.7	94.6
+6.4 MICRONS	91.6	94.6
+5.0 MICRONS	95.4	96.9
+4.0 MICRONS	98.9	98.1
+3.2 MICRONS	98.9	99.0
+2.5 MICRONS	98.9	99.0

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES
COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-G-2

SAMPLE NUMBER G2-312 G2-313

TIME 0: 0 0: 0

DATE 3/27/78 3/27/78

U. S. SIEVE SIZE CUMMULATIVE WEIGHT PERCENT

+80 MICRONS	0.0	0.0
+64 MICRONS	4.3	11.0
+51 MICRONS	12.2	20.1
+40 MICRONS	30.2	38.1
+32 MICRONS	49.7	56.1
+25 MICRONS	64.8	71.1
+20 MICRONS	75.5	81.7
+16 MICRONS	83.2	88.7
+13 MICRONS	87.0	91.9
+10 MICRONS	90.5	94.1
+8.0 MICRONS	95.3	96.7
+6.4 MICRONS	97.2	98.0
+5.0 MICRONS	98.1	98.4
+4.0 MICRONS	99.0	98.9
+3.2 MICRONS	99.0	98.9
+2.5 MICRONS	99.0	98.9

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES
COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-G-3

SAMPLE NUMBER G2-314

TIME 14:30

DATE 3/27/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+80 MICRONS	0.0
+64 MICRONS	1.8
+51 MICRONS	4.7
+40 MICRONS	15.0
+32 MICRONS	35.2
+25 MICRONS	52.4
+20 MICRONS	65.7
+16 MICRONS	75.4
+13 MICRONS	80.5
+10 MICRONS	85.6
+8.0 MICRONS	90.7
+6.4 MICRONS	95.6
+5.0 MICRONS	97.4
+4.0 MICRONS	98.8
+3.2 MICRONS	98.8
+2.5 MICRONS	98.8

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES
COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-G-4

SAMPLE NUMBER	G2-315	G2-316
TIME	2: 0	4:20
DATE	4/27/78	4/ 2/78

U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT	
-----	-----	

+80 MICRONS	0.0	0.0
+64 MICRONS	0.0	0.0
+51 MICRONS	0.0	1.9
+40 MICRONS	10.4	18.7
+32 MICRONS	29.4	37.7
+25 MICRONS	49.0	53.4
+20 MICRONS	65.1	65.3
+16 MICRONS	77.6	74.6
+13 MICRONS	83.9	80.2
+10 MICRONS	89.3	86.5
+8.0 MICRONS	94.2	92.0
+6.4 MICRONS	96.3	95.1
+5.0 MICRONS	97.4	97.1
+4.0 MICRONS	98.1	98.2
+3.2 MICRONS	98.7	98.8
+2.5 MICRONS	98.7	98.8

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-G-5

SAMPLE NUMBER	G2-317	G2-318	G2-319	G2-320	2-321	G2-322
TIME	20: 0	21: 0	22: 0	0: 1	2: 0	4: 0
DATE	4/ 6/78	4/ 6/78	4/ 6/78	4/ 7/78	4/ 7/78	4/ 7/78

U. S. SIEVE SIZE

CUMULATIVE WEIGHT PERCENT

+80 MICRONS	0.0	0.0	0.0	0.0	0.0	0.0+
+64 MICRONS	0.3	0.7	0.6	0.0	0.9	0.0+
+51 MICRONS	1.6	2.1	1.6	0.7	3.0	0.0+
+40 MICRONS	17.9	18.2	14.1	15.3	13.7	0.0+
+32 MICRONS	42.2	39.7	39.3	44.1	36.1	0.0+
+25 MICRONS	58.7	56.2	57.2	63.2	56.5	0.0+
+20 MICRONS	70.4	68.3	73.5	76.7	70.5	0.0+
+16 MICRONS	78.4	77.0	78.0	85.1	79.3	0.0+
+13 MICRONS	82.2	81.7	82.0	89.2	83.1	0.0+
+10 MICRONS	85.5	85.9	85.3	92.6	86.7	0.0+
+8.0 MICRONS	92.2	92.3	91.8	95.4	93.5	0.0+
+6.4 MICRONS	94.1	94.3	93.5	97.1	95.2	0.0+
+5.0 MICRONS	95.6	95.7	94.9	98.0	96.7	0.0+
+4.0 MICRONS	96.8	96.7	96.1	98.5	97.8	0.0+
+3.2 MICRONS	99.1	99.1	99.1	99.1	99.1	0.0+
+2.5 MICRONS	99.1	99.1	99.0	99.1	99.1	0.0+

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES
COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-G-5

SAMPLE NUMBER	G2-323	G2-324	G2-325
TIME	6: 0	8: 0	10: 0
DATE	4/ 7/78	4/ 7/78	4/ 7/78

U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT.		
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+80 MICRONS	0.0	0.0+	0.0
+64 MICRONS	0.8	0.0+	0.0
+51 MICRONS	3.6	0.0+	0.6
+40 MICRONS	27.4	0.0+	5.2
+32 MICRONS	42.6	0.0+	16.3
+25 MICRONS	58.2	0.0+	32.0
+20 MICRONS	68.7	0.0+	48.9
+16 MICRONS	76.5	0.0+	63.8
+13 MICRONS	80.9	0.0+	72.0
+10 MICRONS	85.1	0.0+	80.6
+8.0 MICRONS	91.3	0.0+	86.7
+6.4 MICRONS	94.4	0.0+	92.8
+5.0 MICRONS	96.6	0.0+	95.9
+4.0 MICRONS	98.0	0.0+	97.9
+3.2 MICRONS	99.1	0.0+	99.1
+2.5 MICRONS	99.1	0.0+	99.1

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES,
COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-G-6

SAMPLE NUMBER	G2-326	G2-327	G2-328	G2-329	G2-330
TIME	18:30	19:30	21:45	0:30	2:40
DATE	4/ 8/78	4/ 8/78	4/ 8/78	4/ 9/78	4/ 9/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+80 MICRONS	0.0	0.0	0.0+	0.0	0.0
+64 MICRONS	0.6	0.5	0.0+	0.5	1.3
+51 MICRONS	3.8	1.6	0.0+	2.8	4.8
+40 MICRONS	24.5	19.7	0.0+	17.4	18.1
+32 MICRONS	48.5	44.5	0.0+	38.4	35.8
+25 MICRONS	65.6	61.9	0.0+	54.4	51.6
+20 MICRONS	77.1	74.4	0.0+	66.9	64.2
+16 MICRONS	84.9	82.0	0.0+	77.0	74.5
+13 MICRONS	88.8	85.8	0.0+	82.0	80.2
+10 MICRONS	92.0	89.9	0.0+	87.0	86.6
+8.0 MICRONS	95.9	93.9	0.0+	91.4	92.2
+6.4 MICRONS	97.1	95.9	0.0+	95.0	95.4
+5.0 MICRONS	98.0	97.5	0.0+	96.8	97.2
+4.0 MICRONS	98.5	98.3	0.0+	98.0	98.3
+3.2 MICRONS	98.8	98.8	0.0+	99.0	99.0
+2.5 MICRONS	98.8	98.8	0.0+	99.0	99.0

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES
COULTER ANALYSIS ON -325 MESH MATERIAL

SAMPLE NUMBER	G2-331	G2-332	G2-333	G2-335	G2-336	G2-337
TIME	11: 0	13: 0	15:45	19: 0	21: 0	0: 1
DATE	4/26/78	4/26/78	4/26/78	4/26/78	4/26/78	4/27/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+80 MICRONS	0.0	0.0	0.0+	0.0	0.0+	0.0
+64 MICRONS	0.0	0.0	0.0+	0.7	0.0+	0.5
+51 MICRONS	0.5	3.3	0.0+	3.1	0.0+	2.7
+40 MICRONS	11.4	23.0	0.0+	15.3	0.0+	18.5
+32 MICRONS	30.8	45.6	0.0+	32.8	0.0+	43.4
+25 MICRONS	47.8	61.0	0.0+	47.0	0.0+	62.7
+20 MICRONS	60.7	72.5	0.0+	59.5	0.0+	76.5
+16 MICRONS	71.2	80.5	0.0+	69.4	0.0+	84.2
+13 MICRONS	77.2	85.0	0.0+	75.6	0.0+	88.0
+10 MICRONS	83.4	89.4	0.0+	81.8	0.0+	91.5
+8.0 MICRONS	88.0	92.5	0.0+	86.6	0.0+	94.0
+6.4 MICRONS	91.8	94.8	0.0+	90.9	0.0+	95.6
+5.0 MICRONS	95.6	97.1	0.0+	95.2	0.0+	97.5
+4.0 MICRONS	97.5	98.2	0.0+	97.2	0.0+	98.3
+3.2 MICRONS	99.0	99.0	0.0+	98.8	0.0+	98.9
+2.5 MICRONS	99.0	99.0	0.0+	98.8	0.0+	98.9

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES
COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-I-2

SAMPLE NUMBER	G2-338	G2-339	G2-340
TIME	11:15	13: 0	15:30
DATE	5/17/78	5/17/78	5/17/78

U. S. SIEVE SIZE	CUMULATIVE WEIGHT PERCENT		
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+80 MICRONS	0.0	0.0+	0.0
+64 MICRONS	3.1	0.0+	3.9
+51 MICRONS	9.3	0.0+	8.6
+40 MICRONS	28.9	0.0+	31.4
+32 MICRONS	50.5	0.0+	56.6
+25 MICRONS	65.7	0.0+	73.4
+20 MICRONS	77.0	0.0+	83.5
+16 MICRONS	84.2	0.0+	89.0
+13 MICRONS	87.7	0.0+	91.2
+10 MICRONS	90.6	0.0+	92.8
+8.0 MICRONS	92.3	0.0+	93.8
+6.4 MICRONS	96.7	0.0+	97.4
+5.0 MICRONS	97.3	0.0+	97.7
+4.0 MICRONS	98.2	0.0+	98.3
+3.2 MICRONS	99.0	0.0+	99.0
+2.5 MICRONS	99.0	0.0+	99.0

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES
COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-I-3

SAMPLE NUMBER	G2-341	G2-342	G2-343	G2-344
TIME	2: 0	4: 0	6: 0	8: 0
DATE	5/19/78	5/19/78	5/19/78	5/19/78

U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT			
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+80 MICRONS	0.0	0.0+	0.0+	0.0+
+64 MICRONS	8.4	0.0+	0.0+	0.0+
+51 MICRONS	14.6	0.0+	0.0+	0.0+
+40 MICRONS	31.2	0.0+	0.0+	0.0+
+32 MICRONS	50.6	0.0+	0.0+	0.0+
+25 MICRONS	64.2	0.0+	0.0+	0.0+
+20 MICRONS	74.1	0.0+	0.0+	0.0+
+16 MICRONS	80.9	0.0+	0.0+	0.0+
+13 MICRONS	84.1	0.0+	0.0+	0.0+
+10 MICRONS	87.0	0.0+	0.0+	0.0+
+8.0 MICRONS	89.2	0.0+	0.0+	0.0+
+6.4 MICRONS	95.1	0.0+	0.0+	0.0+
+5.0 MICRONS	96.3	0.0+	0.0+	0.0+
+4.0 MICRONS	97.8	0.0+	0.0+	0.0+
+3.2 MICRONS	99.1	0.0+	0.0+	0.0+
+2.5 MICRONS	99.1	0.0+	0.0+	0.0+

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES
COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-I-4

SAMPLE NUMBER G2-345
TIME 21:30
DATE 5/21/78

U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT
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+80 MICRONS	0.0
+64 MICRONS	6.6
+51 MICRONS	13.8
+40 MICRONS	37.4
+32 MICRONS	62.9
+25 MICRONS	77.9
+20 MICRONS	86.7
+16 MICRONS	91.4
+13 MICRONS	93.2
+10 MICRONS	94.6
+8.0 MICRONS	95.4
+6.4 MICRONS	97.9
+5.0 MICRONS	98.2
+4.0 MICRONS	98.6
+3.2 MICRONS	99.0
+2.5 MICRONS	99.0

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES
COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-I-6

SAMPLE NUMBER	G2-348	G2-349	G2-350	G2-351	G2-352
TIME	3: 0	5: 0	7: 0	9: 0	10: 0
DATE	5/28/78	5/28/78	5/28/78	5/28/78	5/28/78

U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT				
+80 MICRONS	0.0	0.0	0.0	0.0	0.0+
+64 MICRONS	7.8	5.0	6.5	1.6	0.0+
+51 MICRONS	12.1	13.1	14.2	4.6	0.0+
+40 MICRONS	23.6	30.8	36.8	27.4	0.0+
+32 MICRONS	41.3	52.0	62.3	54.4	0.0+
+25 MICRONS	59.8	70.0	78.4	73.6	0.0+
+20 MICRONS	73.4	82.7	88.7	85.0	0.0+
+16 MICRONS	83.5	90.6	93.9	91.6	0.0+
+13 MICRONS	88.4	93.9	95.8	94.3	0.0+
+10 MICRONS	92.6	96.3	97.0	96.3	0.0+
+8.0 MICRONS	94.9	97.5	97.6	97.4	0.0+
+6.4 MICRONS	97.0	98.5	98.0	98.2	0.0+
+5.0 MICRONS	98.1	98.9	98.3	98.9	0.0+
+4.0 MICRONS	98.7	99.1	100.0	99.1	0.0+
+3.2 MICRONS	99.2	99.3	100.0	99.4	0.0+
+2.5 MICRONS	99.2	99.3	100.0	99.4	0.0+

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES
COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-J-1

SAMPLE NUMBER	G2-353	G2-354
TIME	12:30	13:30
DATE	6/12/78	6/12/78

U. S. SIEVE SIZE	CUMULATIVE WEIGHT PERCENT	
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+80 MICRONS	0.0	0.0
+64 MICRONS	0.0	0.7
+51 MICRONS	0.4	3.8
+40 MICRONS	7.5	6.9
+32 MICRONS	22.4	14.2
+25 MICRONS	40.5	33.3
+20 MICRONS	58.7	67.6
+16 MICRONS	70.0	79.0
+13 MICRONS	78.3	84.9
+10 MICRONS	85.6	90.3
+8.0 MICRONS	90.1	93.8
+6.4 MICRONS	95.1	96.1
+5.0 MICRONS	97.2	97.5
+4.0 MICRONS	98.4	98.9
+3.2 MICRONS	99.6	99.7
+2.5 MICRONS	99.6	99.7

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES
COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-J-2

SAMPLE NUMBER	G2-355	G2-356	G2-357	G2-358	G2-359	G2-360	G2-361
TIME	6: 0	7: 0	8: 0	9: 0	10: 0	11: 0	12: 0
DATE	6/17/78	6/17/78	6/17/78	6/17/78	6/17/78	6/17/78	6/17/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

U. S. SIEVE SIZE	G2-355	G2-356	G2-357	G2-358	G2-359	G2-360	G2-361
+80 MICRONS	0.0	0.0+	0.0	0.0	0.0	0.0	0.0
+64 MICRONS	67.0	0.0+	0.0	4.2	2.7	13.3	4.5
+51 MICRONS	73.3	0.0+	2.6	11.7	9.9	23.9	10.5
+40 MICRONS	77.8	0.0+	16.5	30.0	31.8	41.9	29.3
+32 MICRONS	83.2	0.0+	36.4	51.3	56.7	60.6	49.6
+25 MICRONS	89.0	0.0+	53.3	68.5	74.0	73.6	65.3
+20 MICRONS	92.8	0.0+	67.3	80.8	84.8	83.0	76.7
+16 MICRONS	95.6	0.0+	78.2	88.3	90.4	89.1	84.7
+13 MICRONS	96.9	0.0+	84.1	91.8	92.9	92.2	88.9
+10 MICRONS	97.8	0.0+	91.9	94.6	95.2	94.8	92.6
+8.0 MICRONS	98.4	0.0+	93.2	96.3	96.6	96.5	94.9
+6.4 MICRONS	98.8	0.0+	95.8	97.7	98.0	98.0	97.4
+5.0 MICRONS	99.1	0.0+	98.0	98.7	98.8	98.8	98.5
+4.0 MICRONS	99.3	0.0+	98.9	99.1	99.2	99.3	99.1
+3.2 MICRONS	99.5	0.0+	99.6	99.4	99.5	99.5	99.5
+2.5 MICRONS	99.5	0.0+	99.6	99.4	99.5	99.5	99.5

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

RUN 2-DB-J-2

SAMPLE NUMBER	G2-363	G2-364
TIME	14: 0	15: 0
DATE	6/17/78	6/17/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

U. S. SIEVE SIZE	G2-363	G2-364
+80 MICRONS	0.2	0.0+
+64 MICRONS	2.9	0.0+
+51 MICRONS	9.2	0.0+
+40 MICRONS	28.7	0.0+
+32 MICRONS	50.3	0.0+
+25 MICRONS	65.9	0.0+
+20 MICRONS	77.4	0.0+
+16 MICRONS	85.5	0.0+
+13 MICRONS	89.7	0.0+
+10 MICRONS	93.2	0.0+
+8.0 MICRONS	95.4	0.0+
+6.4 MICRONS	97.3	0.0+
+5.0 MICRONS	98.7	0.0+
+4.0 MICRONS	99.2	0.0+
+3.2 MICRONS	99.6	0.0+
+2.5 MICRONS	99.6	0.0+

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLE
COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-J-3

SAMPLE NUMBER	G2-365	G2-366	G2-367	G2-368	G2-369	G2-370
TIME	16:20	17:30	18:50	22: 0	0: 1	2: 0
DATE	6/19/78	6/19/78	6/19/78	6/19/78	6/20/78	6/20/78

U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT					
+80 MICRONS	0.0	2.4	1.2	4.7	0.9	0.5
+64 MICRONS	21.0	11.1	13.9	18.6	3.6	4.6
+51 MICRONS	30.7	15.1	30.8	26.7	7.2	8.4
+40 MICRONS	45.8	24.2	50.8	36.3	10.8	11.8
+32 MICRONS	65.6	41.1	67.6	44.3	17.2	16.3
+25 MICRONS	79.6	58.7	79.5	53.8	29.3	24.8
+20 MICRONS	89.3	72.4	87.2	65.2	45.4	38.6
+16 MICRONS	95.0	82.7	91.7	75.8	61.7	54.1
+13 MICRONS	97.3	88.1	93.9	82.3	71.3	64.4
+10 MICRONS	98.8	92.9	96.0	89.1	81.5	76.3
+8.0 MICRONS	99.4	95.8	97.4	93.7	88.9	85.6
+6.4 MICRONS	99.5	97.6	98.4	96.7	94.0	92.1
+5.0 MICRONS	99.5	98.6	99.0	98.2	96.9	96.0
+4.0 MICRONS	99.5	99.3	99.5	99.1	98.4	98.2
+3.2 MICRONS	99.5	99.7	99.7	99.7	99.7	99.7
+2.5 MICRONS	99.5	99.7	99.7	99.7	99.7	99.7

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES
COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-K-2

SAMPLE NUMBER	G2-371	G2-372	G2-373	G2-374	G2-375	G2-376	G2-377
TIME	11: 0	13: 0	15: 0	18:45	21:15	23: 0	1: 0
DATE	7/11/78	7/11/78	7/11/78	7/11/78	7/11/78	7/11/78	7/12/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

U. S. SIEVE SIZE	G2-371	G2-372	G2-373	G2-374	G2-375	G2-376	G2-377
+80 MICRONS	0.0	0.0	0.0	0.0+	0.0	0.0	0.0
+64 MICRONS	10.5	11.0	13.5	0.0+	16.0	14.4	13.3
+51 MICRONS	18.4	21.9	29.9	0.0+	31.5	25.5	21.6
+40 MICRONS	42.6	47.4	49.0	0.0+	44.1	30.5	27.1
+32 MICRONS	63.5	66.9	65.3	0.0+	53.2	37.3	36.9
+25 MICRONS	79.3	80.8	77.5	0.0+	62.3	49.9	48.8
+20 MICRONS	89.1	89.8	86.5	0.0+	72.5	65.6	62.0
+16 MICRONS	94.3	94.6	91.7	0.0+	81.5	77.9	73.3
+13 MICRONS	96.2	96.5	94.0	0.0+	86.0	83.8	80.0
+10 MICRONS	97.6	97.9	96.0	0.0+	90.6	89.6	86.8
+8.0 MICRONS	98.3	98.6	97.3	0.0+	94.0	93.5	91.9
+6.4 MICRONS	98.6	98.9	98.0	0.0+	96.3	96.1	95.4
+5.0 MICRONS	99.2	99.3	98.8	0.0+	97.9	97.8	97.5
+4.0 MICRONS	99.4	99.5	99.3	0.0+	99.0	99.0	98.9
+3.2 MICRONS	99.5	99.6	99.5	0.0+	99.6	99.6	99.6
+2.5 MICRONS	99.5	99.6	99.5	0.0+	99.6	99.6	99.6

+. = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-L-2

SAMPLE NUMBER	G2-378	G2-379
TIME	23: 0	3:30
DATE	7/21/78	7/22/78

U. S. SIEVE SIZE		CUMMULATIVE WEIGHT PERCENT
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+80 MICRONS	0.0	0.0
+64 MICRONS	8.5	3.2
+51 MICRONS	18.4	9.1
+40 MICRONS	34.4	24.6
+32 MICRONS	49.2	45.8
+25 MICRONS	61.8	63.3
+20 MICRONS	70.9	75.5
+16 MICRONS	79.3	83.5
+13 MICRONS	83.9	87.6
+10 MICRONS	88.1	90.9
+8.0 MICRONS	93.6	95.7
+6.4 MICRONS	96.1	97.4
+5.0 MICRONS	97.8	98.3
+4.0 MICRONS	99.2	99.5
+3.2 MICRONS	99.8	99.8
+2.5 MICRONS	99.6	99.7

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES
COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-L-3

SAMPLE NUMBER	G2-380	G2-381	G2-382	G2-383
TIME	16:30	16:30	20:10	21:45
DATE	7/23/78	7/23/78	7/23/78	7/23/78

U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT			
-----	-----			

+80 MICRONS	0.0	0.0	0.0	0.0
+64 MICRONS	7.9	10.9	5.9	1.3
+51 MICRONS	20.1	23.6	16.9	8.4
+40 MICRONS	37.2	41.9	42.0	31.8
+32 MICRONS	55.0	60.0	63.2	55.3
+25 MICRONS	67.6	71.9	76.4	70.5
+20 MICRONS	76.5	80.0	84.1	79.9
+16 MICRONS	83.1	85.5	88.9	85.8
+13 MICRONS	86.6	88.5	91.2	88.8
+10 MICRONS	90.3	91.7	93.4	91.7
+8.0 MICRONS	95.3	96.2	96.7	95.9
+6.4 MICRONS	96.8	97.4	97.7	97.4
+5.0 MICRONS	98.4	98.9	98.9	98.9
+4.0 MICRONS	99.3	99.5	99.5	99.4
+3.2 MICRONS	99.8	99.8	99.8	99.8
+2.5 MICRONS	99.8	99.8	99.8	99.8

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

**G2 - CHAR CAKE SAMPLES
COULTER ANALYSIS ON -325 MESH MATERIAL**

RUN 2-DB-M-1

SAMPLE NUMBER	G2-384	G2-385	G2-386	G2-387	G2-388	G2-389	G2-390
TIME	10:30	12:30	14:30	18:50	20:30	10:30	12:30
DATE	7/27/78	7/27/78	7/27/78	7/27/78	7/27/78	7/27/78	7/27/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+80 MICRONS	0.0	0.0	0.0	0.0+	0.0	0.0+	0.0
+64 MICRONS	12.0	17.5	4.5	0.0+	0.7	0.0+	0.3
+51 MICRONS	21.7	39.5	15.0	0.0+	4.5	0.0+	4.2
+40 MICRONS	41.7	60.1	27.1	0.0+	9.1	0.0+	14.8
+32 MICRONS	61.4	74.1	39.6	0.0+	18.3	0.0+	30.0
+25 MICRONS	75.4	83.7	52.6	0.0+	33.0	0.0+	46.9
+20 MICRONS	84.7	90.0	65.8	0.0+	48.8	0.0+	61.9
+16 MICRONS	91.0	93.8	77.1	0.0+	62.5	0.0+	73.9
+13 MICRONS	94.1	95.6	83.3	0.0+	71.2	0.0+	80.0
+10 MICRONS	96.8	97.6	90.0	0.0+	83.4	0.0+	89.6
+8.0 MICRONS	98.4	98.6	94.8	0.0+	90.0	0.0+	92.8
+6.4 MICRONS	99.2	99.2	97.5	0.0+	94.8	0.0+	96.9
+5.0 MICRONS	99.6	99.6	98.9	0.0+	97.4	0.0+	98.0
+4.0 MICRONS	99.8	99.8	99.6	0.0+	98.8	0.0+	98.8
+3.2 MICRONS	99.8	99.9	99.9	0.0+	99.9	0.0+	99.7
+2.5 MICRONS	100.0	100.0	99.9	0.0+	100.0	0.0+	99.6

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

RUN 2-DB-M-1

SAMPLE NUMBER	G2-391	G2-392	G2-393	G2-394
TIME	14:30	18:45	20:30	22:30
DATE	7/27/78	7/27/78	7/27/78	7/27/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+80 MICRONS	0.0	0.2	0.0+	1.0
+64 MICRONS	8.2	9.0	0.0+	6.4
+51 MICRONS	14.3	13.7	0.0+	11.3
+40 MICRONS	25.0	20.1	0.0+	17.4
+32 MICRONS	34.9	29.6	0.0+	25.8
+25 MICRONS	45.7	39.8	0.0+	37.7
+20 MICRONS	56.6	50.3	0.0+	50.1
+16 MICRONS	66.0	60.6	0.0+	61.8
+13 MICRONS	73.1	68.3	0.0+	69.9
+10 MICRONS	85.2	82.4	0.0+	81.7
+8.0 MICRONS	89.2	88.1	0.0+	88.2
+6.4 MICRONS	95.2	94.8	0.0+	94.3
+5.0 MICRONS	96.8	96.8	0.0+	96.9
+4.0 MICRONS	98.3	98.3	0.0+	98.5
+3.2 MICRONS	99.8	99.8	0.0+	99.9
+2.5 MICRONS	99.7	99.7	0.0+	99.8

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES
COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-M-2

SAMPLE NUMBER	G2-395	G2-396	G2-397	G2-398	G2-399	G2-400	G2-401
TIME	19: 0	21: 0	23: 0	1: 0	3: 0	5: 0	7: 0
DATE	7/31/78	7/31/78	7/31/78	8/ 1/78	8/ 1/78	8/ 1/78	8/ 1/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

U. S. SIEVE SIZE	G2-395	G2-396	G2-397	G2-398	G2-399	G2-400	G2-401
+80 MICRONS	0.0	0.5	0.2	0.8	0.0	1.7	0.0
+64 MICRONS	0.0	4.3	4.6	2.0	1.1	3.6	9.9
+51 MICRONS	2.7	13.0	10.3	3.8	4.7	9.8	15.4
+40 MICRONS	7.0	34.9	27.7	5.8	7.9	18.6	21.5
+32 MICRONS	15.7	54.9	47.0	11.8	14.6	25.5	27.9
+25 MICRONS	27.7	67.4	61.3	24.7	24.9	32.9	34.3
+20 MICRONS	37.6	75.4	69.7	39.5	36.3	41.3	42.2
+16 MICRONS	46.1	80.5	75.2	53.4	47.6	50.4	49.5
+13 MICRONS	66.5	83.2	83.3	68.5	65.8	66.2	64.1
+10 MICRONS	75.0	91.8	89.1	80.1	77.2	77.2	76.8
+8.0 MICRONS	80.3	93.5	92.0	87.2	84.4	83.0	84.0
+6.4 MICRONS	88.9	97.3	96.0	94.1	92.4	91.9	91.9
+5.0 MICRONS	91.0	98.1	97.1	96.0	94.6	94.3	94.5
+4.0 MICRONS	94.6	98.8	98.7	98.1	97.6	97.3	97.1
+3.2 MICRONS	99.9	99.9	99.9	99.9	99.9	99.9	100.0
+2.5 MICRONS	100.0	100.0	100.0	100.0	100.0	100.0	100.0

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-N-1

SAMPLE NUMBER	G2-402	G2-403	G2-404	G2-405	G2-406
TIME	20:15	23: 0	1:45	3:45	5:35
DATE	8/ 9/78	8/ 9/78	8/10/78	8/10/78	8/10/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+80 MICRONS	0.0	0.0	0.0	0.0	0.0
+64 MICRONS	6.5	9.4	10.1	5.5	9.2
+51 MICRONS	20.3	27.3	17.9	16.9	18.8
+40 MICRONS	35.0	42.0	29.2	33.1	33.9
+32 MICRONS	48.0	56.7	41.8	48.0	48.5
+25 MICRONS	60.9	68.9	53.8	60.0	60.2
+20 MICRONS	70.8	78.3	64.3	70.2	69.6
+16 MICRONS	78.7	83.8	73.0	77.8	77.6
+13 MICRONS	83.4	89.2	78.9	82.7	82.0
+10 MICRONS	88.7	93.0	85.3	88.0	86.9
+8.0 MICRONS	92.6	95.6	90.2	92.2	91.1
+6.4 MICRONS	95.3	97.4	93.9	95.2	94.4
+5.0 MICRONS	97.2	98.9	96.5	97.3	96.8
+4.0 MICRONS	98.9	99.9	98.7	99.0	98.8
+3.2 MICRONS	99.8	99.8	99.9	99.9	99.9
+2.5 MICRONS	99.8	99.9	100.0	99.8	99.8

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES
COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-N-2

SAMPLE NUMBER	G2-407	G2-408	G2-409	G2-410	G2-411	G2-412	G2-413
TIME	13:0	16:15	18:15	20:15	22:30	0:15	2:45
DATE	8/12/78	8/12/78	8/12/78	8/12/78	8/12/78	8/13/78	8/13/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

U. S. SIEVE SIZE	G2-407	G2-408	G2-409	G2-410	G2-411	G2-412	G2-413
+80 MICRONS	0.0	0.5	5.8	0.0+	0.0	2.0	6.1
+64 MICRONS	1.4	7.2	19.9	0.0+	10.2	11.6	15.6
+51 MICRONS	3.4	14.5	36.9	0.0+	20.1	21.8	42.6
+40 MICRONS	14.3	32.4	57.2	0.0+	35.3	39.8	62.5
+32 MICRONS	39.2	52.9	74.1	0.0+	59.3	60.0	76.7
+25 MICRONS	57.6	68.9	84.4	0.0+	76.8	73.5	85.3
+20 MICRONS	70.9	80.0	91.0	0.0+	86.3	83.4	91.0
+16 MICRONS	80.7	87.4	94.8	0.0+	92.7	90.0	93.8
+13 MICRONS	86.4	91.0	96.4	0.0+	94.8	93.2	96.2
+10 MICRONS	91.6	94.5	97.7	0.0+	96.2	96.2	97.7
+8.0 MICRONS	95.1	96.6	98.6	0.0+	97.4	98.0	98.9
+6.4 MICRONS	97.2	98.1	99.2	0.0+	97.9	99.1	99.4
+5.0 MICRONS	98.5	99.0	99.6	0.0+	98.5	99.6	99.9
+4.0 MICRONS	99.4	99.6	99.8	0.0+	99.2	99.9	99.9
+3.2 MICRONS	99.9	99.9	99.9	0.0+	99.8	99.9	99.9
+2.5 MICRONS	99.8	99.9	99.9	0.0+	99.5	99.9	99.9

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

RUN 2-DB-N-2

SAMPLE NUMBER	G2-414	G2-415	G2-416	G2-417	G2-418	G2-419	G2-420
TIME	4:0	4:45	6:0	8:30	9:30	11:30	12:30
DATE	8/13/78	8/13/78	8/13/78	8/13/78	8/13/78	8/13/78	8/13/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

U. S. SIEVE SIZE	G2-414	G2-415	G2-416	G2-417	G2-418	G2-419	G2-420
+80 MICRONS	0.0+	5.6	0.0+	1.5	7.9	0.0+	0.0
+64 MICRONS	0.0+	24.2	0.0+	16.8	19.0	0.0+	5.3
+51 MICRONS	0.0+	51.0	0.0+	39.8	35.0	0.0+	13.6
+40 MICRONS	0.0+	72.4	0.0+	62.1	56.3	0.0+	44.8
+32 MICRONS	0.0+	86.6	0.0+	79.5	76.2	0.0+	64.6
+25 MICRONS	0.0+	92.9	0.0+	87.4	85.4	0.0+	78.0
+20 MICRONS	0.0+	96.2	0.0+	93.4	91.6	0.0+	86.3
+16 MICRONS	0.0+	97.8	0.0+	96.7	95.0	0.0+	91.6
+13 MICRONS	0.0+	98.6	0.0+	97.9	96.6	0.0+	94.0
+10 MICRONS	0.0+	99.2	0.0+	98.7	98.0	0.0+	96.2
+8.0 MICRONS	0.0+	99.6	0.0+	99.1	98.6	0.0+	97.5
+6.4 MICRONS	0.0+	99.9	0.0+	99.5	99.1	0.0+	98.5
+5.0 MICRONS	0.0+	99.9	0.0+	99.3	99.5	0.0+	99.3
+4.0 MICRONS	0.0+	99.9	0.0+	99.9	99.8	0.0+	99.7
+3.2 MICRONS	0.0+	99.9	0.0+	99.9	99.9	0.0+	99.9
+2.5 MICRONS	0.0+	99.9	0.0+	99.9	99.9	0.0+	99.9

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES
COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-N-3

SAMPLE NUMBER	G2-421	G2-422	G2-423	G2-424
TIME	2:15	4:30	6:15	8:45
DATE	8/15/78	8/15/78	8/15/78	8/15/78

U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT			
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+80 MICRONS	0.6	0.4	12.4	5.9
+64 MICRONS	5.3	15.6	27.9	9.2
+51 MICRONS	14.9	38.0	47.8	17.1
+40 MICRONS	37.2	57.5	65.1	38.4
+32 MICRONS	60.3	74.1	79.5	63.2
+25 MICRONS	76.5	85.1	89.7	79.9
+20 MICRONS	87.0	92.5	95.2	89.8
+16 MICRONS	93.4	96.3	97.9	94.6
+13 MICRONS	96.0	97.8	98.8	96.6
+10 MICRONS	98.0	99.0	99.4	98.1
+8.0 MICRONS	99.0	99.6	99.7	99.1
+6.4 MICRONS	99.5	99.9	99.9	99.5
+5.0 MICRONS	99.9	99.9	99.9	99.8
+4.0 MICRONS	99.9	99.9	99.9	99.9
+3.2 MICRONS	99.9	99.9	99.9	99.9
+2.5 MICRONS	99.9	99.9	99.9	99.9

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

**G2 - CHAR CAKE SAMPLES
COULTER ANALYSIS ON -325 MESH MATERIAL**

RUN 2-DB-0-1

SAMPLE NUMBER	G2-425	G2-426	G2-427	G2-428	G2-429	G2-430	G2-431
TIME	15:30	17:30	0:15	2: 0	4:15	6: 0	8: 0
DATE	8/22/78	8/22/78	8/23/78	8/23/78	8/23/78	8/23/78	8/23/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+80 MICRONS	0.0	2.0	12.6	1.5	2.3	0.0	0.0
+64 MICRONS	10.0	23.8	38.0	1.5	6.3	5.6	1.7
+51 MICRONS	17.0	43.1	45.8	4.7	10.7	9.1	4.0
+40 MICRONS	27.5	53.1	50.6	14.1	17.5	20.0	8.8
+32 MICRONS	48.8	60.0	55.5	30.7	31.6	37.2	23.5
+25 MICRONS	68.8	68.7	60.8	48.1	49.7	54.5	45.1
+20 MICRONS	84.0	79.7	67.7	64.9	64.9	69.8	61.7
+16 MICRONS	92.4	86.0	73.8	77.5	78.2	81.1	76.5
+13 MICRONS	96.0	90.1	77.7	83.9	84.7	86.6	83.1
+10 MICRONS	98.6	94.2	81.9	90.2	90.6	91.0	89.6
+8.0 MICRONS	99.8	97.1	85.6	94.5	94.7	95.3	94.3
+6.4 MICRONS	100.0	98.6	89.1	97.2	97.2	97.7	97.2
+5.0 MICRONS	100.0	99.5	92.8	98.6	98.6	98.8	98.6
+4.0 MICRONS	100.0	100.0	97.0	99.4	99.4	99.5	99.3
+3.2 MICRONS	100.0	100.0	100.0	100.0	100.0	100.0	100.0
+2.5 MICRONS	100.0	100.0	100.0	100.0	100.0	100.0	100.0

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

RUN 2-DB-0-1

SAMPLE NUMBER	G2-432	G2-433	G2-434	G2-435	G2-436	G2-437	G2-438
TIME	10:15	12: 0	14:15	16: 0	18: 0	20: 0	22:30
DATE	8/23/78	8/23/78	8/23/78	8/23/78	8/23/78	8/23/78	8/23/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+80 MICRONS	0.0	0.0+	0.0	0.0	0.0	0.0+	0.0
+64 MICRONS	0.0	0.0+	4.5	0.0	0.0	0.0+	0.0
+51 MICRONS	1.2	0.0+	7.5	3.1	0.2	0.0+	0.4
+40 MICRONS	5.7	0.0+	17.2	7.4	2.6	0.0+	4.6
+32 MICRONS	21.0	0.0+	33.3	22.6	13.1	0.0+	13.7
+25 MICRONS	43.9	0.0+	52.6	36.0	34.2	0.0+	33.6
+20 MICRONS	60.4	0.0+	68.0	53.5	53.9	0.0+	52.6
+16 MICRONS	74.5	0.0+	81.6	68.0	70.2	0.0+	66.5
+13 MICRONS	82.2	0.0+	87.8	75.2	77.8	0.0+	74.4
+10 MICRONS	88.9	0.0+	93.1	83.3	86.4	0.0+	82.7
+8.0 MICRONS	93.8	0.0+	96.4	89.8	92.0	0.0+	90.3
+6.4 MICRONS	96.9	0.0+	98.4	94.1	95.7	0.0+	94.0
+5.0 MICRONS	98.5	0.0+	99.2	96.7	97.7	0.0+	97.2
+4.0 MICRONS	99.2	0.0+	99.7	98.5	98.7	0.0+	98.5
+3.2 MICRONS	100.0	0.0+	100.0	100.0	100.0	0.0+	100.0
+2.5 MICRONS	100.0	0.0+	100.0	100.0	100.0	0.0+	100.0

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES
COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-0-1

SAMPLE NUMBER	G2-439	G2-440	G2-441	G2-442	G2-443	G2-444	G2-445
TIME	0: 1	2: 0	4: 0	6: 0	8: 0	12: 0	16: 0
DATE	8/24/78	8/24/78	8/24/78	8/24/78	8/24/78	8/24/78	8/24/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

U. S. SIEVE SIZE	G2-439	G2-440	G2-441	G2-442	G2-443	G2-444	G2-445
+80 MICRONS	0.4	1.5	0.0	0.0	0.0	0.0	0.0
+64 MICRONS	0.6	5.6	3.0	0.0	0.0	1.2	0.0
+51 MICRONS	4.8	20.4	3.1	1.8	1.7	3.2	3.3
+40 MICRONS	9.3	36.8	6.0	6.2	8.2	5.6	7.2
+32 MICRONS	24.1	53.2	12.8	16.5	21.9	12.0	17.7
+25 MICRONS	41.0	65.7	29.3	35.8	44.1	26.8	36.6
+20 MICRONS	59.1	76.0	47.2	55.8	60.9	46.2	53.4
+16 MICRONS	75.6	85.3	65.2	72.9	76.3	63.2	68.3
+13 MICRONS	83.1	89.4	78.2	80.9	84.0	73.6	76.4
+10 MICRONS	90.4	93.3	84.4	88.8	90.5	84.0	85.0
+8.0 MICRONS	94.7	96.3	90.5	93.4	94.7	91.2	91.3
+6.4 MICRONS	97.2	98.1	95.0	96.9	97.4	95.5	95.4
+5.0 MICRONS	98.6	99.0	97.3	98.3	98.7	97.8	97.8
+4.0 MICRONS	99.4	99.6	98.7	99.1	99.3	99.2	99.0
+3.2 MICRONS	100.0	100.0	99.5	100.0	100.0	100.0	100.0
+2.5 MICRONS	100.0	100.0	100.0	100.0	100.0	100.0	100.0

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

RUN 2-DB-0-1

SAMPLE NUMBER	G2-446
TIME	20: 0
DATE	8/24/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

U. S. SIEVE SIZE	G2-446
+80 MICRONS	0.0+
+64 MICRONS	0.0+
+51 MICRONS	0.0+
+40 MICRONS	0.0+
+32 MICRONS	0.0+
+25 MICRONS	0.0+
+20 MICRONS	0.0+
+16 MICRONS	0.0+
+13 MICRONS	0.0+
+10 MICRONS	0.0+
+8.0 MICRONS	0.0+
+6.4 MICRONS	0.0+
+5.0 MICRONS	0.0+
+4.0 MICRONS	0.0+
+3.2 MICRONS	0.0+
+2.5 MICRONS	0.0+

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES
COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-0-2A

SAMPLE NUMBER G2-447

TIME 22: 0
DATE 8/25/78

U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT
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+80 MICRONS	0.0
+64 MICRONS	0.0
+51 MICRONS	0.4
+40 MICRONS	2.6
+32 MICRONS	14.6
+25 MICRONS	34.7
+20 MICRONS	51.9
+16 MICRONS	65.6
+13 MICRONS	73.8
+10 MICRONS	83.0
+8.0 MICRONS	89.4
+6.4 MICRONS	94.3
+5.0 MICRONS	96.6
+4.0 MICRONS	98.0
+3.2 MICRONS	100.0
+2.5 MICRONS	100.0

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES
COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-0-28

SAMPLE NUMBER	G2-448	G2-449	G2-450	G2-451	G2-452	G2-453
TIME	6:30	12: 0	10:30	18: 0	4: 0	8: 0
DATE	8/26/78	8/26/78	8/26/78	8/26/78	8/27/78	8/27/78

U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT					
-----	-----					

+80 MICRONS	0.0	0.9	0.0	0.0	0.0	0.0
+64 MICRONS	10.7	4.7	0.0	0.0	0.0	0.0
+51 MICRONS	21.5	11.5	6.8	2.6	3.0	3.6
+40 MICRONS	41.5	31.0	18.8	10.8	10.4	19.3
+32 MICRONS	63.6	51.3	38.2	25.8	29.2	43.0
+25 MICRONS	76.8	67.1	55.3	44.6	51.8	63.0
+20 MICRONS	86.1	78.5	68.8	61.0	72.6	77.1
+16 MICRONS	91.9	86.9	79.0	73.7	85.4	83.8
+13 MICRONS	94.4	91.3	84.1	80.5	90.5	90.1
+10 MICRONS	96.7	95.2	89.8	87.5	94.7	93.8
+8.0 MICRONS	98.1	97.7	93.0	92.9	97.1	96.7
+6.4 MICRONS	99.0	99.0	96.2	96.6	98.5	98.1
+5.0 MICRONS	99.5	99.7	97.8	98.2	99.1	99.1
+4.0 MICRONS	99.8	100.0	98.8	99.1	99.4	100.0
+3.2 MICRONS	100.0	100.0	100.0	100.0	100.0	100.0
+2.5 MICRONS	100.0	100.0	100.0	100.0	100.0	100.0

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-0-2C

SAMPLE NUMBER	G2-454	G2-455	G2-456	G2-457	G2-458	G2-459	G2-460
TIME	17:45	21:45	2: 0	6: 0	10: 0	14: 0	19: 0
DATE	8/27/78	8/27/78	8/28/78	8/28/78	8/28/78	8/28/78	8/28/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

U. S. SIEVE SIZE	G2-454	G2-455	G2-456	G2-457	G2-458	G2-459	G2-460
+80 MICRONS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
+64 MICRONS	0.0	0.0	2.3	3.0	0.0	0.0	0.0
+51 MICRONS	3.4	2.1	8.6	8.9	1.1	2.0	1.8
+40 MICRONS	8.7	8.1	16.1	22.9	4.3	7.7	8.2
+32 MICRONS	27.6	27.0	34.9	45.0	14.4	22.5	21.6
+25 MICRONS	50.8	48.7	54.5	62.6	37.1	44.2	44.4
+20 MICRONS	68.6	66.3	70.1	76.3	60.8	61.0	64.6
+16 MICRONS	80.5	79.4	82.3	83.1	76.5	75.4	79.2
+13 MICRONS	86.1	85.9	87.3	89.5	84.1	82.4	85.8
+10 MICRONS	91.5	91.7	92.1	94.1	90.4	89.0	91.5
+8.0 MICRONS	94.8	95.1	95.2	96.8	94.4	93.7	95.2
+6.4 MICRONS	97.1	97.3	97.3	98.2	96.7	96.6	97.5
+5.0 MICRONS	98.4	98.6	98.4	99.1	98.2	98.3	98.6
+4.0 MICRONS	99.1	99.3	99.1	100.0	99.0	99.2	99.3
+3.2 MICRONS	100.0	100.0	100.0	100.0	100.0	100.0	100.0
+2.5 MICRONS	100.0	100.0	100.0	100.0	100.0	100.0	100.0

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

RUN 2-DB-0-2C

SAMPLE NUMBER	G2-461
TIME	20: 0
DATE	8/28/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

U. S. SIEVE SIZE	G2-461
+80 MICRONS	0.0
+64 MICRONS	0.0
+51 MICRONS	4.0
+40 MICRONS	14.8
+32 MICRONS	33.2
+25 MICRONS	54.7
+20 MICRONS	70.4
+16 MICRONS	82.4
+13 MICRONS	88.0
+10 MICRONS	92.3
+8.0 MICRONS	95.6
+6.4 MICRONS	97.5
+5.0 MICRONS	98.5
+4.0 MICRONS	99.2
+3.2 MICRONS	100.0
+2.5 MICRONS	100.0

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

G2 - CHAR CAKE SAMPLES
COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-0-3

SAMPLE NUMBER	G2-462	G2-463	G2-464	G2-465
TIME	17:20	21:30	5:30	7:30
DATE	8/29/78	8/29/78	8/31/78	8/31/78

U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT			
-----	-----			

+80 MICRONS	3.5	1.4	1.5	9.1
+64 MICRONS	12.3	3.3	8.4	16.1
+51 MICRONS	24.1	5.1	10.8	35.2
+40 MICRONS	38.1	8.9	16.3	38.7
+32 MICRONS	55.0	24.5	30.5	48.7
+25 MICRONS	71.5	44.4	48.5	64.8
+20 MICRONS	83.5	61.0	65.7	77.5
+16 MICRONS	90.7	75.1	78.4	90.4
+13 MICRONS	94.0	82.2	84.2	94.1
+10 MICRONS	96.4	89.0	90.6	96.6
+8.0 MICRONS	97.8	93.9	93.7	98.1
+6.4 MICRONS	98.7	96.9	96.4	99.0
+5.0 MICRONS	99.2	98.5	98.1	99.5
+4.0 MICRONS	99.4	99.1	99.1	100.0
+3.2 MICRONS	100.0	100.0	100.0	100.0
+2.5 MICRONS	100.0	100.0	100.0	100.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

IG - INERT GAS
FROM HP SPHERE (FA-311)

RUN 2-DB-M-2

BASIS: VOLUME PERCENT

SAMPLE NUMBER	IG- 1	IG- 2
TIME	3: 0	5:45
DATE	8/ 1/78	8/ 1/78
COMPONENTS		

OXYGEN	0.2	0.2
NITROGEN	44.7	41.1
CARBON MONOXIDE	0.1	0.1
CARBON DIOXIDE	55.2	56.4
WATER	0.2	2.2

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

LABORATORY DATA IS NOT NORMALIZED

IG - INERT GAS
FROM HP SPHERE (FA-311)

RUN 2-DB-N-1

BASIS: VOLUME PERCENT

SAMPLE NUMBER IG- 3

TIME 11:30
DATE 8/12/78
COMPONENTS

OXYGEN	0.3
NITROGEN	72.3
CARBON MONOXIDE	1.7
CARBON DIOXIDE	19.8
WATER	5.9

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

LABORATORY DATA IS NOT NORMALIZED

IG - INERT GAS
FROM HP SPHERE (FA-311)

RUN 2-DB-N-2

BASIS: VOLUME PERCENT

SAMPLE NUMBER	IG- 4	IG- 5	IG- 6	IG- 7
TIME	22:25	9:30	12:30	22:15
DATE	8/12/78	8/13/78	8/13/78	8/14/78
COMPONENTS				

	0.3	0.4	0.5	0.3
OXYGEN	50.7	67.5	84.9	47.2
NITROGEN	1.3	1.5	0.5	0.0
CARBON MONOXIDE	46.1	29.6	16.0	54.0
CARBON DIOXIDE	1.7	1.0	0.0	0.0
WATER				

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

LABORATORY DATA IS NOT NORMALIZED

IG - INERT GAS
FROM HP SPHERE (11111)

RUN 2-DB-N-3

BASIS: VOLUME PERCENT

SAMPLE NUMBER	IG- 8	IG- 9	IG- 10
TIME	23:30	6: 0	11:30
DATE	8/21/78	8/22/78	8/22/78
COMPONENTS			
OXYGEN	0.4	0.8	0.3
NITROGEN	37.9	86.5	44.6
CARBON MONOXIDE	0.0	0.0	0.2
CARBON DIOXIDE	59.9	13.6	55.3
WATER	1.8	0.9	0.0

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

LABORATORY DATA IS NOT NORMALIZED

IG - INERT GAS
FROM HP SPHERE (FA-311)

RUN 2-DB-0-1

BASIS: VOLUME PERCENT

SAMPLE NUMBER	IG- 11	IG- 12	IG- 13	IG- 14	IG- 15	IG- 16
TIME	16:30	7:30	16: 0	23: 0	10: 0	16: 0
DATE	8/22/78	8/23/78	8/23/78	8/23/78	8/24/78	8/24/78
COMPONENTS						
<hr/>						
OXYGEN	0.3	0.4	0.4	0.4	0.3	0.5
NITROGEN	56.1	80.0	71.5	73.0	56.7	74.6
CARBON MONOXIDE	0.2	0.3	0.3	0.3	0.3	0.4
CARBON DIOXIDE	43.9	19.3	27.8	22.7	42.3	22.7
WATER	0.0	0.0	0.0	3.6	0.4	1.8

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

LABORATORY DATA IS NOT NORMALIZED

IG - INERT GAS
FROM HP SPHERE (FA-311)

RUN 2-DB-0-2A

BASIS: VOLUME PERCENT

SAMPLE NUMBER IG- 17

TIME 18:15
DATE 8/25/78

COMPONENTS

OXYGEN	0.2
NITROGEN	36.0
CARBON MONOXIDE	0.2
CARBON DIOXIDE	63.8
WATER	0.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

LABORATORY DATA IS NOT NORMALIZED

IG - INERT GAS
FROM HP SPHERE (FA-311)

RUN 2-DB-0-2B

BASIS: VOLUME PERCENT

SAMPLE NUMBER	IG- 18	IG- 19	IG- 20	IG- 21
TIME	20: 0	13: 0	4: 0	11: 0
DATE	8/26/78	8/26/78	8/27/78	8/27/78
COMPONENTS				
OXYGEN	0.3	0.2	0.2	0.3
NITROGEN	56.7	31.4	41.6	53.4
CARBON MONOXIDE	0.3	0.1	0.2	0.2
CARBON DIOXIDE	43.5	68.9	59.2	47.2
WATER	0.0	0.0	0.0	0.0

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

LABORATORY DATA IS NOT NORMALIZED

IG - INERT GAS
FROM HP SPHERE (FA-311)

RUN 2-DB-0-2C

BASIS: VOLUME PERCENT

SAMPLE NUMBER	IG- 22	IG- 23	IG- 24	IG- 25	IG- 26	IG- 27
TIME	20:15	3:30	11:30	21: 0	3:30	11: 0
DATE	8/27/78	8/28/78	8/28/78	8/28/78	8/29/78	8/29/78
COMPONENTS						
OXYGEN	0.4	0.3	0.1	0.3	0.4	0.3
NITROGEN	53.6	56.4	29.3	58.0	77.5	62.8
CARBON MONOXIDE	0.2	0.3	0.4	0.4	0.4	0.3
CARBON DIOXIDE	45.6	42.4	69.6	40.2	16.6	36.6
WATER	0.2	0.6	0.6	1.1	5.1	0.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

LABORATORY DATA IS NOT NORMALIZED

IG - INERT GAS
FROM HP SPHERE (FA-311)

RUN 2-DB-0-3

BASIS: VOLUME PERCENT

SAMPLE NUMBER	IG- 28	IG- 29	IG- 30	IG- 31	IG- 32	IG- 33	IG- 34
TIME	19:30	3:30	14:30	22:30	22:30	2:30	7:30
DATE	8/29/78	8/30/78	8/30/78	8/30/78	8/30/78	8/31/78	8/31/78
COMPONENTS							
OXYGEN	0.1	0.3	0.3	0.4	0.3	0.3	0.3
NITROGEN	17.1	61.2	48.0	58.9	42.8	40.9	47.5
CARBON MONOXIDE	0.0	0.0	0.0	0.2	0.0	0.0	0.0
CARBON DIOXIDE	89.8	35.4	52.0	42.0	66.9	58.8	53.2
WATER	0.0	3.1	0.0	0.0	0.0	0.0	0.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

LABORATORY DATA IS NOT NORMALIZED

IG - INERT GAS
FROM HP SPHERE (FA-311)

RUN 2-DB-0-3

BASIS: VOLUME PERCENT

SAMPLE NUMBER	IG- 35	IG- 36
TIME	22:15	23:30
DATE	9/13/78	9/15/78
COMPONENTS		

OXYGEN	0.4	0.4
NITROGEN	75.3	75.9
CARBON MONOXIDE	0.1	0.4
CARBON DIOXIDE	21.5	16.1
WATER	2.7	7.2

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

LABORATORY DATA IS NOT NORMALIZED

P1 - GAS FROM PRETREATER

RUN 2-DB-0-1

BASIS: VOLUME PERCENT

SAMPLE NUMBER P1- 1 P1- 2

TIME 8: 0 18: 0

DATE 8/24/78 8/24/78

COMPONENTS

HYDROGEN	0.2	0.3
OXYGEN	0.4	0.4
NITROGEN	60.9	57.1
METHANE	0.8	1.2
CARBON MONOXIDE	1.9	2.3
CARBON DIOXIDE	22.5	22.4
HYDROGEN SULFIDE	0.6	0.6
WATER	12.3	15.0
ETHYLENE	0.1	0.2
ETHANE	0.3	0.5
PROPYLENE	0.0+	0.0+
PROPANE	0.0+	0.0+
1, BUTENE	0.0+	0.0+
N-BUTANE	0.0+	0.0+

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

LABORATORY DATA IS NOT NORMALIZED

P1 - GAS FROM PRETREATER

RUN 2-DB-0-2B

BASIS: VOLUME PERCENT

SAMPLE NUMBER	P1- 3	P1- 4	P1- 5
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TIME	4: 0	14: 0	20:30
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DATE	8/27/78	8/26/78	8/26/78
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COMPONENTS

HYDROGEN	0.3	0.2	0.2
OXYGEN	0.2	0.1	0.2
NITROGEN	35.2	23.4	40.0
METHANE	0.6	0.9	0.5
CARBON MONOXIDE	1.8	1.7	1.4
CARBON DIOXIDE	51.9	65.4	46.7
HYDROGEN SULFIDE	0.5	0.7	0.6
WATER	9.1	7.2	10.1
ETHYLENE	0.6	0.1	0.1
ETHANE	0.3	0.3	0.2
PROPYLENE	0.0+	0.0+	0.0+
PROPANE	0.0+	0.0+	0.0+
1, BUTENE	0.0+	0.0+	0.0+
N-BUTANE	0.0+	0.0+	0.0+

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

LABORATORY DATA IS NOT NORMALIZED

P1 - GAS FROM PRETREATER

RUN 2-DB-0-20

BASIS: VOLUME PERCENT

SAMPLE NUMBER	P1- 6	P1- 7	P1- 8
TIME	3: 0	12: 0	20: 0
DATE	8/28/78	8/28/78	8/28/78

COMPONENTS

HYDROGEN	5.2	0.3	6.1
OXYGEN	0.3	0.2	0.3
NITROGEN	44.1	21.5	50.4
METHANE	0.6	0.8	0.1
CARBON MONOXIDE	1.5	2.0	1.1
CARBON DIOXIDE	43.1	66.9	36.3
HYDROGEN SULFIDE	0.5	0.6	0.0
WATER	4.4	7.3	5.7
ETHYLENE	0.1	0.1	0.0
ETHANE	0.2	0.3	0.0
PROPYLENE	0.0+	0.0+	0.0+
PROPANE	0.0+	0.0+	0.0+
1, BUTENE	0.0+	0.0+	0.0+
N-BUTANE	0.0+	0.0+	0.0+

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

LABORATORY DATA IS NOT NORMALIZED

P1 - GAS FROM PRETREATER

RUN 2-DB-0-3

BASIS: VOLUME PERCENT

SAMPLE NUMBER

P1- 9

TIME

21: 0

DATE

8/29/78

COMPONENTS

HYDROGEN	0.0
OXYGEN	0.3
NITROGEN	30.2
METHANE	0.8
CARBON MONOXIDE	1.7
CARBON DIOXIDE	62.4
HYDROGEN SULFIDE	0.7
WATER	3.5
ETHYLENE	0.1
ETHANE	0.4
PROPYLENE	0.0+
PROPANE	0.0+
1, BUTENE	0.0+
N-BUTANE	0.0+

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

LABORATORY DATA IS NOT NORMALIZED

SC2 - GAS FROM ABSORBER FEED
K. O. DRUM (FA-203)

RUN 2-DB-G-5

BASIS: VOLUME PERCENT

SAMPLE NUMBER SC2-160 SC2-161 SC2-162

TIME 6:50 8:30 10:30

DATE 4/ 7/78 4/ 7/78 4/ 7/78

COMPONENTS

HYDROGEN	0.4	14.6	17.2
OXYGEN	0.0+	0.0+	0.0+
NITROGEN	36.5	22.0	21.8
METHANE	5.6	9.3	8.7
CARBON MONOXIDE	4.7	6.3	7.3
CARBON DIOXIDE	48.3	46.0	43.3
HYDROGEN SULFIDE	1.3	1.7	1.5
WATER	2.5	0.0	0.0
ETHYLENE	0.2	0.2	0.1
ETHANE	0.9	1.2	1.0
PROPYLENE	0.0+	0.0+	0.0+
PROPANE	0.0+	0.0+	0.0+
1, BUTENE	0.0+	0.0+	0.0+
N-BUTANE	0.0+	0.0+	0.0+

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

LABORATORY DATA IS NOT NORMALIZED

SC2 - GAS FROM ABSORBER FEED
K. O. DRUM (FA-203)

RUN 2-DB-G-6

BASIS: VOLUME PERCENT

SAMPLE NUMBER SC2-163

TIME 23:40
DATE 4/ 8/78

COMPONENTS

HYDROGEN	19.4
OXYGEN	0.0+
NITROGEN	9.2
METHANE	11.6
CARBON MONOXIDE	6.1
CARBON DIOXIDE	50.8
HYDROGEN SULFIDE	1.8
WATER	0.0
ETHYLENE	0.2
ETHANE	1.1
PROPYLENE	0.0+
PROPANE	0.0+
1, BUTENE	0.0+
N-BUTANE	0.0+

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

LABORATORY DATA IS NOT NORMALIZED

SC2 - GAS FROM ABSORBER FEED
K. O. DRUM (FA-203)

RUN 2-DB-J-3

BASIS: VOLUME PERCENT

SAMPLE NUMBER	SC2-165	SC2-166	SC2-167
TIME	22: 0	0:10	2: 0
DATE	6/19/78	6/20/78	6/20/78
COMPONENTS			

HYDROGEN	24.2	23.3	23.6
OXYGEN	0.0	0.0	0.1
NITROGEN	13.5	1.5	11.3
METHANE	6.7	9.3	9.3
CARBON MONOXIDE	7.6	7.7	6.2
CARBON DIOXIDE	49.4	60.9	51.6
HYDROGEN SULFIDE	0.9	1.7	0.8
WATER	0.0	0.0	0.0
ETHYLENE	0.1	0.0	0.0
ETHANE	0.0	0.2	0.2
PROPYLENE	0.0+	0.0+	0.0+
PROPANE	0.0+	0.0+	0.0+
1, BUTENE	0.0+	0.0+	0.0+
N-BUTANE	0.0+	0.0+	0.0+

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

LABORATORY DATA IS NOT NORMALIZED

SC2 - GAS FROM ABSORBER FEED
K. O. DRUM (FA-203)

RUN 2-DB-K-2

BASIS: VOLUME PERCENT

SAMPLE NUMBER	SC2-168	SC2-169	SC2-170
TIME	16:0	19:30	21:0
DATE	7/11/78	7/11/78	7/11/78
COMPONENTS			

HYDROGEN	22.4	17.6	20.7
OXYGEN	0.2	0.2	0.0
NITROGEN	0.5	0.4	0.1
METHANE	9.5	8.8	8.1
CARBON MONOXIDE	6.9	8.1	8.4
CARBON DIOXIDE	61.4	61.4	64.5
HYDROGEN SULFIDE	1.2	1.2	0.2
WATER	0.0	0.0	0.0
ETHYLENE	0.0	0.0*	0.0*
ETHANE	0.3	0.3	0.4
PROPYLENE	0.0	0.0	0.0
PROPANE	0.0	0.0	0.0
1, BUTENE	0.0	0.0	0.0
N-BUTANE	0.0	0.0	0.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

LABORATORY DATA IS NOT NORMALIZED

SC2 - GAS FROM ABSORBER FEED
K. O. DRUM (FA-203)

RUN 2-DB-M-2

BASIS: VOLUME PERCENT

SAMPLE NUMBER	SC2-175	SC2-176	SC2-177	SC2-178
TIME	0:30	2:30	4:30	6:30
DATE	8/ 1/78	8/ 1/78	8/ 1/78	8/ 1/78
COMPONENTS				
HYDROGEN	24.7	26.0	22.4	23.2
OXYGEN	0.1	0.1	0.1	0.1
NITROGEN	10.7	7.9	9.6	8.8
METHANE	10.3	11.5	10.6	12.0
CARBON MONOXIDE	7.7	6.9	6.2	5.3
CARBON DIOXIDE	46.0	45.8	47.6	44.6
HYDROGEN SULFIDE	1.1	1.3	1.5	1.3
WATER	0.0	0.1	1.3	4.1
ETHYLENE	0.0	0.0*	0.1	0.0*
ETHANE	0.6	0.5	0.7	0.6
PROPYLENE	0.0+	0.0+	0.0+	0.0+
PROPANE	0.0+	0.0+	0.0+	0.0+
1, BUTENE	0.0+	0.0+	0.0+	0.0+
N-BUTANE	0.0+	0.0+	0.0+	0.0+

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

LABORATORY DATA IS NOT NORMALIZED

SC2 - GAS FROM ABSORBER FEED
K. O. DRUM (FA-203)

RUN 2-DB-M-1

BASIS: VOLUME PERCENT

SAMPLE NUMBER	SC2-171	SC2-172	SC2-173	SC2-174
TIME	14:30	16:30	19:15	20:30
DATE	7/27/78	7/27/78	7/27/78	7/27/78
COMPONENTS				

HYDROGEN	23.9	23.4	22.6	20.7
OXYGEN	0.0	0.1	0.0*	0.0*
NITROGEN	5.3	5.0	3.9	4.9
METHANE	10.9	10.3	11.0	8.3
CARBON MONOXIDE	6.3	4.7	7.3	8.0
CARBON DIOXIDE	49.2	51.8	50.7	52.6
HYDROGEN SULFIDE	1.2	1.3	1.0	1.3
WATER	2.5	3.2	2.9	3.6
ETHYLENE	0.0*	0.0*	0.0*	0.1
ETHANE	0.6	0.3	0.5	0.5
PROPYLENE	0.0	0.0	0.0	0.0
PROPANE	0.0	0.0	0.0	0.0
1, BUTENE	0.0	0.0	0.0	0.0
N-BUTANE	0.0	0.0	0.0	0.0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

LABORATORY DATA IS NOT NORMALIZED

SC2 - GAS FROM ABSORBER FEED
K. O. DRUM (FA-203)

RUN 2-DB-0-1

BASIS: VOLUME PERCENT

SAMPLE NUMBER	SC2-179	SC2-180	SC2-181	SC2-182	SC2-183	SC2-184	SC2-185
TIME	22: 0	0:17	1:56	4: 3	6: 6	8: 0	10: 0
DATE	8/22/78	8/23/78	8/23/78	8/23/78	8/23/78	8/23/78	8/23/78
COMPONENTS							
HYDROGEN	21.8	26.4	25.0	23.2	26.2	0.0+	23.8
OXYGEN	0.1	0.1	0.1	0.1	0.1	0.0+	0.1
NITROGEN	15.2	18.3	16.8	18.7	14.8	0.0+	21.8
METHANE	11.5	10.9	10.5	10.5	10.5	0.0+	10.8
CARBON MONOXIDE	7.1	6.2	6.0	6.1	5.5	0.0+	6.4
CARBON DIOXIDE	46.7	35.5	37.5	37.3	37.2	0.0+	34.3
HYDROGEN SULFIDE	0.9	0.4	1.1	0.9	1.5	0.0+	1.3
WATER	0.0	0.0	2.6	2.5	3.6	0.0+	0.7
ETHYLENE	0.1	0.0*	0.0*	0.1	0.5	0.0+	0.1
ETHANE	0.8	0.4	0.4	0.6	0.5	0.0+	0.7
PROPYLENE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
PROPANE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
1, BUTENE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
N-BUTANE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+

+ = NO ANALYSIS DONE

* = TRACE

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LABORATORY DATA IS NOT NORMALIZED
RUN 2-DB-0-1

BASIS: VOLUME PERCENT

SAMPLE NUMBER	SC2-186	SC2-187	SC2-188	SC2-189	SC2-190	SC2-191	SC2-192
TIME	12: 0	14:15	16: 0	18: 0	20: 0	22:15	0: 1
DATE	8/23/78	8/23/78	8/23/78	8/23/78	8/23/78	8/23/78	8/24/78
COMPONENTS							
HYDROGEN	22.0	22.6	21.3	20.0	23.6	22.1	19.8
OXYGEN	0.1	0.2	0.1	0.1	0.1	0.2	0.2
NITROGEN	18.7	20.3	17.7	19.0	18.9	15.8	20.7
METHANE	11.1	10.3	10.0	10.6	9.7	10.9	10.1
CARBON MONOXIDE	6.9	6.1	6.8	7.3	6.1	5.9	5.5
CARBON DIOXIDE	39.3	37.9	41.9	41.1	33.3	39.8	36.4
HYDROGEN SULFIDE	1.5	1.6	1.4	1.3	1.0	1.5	1.3
WATER	0.0	0.2	0.0	0.0	6.8	2.9	5.0
ETHYLENE	0.1	0.1	0.1	0.1	0.1	0.1	0.1
ETHANE	0.7	0.7	0.7	1.1	0.5	0.8	0.9
PROPYLENE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
PROPANE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
1, BUTENE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
N-BUTANE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+

+ = NO ANALYSIS DONE

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LABORATORY DATA IS NOT NORMALIZED

SC2 - GAS FROM ABSORBER FEED
K. O. DRUM (FA-203)

RUN 2-DB-0-1

BASIS: VOLUME PERCENT

SAMPLE NUMBER	SC2-193	SC2-194	SC2-195	SC2-196	SC2-197	SC2-198	SC2-199
TIME	2: 0	4: 0	6: 0	8: 0	12: 0	13:50	16: 0
DATE	8/24/78	8/24/78	8/24/78	8/24/78	8/24/78	8/24/78	8/24/78
COMPONENTS							
HYDROGEN	22.2	21.5	23.4	20.5	25.8	26.0	25.9
OXYGEN	0.2	0.3	0.2	0.1	0.1	0.1	0.1
NITROGEN	18.3	22.0	18.3	21.6	16.5	11.0	16.7
METHANE	10.4	10.3	11.2	11.2	10.8	10.8	9.8
CARBON MONOXIDE	5.0	5.0	5.1	5.4	6.8	6.9	5.7
CARBON DIOXIDE	39.0	34.1	36.2	35.3	34.7	40.2	36.8
HYDROGEN SULFIDE	1.5	1.3	1.6	1.4	1.3	1.5	1.4
WATER	2.7	4.8	3.4	3.8	3.7	3.3	3.4
ETHYLENE	0.1	0.1	0.1	0.1	0.0*	0.0*	0.0*
ETHANE	0.6	0.6	0.5	0.6	0.3	0.3	0.2
PROPYLENE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
PROPANE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
1, BUTENE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
N-BUTANE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+

+ = NO ANALYSIS DONE

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LABORATORY DATA IS NOT NORMALIZED
RUN 2-DB-0-1

BASIS: VOLUME PERCENT

SAMPLE NUMBER	SC2-200	SC2-201
TIME	18: 0	19:45
DATE	8/24/78	8/24/78
COMPONENTS		
HYDROGEN	23.2	21.0
OXYGEN	0.1	0.1
NITROGEN	19.4	16.7
METHANE	9.8	8.4
CARBON MONOXIDE	5.9	6.3
CARBON DIOXIDE	35.9	41.0
HYDROGEN SULFIDE	1.6	1.2
WATER	3.6	4.8
ETHYLENE	0.1	0.1
ETHANE	0.4	0.4
PROPYLENE	0.0+	0.0+
PROPANE	0.0+	0.0+
1, BUTENE	0.0+	0.0+
N-BUTANE	0.0+	0.0+

+ = NO ANALYSIS DONE

* = TRACE

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LABORATORY DATA IS NOT NORMALIZED

SC2 - GAS FROM ABSORBER FEED
K. O. DRUM (FA-203)

RUN 2-DB-0-2A

BASIS: VOLUME PERCENT

SAMPLE NUMBER SC2-202 SC2-203

TIME 22:40 0:40
DATE 8/25/78 8/26/78

COMPONENTS

HYDROGEN	24.6	11.5
OXYGEN	0.1	0.1
NITROGEN	9.8	19.2
METHANE	10.2	6.0
CARBON MONOXIDE	5.9	7.7
CARBON DIOXIDE	45.9	48.4
HYDROGEN SULFIDE	1.2	0.5
WATER	2.1	5.7
ETHYLENE	0.0	0.3
ETHANE	0.2	0.6
PROPYLENE	0.0+	0.0+
PROPANE	0.0+	0.0+
1, BUTENE	0.0+	0.0+
N-BUTANE	0.0+	0.0+

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

LABORATORY DATA IS NOT NORMALIZED

SC2 - GAS FROM ABSORBER FEED
K. O. DRUM (FA-203)

RUN 2-DB-0-2B

BASIS: VOLUME PERCENT

SAMPLE NUMBER	SC2-206	SC2-207	SC2-208	SC2-209	SC2-210	SC2-211
TIME	17:30	20:00	0:1	2:30	4:0	8:0
DATE	8/26/78	8/26/78	8/27/78	8/27/78	8/27/78	8/27/78
COMPONENTS						

HYDROGEN	23.4	22.4	11.8	5.3	18.8	22.2
OXYGEN	0.1	0.1	0.1	0.2	0.1	0.0
NITROGEN	14.2	17.3	18.6	27.8	14.7	12.8
METHANE	9.7	10.3	5.8	2.5	9.0	9.8
CARBON MONOXIDE	5.2	4.6	9.6	9.8	4.8	4.8
CARBON DIOXIDE	43.5	42.0	44.4	46.5	48.4	46.3
HYDROGEN SULFIDE	1.4	0.8	0.8	0.5	1.0	0.1
WATER	2.4	2.3	8.1	7.1	2.6	3.6
ETHYLENE	0.0	0.0	0.1	0.1	0.1	0.0
ETHANE	0.1	0.2	0.7	0.2	0.5	0.4
PROPYLENE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
PROPANE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
1, BUTENE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
N-BUTANE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

LABORATORY DATA IS NOT NORMALIZED

SC2 - GAS FROM ABSORBER FEED
K. O. DRUM (FA-203)

RUN 2-DB-0-2C

BASIS: VOLUME PERCENT

SAMPLE NUMBER	SC2-212	SC2-213	SC2-214	SC2-215	SC2-216	SC2-217	SC2-218
TIME	17:50	20:15	22:00	0:01	2:00	4:00	6:00
DATE	8/27/78	8/27/78	8/27/78	8/28/78	8/28/78	8/28/78	8/28/78
COMPONENTS							
HYDROGEN	14.2	10.6	14.3	15.4	16.5	16.2	15.5
HYDROGEN	14.2	10.6	14.3	15.4	16.5	16.2	15.5
OXYGEN	0.1	0.1	0.1	0.1	0.1	0.1	0.1
NITROGEN	20.7	22.0	20.8	20.1	21.8	19.5	14.8
METHANE	10.5	9.1	10.3	10.2	10.1	9.8	9.5
CARBON MONOXIDE	5.4	4.5	4.4	4.4	4.2	4.0	3.5
CARBON DIOXIDE	44.2	45.2	45.3	43.2	41.2	44.1	51.3
HYDROGEN SULFIDE	1.2	1.4	1.2	1.7	1.6	1.6	1.6
WATER	2.9	6.8	3.5	3.9	3.6	3.8	3.1
ETHYLENE	0.1	0.2	0.1	0.1	0.1	0.1	0.0*
ETHANE	0.7	1.1	1.0	0.9	0.8	0.8	0.6
PROPYLENE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
PROPANE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
1, BUTENE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
N-BUTANE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

LABORATORY DATA IS NOT NORMALIZED

RUN 2-DB-0-2C

BASIS: VOLUME PERCENT

SAMPLE NUMBER	SC2-219	SC2-220	SC2-221	SC2-222	SC2-223	SC2-224
TIME	8:00	10:15	14:20	16:00	19:00	20:00
DATE	8/28/78	8/28/78	8/28/78	8/28/78	8/28/78	8/28/78
COMPONENTS						
HYDROGEN	18.1	19.7	19.7	18.3	19.5	19.3
OXYGEN	0.1	0.2	0.1	0.1	0.3	0.2
NITROGEN	14.2	9.7	16.3	16.1	22.0	26.8
METHANE	10.6	10.3	10.3	8.0	10.6	3.6
CARBON MONOXIDE	3.3	4.3	5.2	3.6	4.0	3.2
CARBON DIOXIDE	48.2	55.1	43.0	48.8	38.8	42.0
HYDROGEN SULFIDE	1.8	1.0	1.3	1.7	1.4	0.8
WATER	3.1	0.0	3.8	3.1	2.9	4.1
ETHYLENE	0.0*	0.0*	0.0*	0.0*	0.0*	0.0
ETHANE	0.5	0.2	0.3	0.3	0.5	0.0
PROPYLENE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
PROPANE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
1, BUTENE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
N-BUTANE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

LABORATORY DATA IS NOT NORMALIZED

SC2 - GAS FROM ABSORBER FEED
K. O. DRUM (FA-203)

RUN 2-DB-0-3

BASIS: VOLUME PERCENT

SAMPLE NUMBER	SC2-225	SC2-226	SC2-227	SC2-228	SC2-229	SC2-230	SC2-231
TIME	14: 0	16:22	17:54	19:56	22: 0	5:30	7:30
DATE	8/29/78	8/29/78	8/29/78	8/29/78	8/29/78	8/31/78	8/31/78
COMPONENTS							
HYDROGEN	12.9	17.6	19.8	17.3	20.3	12.6	19.9
OXYGEN	0.1	0.1	0.1	0.1	0.1	0.9	0.1
NITROGEN	22.8	16.4	14.0	8.5	13.8	15.8	15.7
METHANE	10.0	11.2	10.9	10.3	11.2	9.7	13.7
CARBON MONOXIDE	4.4	3.3	4.3	5.1	5.6	4.6	4.6
CARBON DIOXIDE	43.7	49.4	49.7	56.5	48.5	54.7	46.0
HYDROGEN SULFIDE	1.5	1.1	1.3	1.5	1.2	0.0	1.7
WATER	3.6	0.0	0.0	0.0	0.0	0.5	0.0
ETHYLENE	0.1	0.1	0.0*	0.0*	0.1	0.2	0.1
ETHANE	0.9	0.8	0.6	0.7	0.8	0.8	1.2
PROPYLENE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
PROPANE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
1, BUTENE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
N-BUTANE	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

LABORATORY DATA IS NOT NORMALIZED

S3 - WATER TO VENTURI SCRUBBER<EE-201>

WATER SAMPLES

RUN 2-DB-A-2

SAMPLE NUMBER

S3-236

TIME

5:30

DATE

9/26/77

COMPONENTS

PHENOLS (PPM)	0.0+
COD (PPM)	0.0+
P-ALKALINITY (GR/GAL)	0.0+
M-ALKALINITY (GR/GAL)	0.0+
N AS NH3 (PPM)	0.0+
S (PPM)	0.0+
CHLORIDE (PPM)	0.0+
DISSOLVED SOLIDS (PPM)	0.0+
THIOCYANATE (PPM)	0.0+
CYANIDE (PPM)	0.0+
PH	5.5
TSS (WEIGHT %)	0.0*

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

S3 - WATER TO VENTURI SCRUBBER<EE-201>

WATER SAMPLES

RUN 2-DB-B

SAMPLE NUMBER	S3-237	S3-238
TIME	13:40	20: 0
DATE	10/25/77	10/31/77
COMPONENTS		
PHENOLS (PPM)	0.0+	0.0+
COD (PPM)	0.0+	0.0+
P-ALKALINITY (GR/GAL)	0.0+	0.0+
M-ALKALINITY (GR/GAL)	0.0+	0.0+
N AS NH3 (PPM)	0.0+	0.0+
S (PPM)	0.0+	0.0+
CHLORIDE (PPM)	0.0+	0.0+
DISSOLVED SOLIDS (PPM)	0.0+	0.0+
THIOCYANATE (PPM)	0.0+	0.0+
CYANIDE (PPM)	0.0+	0.0+
PH	4.9	5.7
TSS (WEIGHT %)	0.2	0.2

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

S3 - WATER TO VENTURI SCRUBBER (EE-201)

WATER SAMPLES

RUN 2-DB-D-3

SAMPLE NUMBER 53-239

TIME 10:30

DATE 12/14/77

COMPONENTS

PHENOLS (PPM)	38.0
COD (PPM)	1150.0
P-ALKALINITY (GR/GAL)	0.0+
M-ALKALINITY (GR/GAL)	0.0+
N AS NH3 (PPM)	82.4
S (PPM)	0.0+
CHLORIDE (PPM)	0.0+
DISSOLVED SOLIDS (PPM)	0.0+
THIOCYANATE (PPM)	0.0+
CYANIDE (PPM)	0.0+
PH	2.4
TSS (WEIGHT %)	0.0*

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

S3 - WATER TO VENTURI SCRUBBER<EE-201>

WATER SAMPLES

RUN 2-DB-G-5

SAMPLE NUMBER	S3-240	S3-241	S3-242
TIME	6: 0	10: 0	14: 0
DATE	4/ 7/78	4/ 7/78	4/ 7/78
COMPONENTS			

PHENOLS (PPM)	0. 0+	0. 0+	0. 0+
COD (PPM)	0. 0+	0. 0+	0. 0+
P-ALKALINITY (GR/GAL)	0. 0+	0. 0+	0. 0+
M-ALKALINITY (GR/GAL)	0. 0+	0. 0+	0. 0+
N AS NH3 (PPM)	0. 0+	0. 0+	0. 0+
S (PPM)	0. 0+	0. 0+	0. 0+
CHLORIDE (PPM)	0. 0+	0. 0+	0. 0+
DISSOLVED SOLIDS (PPM)	0. 0+	0. 0+	0. 0+
THIOCYANATE (PPM)	0. 0+	0. 0+	0. 0+
CYANIDE (PPM)	0. 0+	0. 0+	0. 0+
PH	6. 8	6. 9	7. 1
TSS (WEIGHT %)	0. 6	2. 0	29. 5

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

S3 - WATER TO VENTURI SCRUBBER (EE-201)

WATER SAMPLES

RUN 2-DB-G-6

SAMPLE NUMBER	S3-243	S3-244	S3-245	S3-246	S3-247
TIME	20:45	1: 0	5: 0	9: 0	9: 0
DATE	4/ 8/78	4/ 9/78	4/ 9/78	4/10/78	4/10/78
COMPONENTS					

PHENOLS (PPM)	0.0+	0.0+	0.0+	1020.0	580.0
COD (PPM)	0.0+	0.0+	0.0+	9400.0	2100.0
P-ALKALINITY (GR/GAL)	0.0+	0.0+	0.0+	0.0+	0.0+
M-ALKALINITY (GR/GAL)	0.0+	0.0+	0.0+	0.0+	0.0+
N AS NH3 (PPM)	0.0+	0.0+	0.0+	0.0	405.0
S (PPM)	0.0+	0.0+	0.0+	865.0	149.0
CHLORIDE (PPM)	0.0+	0.0+	0.0+	0.0+	0.0+
DISSOLVED SOLIDS (PPM)	0.0+	0.0+	0.0+	0.0+	0.0+
THIOCYANATE (PPM)	0.0+	0.0+	0.0+	0.0+	0.0+
CYANIDE (PPM)	0.0+	0.0+	0.0+	0.0	0.2
PH	6.7	7.9	7.0	0.0+	0.0+
TSS (WEIGHT %)	0.0*	0.0*	7.8	0.0+	0.0+

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

S3 - WATER TO VENTURI SCRUBBER<EE-201>

WATER SAMPLES

RUN 2-DB-H-2

SAMPLE NUMBER 53-248

TIME 0:30

DATE 4/27/78

COMPONENTS

PHENOLS (PPM)	290.0
COD (PPM)	2550.0
P-ALKALINITY (GR/GAL)	0.0+
M-ALKALINITY (GR/GAL)	0.0+
N AS NH3 (PPM)	70.0
S (PPM)	126.0
CHLORIDE (PPM)	0.0+
DISSOLVED SOLIDS (PPM)	0.0+
THIOCYANATE (PPM)	0.0+
CYANIDE (PPM)	0.0
PH	5.2
TSS (WEIGHT %)	0.0*

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

S3 - WATER TO VENTURI SCRUBBER (EE-201)

WATER SAMPLES

RUN 2-DB-J-3

SAMPLE NUMBER	S3-249	S3-250
TIME	18:50	23:15
DATE	6/19/78	6/19/78
COMPONENTS		

PHENOLS (PPM)	375.0	92.0
COD (PPM)	5870.0	7680.0
P-ALKALINITY (GR/GAL)	0.0+	0.0+
M-ALKALINITY (GR/GAL)	0.0+	0.0+
N AS NH3 (PPM)	65.9	1000.0
S (PPM)	176.0	97.1
CHLORIDE (PPM)	0.0+	9.5
DISSOLVED SOLIDS (PPM)	0.0+	0.0+
THIOCYANATE (PPM)	0.0	0.0
CYANIDE (PPM)	0.0	0.0
PH	7.6	7.2
TSS (WEIGHT %)	0.0*	6.3

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

S3 - WATER TO VENTURI SCRUBBER (EE-201)

WATER SAMPLES

RUN 2-DB-K-2

SAMPLE NUMBER	S3-251	S3-252	S3-253	S3-254
TIME	10:45	14:30	19:30	0: 5
DATE	7/11/78	7/11/78	7/11/78	7/12/78
COMPONENTS				
PHENOLS (PPM)	300.0	980.0	290.0	268.0
COD (PPM)	5090.0	7820.0	2050.0	1800.0
P-ALKALINITY (GR/GAL)	0.0+	0.0+	0.0+	0.0+
M-ALKALINITY (GR/GAL)	0.0+	0.0+	0.0+	0.0+
N AS NH3 (PPM)	412.0	4420.0	9450.0	5190.0
S (PPM)	197.0	529.0	178.0	238.0
CHLORIDE (PPM)	0.0+	0.0+	0.0+	108.0
DISSOLVED SOLIDS (PPM)	0.0+	0.0+	0.0+	0.0+
THIOCYANATE (PPM)	0.0+	0.0+	0.0+	0.0+
CYANIDE (PPM)	0.0+	0.0+	0.0+	0.0+
PH	6.1	7.7	8.0	6.6
TSS (WEIGHT %)	0.0*	0.1	5.9	10.4

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

S3 - WATER TO VENTURI SCRUBBER<EE-201>

WATER SAMPLES

RUN 2-DB-M-1

SAMPLE NUMBER	53-255	53-256	53-257
TIME	13:45	18:30	22:30
DATE	7/27/78	7/27/78	7/27/78
COMPONENTS			
PHENOLS (PPM)	420.0	840.0	170.0
COD (PPM)	4080.0	3200.0	2960.0
F-ALKALINITY (GR/GAL)	0.0+	0.0+	0.0+
M-ALKALINITY (GR/GAL)	0.0+	0.0+	0.0+
N AS NH3 (PPM)	7770.0	9470.0	6560.0
S (PPM)	271.0	423.0	47.4
CHLORIDE (PPM)	0.0+	0.0+	0.0+
DISSOLVED SOLIDS (PPM)	0.0+	0.0+	0.0+
THIOCYANATE (PPM)	0.0+	0.0+	0.0+
CYANIDE (PPM)	0.0+	0.0+	0.0+
PH	7.5	8.2	7.2
TSS (WEIGHT %)	2.7	6.9	0.7

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

S3 - WATER TO VENTURI SCRUBBER (EE-201)

WATER SAMPLES

RUN 2-DB-N-2

SAMPLE NUMBER

S3-258

TIME

16:30

DATE

8/12/78

COMPONENTS

PHENOLS (PPM)	0.0+
COD (PPM)	2150.0
P-ALKALINITY (GR/GAL)	0.0+
M-ALKALINITY (GR/GAL)	0.0+
N AS NH3 (PPM)	0.0+
S (PPM)	0.0+
CHLORIDE (PPM)	0.0+
DISSOLVED SOLIDS (PPM)	0.0+
THIOCYANATE (PPM)	0.0+
CYANIDE (PPM)	0.0+
PH	7.3
TSS (WEIGHT %)	0.3

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

S3 - WATER TO VENTURI SCRUBBER<EE-201>

WATER SAMPLES

RUN 2-DB-0-1

SAMPLE NUMBER	S3-259	S3-260	S3-261	S3-262	S3-263	S3-264	S3-265
TIME	2: 0	6: 0	10: 0	14: 0	2: 0	6: 0	10: 0
DATE	8/23/78	8/23/78	8/23/78	8/23/78	8/24/78	8/24/78	8/24/78
COMPONENTS							
PHENOLS (PPM)	400.0	580.0	580.0	440.0	800.0	640.0	580.0
COD (PPM)	2150.0	2620.0	1670.0	2360.0	2960.0	2230.0	2430.0
P-ALKALINITY (GR/GAL)	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
M-ALKALINITY (GR/GAL)	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
N AS NH3 (PPM)	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
S (PPM)	325.0	293.0	266.0	411.0	219.0	251.0	344.0
CHLORIDE (PPM)	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
DISSOLVED SOLIDS (PPM)	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
THIOCYANATE (PPM)	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
CYANIDE (PPM)	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
PH	8.3	8.3	8.7	7.5	8.2	8.2	8.5
TSS (WEIGHT %)	0.0*	2.4	6.5	7.3	2.7	3.5	1.5

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

RUN 2-DB-0-1

SAMPLE NUMBER	S3-266	S3-267
TIME	14: 0	18: 0
DATE	8/24/78	8/24/78
COMPONENTS		
PHENOLS (PPM)	110.0	130.0
COD (PPM)	1000.0	907.0
P-ALKALINITY (GR/GAL)	0.0+	0.0+
M-ALKALINITY (GR/GAL)	0.0+	0.0+
N AS NH3 (PPM)	0.0+	0.0+
S (PPM)	222.0	266.0
CHLORIDE (PPM)	0.0+	0.0+
DISSOLVED SOLIDS (PPM)	0.0+	0.0+
THIOCYANATE (PPM)	0.0+	0.0+
CYANIDE (PPM)	0.0+	0.0+
PH	8.5	8.2
TSS (WEIGHT %)	9.5	4.1

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

S3 - WATER TO VENTURI SCRUBBER (EE-201)

WATER SAMPLES

RUN 2-DB-0-2A

SAMPLE NUMBER	S3-268	S3-269
TIME	21:10	1: 0
DATE	8/25/78	8/26/78
COMPONENTS		

PHENOLS (PPM)	510. 0	460. 0
COD (PPM)	3310. 0	3770. 0
P-ALKALINITY (GR/GAL)	0. 0+	0. 0+
M-ALKALINITY (GR/GAL)	0. 0+	0. 0+
N AS NH3 (PPM)	0. 0+	0. 0+
S (PPM)	250. 0	300. 0
CHLORIDE (PPM)	0. 0+	0. 0+
DISSOLVED SOLIDS (PPM)	0. 0+	0. 0+
THIOCYANATE (PPM)	0. 0+	0. 0+
CYANIDE (PPM)	0. 0+	0. 0+
PH	8. 3	8. 1
TSS (WEIGHT %)	0. 5	0. 2

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

S3 - WATER TO VENTURI SCRUBBER<EE-201>

WATER SAMPLES

RUN 2-DB-0-2B

SAMPLE NUMBER	S3-270	S3-271	S3-272	S3-273	S3-274	S3-275	S3-276
TIME	8:15	13:30	18:00	21:30	1:30	6:00	10:00
DATE	8/26/78	8/26/78	8/26/78	8/26/78	8/26/78	8/27/78	8/27/78
COMPONENTS							
PHENOLS (PPM)	360.0	610.0	165.0	490.0	239.0	565.0	200.0
COD (PPM)	4140.0	5160.0	768.0	1550.0	500.0	1630.0	341.0
P-ALKALINITY (GR/GAL)	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
M-ALKALINITY (GR/GAL)	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
N AS NH3 (PPM)	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
S (PPM)	23.0	43.0	368.0	222.0	94.0	341.0	157.0
CHLORIDE (PPM)	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
DISSOLVED SOLIDS (PPM)	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
THIOCYANATE (PPM)	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
CYANIDE (PPM)	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
PH	5.7	6.6	8.3	8.1	6.9	7.0	8.2
TSS (WEIGHT %)	0.0*	0.7	0.7	8.9	2.1	9.1	8.9

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

S3 - WATER TO VENTURI SCRUBBER (EE-201)

WATER SAMPLES

RUN 2-DB-0-2C

SAMPLE NUMBER	S3-277	S3-278	S3-279	S3-280	S3-281
TIME	21:45	2: 0	6: 0	10:30	14: 0
DATE	8/27/78	8/28/78	8/28/78	8/28/78	8/28/78
COMPONENTS					

PHENOLS (PPM)	1000.0	960.0	650.0	100.0	375.0
COD (PPM)	5020.0	4000.0	2510.0	2650.0	310.0
P-ALKALINITY (GR/GAL)	0.0+	0.0+	0.0+	0.0+	0.0+
M-ALKALINITY (GR/GAL)	0.0+	0.0+	0.0+	0.0+	0.0+
N AS NH3 (PPM)	0.0+	0.0+	0.0+	0.0+	0.0+
S (PPM)	125.0	119.0	323.0	186.0	318.0
CHLORIDE (PPM)	0.0+	0.0+	0.0+	0.0+	0.0+
DISSOLVED SOLIDS (PPM)	0.0+	0.0+	0.0+	0.0+	0.0+
THIOCYANATE (PPM)	0.0+	0.0+	0.0+	0.0+	0.0+
CYANIDE (PPM)	0.0+	0.0+	0.0+	0.0+	0.0+
PH	8.3	7.5	7.5	7.5	7.7
TSS (WEIGHT %)	0.0*	2.6	13.9	0.0*	3.0

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

S3 - WATER TO VENTURI SCRUBBER<EE-201>

WATER SAMPLES

RUN 2-DB-0-3

SAMPLE NUMBER	53-282	53-283	53-284
TIME	14: 0	18:45	22: 0
DATE	8/29/78	8/29/78	8/29/78
COMPONENTS			
PHENOLS (PPM)	1100.0	680.0	850.0
COD (PPM)	6340.0	1060.0	1860.0
P-ALKALINITY (GR/GAL)	0.0+	0.0+	0.0+
M-ALKALINITY (GR/GAL)	0.0+	0.0+	0.0+
N AS NH3 (PPM)	0.0+	0.0+	0.0+
S (PPM)	314.0	152.0	228.0
CHLORIDE (PPM)	0.0+	0.0+	0.0+
DISSOLVED SOLIDS (PPM)	0.0+	0.0+	0.0+
THIOCYANATE (PPM)	0.0+	0.0+	0.0+
CYANIDE (PPM)	0.0+	0.0+	0.0+
PH	8.2	7.5	7.5
TSS (WEIGHT %)	2.1	12.0	5.9

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

S3 - WATER TO VENTURI SCRUBBER<EE-201>

SOLIDS FILTERED FROM SAMPLE

CHEMICAL ANALYSIS

RUN 2-DB-G-5

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	S3-240	S3-241	S3-242
TIME	6: 0	10: 0	14: 0
DATE	4/ 7/78	4/ 7/78	4/ 7/78
PROXIMATE ANALYSIS			

VOLATILE MATTER	0.0+	0.0+	12.1
FIXED CARBON	0.0+	0.0+	69.9
ASH	0.0+	0.0+	18.0
TOTAL	0.0	0.0	100.0

ULTIMATE ANALYSIS

HYDROGEN	0.0+	0.0+	2.3
CARBON	0.0+	0.0+	73.6
NITROGEN	0.0+	0.0+	1.1
OXYGEN	0.0	0.0	2.8
SULFUR	0.0+	0.0+	2.2
ASH	0.0+	0.0+	18.0
TOTAL	0.0	0.0	100.0

HEAT OF COMBUSTION (BTU/LB)	0. +	0. +	11900.
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+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

S3 - WATER TO VENTURI SCRUBBER (EE-201)

SOLIDS FILTERED FROM SAMPLE

CHEMICAL ANALYSIS

RUN 2-DB-G-6

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	S3-243	S3-244	S3-245	S3-246	S3-247
TIME	20:45	1: 0	5: 0	9: 0	9: 0
DATE	4/ 8/78	4/ 9/78	4/ 9/78	4/10/78	4/10/78

PROXIMATE ANALYSIS

VOLATILE MATTER	0.0+	0.0+	9.7	0.0+	0.0+
FIXED CARBON	0.0+	0.0+	71.4	0.0+	0.0+
ASH	0.0+	0.0+	18.9	0.0+	0.0+
TOTAL	0.0	0.0	100.0	0.0	0.0

ULTIMATE ANALYSIS

HYDROGEN	0.0+	0.0+	2.0	0.0+	0.0+
CARBON	0.0+	0.0+	74.7	0.0+	0.0+
NITROGEN	0.0+	0.0+	1.1	0.0+	0.0+
OXYGEN	0.0	0.0	1.3	0.0	0.0
SULFUR	0.0+	0.0+	2.0	0.0+	0.0+
ASH	0.0+	0.0+	18.9	0.0+	0.0+
TOTAL	0.0	0.0	100.0	0.0	0.0

HEAT OF COMBUSTION (BTU/LB)	0. +	0. +	11900.	0. +	0. +
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+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

S3 - WATER TO VENTURI SCRUBBER<EE-201>

SOLIDS FILTERED FROM SAMPLE

CHEMICAL ANALYSIS

RUN 2-08-0-20

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	S3-277	S3-278	S3-279	S3-280	S3-281
TIME	21:45	6: 0	6: 0	10:30	14: 0
DATE	8/27/78	8/28/78	8/28/78	8/28/78	8/28/78

PROXIMATE ANALYSIS

VOLATILE MATTER	0.0+	12.0	0.0+	0.0+	0.0+
FIXED CARBON	0.0+	89.9	0.0+	0.0+	0.0+
ASH	0.0+	19.8	0.0+	0.0+	0.0+
TOTAL	0.0	121.7	0.0	0.0	0.0

ULTIMATE ANALYSIS

HYDROGEN	0.0+	2.2	0.0+	0.0+	0.0+
CARBON	0.0+	72.3	0.0+	0.0+	0.0+
NITROGEN	0.0+	1.0	0.0+	0.0+	0.0+
OXYGEN	0.0	2.7	0.0	0.0	0.0
SULFUR	0.0+	2.0	0.0+	0.0+	0.0+
ASH	0.0+	19.8	0.0+	0.0+	0.0+
TOTAL	0.0	100.0	0.0	0.0	0.0

HEAT OF COMBUSTION (BTU/LB)	0. +	11700.	0. +	0. +	0. +
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+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

S3 - WATER TO VENTURI SCRUBBER<EE-201>

SOLIDS FILTERED FROM SAMPLE

CHEMICAL ANALYSIS

RUN 2-DB-0-3

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	S3-282	S3-283	S3-284
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TIME	14: 0	18:45	22: 0
DATE	8/29/78	8/29/78	8/29/78

PROXIMATE ANALYSIS

VOLATILE MATTER	0.0+	10.1	0.0+
FIXED CARBON	0.0+	70.5	0.0+
ASH	0.0+	19.4	0.0+
TOTAL	0.0	100.0	0.0

ULTIMATE ANALYSIS

HYDROGEN	0.0+	2.3	0.0+
CARBON	0.0+	72.8	0.0+
NITROGEN	0.0+	1.0	0.0+
OXYGEN	0.0	2.4	0.0
SULFUR	0.0+	2.0	0.0+
ASH	0.0+	19.4	0.0+
TOTAL	0.0	100.0	0.0

HEAT OF COMBUSTION (BTU/LB)	0. +	11800.	0. +
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+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

S3 - WATER TO VENTURI SCRUBBER (EE-201)

SOLIDS FILTERED FROM SAMPLE

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-G-5

SAMPLE NUMBER

S3-240

S3-241

S3-242

TIME

6: 0

10: 0

14: 0

DATE

4/ 7/78

4/ 7/78

4/ 7/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0+	0.0+	0.0
+20 MESH	0.0+	0.0+	0.0
+30 MESH	0.0+	0.0+	0.1
+50 MESH	0.0+	0.0+	0.5
+60 MESH	0.0+	0.0+	1.4
+100 MESH	0.0+	0.0+	21.0
+140 MESH	0.0+	0.0+	39.1
+200 MESH	0.0+	0.0+	58.5
+325 MESH	0.0+	0.0+	81.1
-325 MESH(WEIGHT PERCENT)	0.0+	0.0+	18.9

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

S3 - WATER TO VENTURI SCRUBBER (EE-201)

SOLIDS FILTERED FROM SAMPLE

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-G-6

SAMPLE NUMBER	S3-243	S3-244	S3-245	S3-246	S3-247
TIME	20:45	1: 0	5: 0	9: 0	9: 0
DATE	4/ 8/78	4/ 9/78	4/ 9/78	4/10/78	4/10/78

U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT				
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+8 MESH	0.0+	0.0+	0.0	0.0+	0.0+
+20 MESH	0.0+	0.0+	0.0	0.0+	0.0+
+30 MESH	0.0+	0.0+	0.0	0.0+	0.0+
+50 MESH	0.0+	0.0+	0.1	0.0+	0.0+
+60 MESH	0.0+	0.0+	0.2	0.0+	0.0+
+100 MESH	0.0+	0.0+	0.9	0.0+	0.0+
+140 MESH	0.0+	0.0+	2.6	0.0+	0.0+
+200 MESH	0.0+	0.0+	87.7	0.0+	0.0+
+325 MESH	0.0+	0.0+	92.8	0.0+	0.0+
-325 MESH(WEIGHT PERCENT)	0.0+	0.0+	7.2	0.0+	0.0+

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

S3 - WATER TO VENTURI SCRUBBER <EE-201>

SOLIDS FILTERED FROM SAMPLE

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-0-2C

SAMPLE NUMBER	S3-277	S3-278	S3-279	S3-280	S3-281
TIME	21:45	6:0	6:0	10:30	14:0
DATE	8/27/78	8/28/78	8/28/78	8/28/78	8/28/78

U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT				
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+8 MESH	0.0+	0.0+	0.0+	0.0+	0.0+
+20 MESH	0.0+	0.0+	0.0+	0.0+	0.0+
+30 MESH	0.0+	0.0+	0.0+	0.0+	0.0+
+50 MESH	0.0+	0.0+	0.0+	0.0+	0.0+
+60 MESH	0.0+	0.0+	0.0+	0.0+	0.0+
+100 MESH	0.0+	3.7	0.0+	0.0+	0.0+
+140 MESH	0.0+	1.6	0.0+	0.0+	0.0+
+200 MESH	0.0+	3.4	0.0+	0.0+	0.0+
+325 MESH	0.0+	10.5	0.0+	0.0+	0.0+
-325 MESH<WEIGHT PERCENT>	0.0+	89.5	0.0+	0.0+	0.0+

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

S3 - WATER TO VENTURI SCRUBBER (EE-201)

SOLIDS FILTERED FROM SAMPLE

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-0-3

SAMPLE NUMBER

S3-282

S3-283

S3-284

TIME

14: 0

18:45

22: 0

DATE

8/29/78

8/29/78

8/29/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0. 0+	0. 0+	0. 0+
+20 MESH	0. 0+	0. 0+	0. 0+
+30 MESH	0. 0+	0. 0+	0. 0+
+50 MESH	0. 0+	0. 0+	0. 0+
+60 MESH	0. 0+	0. 0+	0. 0+
+100 MESH	0. 0+	0. 3	0. 0+
+140 MESH	0. 0+	0. 6	0. 0+
+200 MESH	0. 0+	4. 2	0. 0+
+325 MESH	0. 0+	15. 9	0. 0+
-325 MESH(WEIGHT PERCENT)	0. 0+	84. 1	0. 0+

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

S3 - WATER TO VENTURI SCRUBBER<EE-201>

SOLIDS FILTERED FROM SAMPLE COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-0-20

SAMPLE NUMBER	S3-277	S3-278	S3-279	S3-280	S3-281
TIME	21:45	6: 0	6: 0	10:30	14: 0
DATE	8/27/78	8/28/78	8/28/78	8/28/78	8/28/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+80 MICRONS	0.0+	0.0	0.0+	0.0+	0.0+
+64 MICRONS	0.0+	2.2	0.0+	0.0+	0.0+
+51 MICRONS	0.0+	3.5	0.0+	0.0+	0.0+
+40 MICRONS	0.0+	7.7	0.0+	0.0+	0.0+
+32 MICRONS	0.0+	20.7	0.0+	0.0+	0.0+
+25 MICRONS	0.0+	39.5	0.0+	0.0+	0.0+
+20 MICRONS	0.0+	59.7	0.0+	0.0+	0.0+
+16 MICRONS	0.0+	71.2	0.0+	0.0+	0.0+
+13 MICRONS	0.0+	78.7	0.0+	0.0+	0.0+
+10 MICRONS	0.0+	85.0	0.0+	0.0+	0.0+
+8.0 MICRONS	0.0+	89.4	0.0+	0.0+	0.0+
+6.4 MICRONS	0.0+	92.6	0.0+	0.0+	0.0+
+5.0 MICRONS	0.0+	95.9	0.0+	0.0+	0.0+
+4.0 MICRONS	0.0+	98.2	0.0+	0.0+	0.0+
+3.2 MICRONS	0.0+	100.0	0.0+	0.0+	0.0+
+2.5 MICRONS	0.0+	100.0	0.0+	0.0+	0.0+

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

S3 - WATER TO VENTURI SCRUBBER<EE-201>

SOLIDS FILTERED FROM SAMPLE COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-0-3

SAMPLE NUMBER

S3-282

S3-283

S3-284

TIME

14: 0

18:45

22: 0

DATE

8/29/78

8/29/78

8/29/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+80 MICRONS	0.0+	4.5	0.0+
+64 MICRONS	0.0+	36.8	0.0+
+51 MICRONS	0.0+	57.2	0.0+
+40 MICRONS	0.0+	72.6	0.0+
+32 MICRONS	0.0+	78.3	0.0+
+25 MICRONS	0.0+	85.9	0.0+
+20 MICRONS	0.0+	91.9	0.0+
+16 MICRONS	0.0+	95.1	0.0+
+13 MICRONS	0.0+	96.8	0.0+
+10 MICRONS	0.0+	98.3	0.0+
+8.0 MICRONS	0.0+	99.1	0.0+
+6.4 MICRONS	0.0+	99.5	0.0+
+5.0 MICRONS	0.0+	99.9	0.0+
+4.0 MICRONS	0.0+	100.0	0.0+
+3.2 MICRONS	0.0+	100.0	0.0+
+2.5 MICRONS	0.0+	100.0	0.0+

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

S4 - WATER TO RAW GAS SCRUBBER(DA-201)

SOLIDS FILTERED FROM SAMPLE

CHEMICAL ANALYSIS

RUN 2-DB-G

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	S4-246	S4-247	S4-248	S4-249	S4-250	S4-251	S4-252
TIME	6: 0	10: 0	14: 0	19:50	1: 0	5: 0	9: 0
DATE	4/ 7/78	4/ 7/78	4/ 7/78	4/ 8/78	4/ 9/78	4/ 9/78	4/10/78
PROXIMATE ANALYSIS							

VOLATILE MATTER	0.0+	0.0+	0.0+	0.0+	10.3	0.0+	0.0+
FIXED CARBON	0.0+	0.0+	0.0+	0.0+	70.5	0.0+	0.0+
ASH	0.0+	0.0+	0.0+	0.0+	19.2	0.0+	0.0+
TOTAL	0.0	0.0	0.0	0.0	100.0	0.0	0.0

ULTIMATE ANALYSIS

HYDROGEN	0.0+	0.0+	0.0+	0.0+	2.1	0.0+	0.0+
CARBON	0.0+	0.0+	0.0+	0.0+	73.6	0.0+	0.0+
NITROGEN	0.0+	0.0+	0.0+	0.0+	1.1	0.0+	0.0+
OXYGEN	0.0	0.0	0.0	0.0	2.1	0.0	0.0
SULFUR	0.0+	0.0+	0.0+	0.0+	1.9	0.0+	0.0+
ASH	0.0+	0.0+	0.0+	0.0+	19.2	0.0+	0.0+
TOTAL	0.0	0.0	0.0	0.0	100.0	0.0	0.0

HEAT OF COMBUSTION (BTU/LB)	0. +	0. +	0. +	0. +	11800.	0. +	0. +
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+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

S4 - WATER TO RAW GAS SCRUBBER(DA-201)

SOLIDS FILTERED FROM SAMPLE

CHEMICAL ANALYSIS

RUN 2-DB-0-2B

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	S4-277	S4-278	S4-279	S4-280	S4-281	S4-282	S4-283
TIME	8:15	13:30	18: 0	21:30	1:30	6: 0	10: 0
DATE	8/26/78	8/26/78	8/26/78	8/26/78	8/27/78	8/27/78	8/27/78
PROXIMATE ANALYSIS							
VOLATILE MATTER	0.0+	0.0+	0.0+	0.0+	0.0+	8.1	0.0+
FIXED CARBON	0.0+	0.0+	0.0+	0.0+	0.0+	73.0	0.0+
ASH	0.0+	0.0+	0.0+	0.0+	0.0+	19.0	0.0+
TOTAL	0.0	0.0	0.0	0.0	0.0	100.0	0.0
ULTIMATE ANALYSIS							
HYDROGEN	0.0+	0.0+	0.0+	0.0+	0.0+	2.0	0.0+
CARBON	0.0+	0.0+	0.0+	0.0+	0.0+	73.4	0.0+
NITROGEN	0.0+	0.0+	0.0+	0.0+	0.0+	0.9	0.0+
OXYGEN	0.0	0.0	0.0	0.0	0.0	2.7	0.0
SULFUR	0.0+	0.0+	0.0+	0.0+	0.0+	2.0	0.0+
ASH	0.0+	0.0+	0.0+	0.0+	0.0+	19.0	0.0+
TOTAL	0.0	0.0	0.0	0.0	0.0	100.0	0.0
HEAT OF COMBUSTION (BTU/LB)	0. +	0. +	0. +	0. +	0. +	11700.	0. +

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

004

S4 - WATER TO RAW GAS SCRUBBER (DA-201)

SOLIDS FILTERED FROM SAMPLE

CHEMICAL ANALYSIS

RUN 2-DB-0-3

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER	S4-287	S4-288	S4-289
TIME	14: 0	18:48	22: 0
DATE	8/29/78	8/29/78	8/29/78

PROXIMATE ANALYSIS

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VOLATILE MATTER	0.0+	9.9	0.0+
FIXED CARBON	0.0+	70.4	0.0+
ASH	0.0+	19.7	0.0+
TOTAL	0.0	100.0	0.0

ULTIMATE ANALYSIS

HYDROGEN	0.0+	2.2	0.0+
CARBON	0.0+	72.8	0.0+
NITROGEN	0.0+	0.9	0.0+
OXYGEN	0.0	2.3	0.0
SULFUR	0.0+	2.1	0.0+
ASH	0.0+	19.7	0.0+
TOTAL	0.0	100.0	0.0

HEAT OF COMBUSTION (BTU/LB)	0. +	11800.	0. +
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+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

S4 - WATER TO RAW GAS SCRUBBER(DA-201)

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-G

SAMPLE NUMBER	S4-246	S4-247	S4-248	S4-249	S4-250	S4-251	S4-252
TIME	6: 0	10: 0	14: 0	19:50	1: 0	5: 0	9: 0
DATE	4/ 7/78	4/ 7/78	4/ 7/78	4/ 8/78	4/ 9/78	4/ 7/78	4/10/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0+	0.0+	0.0+	0.0+	0.0	0.0+	0.0+
+20 MESH	0.0+	0.0+	0.0+	0.0+	0.0	0.0+	0.0+
+30 MESH	0.0+	0.0+	0.0+	0.0+	0.0	0.0+	0.0+
+50 MESH	0.0+	0.0+	0.0+	0.0+	0.1	0.0+	0.0+
+60 MESH	0.0+	0.0+	0.0+	0.0+	0.5	0.0+	0.0+
+100 MESH	0.0+	0.0+	0.0+	0.0+	12.0	0.0+	0.0+
+140 MESH	0.0+	0.0+	0.0+	0.0+	30.1	0.0+	0.0+
+200 MESH	0.0+	0.0+	0.0+	0.0+	51.0	0.0+	0.0+
+325 MESH	0.0+	0.0+	0.0+	0.0+	85.0	0.0+	0.0+
-325 MESH(WEIGHT PERCENT)	0.0+	0.0+	0.0+	0.0+	15.0	0.0+	0.0+

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

SAMPLE NUMBER

S4-253

TIME

9: 0

DATE

4/10/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0+
+20 MESH	0.0+
+30 MESH	0.0+
+50 MESH	0.0+
+60 MESH	0.0+
+100 MESH	0.0+
+140 MESH	0.0+
+200 MESH	0.0+
+325 MESH	0.0+
-325 MESH(WEIGHT PERCENT)	0.0+

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

S4 - WATER TO RAW GAS SCRUBBER(DA-201)

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-0-28

SAMPLE NUMBER	S4-277	S4-278	S4-279	S4-280	S4-281	S4-282	S4-283
TIME	8:15	13:30	18:0	21:30	1:30	6:0	10:0
DATE	8/26/78	8/26/78	8/26/78	8/26/78	8/27/78	8/27/78	8/27/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

U. S. SIEVE SIZE	S4-277	S4-278	S4-279	S4-280	S4-281	S4-282	S4-283
+8 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0	0.0+
+20 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0	0.0+
+30 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0	0.0+
+50 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0	0.0+
+60 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+100 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	0.5	0.0+
+140 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	7.4	0.0+
+200 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	34.3	0.0+
+325 MESH	0.0+	0.0+	0.0+	0.0+	0.0+	43.8	0.0+
-325 MESH(WEIGHT PERCENT)	0.0+	0.0+	0.0+	0.0+	0.0+	56.2	0.0+

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

S4 - WATER TO RAW GAS SCRUBBER(DA-281)

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-0-3

SAMPLE NUMBER	S4-287	S4-288	S4-289
TIME	14: 0	18:48	22: 0
DATE	8/29/78	8/29/78	8/29/78

U. S. SIEVE SIZE	CUMMULATIVE WEIGHT PERCENT		
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+8 MESH	0. 0+	0. 0	0. 0+
+20 MESH	0. 0+	0. 0	0. 0+
+30 MESH	0. 0+	0. 0	0. 0+
+50 MESH	0. 0+	0. 0	0. 0+
+60 MESH	0. 0+	0. 0+	0. 0+
+100 MESH	0. 0+	0. 0	0. 0+
+140 MESH	0. 0+	0. 1	0. 0+
+200 MESH	0. 0+	1. 5	0. 0+
+325 MESH	0. 0+	12. 1	0. 0+
-325 MESH(WEIGHT PERCENT)	0. 0+	87. 9	0. 0+

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

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S4 - WATER TO RAW GAS SCRUBBER(DA-201)

SOLIDS FILTERED FROM SAMPLE COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-0-28

SAMPLE NUMBER	S4-277	S4-278	S4-279	S4-280	S4-281	S4-282	S4-283
TIME	8:15	13:30	18:00	21:30	1:30	6:00	10:00
DATE	8/26/78	8/26/78	8/26/78	8/26/78	8/27/78	8/27/78	8/27/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+80 MICRONS	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+64 MICRONS	0.0+	0.0+	0.0+	0.0+	0.0+	15.4	0.0+
+51 MICRONS	0.0+	0.0+	0.0+	0.0+	0.0+	31.7	0.0+
+40 MICRONS	0.0+	0.0+	0.0+	0.0+	0.0+	58.1	0.0+
+32 MICRONS	0.0+	0.0+	0.0+	0.0+	0.0+	74.0	0.0+
+25 MICRONS	0.0+	0.0+	0.0+	0.0+	0.0+	85.3	0.0+
+20 MICRONS	0.0+	0.0+	0.0+	0.0+	0.0+	88.0	0.0+
+16 MICRONS	0.0+	0.0+	0.0+	0.0+	0.0+	89.4	0.0+
+13 MICRONS	0.0+	0.0+	0.0+	0.0+	0.0+	91.2	0.0+
+10 MICRONS	0.0+	0.0+	0.0+	0.0+	0.0+	93.2	0.0+
+8.0 MICRONS	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+6.4 MICRONS	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+5.0 MICRONS	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+4.0 MICRONS	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+3.2 MICRONS	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+
+2.5 MICRONS	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+	0.0+

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

S4 - WATER TO RAW GAS SCRUBBER(DA-201)

SOLIDS FILTERED FROM SAMPLE COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-0-3

SAMPLE NUMBER	S4-287	S4-288	S4-289
TIME	14: 0	18:48	22: 0
DATE	8/29/78	8/29/78	8/29/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

U. S. SIEVE SIZE	S4-287	S4-288	S4-289
+80 MICRONS	0.0+	0.0+	0.0+
+64 MICRONS	0.0+	33.8	0.0+
+51 MICRONS	0.0+	51.6	0.0+
+40 MICRONS	0.0+	61.7	0.0+
+32 MICRONS	0.0+	67.4	0.0+
+25 MICRONS	0.0+	71.5	0.0+
+20 MICRONS	0.0+	74.7	0.0+
+16 MICRONS	0.0+	78.7	0.0+
+13 MICRONS	0.0+	80.2	0.0+
+10 MICRONS	0.0+	84.4	0.0+
+8.0 MICRONS	0.0+	88.9	0.0+
+6.4 MICRONS	0.0+	92.5	0.0+
+5.0 MICRONS	0.0+	96.3	0.0+
+4.0 MICRONS	0.0+	99.1	0.0+
+3.2 MICRONS	0.0+	0.0+	0.0+
+2.5 MICRONS	0.0+	0.0+	0.0+

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

90t

S5 - EFFLUENT FROM SCRUBBER SURGE TANK<FA-215>

WATER SAMPLES

RUN 2-DB-A-2

SAMPLE NUMBER

S5-209

TIME

5:30

DATE

9/26/77

COMPONENTS

PHENOLS (PPM)	0.0+
COD (PPM)	0.0+
P-ALKALINITY (GR/GAL)	0.0+
M-ALKALINITY (GR/GAL)	0.0+
N AS NH3 (PPM)	0.0+
S (PPM)	0.0+
CHLORIDE (PPM)	0.0+
DISSOLVED SOLIDS (PPM)	0.0+
THIOCYANATE (PPM)	0.0+
CYANIDE (PPM)	0.0+
PH	4.4
TSS (WEIGHT %)	0.0*

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

Lot

SS - EFFLUENT FROM SCRUBBER SURGE TANK<FA-215>

WATER SAMPLES

RUN 2-DB-B-1

SAMPLE NUMBER

SS-210

TIME

13:40

DATE

10/25/77

COMPONENTS

PHENOLS (PPM)	0.0+
COD (PPM)	0.0+
P-ALKALINITY (GR/GAL)	0.0+
M-ALKALINITY (GR/GAL)	0.0+
N AS NH3 (PPM)	0.0+
S (PPM)	0.0+
CHLORIDE (PPM)	0.0+
DISSOLVED SOLIDS (PPM)	0.0+
THIOCYANATE (PPM)	0.0+
CYANIDE (PPM)	0.0+
PH	4.0
TSS (WEIGHT %)	0.1

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

S5 - EFFLUENT FROM SCRUBBER SURGE TANK (FA-215)

WATER SAMPLES

RUN 2-DB-D-3

SAMPLE NUMBER S5-211

TIME 10:30

DATE 12/14/77

COMPONENTS

PHENOLS (PPM)	22.4
COD (PPM)	1290.0
P-ALKALINITY (GR/GAL)	0.0+
M-ALKALINITY (GR/GAL)	0.0+
N AS NH3 (PPM)	89.3
S (PPM)	0.0+
CHLORIDE (PPM)	0.0+
DISSOLVED SOLIDS (PPM)	0.0+
THIOCYANATE (PPM)	0.0+
CYANIDE (PPM)	0.0+
PH	2.3
TSS (WEIGHT %)	0.0*

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

SS - EFFLUENT FROM SCRUBBER SURGE TANK (FA-215)

WATER SAMPLES

RUN 2-DB-G-6

SAMPLE NUMBER

SS-212

TIME

1: 0

DATE

4/ 9/78

COMPONENTS

PHENOLS (PPM)	2800.0
COD (PPM)	9070.0
P-ALKALINITY (GR/GAL)	0.0+
M-ALKALINITY (GR/GAL)	0.0+
N AS NH3 (PPM)	1200.0
S (PPM)	234.0
CHLORIDE (PPM)	0.0+
DISSOLVED SOLIDS (PPM)	0.0+
THIOCYANATE (PPM)	0.0+
CYANIDE (PPM)	0.0
PH	7.5
TSS (WEIGHT %)	2.9

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

S5 - EFFLUENT FROM SCRUBBER SURGE TANK (FA-215)

WATER SAMPLES

RUN 2-DB-H-2

SAMPLE NUMBER 55-213

TIME 0:30

DATE 4/27/78

COMPONENTS

PHENOLS (PPM)	930.0
COD (PPM)	6650.0
P-ALKALINITY (GR/GAL)	0.0+
M-ALKALINITY (GR/GAL)	0.0+
N AS NH3 (PPM)	468.0
S (PPM)	95.0
CHLORIDE (PPM)	0.0+
DISSOLVED SOLIDS (PPM)	0.0+
THIOCYANATE (PPM)	0.0
CYANIDE (PPM)	0.1
PH	0.0+
TSS (WEIGHT %)	0.0+

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

SS - EFFLUENT FROM SCRUBBER SURGE TANK (FA-215)

WATER SAMPLES

RUN 2-DB-J-3

SAMPLE NUMBER

SS-214

TIME

18:50

DATE

6/19/78

COMPONENTS

PHENOLS (PPM)	365.0
COD (PPM)	5740.0
P-ALKALINITY (GR/GAL)	0.0+
M-ALKALINITY (GR/GAL)	0.0+
N AS NH3 (PPM)	96.2
S (PPM)	147.0
CHLORIDE (PPM)	0.0+
DISSOLVED SOLIDS (PPM)	0.0+
THIOCYANATE (PPM)	0.0
CYANIDE (PPM)	0.0*
PH	7.1
TSS (WEIGHT %)	0.0*

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

S5 - EFFLUENT FROM SCRUBBER SURGE TANK<FA-215>

WATER SAMPLES

RUN 2-DB-M-1

SAMPLE NUMBER	S5-216	S5-217
TIME	13:45	22:30
DATE	7/27/78	7/27/78
COMPONENTS		

PHENOLS (PPM)	750.0	80.0
COD (PPM)	3920.0	1120.0
P-ALKALINITY (GR/GAL)	0.0+	0.0+
M-ALKALINITY (GR/GAL)	0.0+	0.0+
N AS NH3 (PPM)	7320.0	6150.0
S (PPM)	273.0	31.7
CHLORIDE (PPM)	0.0+	0.0+
DISSOLVED SOLIDS (PPM)	0.0+	0.0+
THIOCYANATE (PPM)	0.0+	0.0+
CYANIDE (PPM)	0.0+	0.0+
PH	7.3	8.6
TSS (WEIGHT %)	1.1	5.4

+ = NO ANALYSIS DONE
 * = TRACE
 ** = SUSPECT ANALYSIS

SS - EFFLUENT FROM SCRUBBER SURGE TANK (FA-215)

WATER SAMPLES

RUN 2-DB-0-1

SAMPLE NUMBER SS-218

TIME 14: 0

DATE 8/23/78

COMPONENTS

PHENOLS (PPM)	370. 0
COD (PPM)	1820. 0
P-ALKALINITY (GR/GAL)	0. 0+
M-ALKALINITY (GR/GAL)	0. 0+
N AS NH3 (PPM)	1030. 0
S (PPM)	434. 0
CHLORIDE (PPM)	0. 0+
DISSOLVED SOLIDS (PPM)	0. 0+
THIOCYANATE (PPM)	0. 0+
CYANIDE (PPM)	0. 0+
PH	8. 1
TSS (WEIGHT %)	5. 0

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

SS - EFFLUENT FROM SCRUBBER SURGE TANK (FA-215)

WATER SAMPLES

RUN 2-DB-0-2B

SAMPLE NUMBER SS-219

TIME 1:30

DATE 8/27/78

COMPONENTS

PHENOLS (PPM)	0.1
COD (PPM)	91.0
P-ALKALINITY (GR/GAL)	0.0+
M-ALKALINITY (GR/GAL)	0.0+
N AS NH3 (PPM)	289.0
S (PPM)	92.0
CHLORIDE (PPM)	0.0+
DISSOLVED SOLIDS (PPM)	0.0+
THIOCYANATE (PPM)	0.0+
CYANIDE (PPM)	0.0+
PH	7.1
TSS (WEIGHT %)	11.9

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

55 - EFFLUENT FROM SCRUBBER SURGE TANK (FA-215)

SOLIDS FILTERED FROM SAMPLE

CHEMICAL ANALYSIS

RUN 2-DB-G-6

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER 55-212

TIME 1: 0
DATE 4/ 9/78

PROXIMATE ANALYSIS

VOLATILE MATTER	11.2
FIXED CARBON	69.6
ASH	19.3
TOTAL	100.0

ULTIMATE ANALYSIS

HYDROGEN	2.2
CARBON	72.3
NITROGEN	0.7
OXYGEN	3.1
SULFUR	2.4
ASH	19.3
TOTAL	100.0

HEAT OF COMBUSTION (BTU/LB) 11700

+ = NO ANALYSIS DONE
* = TRACE
** = SUSPECT ANALYSIS

S5 - EFFLUENT FROM SCRUBBER SURGE TANK (FA-215)

SOLIDS FILTERED FROM SAMPLE

CHEMICAL ANALYSIS

RUN 2-DB-0-2B

BASIS: MOISTURE FREE WEIGHT PERCENT - ASTM D3180-74

SAMPLE NUMBER S5-219

TIME 1:30

DATE 8/27/78

PROXIMATE ANALYSIS

VOLATILE MATTER 6.6

FIXED CARBON 72.3

ASH 21.1

TOTAL 100.0

ULTIMATE ANALYSIS

HYDROGEN 1.6

CARBON 72.4

NITROGEN 0.9

OXYGEN 2.4

SULFUR 1.6

ASH 21.1

TOTAL 100.0

HEAT OF COMBUSTION (BTU/LB) 11500.

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

SS - EFFLUENT FROM SCRUBBER SURGE TANK(FA-215)

SOLIDS FILTERED FROM SAMPLE

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-G-6

SAMPLE NUMBER 55-212

TIME 1: 0

DATE 4/ 9/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0
+20 MESH	0.0
+30 MESH	0.0
+50 MESH	0.0
+60 MESH	2.3
+100 MESH	13.2
+140 MESH	30.5
+200 MESH	53.4
+325 MESH	82.6

-325 MESH(WEIGHT PERCENT) 17.4

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

S5 - EFFLUENT FROM SCRUBBER SURGE TANK<FA-215>

SOLIDS FILTERED FROM SAMPLE

PARTICLE SIZE DISTRIBUTION

RUN 2-DB-0-2B

SAMPLE NUMBER

S5-219

TIME

1:30

DATE

8/27/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+8 MESH	0.0
+20 MESH	0.0
+30 MESH	0.0
+50 MESH	0.0
+60 MESH	0.0+
+100 MESH	1.6
+140 MESH	5.5
+200 MESH	12.7
+325 MESH	40.9
-325 MESH<WEIGHT PERCENT>	59.1

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

55 - EFFLUENT FROM SCRUBBER SURGE TANK (FA-215)

SOLIDS FILTERED FROM SAMPLE COULTER ANALYSIS ON -325 MESH MATERIAL

RUN 2-DB-0-2B

SAMPLE NUMBER

55-219

TIME

1:30

DATE

8/27/78

U. S. SIEVE SIZE

CUMMULATIVE WEIGHT PERCENT

+80 MICRONS	0.0+
+64 MICRONS	35.4
+51 MICRONS	48.5
+40 MICRONS	56.3
+32 MICRONS	65.5
+25 MICRONS	75.0
+20 MICRONS	82.8
+16 MICRONS	88.3
+13 MICRONS	91.6
+10 MICRONS	95.2
+8.0 MICRONS	97.9
+6.4 MICRONS	99.2
+5.0 MICRONS	99.8
+4.0 MICRONS	99.9
+3.2 MICRONS	0.0+
+2.5 MICRONS	0.0+

+ = NO ANALYSIS DONE

* = TRACE

** = SUSPECT ANALYSIS

APPENDIX IV - MEMORANDA

Table of Contents

Material Balance improvements - Memorandum 7849-JLV-152-78
Activities to Close Material Balances - Memorandum 7849-JCO-024-78
Effect of Internal Baffle on Gasifier Operation - Memorandum 7849-EVG-174-78
Char System Study - Memorandum 7848-JSC-05-77
H.P. Char Slurry System - Memorandum 7849-JSC-33-78

INTER-OFFICE CORRESPONDENCE

TO J.L. Vukotich Bruceton
(OFFICE)

DATE March 2, 1978

FROM M. Kuttan Bruceton
(OFFICE)

NUMBER 7849-JLV-152-78

SUBJECT MATERIAL BALANCE IMPROVEMENTS

Several functions listed in your memo #7849-JLV-145-78, dated 2/15/78, were investigated, in light of the improvements toward an on-line material balance of the Synthane process. A summary of the findings and some conclusions are given below. It is based on my discussions with D. Stavsky, A. Mathur, J. Olson, D. Boyer and yourself.

1) Coal Feed Rate

- a) The ΔP correlations appear to be a promising technique of measuring the instantaneous coal feed rate into the gasification system. In order to increase the accuracy of these correlations, the parameters of Zenz's equations should be adjusted based on actual data of the process.
- b) There appears to be no standard instrumentation to measure solid rate in the Transfer Line. Two vendors (EE&G, Oak Ridge, Tennessee and Blake Instruments Company, New Jersey) claim to have the capability of solving the problems and agreed to look into the matter upon receiving more information.

2) Char Withdrawal Rate

- a) The sonic instrument to measure the slurry flow rate was installed. Calibration is needed. As soon as the instrument works properly, it is suggested that it is hooked up to the computer.
- b) Density measurement of the slurry is needed in order to measure the char rate. J. Olson will check on the availability of instrumentation for this purpose.

3) Char Analysis

- a) In order to minimize the time lag involved in the analysis of the char, a sampling point-closer to the gasifier- should be implemented.
- b) In order to further reduce the time lag of the char analysis, %C measurement of the slurry can be done within minutes after taking the sample at a desired frequency, using a Carbon Concentration Determinator (manufactured by ELCO Company, Michigan). The cost of such an instrument (including an analyzer) is \$14,000. Further investigation will be done by J. Olson in order to determine whether this analysis can be

done on-line or whether the lab analyzer can be used.

4) On-Line Gas Analysis

- a) Operation of the on-line analysis system requires an installment of a cleaning and drying system.
- b) Development of a new software package is required to support the on-line gas analysis.

5) CO₂ and H₂O Balances

- a) Assuming that the proposed scheme of controlling the pressure in the Primary Injector by the CO₂ vent valve will be used, CO₂ balance can be considerably improved by measuring the vent line in addition to the input line. Leakages can be estimated and compensated for.
- b) Closing the H₂O balance in the scrubbing area is essential. The proposed design change of the flow from FA-215 and the measurement of the net flow to the Thermal Oxidizer will solve the problem.
- c) The addition of the flow instruments on the damped and on the make up water will allow closure of the material balance in the Filter area.

6) Density Profile

Investigation will be continued in order to find a solution for this problem.

The above functions should be regarded as key functions to achieve an improved material balance (which is essential for meaningful process evaluation), and as a first step toward on-line calculation. It will also help to identify, on-line, steady state periods.

Most of the above suggestions have been proposed by the plant people. Priorities should be given if we want to achieve the above goals.

M. Kuttan

MK/cab

cc: B. Bergen, Bloomfield

INTER-OFFICE CORRESPONDENCE

TO E.O. Curtiss, Jr.
(OFFICE)

DATE March 23, 1978

FROM J.C. Olson
(OFFICE)

NUMBER 7849-JCO-024-78

SUBJECT ACTIVITIES TO CLOSE MATERIAL BALANCES

We have received three memos from the Technical Department in recent weeks on improving our material balances (7849-JLV-152-78, 7849-JLV-155-78, and 7849-EOC-1129-78). The purpose of this memo is to summarize the status and planned action for each of the items enumerated by M. Kутten. Please note that the engineering required to complete design for the items summarized here will require about 500 hours.

The following items have been identified by M. Kутten as key areas for study; the actions being taken or to be taken are as indicated:

1. Cleaning and Drying of Sample Streams to Process Analyzers

The Instrument Shop has proposed a system for removing water, oils, and solids from these sample streams. This proposal is presently being reviewed by your department. The equipment for AR-238-1 (coolers, coalescers, etc.) is on order by Maintenance.

2. Density and Flow Rate of Char Slurry

Some time ago we installed a sonic flow meter on the char slurry line 1" P4201 from FA-401. We have since written a work order (B9910) to calibrate this instrument and tie it into the computer. Also, Kay Ray has submitted a proposal for a nuclear density measurement device for this line. The combination of sonic flow meter and nuclear density meter could be used to calculate a mass flow. This calculation could be done automatically by the computer.

We are continuing to investigate other sources of mass flow and density meters.

3. Rapid Carbon and Ash Analysis

Engineering is now in the final design stages of a char slurry sample point. This sample point will be located directly below FA-401 with only 5 to 7 feet of pipe in between. It is designed so that it can be used as often as once every few minutes. This sample, in combination with the flow and density measurements, should provide complete data for the char line. We are still investigating means of quickly analyzing the sample once it is taken.

4. Water from Gas Scrubbing

Engineering has completed design for installation of heat exchangers EA-225A & B. The installation of these exchangers will permit EA-213SS to be used for blowdowns from FA-215. As you have suggested, if this blowdown is taken to FA-202, we can then measure the total water flow out of the Gas Scrubbing Area. This repiping of EA-213 & S is also included in the installation design of EA-225A & B.

5. Water in Filter Area

We have not yet looked at possible water losses in the Filter Area.

6. CO₂ in Petrocarb

A work order to install FE-9 in the vent from the primary injector was sent to Maintenance. The transmitter and integral orifice device are scheduled for delivery late next month (April). The more complicated problem of measuring the flow from vents on the lock hoppers has been investigated and remains unresolved at this time.

7. Steam Balance

Engineering is complete for all high pressure steam flow meters requested by the Technical Department.

I hope this summary is of use to you, Janet, and Mr. Kutten. If you have further questions, please call.

J.C. Olson

JCO/dee

cc: G.D. Cliff
K.V. Chauhan
J.L. Vukotich
E.V. Ganapathy
R.M. Stavsky
M. Kutten

INTER-OFFICE CORRESPONDENCE

TO G. D. Cliff (OFFICE) DATE May 11, 1978
FROM E. V. Ganapathy (OFFICE) NUMBER 7849-EVG-174-78
SUBJECT Effect of Internal Baffle on Gasifier Operation

Synthane Operating Committee has recommended the installation of a venetian blind type of baffle in the gasifier. The reasoning behind this recommendation is not clear at this time. However, our studies based on the operating data from the deep bed coal injection runs with Montana Rosebud Coal, data from IGT-Hygaz plant operation with Illinois #6 coal, and Ingemar Bjerle's calculations, conclude that the installation of baffles in the gasifier is a part of process optimization which should be done only after determining the influence of variables such as temperature, steam to coal ratio and residence time. Therefore, such modifications may be considered at a later time. Because of these conclusions we are discontinuing any further technical efforts to install the baffles. However, we will continue our comparative study of the data from Hygaz runs with Montana Coal, which IGT has been requested to send us, and Synthane runs.

Theoretical calculations of carbon conversions obtainable as a function of char residence time, steam to coal ratio, and average bed temperature were made by Ingemar Bjerle using the mathematical model proposed by IGT in "Preparation of a Coal Conversion Systems Data Book" section CFa 40. This model assumes an ideal stirred tank flow reactor for the solids and plug flow for the gases. The results are summarized in Figures 1, 2 and 3 where the abscissae are char residence time. Figure 1 has been replotted using coal residence time (or coal space time) in Figure 4. The Synthane plant has, to date, operated typically in the range of 20 minutes to 40 minutes coal residence time which represents a char residence time of 60 to 150 minutes (depending on carbon conversion). Examination of Figures 1 through 4 indicates that any further increase in residence time has only a marginal influence on carbon conversion. In fact it appears that we may already have more than adequate residence time. Similarly, steam to coal ratio also has only a minor influence, on carbon conversion. However, the steam to coal ratio may have a little stronger influence than residence time does.

Installation of a baffle in the gasifier in effect will divide the bed into two with the upper bed operating at lower temperature. However, when the desired operating conditions of 1700°F or greater is maintained in the lower bed, residence times much lower than present levels will be required. Under these conditions, the upper bed will only act as a devolatilizing zone and will have essentially no influence on carbon conversion.

The results of Ingemar Bjerle's calculations and the published literature on the effect of baffles in fluidized beds can be interpreted as indicating that dividing the gasifier with a baffle does not increase carbon conversion. Experimental evidence in support of this conclusion can be obtained from a comparison of Synthane plant data and IGT-Hygas plant data. Synthane process uses a single fluidized bed while the IGT-Hygas plant is a multiple fluidized bed operation. However, both plants produce essentially the same carbon conversion, and ultimate methane. Methane concentration in the gas from the Hygas operation with Illinois #6 coal is somewhat higher than that from Synthane gas from Montana Rosebud Coal. These results are shown in Figures 5 through 8. The difference in methane production is partly due to the Hygas plant operating at 1000 psig as opposed to Synthane operating at 600 psig and the differences in the coal. However, Hygas process is expected to yield slightly higher methane than Synthane due to the former being a multi-bed operation which permits the final reactions to take place at a lower temperature before the gas is quenched.

One of the major operating problems we are presently having is growth of clinkers in the gasifier. Formation of clinkers is a function of the particle temperature and how effectively the hot (softened) char particles are prevented from contacting each other. These two quantities represent the heat transfer and fluidization efficiencies of the system. Installation of a baffle will interfere with the fluidization pattern and may have detrimental effects on heat transfer within the bed. It can be shown by suitable modelling that heat transfer from the gasifier cone to the main bed is effected primarily by the circulation or mixing of solids in the fluid bed. Thus obstructing this solids movement by any kind of baffling may be expected to promote localized high temperatures and thereby clinker growth.

In the final analysis, internal baffling of the gasifier will divide it into two or more bed operation and result in different temperature level for each bed. The advantage of such a system is a minor increase in methane content of raw gas. However, such baffling could promote clinker formation and does not contribute to increased carbon conversion.

Moreover, the coal feed may have to be terminated above the baffle where the temperature is low. In this case, the advantage of cracking the tars and other volatiles will be lost and we will be confronted once again with dirty gas in the scrubber system. The situation may revert to the operation we had with free fall injection of coal and the associated problems in the scrubber area.

In view of the above, we should not consider the installation of baffles in the gasifier until after solving the two most important problems, viz. clinker formation and fines removal from gasifier. An internal baffle in the gasifier may be considered as a process optimization which may be done after evaluating the effect of thermodynamic and kinetic variables, such as temperature, steam to coal ratio and particle residence time, on the process. In designing a baffled gasifier, the major advantage of the present design viz. simplicity of design, operation and scale up, must be considered.

E. V. Ganapathy

EVG/vw

cc:

S. E. Carson

E. O. Curtiss, Jr.

A. J. Weiss, Bloomfield

J. F. Frith, Bloomfield

Utah Tsao

Technical Personnel

MODEL: IGT

SOLID PHASE: IDEAL STIRRED TANK

GAS PHASE: PLUG FLOW

FIXED PARAMETER:

STEAM/COAL RATIO = 1.5 lb/lb

PRESSURE 40 atm.

OXYGEN/COAL RATIO = 0.23 lb/lb

FIG. 1 THE INFLUENCE OF TEMPERATURE ON CARBON-CONVERSION

The figures are showing parametric sensitivity of the Synthane process. The carbon conversion level might be somewhat in error because thermobalance experimental data of Rosebud coal is lacking and certain parameters had to be estimated. Also the IGT models separates devolatilization - and char gasification step. In the Synthane process both processes are running in parallel.

FIXED PARAMETERS:

TEMP. = 1500° F

S/C ratio = 1.5 lb/lb

O/C ratio = 0.23 lb/lb

FIG. 2 INFLUENCE OF PRESSURE ON CARBON-CONVERSION

FIXED PARAMETERS:

O/C = 0.23 lb/lb

TEMP = 1400, 1500°F

PRESSURE 40 atm.

FIG. 3 THE INFLUENCE OF STEAM/COAL RATIO ON CARBON CONVERSION

FIG. 4 INFLUENCE OF RESIDENCE TIME ON CARBON CONVERSION

FIG. 5 COMPARISON OF SYNTHANE 1-DB DATA AND IGT-HYGAS DATA

FIG. 6 COMPARISON OF SYNTHANE, 1-DB DATA AND IGT-HYGAS DATA

FIG. 7 COMPARISON OF SYNTHANE 1-DB DATA AND IGT-HYGASH DATA

FIG. 8 COMPARISON OF SYNTHANE 1-DB AND IGT-HYGAS DATA

INTER-OFFICE CORRESPONDENCE

TO D. M. Bailey
(OFFICE)

DATE September 27, 1977

FROM J. S. Chartier/D. M. Jackson
(OFFICE)

NUMBER 7848-JSC-05-77

SUBJECT Char System Study

In memorandum 7848-DMJ-32-77, dated March 4, 1977, the conclusions derived from a Technical Department study of the use of a Char Lock Hopper as a High Pressure Slurry Tank were presented. At that time a preliminary P & I diagram was also made available.

Further examination of this design proposal has resulted in preparation of a detailed P & I diagram and preliminary valve/orifice/transmitter specifications, both of which are attached. Also included in the attachments is a material balance diagram.

The proposed design scheme offers, in addition to the basic system advantages quoted in the previous memorandums, the advantages of controlling the total filtrate circulation rate while maintaining the flexibility to re-distribute flows as operating experience dictates.

The basic premise behind this redesign is that char flow rates and slurry concentration can best be stabilized by operating the H.P. Slurry Tank at the same pressure as the Char Cooler. A bed of char will be built in the Char Cooler with removal to the Slurry Tank by gravity flow via an overflow nozzle. Filtrate will be recycled to the H.P. Slurry Tank in a quantity sufficient to dilute the slurry to a 10 wt. % concentration and bring the temperature to 160°F.

Differential pressure between the Char Cooler and the H.P. Slurry Tank is maintained at zero psi by the addition of CO₂ to the H.P. Slurry Tank. A portion of the CO₂ is absorbed by the circulating filtrate, thus a constant CO₂ bleed system has been included to aid in smoothing pressure fluctuations.

If the Gasifier/Char Cooler system pressure should decrease relative to the H.P. Slurry Tank, pressure equalization between the Char Cooler and the Slurry Tank will take place through the 6" overflow pipe. In the event that the Char Cooler pressure increases over the Slurry Tank pressure, a differential pressure control valve has been included to provide sufficient CO₂ for maintaining system differential.

In the normal mode of operation, 21.6 gpm of filtrate is distributed between two agitation rings immersed in the vessel, and a spray nozzle located in the vapor space above the liquid. The bottom agitation ring, located within the cone portion of the Lock Hopper, receives 5.1 gpm of the filtrate so as to agitate the cone volume. The upper agitation ring is located 0.5 feet above the cone line with nozzles directed such that bridging of the cone by

char will not occur. This ring will receive a flow of 10.8 gpm under control by FCV-403. The spray nozzle receives 5.7 gpm of filtrate for the purpose of condensing steam entrained from the Char Cooler as well as scrubbing the vapor space of any particulate matter.

The flows to the lower agitation ring and the spray nozzle are measured and controlled individually by restriction orifices and rotameters. Minor flow adjustments may be made by adjusting the respective downstream globe valves.

Major control of the filtrate flow is accomplished by FCV-403 which is a board operated flow control valve. This flow may be varied to a maximum of 19.2 gpm for the purposes of adjusting slurry concentration and/or vessel agitation and cooling.

The attached P & I Diagram illustrates valving in the system which allows a large degree of flexibility in the distribution of filtrate flow between the upper agitation ring and the spray nozzle. The distribution ring may be isolated entirely with a maximum flow being routed to the overhead spray. Alternately, the flows may be distributed in any desired proportion while still maintaining control of the total filtrate circulation.

Control of the filtrate flow to the lower agitation ring is intentionally narrow. As this ring is designed for agitation and dilution purposes only, and is not required for the heat balance, the design flowrate is considered to be the maximum required.

Implementation of the system will require the acquisition of the required globe valves and restriction orifices. The two control valves, one CO₂ and one filtrate, are existing in the present system and can be modified as required. Additionally, both the existing filtrate flow transmitter and the differential pressure control transmitter may be utilized in the new design.

J. S. Chartier

JSC:lw

cc: S. E. Carson
N. P. Dorsey
P. C. Strebing
A. J. Weiss, Bloomfield
Technical Personnel

VALVE SPECIFICATIONS
(Preliminary)

CO₂ Pressurization Valves

	<u>PDCV-443</u> (Existing)
Flowing Fluid	CO ₂
Upstream Pressure, psig	750
Upstream Temperature, °F	120
Downstream Pressure, psig	600
Normal Flow rate, lb/hr.	---
SCFH	---
Maximum Flow rate, SCFH	1336
Maximum C _v	'0.1
Expected C _v	---

Filtrate Control Valve

	<u>FCV-403</u> (Existing)
Flowing Fluid	Filtrate
Upstream Pressure, psig	1105
Upstream Temperature, °F	115
Downstream Pressure, psig	729
Normal Flow rate, lb/hr.	5347
GPM	10.8
Maximum C _v	2.5
Expected C _v	0.57

ORIFICE SPECIFICATIONS
(Preliminary)

	<u>OR-A</u> (New)	<u>OR-B</u> (New)	<u>OR-C</u> (New)
Flowing Fluid	Filtrate	Filtrate	Filtrate
Upstream Pressure, psig	1105	1105	729
Temperature, °F	115	115	115
Downstream Pressure, psig	805	755	622
Line Size, inches	1 Sch. 80	1 1/2 Sch. 80	1 1/2 Sch.
Bore Diameter, inches	0.128	0.132	0.242
B Ratio	0.134	0.088	0.161
Design Flow rate, lb/hr.	2525	2822	5346
gpm	5.1	5.7	10.8

ROTAMETER SPECIFICATIONS

	<u>FI-404</u>
Flowing Fluid	CO ₂
Upstream Pressure, psig	750
Temperature, °F	120
Downstream Pressure, psig	600
Normal Flow rate, lb/hr.	176.9
SCFH	1525
Maximum Flow rate, SCFH	3259
Normal Reading	47%
Model	W/T 5120M12532

TRANSMITTER DATA
(Preliminary)

FT-403
(Existing)

Flowing Fluid	Filtrate
Upstream Pressure, psig	1150
Upstream Temperature	115
Downstream Pressure, psig	--
Line Size, inches	3 Sch. 80
Bore Diameter, inches	0.8784
Transmitter P, inches H ₂ O	127.2
Normal Flow rate, lb/hr.	10690
gpm	21.6
Maximum Flow rate, lb/hr.	14850
gpm	30
Normal Reading	7.2
Flow Factor, gpm per division	3.0

PDT-443
(New)

Fluid (Char Cooler)	CO ₂ /Steam
Temperature, °F	600
Pressure (Design), psig	600
Fluid (Lock Hopper)	CO ₂
Temperature, °F	120
Pressure (Design), psig	600
Maximum Differential, psig	1000
Range, psi	-1 to +10

H.P. SLURRY TANK QUENCH/AGITATION WATER DISTRIBUTION

UPPER RING TO BE $1\frac{1}{2}$ " Sched. 80 with 1" NOZZLES DRILLED TO $\frac{1}{8}$ "
LOWER RING TO BE 1" Sched 80 with 1" NOZZLES DRILLED TO $\frac{3}{32}$ "

ENLARGED TYPICAL TOP
VIEW OF RING

TYPICAL PLAN VIEW OF
BOTH RINGS

NOZZLES TANGENT
TO RING AT 60° INTERVALS

TYPICAL SIDE VIEW OF
UPPER RING

NOZZLES TO ALTERNATE
60°/30° FROM VERTICAL

TYPICAL SIDE VIEW OF
LOWER RING

NOZZLES TO ALTERNATE
60°/75° FROM VERTICAL

BY ISC DATE 8/29/77
CHKD. _____
BY _____ DATE _____

THE LUMMUS COMPANY

E. OR J. NO. 7848

SHEET _____ OF _____

SUBJECT CHAR SYSTEM STUDY - DISTRIBUTION RINGS

Stream	H ₂ O	CO ₂	Char	Temperature (°F)
1	5	-95	1200	574
2	—	332	—	120
3*	2822	—	—	115
4	5345	—	—	115
5	2525	—	—	115
6	-10713	-237	-1200	133.5
7	16	—	—	700
8	0	0	0	~133.5

Y. Smf
CHKD. BY
DATE 8/10/77

THE LUMMUS COMPANY

E. OR J. NO. 7848

SUBJECT Char Lock Hopper - Original Material Balance

SHEET OF

CHAR SYSTEM STUDY USE OF A CHAR LOCK HOPPER AS A H.P. CHAR SLURRY TANK

7848-SKD-DMJ-110-77
22 August 1977

INTER-OFFICE CORRESPONDENCE

TO E. O. Curtiss, Jr.
(OFFICE)

DATE October 31, 1978

FROM J. S. Chartier
(OFFICE)

NUMBER 8530-JSC-33-78

SUBJECT H.P. Char Slurry System

A review of the control scheme for the proposed use of a lock hopper as a char slurry tank has resulted in modifications as shown on the attached sheets. The following revisions were made to the original proposal for filtrate flow control:

- a) All restriction orifices were removed.
- b) Local flow controllers and control valves were substituted for the globe valves and rotameters.
- c) A pump recycle line with pressure control has been added.
- d) The filtrate flow rate to the spray nozzle has been increased considerably.

These revisions have been made necessary due to 1) the use of a positive displacement filtrate recycle pump, and 2) the use of a char transport system as opposed to the overflow withdrawal method proposed in memorandum 7849-JSC-05-77.

By utilizing a continuous recycle stream from the pump discharge, the pressure upstream of the control valves can remain constant, while the valves adjust for changes in downstream conditions. Furthermore, the continuous recycle allows the total filtrate flow rate to be adjusted higher or lower without having to constantly change the pump speed. Therefore, higher filtrate flow rates can be made immediately available directly from the control room. Controlling the pump discharge pressure in this manner also minimizes the possibility of exceeding the design pressure of the vessel should plugs develop in the char slurry system.

Attached to this memorandum is a heat balance which demonstrates the effect of steam transport of the char on the required filtrate flow rate. It is obvious from the heat balance that the largest heat duty is that required to condense and cool the incoming steam. When feeding char to the slurry tank via an overflow nozzle, only 21 lb/hr of steam is estimated to be entrained. When transporting the char by steam, however, a minimum of 360 lb/hr of steam enters the slurry tank. Furthermore, experience has shown us that as much as 2000-3000 lb/hr of steam may flow from the char cooler to the slurry tank with the char. Using an average

figure of 2500 lb/hr of char cooler steam results in the original design filtrate rate of 21.6 gpm cooling the feed mixture to only 370°F. At least 12 gpm of that filtrate flow would be required at the spray nozzle to desuperheat and condense the steam.

As perfect mixing and heat transfer is not expected to occur in the vapor space of the lock hopper, the filtrate rate to condense and cool the steam to 350°F was calculated. This quantity, approximately 24 gpm, is the present design flow assumed to be suitable for knocking down the steam feed to the slurry tank.

Therefore, depending on the operating conditions, the filtrate flow to the spray nozzle may be varied from 3 gpm, at low steam input, to 24 gpm. As a minimum filtrate flow of 19 gpm is required to maintain a maximum slurry concentration of 21 wgt%, 16 gpm is used for agitation and sensible heat removal. Maintaining the agitation flow rate as a constant results in variation of the total filtrate flow between 19 and 40 gpm. The slurry concentration may vary, depending on the char removal rate, between 21 wgt% and 5 wgt%.

The operational procedure for the system should be as follows.

- a) Set recycle pressure controller for 800 psig.
- b) Set speed control on GA-401 for a flow in excess of that required by the system (Approx. 50 gpm)
- c) Adjust upper ring flow controller for agitation flow required. This can be done on the control board.
- d) Adjust the local flow controllers for the suitable flows to the spray nozzle and lower distribution ring (See attached table).

By controlling the upper ring flow from the control room, the board operator can be assured that agitation is being constantly provided.

Data has been provided in the attachments to provide a check on the controllability of the valves, should the filtrate pump be operated at higher pressures.

A specification for the flow orifices, transmitters, and spray nozzle is also attached.

J. S. Chartier

JSC/vw

cc:

S. E. Carson N. P. Dorsey

G. D. Cliff

K.V. Chauhan

B. N. McSkimming

Technical Personnel

RECYCLE FILTRATE CONTROL USING
CHAR LOCK HOPPER AS H.P.
SLURRY TANK

10/20/78
 JSC

Char Slurry Tank Heat Balance

	Char Feedrate	Steam Flow rate	Filtrate Flow	Slurry Mix Temp	Heat Duty for Steam Only	Filtrate Required	Slurry Concent.
Overflow Feed	2500 #/Hr	21 #/Hr	21.6 GPM	150°F	0.025 MM BTU	1.4 GPM	18.8 wt%
Char Transport	2500 #/Hr	360 #/Hr	21.6 GPM	185°F	0.409 MM BTU	11.7 GPM	18.3 wt%
Char Transport	2500 #/Hr	2860 #/Hr	21.6 GPM	375°F	2.694 MM BTU	20.3 GPM	15.5 wt%
Char Transport	2500 #/Hr	2860 #/Hr	40.0 GPM	275°F	2.992 MM BTU	37.2 GPM	9.9 wt%
Char Transport	1200 #/Hr	360 #/Hr	21.6 GPM	170°F	0.415 MM BTU	15.1 GPM	9.7 wt%
Char Transport	1200 #/Hr	2860 #/Hr	21.6 GPM	370°F	2.708 MM BTU	20.8 GPM	8.1 wt%
Char Transport	1200 #/Hr	2860 #/Hr	40.0 GPM	270°F	3.006 MM BTU	38.5 GPM	5.0 wt%

- Notes:
- 1) Char / Steam mixture assumed to enter slurry tank at 600°F
 - 2) Filtrate assumed to enter slurry tank at 115°F
 - 3) Saturation Temp of Steam at 600 PSIG is $\approx 490^\circ\text{F}$

Char Transport	—	360 #/Hr	—	490°F	0.293 MM BTU	1.5 GPM	—
Char Transport	—	2860 #/Hr	—	490°F	2.328 MM BTU	11.8 GPM	—
Char Transport	—	2860 #/Hr	—	350°F	2.768 MM BTU	23.2 GPM	—

10/25/78
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LOCK HOPPER CHAR SLURRY TANK

SPECIFICATION SHEET FOR RECYCLE FILTRATE CONTROLS

A) CONTROL VALVES

	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
	(Lower Ring)	(Spray Nozz)	(Upper Ring)	(Recycle)
Flowing Fluid	Filtrate	Filtrate	Filtrate	Filtrate
Upstream Press., psig	750	750	750	80
Upstream Temp., °F	115	115	115	16
Downstream Press., psig	592	625	581	C
Normal Flowrate, gpm	10.8	24.1	5.1	10.0
Maximum Flowrate, gpm	20.0	30.0	10.0	50.0
Expected C_v	0.85	2.12	0.39	0.35
Maximum C_v	2.71	3.21	1.12	1.76

NOTE: Valve sizes are approximate

B) TRANSMITTERS

	<u>A</u>	<u>B</u>	<u>C</u>
	(Header)	(Spray Nozzle)	(Lower Ring)
Flowing Fluid	Filtrate	Filtrate	Filtrate
Upstream Pressure, psig	750	750	750
Upstream Temperature, °F	115	115	115
Line Size, inch	2.900	1.500	1.500
Bore Diameter, inch	1.045	0.768	0.540
Transmitter ΔP , inches H_2O	250	200	100
Normal Flowrate, gpm	30.0	24.1	5.1
Maximum Flowrate, gpm	60.0	30.0	10.0

C) SPRAY NOZZLE - Spraying Systems Co. Type IHS/IIHS Capacity 33 gpm at 150 psi 60° - 70° spray angle

Nozzle to be mounted so that spray impinges 10/26/78
above char inlet. JSC.

CHAR SLURRY RECYCLE FILTRATE PRESSURE PROFILE AND VALVE SIZES

	FLOWRATE GPM	RING/SPRAY Δ P PSI	CONTROL VALVE Δ P PSI	PUMP OUTLET PRESSURE PSIG	CONTROL VALVE CV		CONTROL VALVE Δ P PSI	CONTROL VALVE CV	PUMP OUTLET PRESSURE PSIG		SLURRY TANK P PSIG
LOWER RING	5.10 (NORMAL)	31	169	800	0.390		519	0.222	1150		550
	10.10 (MAX.)	121	79	800	1.119 (Full Open)		429	0.485 (2)	1150		550
UPPER RING	10.8 (NORMAL)	42	158	800	0.846		508	0.472	1150		550
	20.2 (MAX)	146	54	800	2.708 (Full Open)		404	0.990 (3)	1150		550
SPRAY NOZZLE	24.1 (NORMAL)	175	125	800	2.123		475	1.089	1150		550
	30.0 (MAX)	115	85	800	3.205 (Full Open)		435	1.417 (4)	1150		550

NOTES:

- 1) ΔP for piping and EA-401 assumed to be 50 psi. constant
- 2) Maximum possible flow 16.8 GPM
- 3) Maximum possible flow 34.3 GPM
- 4) Maximum possible flow 50.0 GPM

10/25/78

lee

CONTROL VALVES

VALVE FAILURE CODE	
O	= OPEN
S	= CLOSED
L	= LOCK UP

JOB: _____
DATE: 10/22/78
BY: js
SHEET: _____ OF _____

[illegible]

FLOW INSTRUMENTS

REV.	DATE	BY

NOTE: ANY OPERATING MINIMUM & MAXIMUM FLOW RATES SHALL BE LISTED WITH CORRESPONDING PRESSURE CONDITIONS.

PAGE: _____ OF _____

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