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SOLVENT REFINED COAL (SRC) PROCESS

Quarterly Technical Progress Report for January-March 1980

MASTER

January 1981

Work Performed Under Contract No. AC05-76ET10104

The Pittsburg & Midway Coal Mining Co.
Englewood, Colorado

U. S. DEPARTMENT OF ENERGY

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QUARTERLY TECHNICAL PROGRESS REPORT
FOR THE PERIOD
JANUARY 1980 THROUGH MARCH 1980

THE PITTSBURG & MIDWAY COAL MINING CO.
P. O. BOX 3396
ENGLEWOOD, COLORADO 80111

January 1981

PREPARED FOR THE
U.S. DEPARTMENT OF ENERGY
DIVISION OF COAL CONVERSION AND UTILIZATION
UNDER CONTRACT DEAC-0179-ET10104
(formerly EX-76-C-01-0496)

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ABSTRACT

This report summarizes the progress of the Solvent Refined Coal (SRC) project by The Pittsburgh & Midway Coal Mining Co. at the SRC Pilot Plant in Fort Lewis, Washington and the Gulf Science and Technology Company Process Development Unit (P-99) in Harmarville, Pennsylvania for the Department of Energy during the period January 1, 1980 through March 31, 1980. After the remaining runs of the slurry preheater survey test program were completed January 14, the Fort Lewis Pilot Plant was shut down to inspect Slurry Preheater B and to insulate the coil for future testing at higher rates of heat flux. Radiographic inspection of the coil showed that the welds at the pressure taps and the immersion thermowells did not meet design specifications. Slurry Preheater A was used during the first 12 days of February while weld repairs and modifications to Slurry Preheater B were completed. Two attempts to complete a material balance run on Powhatan No. 6 Mine coal were attempted during this time but neither was successful. Slurry Preheater B was in service the remainder of the quarter. The start of a series of runs at higher heat flux was delayed because of plugging in both the slurry and the hydrogen flow metering systems. Three baseline runs and three slurry runs of the high heat flux program were completed before the plant was shut down March 12 for repair of the Inert Gas Unit. Attempts during the remainder of the quarter to complete a fourth slurry run at high heat flux were unsuccessful because of problems with the coal feed handling and the vortex mix systems. Process Development Unit (P-99) completed three of the four runs designed to study the effect of dissolver L/D ratio. The fourth was under way at the end of the period. SRC yield correlations have been developed that include coal properties as independent variables. A preliminary ranking of coals according to their reactivity in PDU P-99 has been made. Techniques for studying coking phenomenon are now in place.

I. Summary

Testing of Slurry Preheater B continued through the first fourteen days of January. During this time, the final three runs of the II-2 slurry survey tests and a follow-up baseline run were completed.

The plant was shut down from January 14 to January 31 to inspect the preheater and to insulate the lower 30% of the coil. Inspection of the coil indicated that the welds joining the seven pressure taps and the seven immersion thermowells to the heater coil were not full penetration welds and did not conform to design specifications. Because repair of these welds was expected to require at least two weeks, the preheater test program was revised to include operation of the plant with Slurry Preheater A. After two unsuccessful attempts to line out for a material balance run with Slurry Preheater A, a short plant shutdown began February 13 to return to operation with Slurry Preheater B and resume the scheduled test program. Slurry Preheater B was returned to service February 15 but because of problems with the recycle slurry flowmeter (FT 1152) and discrepancies among the hydrogen flowmeters, the high heat flux test series did not resume until February 22, when two baseline runs P-10 and P-11 were completed.

Start of the first slurry run, A-2, at a higher heat flux (12,000 Btu/hr. Ft²) was delayed because of continuing problems with the hydrogen flowmeters, a leaking Grayloc hub at the dissolver inlet and loss of flow through Preheater Charge Pump B. Run A-2 was completed February 27 and a repeat of run A-2, designated AA-2, was completed March 6; a third slurry run, B-2, was completed March 11.

The results of these runs indicate that there should be no problems with the operation of a preheater designed for a heat flux as high as 12,000 Btu/hr.Ft². This conclusion is based on the following observations:

- 1) The preheater operated successfully under the high heat flux load.
- 2) Coil skin temperatures did not become high enough to cause any serious coking concern.

The plant was shut down on March 12 because of problems with the Inert Gas Unit. Repairs were completed March 19. Oil circulation and coal feed were started March 21 but each of several attempts to complete a fourth slurry run during the remainder of the month were unsuccessful, primarily because of problems with the vortex mix system and the coal feeding system.

Three of the four runs designed to study the effect of dissolver L/D ratio on SRC-II yields were completed in Process Development Unit P-99 and the fourth was under way. The first two of these runs used a 20-ft x 4-1/4 in. ID dissolver, while the last two runs used a 10-ft x 6-in. ID dissolver. The two different dissolvers exhibited a difference in axial temperature profile but no differences in operability were noted.

Yield structure and coal property data generated by PDU P-99 were assembled into a database from which a ranking based on reactivity can be made. Modeling and simulation of SRC reactor systems have developed yield correlations that include coal properties as well as process and hydrodynamic variables. Work has begun on development of a process cost model of the SRC-II process which will consist of modular processing blocks with the capital investment and operating costs as a fraction of the stream parameters. Laboratory corrosion tests confirmed that carbon steel can be used for handling SRC-II process water at 150°F but that Hasteloy C and Sandvik 3 RE 60 may be required for temperatures between 400 and 450°F. A study of SRC-II streams using techniques based on pressure differential scanning calorimetry and thermogravimetric microprocesses are providing a wide range of information on the fundamentals of coke formation.

II. Pilot Plant Operations, Engineering and Maintenance

A. Coal Receiving and Slurry Preparation (Area 01)

In the first quarter of 1980, approximately 1016 tons of Pittsburgh Seam coal from North American Coal Corporation's Powhatan No. 6 Mine were processed. The hourly onstream factor, adjusted for downtime not directly caused by process problems or equipment failures, was 69.0%. A coal processing summary is shown in Table A-1.

While the plant was shut down between January 14 and January 31, 1980, maintenance completed the following work in Area 01.

- 1) The thermocouple (TE 1132) on the recycle slurry line was relocated for more accurate slurry temperature measurements.
- 2) The pulverizer was opened, inspected, cleaned and returned to service.
- 3) The valve seats in Preheater Charge Pump A were bored out and replaced with larger seats.

Recycle slurry flowmeter (FT 1152) continues to be unreliable. During the quarter, restrictions in the orifice taps or impulse lines of this meter were a continuing problem. Although most of the restrictions were cleared by flushing with hot solvent, maintenance action was required three times in January, seven times in February and three times in March for cleaning and recalibration.

During March, a feasibility study was conducted to determine if the high slurry blend tank temperature requirements of the eight week SRC I test program planned for second quarter 1980

were possible. Results of this study indicated that a temperature of 375°F can be obtained with little modification to existing equipment, but higher temperatures may require a process solvent/Dowtherm heat exchanger, major piping modifications and possibly a pressurized system. Immediate plans are to complete the eight week test program at 375°F and to proceed with design modifications for higher temperatures only if it becomes necessary.

B. Slurry Preheating and Dissolving (Area 02)

Testing of Slurry Preheater B continued through the first fourteen days of January. During this time, the final three slurry survey II-2 test runs as well as a follow up baseline run were completed.

On January 14, the plant was shut down to inspect Slurry Preheater B for signs of erosion and coke deposition. No erosion was found but there were signs of coke deposition near the outlet of the coil.

During the inspection it was also discovered that the welds joining the seven pressure taps and seven immersion thermowells to the heater coil were not full penetration welds as originally specified by the manufacturer. To assure safe operation, repair of these welds was recommended by a representative of Heat Research Corporation. Repairs consisted of removal of all the thermowell elbows and pressure tap nipples from the coil and rewelding these in place with full penetration welds. Modifications to the coil consisted of the installation of eighteen additional thermocouples along the preheater coil and the addition of insulation around the bottom 30% of the coil.

At the end of January, Slurry Preheater A was commissioned for temporary use while repairs and modifications to Slurry Preheater B were completed. Operation with Slurry Preheater A was for the purpose of conducting a material balance run on Powhatan No. 6 Mine coal at target conditions similar to a previous run with Powhatan No. 5 Mine coal. Although two attempts were made to complete this run, neither attempt was successful. The first attempt was aborted February 9 when a leak developed at a bleed nipple riser in the transfer line, SL-13, between Slurry Preheater A and the dissolver. The second attempt was terminated February 12 because of problems with recycle slurry flowmeter FT 1152.

Slurry Preheater B was returned to service February 15 but because of problems with slurry flowmeter FT 1152 and discrepancies in the reading of hydrogen flow meters, testing did not resume until February 22. At this time, two baseline runs P-10 and P-11, were completed to establish reference numbers for the coil prior to the high heat flux runs.

The start of the first high heat flux run, A-2, was delayed because of continuing problems with the hydrogen flow meters, a leaking Grayloc hub at the dissolver inlet and loss of flow through Preheater Charge Pump B. Run A-2 finally began February 27 but was terminated within 3 hours because of a leak at a Grayloc fitting at preheater outlet thermocouple, TE 827. After the leak was repaired, a follow-up meter proving test was conducted to balance the hydrogen flowmeters for the preheater. Results, however, were unsatisfactory and indicated the need to inspect the hydrogen system.

At the end of February, plant operation was suspended to steam clean the hydrogen system of oil and grit which had apparently migrated from the recycle hydrogen purification and compression system into the flow elements of the meters.

Operation through the month of March was for the purpose of testing Slurry Preheater B at higher heat flux. One baseline run, P-12, was conducted March 3 not only to provide reference data but also to determine if coking of the coil had occurred February 23, when a safety valve on Preheater Charge Pump A lifted causing a drastic reduction in slurry flow to the preheater. Results of this test confirmed that no coking had occurred.

Coal was fed on March 4 and the second high heat flux run (AA-2) of the Slurry Preheater B experimental program was completed March 6. A third run (B-2) was completed March 11.

From March 12 through March 20, the plant was shut down for repair of the Inert Gas Unit. Work conducted in Area 02 during this shutdown included the installation of 30 new skin thermocouples in Slurry Preheater B, the installation of new trim in LCV 166A (the level control valve of the high pressure flash vessel), and the clearing of the differential pressure tap on coil no. 13 of Slurry Preheater B.

Oil circulation and coal injection began March 21. Several attempts to complete a fourth slurry run were unsuccessful because of problems with the coal feed handling and the vortex mix systems.

C. Solvent Recovery (Area 04)

During the January shutdown the Wash Solvent Column overhead fin fan cooler was retubed.

All operation during the quarter was with Vacuum Flash Drum B. Plugging of the system continued to be the major operating problem. Shutdowns were required February 4 to clear restrictions at the level control valve LCV 1465 and later at the feed control valve PCV 1405; February 12 to clear PCV 1405; February 24 to clear the spool piece down stream of LCV 1465; and March 26 to clear PCV 1405.

The end point specification for middle distillate was reduced twice to improve heavy distillate inventory. In February, it was reduced from 600°F to 575°F, and in March it was reduced from 575°F to 550°F.

D. Gas Recovery and Recompression (Area 05)

Cleaning of the hydrogen system was required twice during February after gas meter proving tests indicated the hydrogen lines were contaminated. Sediments which formed in the system were deposited on the hydrogen orifice plates and in the impulse lines, giving false flow readings. An emulsion of lubricating oil and amine was found in the recycle hydrogen compressor discharge scrubber, and a dry, black deposit in the suction scrubber. Indications are that foaming in either the DEA or Naphtha Unit, or both, may have contributed to the contamination.

The recycle hydrogen compressor suction and discharge scrubbers were again opened for inspection during the extended coal outage of March 12 through March 21. The suction scrubber contained approximately seven gallons of a mixture of water and a thin film of wet particulate matter on the walls of the vessel. The discharge scrubber also had a thin film of wet particulate matter on the vessel walls but contained no water. Both vessels were cleaned thoroughly before returning them to service.

E. Gas Systems (Area 09.5)

Inert Gas Unit

Coal feed was stopped between March 12 and March 21 to repair an internal crack which had developed in the MEA reboiler of the Inert Gas Unit. The crack, which was in the MEA stripper tower reflux preheater, allowed MEA solution to leak into the natural gas combustion barrel of the reboiler. Thermal decomposition products of the solution were carried through the deoxo catalyst and entered the nitrogen MEA absorber. This resulted in the contamination of the MEA solution. As a result, it was necessary to drain all solution to waste treatment and charge the unit with fresh solution. The deoxo catalyst was removed, the deoxo catalyst vessel cleaned, and the old catalyst returned to the unit. Temporary repairs were also made to the heat shield on the fired side of the preheater and to the refractory around the combustion barrel. Further repairs to this unit have been scheduled for the April/May shutdown.

DEA UNIT

On March 7 high foaming levels were observed in laboratory analyses of the DEA solution which are normally an indication of the presence of oil (carryover from the Recycle Condensate

Separator) in the solution. On March 8 the DEA Absorber foamed over into the Naphtha Unit. This caused an upset in the reaction area of the plant due to a sudden decrease in recycle hydrogen purity. New charcoal was charged to the DEA charcoal filter on March 8 and approximately 10 gallons of heavy oil were drawn from low points in the DEA system. Engineering is currently working on methods to control the formation of foam in this unit. As a first step, operation of the charcoal filters will become continuous rather than intermittent.

III. Process Analytical Data

The average results of selected samples analyzed on a routine basis are shown in Tables A-2 through A-9.

IV. Process Evaluation and Special Projects

A. SRC-II Liquids Inventory

In accord with standard procedure, weekly measurements were made of SRC-II liquids inventories during the recent SRC II operations. The results of these determinations are shown on Table A-10, and graphically presented in Figure A-1.

As the figure and table indicate, the major product accumulated during the period was middle distillate, which was produced at a rate of 1.2 bbl oil/ton feed coal. Naphtha production was next in abundance, with a net production rate of 0.4 bbl oil/ton feed coal. Heavy distillate production during the period was nearly zero. The decrease in heavy distillate was probably due to increasing the 90% overpoint of middle distillate to 540°F on December 8, 1979.

B. Preheater B Experimental Program

Following completion of the slurry survey series runs, a solvent and gas baseline run (F7-2T10) was made at conditions similar to those studied before the introduction of coal slurry to the heater.

The purpose of the F7-2T10 baseline run was to determine if any detectable changes in preheater instrumentation, pressure drop, or heat transfer had occurred during slurry service. Run F7-2T10 can be best compared to baseline run P-5B which had been performed prior to slurry service. Unfortunately, runs F7-2T10 and P-5B were not performed at precisely identical conditions. Run F7-2T10 had about an 11% lower distillate feedrate, and the preheater inlet temperature was 47°F higher. Also, the distillate feed in run F7-2T10 was contaminated with 5% solids. See Table A-11 for a more detailed comparison of the operating conditions maintained in the two runs.

Heat balances for the complete series of baseline runs of the slurry survey series are presented in Table A-12. Comparing runs P-5B and F7-2T10 (Table A-14) it can be seen that the calculated overall heat transfer coefficients for both runs were identical at $196 \text{ Btu}/(\text{hr})(\text{ft}^2)(^\circ\text{F})$, thus implying that no appreciable coking or impairment of temperature measurement resulted from slurry service.

Figure A-2 shows the heater temperature profiles obtained from runs P-5B and F2-7T10. The temperature profiles shown in Figure A-2 are similar except that the temperatures in run F7-2T10 are approximately 50°F higher due to the 50°F higher operating temperature of this run. Overall heat transfer coefficients calculated at several points along the coil yield the profiles shown in Figure A-3. Although the profiles are virtually identical through most of the coil length, they differ by around 20% at the outlet third of the coil. This difference suggested that some coking did occur in this region. Subsequent visual and radiographic inspection of this region did, in fact, confirm coke deposits. These coke deposits were removed during the January 14 shutdown to eliminate their possible interference in future tests.

Slurry Preheater B was returned to service on February 22 and two baseline runs, P-10 and P-11, were completed to establish reference numbers for the coil prior to the high heat flux runs.

For the high heat flux run series the lower part of the coil was insulated so that all required heat transfer will take place through the upper part of the coil. The high heat flux runs were designed to be directly compared to the results of the earlier slurry survey runs conducted at similar conditions with the coil uninsulated. The effects of heat flux level on preheater performance and operation can then be obtained.

Three baseline runs (P-10, P-11, and P-12) and three high heat flux runs of the program were completed. Run P-12 was a repeat of run P-10 and will be used for reference data on coil performance. Run conditions and sample analysis for the three baseline runs are listed in Tables A-13 and A-14, respectively. The results of the slurry runs will be reported at a later date.

C. Rheological Program

During the reporting period, the viscosities of a plant-produced vacuum bottoms sample and three recycle slurry samples were measured under inert gas pressure in the Haake Rotovisco pressure cell. The tested vacuum bottoms sample had the composition shown below:

<u>Component</u>	<u>WT %</u>
650-750°F	0.30
750-850°F	1.64
850°F (SRC)	57.25
Ash	31.87
IOM	8.94

The viscosity of the plant-produced vacuum bottoms sample was measured with the Haake Rotovisco viscometer with a pressure tight cell under an inert atmosphere. Shear rates up to the maximum allowable with the sample were used. The results, plotted as viscosity versus shear rate at two temperatures, are shown in Figure A-4. At very low shear rates (less than 100/sec), the sample exhibited highly non-Newtonian behavior, showing a high level of shear dependence. At higher levels of shear, however, the shear sensitivity decreased markedly.

The composition of the three synthesized recycle slurry blend samples is shown in Table A-15. Since an 850-900° cut could not be produced by laboratory distillation, some available 750-850° cut material was substituted for the heavier fraction.

Viscosity measurements of recycle slurry blend samples No. 1 and No. 2 were also made with the Haake Rotovisco viscometer with the pressure tight cell under a nitrogen atmosphere. Throughout the runs, the pressure was held at 50-70 psig to prevent sample vaporization. Preliminary experiments revealed that at shear rates above 200/sec the viscosity of the recycle slurry was not shear sensitive; therefore, all measurements were made at shear rates above this threshold value, and shear is not reported as an independent variable for these runs.

The data obtained for this series of runs is shown in Figure A-5, where viscosity is plotted as a function of temperature. Both blends were run twice in order to check the data reproducibility. Figure A-5 shows reasonable agreement between the two determinations at temperatures greater than 300°F, but the values vary at the lower temperatures. The second run of blend No. 1 shows an increase in viscosity over the first run. This could be due partly to a loss of the lower boiling components when heating the sample to a liquid in order to introduce it to the cell, and partly to mechanical problems. Blend No. 2 results showed the same trend, although not to as great an extent, and also showed slightly higher viscosities than blend No. 1.

The viscosity of recycle slurry blend No. 3 was measured at shear rates varying from 18-2200 per second, and at temperatures ranging from 284 to 600°F. Most of the data shown on Figure A-6 was obtained with the Haake Rotovisco viscometer, excepting the low shear rate data (below 186/sec) which was obtained with a Brookfield Model HA viscometer. The latter

instrument was employed to avoid the low shear rate error problems previously reported for the Haake unit. The fact that the data taken with the separate instruments forms a close data continuum suggests that good quality data was produced from both. This conclusion was further verified by comparing the response of each instrument to several Newtonian viscosity standards. The Brookfield produced data which were in close agreement ($\pm 10\%$) to these viscosity standards. The Haake Rotovisco also produced reliable data at shear rates above 200/sec.

During the aforementioned calibration tests it was found that the Haake MK-500 measuring head gave results which were at times random and inconsistent. As a result it was decided to send the MK-500 measuring head back to Haake for replacement and use a MK-1000 head which has produced reliable data. The problems observed with the MK-500 head cast some doubt upon previously reported Haake viscosity measurements.

Due to the encouraging results obtained from the Brookfield instrument thus far, a modified Brookfield viscometer has been ordered. It is capable of producing shear rates as high as 372/sec and measuring viscosities as high as 5000 cp at that shear rate. The model HA Brookfield viscometer currently on hand is limited to shears of 186/sec with a maximum viscosity of 500 cp at that shear rate. The new Brookfield will also be fitted with a cell which can be inerted with nitrogen at atmospheric pressure. The Brookfield thermocell will also be capable of producing sample temperatures as high as 650°F.

D. FE 1152 Flowmeter and Slurry Charge Pump Calibration Test

Flowrate calibration tests were conducted on FE 1152 recycle slurry flowmeter and Slurry Charge Pumps A and B on February 17. The tests were designed to show whether or not any change had taken place in the flowmeter or charge pump calibration since they were last measured in November, 1979.

The flowmeter tests were conducted by circulating heavy distillate from the flush solvent accumulator through FE 1152 and then into the slurry blend tank. The rate of level rise in the slurry blend tank, as measured by LT 10, was used to determine the actual flowrate through FE 1152. The test rates ranged from 3000-6000 lb/hr, with temperatures of 275-325°F and system pressure at 2000 psig. The duration of each test was fifteen minutes.

The data obtained in the FE 1152 tests is presented in Figure A-7, along with the results of a previous test completed in November. The November data had been corrected by inserting a factor of 1.08 into the computer so that the experimental data would lie on the theoretical parity line. Using this same 1.08 correction factor, the recent February tests produced

data which also lie on the theoretical curve. It can therefore be concluded that the meter calibration is the same as it was in November.

Slurry charge pumps A and B were also calibrated during the FE 1152 meter proving tests while pumping solvent out of the slurry blend tank. The charge pump tests consist of determining the solvent flowrates at a constant pump stroke count, using the blend tank level drop to indicate the actual flow. During the tests, system pressure was held at 2000 psig and the temperature of the solvent was in the range of 200-250°F. Each test was continued for fifteen minutes.

The pump stroke versus flowrate characteristics are presented on Figure A-8, which shows data from the current tests as well as those obtained in November. The data for both the November and February test fall on the same curve. This is not surprising since no major maintenance was performed on the pumps during this time, other than replacing the balls in the check valves. In previous calibrations where both pumps were tested, charge pump A showed a greater efficiency in its pumping action, pumping more fluid per stroke. Its characteristic curve thus lies above the charge pump B curve. The two curves are parallel, which is expected since both are identical Wilson-Snyder reciprocating positive displacement pumps and they should have similar pumping characteristics. The difference between the two curves is due to differences in pumping efficiencies, which may reflect minor differences in the operation of the pump inlet and discharge check valves.

Despite the consistency of the pump characteristics over this period, the use of the charge pumps as accurate slurry flowmeters is still not recommended. For one thing, all tests were performed with heavy distillate, not with slurry. Slurry flow from the charge pumps is subject to greater error since slurry particles lodged into valve seats tend to keep the balls from seating properly in the check valves. (This is reflected in the characteristic curves previously obtained by correcting the heavy distillate tests to slurry specific gravity and comparing this with the actual pump strokes obtained during slurry pumping.) Pump efficiency appears to be a function of the pump speed, the status of repair of the pumps, the discharge pressure and the type of material being pumped. When other means of measuring flowrate are not available, or when it is necessary to obtain a second indication, the charge pumps can be used as an approximate estimate of flowrate.

E. Preheater and Dissolver Sampling

An ongoing program is being conducted to investigate the coal reaction from the time it enters the preheater until it leaves the dissolver. This program included the design and installation of special sampling apparatus to obtain quantities of

coal slurry in various stages of reaction. These are located at the outlet of Slurry Preheater B, the inlet of the dissolver, the middle of the dissolver, and the outlet of the dissolver.

Previously, behavior modeling of the reaction has been based on assumption because of the lack of adequate data. Ultimate objectives of the sampling program are to discover the behavior and effects of intermediates in the reaction, to determine the effect of preheater operation on the reaction before entering the dissolver, and to develop hydrodynamic/kinetic models of the behavior and composition of the material as it enters and proceeds through the dissolver.

Nine samples taken from Slurry Preheater B and the dissolver during November and December were analyzed by Eyring Research Institute, Inc. using special chromatographic procedures (sequential elution with specific solvents). Table A-16 shows the solvent sequence using this procedure. Results of these analyses are given in Table A-17. Six additional samples were sent to Conoco Coal Development Company for identical analyses. The results of these analyses are given in Table A-18.

SESC analysis is subject to several constraints that affect data accuracy. These are:

- 1) SESC analysis does not include much of the material below approximately 600°F boiling range;
- 2) preheater outlet and dissolver inlet samples consisted of mostly gas, and what slurry was obtained was diluted at least several fold by solvent used to flush the lines after sampling; and,
- 3) the results of SESC analysis appear to be inconsistent with previous data because this procedure was originally intended to analyze SRC (vacuum tower bottoms) only.

To improve sampling, the Slurry Preheater B outlet sample point was moved to a horizontal section of line and placed 5/8 of an inch from the bottom. Samples from that location and the dissolver inlet point will be throttled to increase sampling time from 0.5-1.0 second to about 3-5 minutes. The flush solvent was changed from a middle-heavy distillate mixture to all middle distillate.

Samples were also taken at the preheater outlet and dissolver inlet on March 6, and at the preheater outlet, dissolver inlet and dissolver middle on March 25. Plant operating conditions, process gas analysis and sample gas analysis are listed in Table A-19. In order to improve data accuracy, a modified solvent elution chromatography plus gel permeation chromatography analysis will be used for these and all future samples.

F. Tracer Studies of Preheater and Dissolver Mixing

A study was made in June, 1979, to determine gas and liquid flow characteristics in the slurry preheater and the dissolver. Radioactively tagged argon, bromine (as bromophenanthrene) and gold (flakes and colloid) were injected upstream of Slurry Preheater A while in the SRC-I mode of operation, and detectors were located to measure transit time of the process liquid and process gas through the preheater and dissolver (see Table A-20). The purpose of the study was to gather data to calculate gas and liquid volumes, to understand gas and liquid flow regimes, and to determine gas and liquid transit time. Data from this study was reported in the Quarterly Technical Progress Report for July through September, 1979.

The mixing study was repeated during SRC-II operation between December 12, and December 15, 1979. A second tracer injection point was installed sixteen feet upstream of the dissolver (in SL-13) because during the previous study much of the gold remained in the preheater or mixed sufficiently so that the signal level was poor entering and leaving the dissolver.

Radioactive isotopes (Ar-41, Br-82, Au-198) were injected into the process flow at Slurry Preheater B inlet and at Dissolver A inlet. Detectors to measure transit time were located two feet upstream of Slurry Preheater B (on SL-181), 32 feet downstream of Slurry Preheater B (on SL-182), ten feet upstream of Dissolver A (on SL-13), and 65 feet downstream of Dissolver A (on SL-15). Detector and injection locations are shown in Figure A-9. Six injections were made at the preheater and seven injections at the dissolver. These injections are summarized in Table A-21. Computer analysis of the digital data which was gathered has not been completed, however, preliminary estimates of the delay times from four of the analog recordings are included as Figures A-10 thru A-13.

Figure A-10 shows the analog recording of the bromine isotope injected at the inlet of Slurry Preheater B. Detectors were located two feet upstream and 32 feet downstream of the preheater. Transit time for the liquid phase appears to be about 1.8 minutes through the preheater in this run.

Figure A-11 is an analog recording of the detector signal located 64 feet downstream of the dissolver. The signal profile for the bromophenanthrene injection indicates that some material passed through the dissolver in about one minute and full mixing (peak intensity) occurred in about six minutes. The decay curve is several hours long, verifying thorough mixing.

Figure A-12 indicates that it took about 52 seconds for radioactive argon to transit the preheater coil and about 20 seconds longer to transit the line to the dissolver. The detector was located 32 feet downstream of the heater outlet.

Figure A-13 is an analog recording of the dissolver inlet and outlet detectors with argon injection just upstream of the dissolver. It shows a delay of about 40 seconds, but of this about half should be residence time in the 75 feet of 4 inch Schedule XX piping between the dissolver and the two detectors.

Half-life of argon 41 is about 4 hours, thus its availability limited when the tests could be run.

Gold injections were more limited in quantity and therefore results are not so apparent on the analog charts.

G. Vacuum Flash Test Stand

Construction work on the vacuum flash test stand was nearly complete by the end of the reporting period. Three laboratory sized vacuum pumps were installed at the unit. After replacement of a rupture disc which prematurely imploded during leak tests, the system held full vacuum for three days. This established the dependability of two experimental ball valves which were included in the vacuum loop. A review of operating and safety considerations resulted in a redesign of the unit flare system. This new system as well as all remaining precommissioning work should be completed by the end of May.

H. Inspection and Materials Performance
Slurry Preheating and Dissolving (Area 02)

During the January turnaround, Slurry Preheater B was extensively inspected both before and after decoking. The coil was inspected using visual, ultrasonic, radiographic, and liquid penetrant techniques. Prior to decoking the following observations were made:

- 1) Metal loss on the preheater was minor (0-4 mils).
- 2) The last half of the coil had increasing amounts of coke towards the outlet. The amount of coke varied from approximately 1/32" at the middle of the coil to a maximum of 1/8" at the outlet.
- 3) The upper 4 thermowells indicated a significant amount of erosion/corrosion (.010 to .012").
- 4) The hard facing on the thermowells was pitted in areas where flow did not occur.
- 5) Neither the pressure tap nor thermowell branch connection fittings were designed for full penetration welds, as was required by manufacturer's design specifications.

Even though the metal loss on the coil was minor (4 mils maximum), the calculated average annual rate of metal loss would be relatively high (approximately 24 mils per year).

However, this calculation would not be representative of longer periods of operation because the corrosion/erosion rate was probably high initially and then decreased after the coherent scale was formed on the metal. Unfortunately, the decoking of the coil removes part of this protective scale, and consequently, each time the coil is decoked, a small amount of exposed metal loss can be expected when slurry service is resumed.

The metal loss on the hard facing of the thermowells was not considered to be pure erosion for two reasons. First, the hard facing was corroded (pitted) in areas where there was low or no flow and secondly, the coil wall adjacent to the thermowell did not show significant erosion/corrosion.

After decoking, the coil was again inspected and found to be clean. Thickness measurements were also taken and verified that no metal loss had occurred during decoking.

In conjunction with Mr. C. A. Youngdahl of Argonne National Laboratory, the Slurry Preheater B coil and the erosion/corrosion loop were inspected on January 17, to evaluate the performance of the continuous high temperature thickness monitoring system. Direct wall contact data was taken before start up of Slurry Preheater B and then again during the January shutdown. The above data confirmed that the system is capable of making accurate thickness measurements under plant operating conditions.

The inspection of the erosion/corrosion loop which is shown in Figure A-14, revealed that: 8-10 mils of wear was indicated in the first bend of the 1 1/2" piping, somewhat less wear in the last 1 1/2" pipe bend, and only 2 mils of thickness loss in straight runs. The 2" pipe, which is in series with the 1 1/2" pipe, exhibited 0-3 mils of apparent wear, but a direct comparison between wear rates in these pipe sizes cannot be made since the 1 1/2" pipe was new at the time of baseline measurement. As mentioned earlier, one would expect a higher rate of wear initially on new pipe.

The continuous ultrasonic metal thickness monitoring system continued to operate smoothly during the reporting period and baseline readings were again taken during the March shutdown. The measurements confirmed that the metal loss since the last major inspection (January 17, 1980) was relatively minor (less than 5 mils). A more accurate assessment of the metal loss will be made during the next scheduled turnaround.

On February 9, the plant was shut down when a 1" nipple downstream of Slurry Preheater B (SL-13-A6) began to leak. A subsequent failure analysis by Gulf Science & Technology Company (GS&TC) revealed that the nipple failure was caused by chloride stress corrosion cracking (SCC). A decision was then made to conduct further testing of the 347 stainless steel

piping in Area 02 for SCC. The testing was conducted by an outside contractor using an ultrasonic technique (shear wave). Of the 65 areas inspected, only one nipple gave a positive indication of cracking. This nipple along with one which did not indicate cracking was sent to GS&TC for further examination. The metallurgical examination by GS&TC confirmed the ultrasonic results. That is, one nipple had chloride SCC cracks and the other one did not. The 3 nipples that were examined by GS&TC were from SL-13-A6 as shown in Figure A-15. The remaining areas which were ultrasonically examined (shear wave) are shown in Figures A-15 through A-17.

Prior to the above two riser failures, there has been only one other failure of a piping component. All three failures have been in "dead legs" where it is possible for condensation and evaporation of water to take place, resulting in the build-up of chlorides in the area. The elimination of unnecessary "dead legs" and the insulation of the remaining areas will minimize the chances of future SCC failures. However, if failures continue, it may be necessary to upgrade to an alloy which is more resistant to chloride SCC such as Incoloy 800H.

Mineral Separation (Area 03)

As a result of a previous failure in December of the vapor line from the Filter Feed Flash Vessel (VA-5), the complete line was inspected. As one can see from examination of Figure A-18, only the hot vapors from the Filter Feed Flash Vessel appear to be corroding the line.

The line from the Filter Feed Surge Vessel to the filter feed surge pumps was changed from carbon steel to 316L stainless steel. After inspection, the line was hydrotested at 1050 psig.

Solvent Recovery (Area 04)

There was a considerable amount of work around the Wash Solvent Column during the reporting period. The work included the replacement of lines, retubing of the wash solvent overhead cooler, inspection of the column, and inspection of the overhead vapor line (VA-21-D4).

As a result of corrosion, much of the Wash Solvent Column bottoms pump suction (HL-43-G1) and discharge (HL-45-G1) piping was replaced. Both lines were hydrotested at 1050 psig after 10% of the butt welds had been radiographed.

The Wash Solvent Column overhead cooler was retubed with 316 stainless steel by an outside contractor. Both tube sheets (316L) were inspected and found to be in good condition. However, the exchanger tubes may require upgrading to Hastelloy C since the previous 316 stainless steel tubes failed.

In conjunction with Oak Ridge National Laboratory (ORNL) the Wash Solvent Column was inspected on January 17. The column was inspected before and after steaming. A sample of the scale from the column wall, taken before the column was steamed, was analyzed by ORNL. The analysis of the scale showed an unusually high concentration of chlorides (+8900 PPM). This high concentration of chlorides supports the theory that chlorides are involved in the Wash Solvent Column corrosion mechanism. Three corrosion racks were removed for analysis and replaced with new racks. The results will be reported later.

As shown in Figure A-19, a considerable amount of corrosion (.015 to .025") has occurred in the overhead vapor line (VA-21-D4) since the last inspection on December 6, 1979. The majority of this corrosion is attributed to the change in middle distillate specification which resulted in much higher overhead temperatures. Previously, the upper section of the column had the highest rate of corrosion. It now appears as if the area of most severe corrosion has moved forward into either the vapor line or the overhead cooler.

The detailed engineering for both the flow through corrosion probes and the side draw sampling system on the Wash Solvent Column was completed. The flow through corrosion probes will provide a more representative indication of the corrosion rate in the column than the conventional corrosion probes presently being used.

The probes were developed and are being installed in cooperation with GS&TC in the following locations:

- 1) Feed (light ends column reboiler bottoms pump - across suction and discharge),
- 2) bottoms (Wash Solvent Column reboiler bottoms pump - across suction and discharge),
- 3) overhead vapor line, and
- 4) side draw tray no. 19.

Tie-ins for both the sampling system and the corrosion probes were made during the shutdown for the repair of the MEA Unit.

Hydrogen Compression (Area 05)

An inspection of the recycle hydrogen scrubber and the recycle hydrogen compressor scrubber, March 3, revealed that both vessels had lost a significant amount of metal (Figures A-20 and A-21). The metal thickness of both vessels is still within the design requirements. However, if the corrosion of the base metal continues, the vessels may require replacement in one to two years. The metal loss appears to be the result of wet carbon dioxide and hydrogen sulfide.

Gas Systems (Area 09.5)

On March 12, the Inert Gas Unit was shut down to locate and repair an MEA leak. The leak was found in the MEA preheater by hydrotesting. The exact location of the leak was not determined until the preheater was removed. A 4" to 6" crack was found between the preheater chamber and the flange. About 80% of the crack was in the weld and about 20% in the flange. The repair was made by grinding out the crack and rewelding. Since this piece of equipment vibrates during periods of unstable operation, it is possible that the crack was caused by fatigue. Temporary repairs were made to the preheater heat shield and to the refractory in the combustion barrel and the unit was put back in service on March 19, 1980.

I. Data Acquisition System

Two new programs were designed during the reporting period. One is to automate a great deal of the calculations routinely performed in connection with Slurry Preheater B test runs. The other is a new gas balance program designed to produce process gas yield and hydrogen consumption data.

Foxboro Company representatives attempted to correct a recurring problem which produces sudden machine shutdowns. Unfortunately, the shutdowns continued despite several hardware modifications. One other machine shutdown was caused by a faulty memory circuit card which resulted in more than one day of lost data.

V. Process Development Unit P-99

During the first quarter of 1980, Process Development Unit P-99 completed three runs (Runs 63, 64 and 65). At the end of the period, Run 66 was underway. These four runs constitute a study to determine the effect of dissolver L/D ratio on SRC-II yields. Runs 63 and 64 were made using a 20-ft x 4-1/4 in. ID dissolver (57 L/D ratio) and Runs 65 and 66 were made using a 10-ft x 6-in. ID dissolver (20 L/D ratio). The coal used in this work was the relatively low reactivity, low ash, second batch of the fourth shipment of Powhatan No. 5 Mine coal (see 1979 Annual Report for properties of this coal).

Operating conditions for Runs 63 to 66 are given in Table B-1. Run 64 differed from Run 63 in that dissolver inlet hydrogen purity was increased from 85 vol% to 94 vol%, and gas rate was adjusted to keep the SCF of hydrogen per ton of feed coal constant. Runs 65 and 66 were duplicates of Runs 63 and 64 except for the use of a lower L/D ratio dissolver. Hydrogen partial pressure at the dissolver outlet was 1375-1380 psia for Runs 63 and 65 and 1510-1525 psia for Runs 64 and 66.

The 20 ft dissolver exhibited less thermal backmixing than the 10 ft dissolver, as evidenced by a steeper axial temperature gradient.

Other than the temperature profile, little difference was noted in the operation of the unit with the two different dissolvers installed. Slurry viscosities and other operating parameters did not appear to be significantly affected by dissolver L/D ratio, at least not within the range covered by this investigation.

The second shipment of the fourth batch of Powhatan No. 5 Mine coal exhibited a considerable tendency to form coke in the dissolver; thus, when PDU P-99 was shutdown at the end of Run 64 to change dissolvers, it was found that both the dissolver and hot separator contained considerable quantities of coke. A description of the condition of selected equipment items is given in the following paragraphs.

Dissolver

The dissolver was found to contain a considerable amount of hard coke (see Figure B-1). The bottom of the vessel contained about 3.3 lb of solids that had deposited mostly near the bottom head. The top half contained about 21.6 lb of solids which had collected along the walls. The top 5 ft of the vessel had a layer of solids about 2-in. thick. Altogether, solids occupied almost 20% of the reactor volume. Coal had been fed to the dissolver for 22 days.

Hot High Pressure Separator

The hot separator contained 6.4 lb of solids (see Figure B-2). The solids along the walls and internals were dry and crumbly, while those at the bottom were hard and coke-like. The separator had operated at 800°F for the 22 day operating period.

Atmospheric Fractionator

The 316 stainless steel Goodloe packing in the top half of the column was coated with black solids but was intact. The bottom Goodloe packing, however, had completely disintegrated into a pile of crumbly, mud-like scale. Because of this corrosion, 1/2 in. ceraminc Berl saddles were installed in the bottom half of the column. Solids found in the fractionator contained iron, nickel, chromium and sulfur, indicating that they were mainly sulfide corrosion products of stainless steel. They also contained a small amount of chlorine, indicating that ammonium chloride may be involved in the corrosion mechanism.

Dissolver Temperature Profiles

As mentioned previously, significant differences were found between the temperature profiles for the 20 ft and 10 ft dissolvers, based on comparing temperatures at the same relative axial position. Specifically, there was less thermal backmixing with the 20 ft dissolver. Since both dissolvers were run at the same dissolver outlet temperature, this resulted in a steeper gradient and lower average temperature for the 20 ft dissolver than for the 10 ft dissolver. In an attempt to bring the temperature profiles closer

together, a higher preheater outlet temperature and a higher quench rate were used with the 20 ft dissolver, but as Figure B-3 shows, this attempt was not completely successful.

Engineering and Special Studies

Engineering studies on PDU P-99 for the first quarter of 1980 consisted of monitoring the recycle gas scrubber system, observing the operation of the separator system, and running a series of tests on the vacuum column to study the effect of flash zone temperature and pressure on distillate content of the bottoms product.

Work on the lean oil scrubber has shown that the lean oil picks up significant quantities of naphtha from the cold separator. As the naphtha content of the lean oil increases, its efficiency for naphtha absorption drops; thus, the rate of accumulation in the lean oil absorber gradually decreases as a run progresses. This work has also shown that lowering the temperature of the cold separator from 155°F to 80°F reduces the amount of naphtha picked up in the lean oil absorber to a very low level.

Although there is some scatter in the data, the vacuum column generally shows a consistent pattern of lower distillate content of the vacuum bottoms as flash zone temperature is increased and/or pressure is decreased. When the data are converted to equivalent temperatures at atmospheric pressure, the majority of the data lie on a single line.

Under special studies, distillation of approximately 150 gal of P-99 product into narrow boiling (approximately 50°F) cuts was partially completed. An extensive array of physical and thermodynamic properties will be determined on these cuts.

Appendix D is a detailed report covering the processing of Powhatan No. 5 Mine coal (third shipment, second batch) with special emphasis on Runs 48 through 55. These runs evaluated the effect of various process variables on product yields.

VI. Demonstration Plant Support Projects (R&D)

A. Feedstock Screening Methods

The SRC-II Feedstock Screening Methods project was activated late during the month of January 1980 as an extension of preliminary coal correlation studies done in 1979. The objective of this project is the development of reliable methods of feedstock screening for use in the selection and ranking of coals suitable for use in the SRC-II Demonstration Plant. These screening methods are expected to be less expensive than continuous-flow pilot-scale testing. Data from the open literature as well as SRC-II yield data generated by the various SRC-II pilot units (Harmarville, Merriam, Ft. Lewis) will be evaluated as to their usefulness in the formulation of

the screening technique. Additionally, a database which includes the properties of coals used in SRC-II processing will be assembled and maintained.

Work towards the accomplishment of these objectives was performed during the first quarter of 1980. Data relating to the SRC-II coal liquefaction product yield structures and the associated feed coal properties for experimental runs performed on the P-99 Process Development Unit have been assembled into a computer database. A preliminary ranking of the various P-99 feed coals with respect to their liquefaction yields of selected products has been made.

Correlation Studies

The data used in the present analysis represents all of the P-99 individual runs generated up to and including run P-99-62. This product yield data is shown in Table C-1. The associated experimental operating conditions are shown in Table C-2. Table C-2a defines the coding used in these analyses. A regression has been made over these data using a correlative model which includes both first-order and interaction (cross-product) terms for the operating variables. Due to the small range of variation in the P-99 operating data, the use of squared terms, in order to introduce curvature into the model, was deemed to be unnecessary.

The different coals processed by P-99 were entered into the model as class variables. The use of coal type as a class variable provides a way of ranking the coals versus their product yields without introducing discrete coal properties during the ranking procedure. These discrete properties are to be used in future work. The coals used and the corresponding experimental runs for which they were used are presented in Table C-3. In order to provide a base set of rankings, yield predictions were generated for each coal at two "standard" sets of conditions. These conditions were TAVG=455°C, inlet PH2=1800 psig, SRT=1.0 hr, CIN=30 wt%, and recycle ash=10 wt% or recycle solids=15 wt%. The use of either the recycle ash or the recycle solids terms defines the two "standard" conditions. Recycle solids equals the sum of the recycle ash and the recycle IOM.

Discussion

The results of the coal type versus product yield ranking for the production of C₅-900°F liquids, IOM, and 900°F organics are shown in Tables C-4, C-5, and C-6, respectively. The correlative models from which these rankings were devised are rather good for the P-99 dataset. They exhibit R² values (fraction of the variation in the data explained by the model) of 0.94, 0.96, and 0.96, respectively. The models also show low standard deviations of 1.8, 0.9, and 2.1 yield units (wt% maf feed coal), respectively. All three of the models have a significance of greater than 99.9%.

Few final teachings can be extracted from these models in their present intermediate state. They do, however, illustrate the wide range of variance of product yield with coal type. It is important to note that the ranking of product yield with respect to coal type differs markedly depending upon whether recycle ash or recycle solids are used as the independent correlating variable. The reason for this difference is evident. The percentage of recycle ash in the recycle solids varies among the coals from between about 50% (ex. - Blacksville) to about 70% (ex. - Ireland). If one of these variables is held constant, the other one will still vary. This observation becomes important for a recycle process such as SRC-II which depends on the recycle ash for catalytic activity. The recycle ash term is the more fundamental reactor kinetics-related parameter, while the recycle solids term is a more process constraint-related parameter for SRC-II operation. When comparing coals as related to their end-use in the Demonstration Plant, recycle solids may be the more appropriate feed variable. The increase in production of IOM from the feed coal, a fraction of which is recycled, in effect decreases the amount of recycle ash that the feed system can accommodate. The present feed systems for the SRC-II pilot units appear to have an operability-imposed upper limit on feed solids (coal+ recycle solids) of about 45-48 wt%. The amount of recycle ash utilized can only be increased by decoupling the coal-characterized ash: IOM ratio imposed by the present SRC-II product fraction system or by making improvements in the feed system. This operability constraint should be remembered when using reactivity measured for the comparison of candidate coals for SRC-II processing.

Conclusions

The work presented above represents a foundation upon which the continued evaluation of coal reactivity in SRC-II coal liquefaction can be based. Future work leading to the identification of coal properties which are important to liquefaction behavior will grow from this base. Information from other sources (literature, pilot plants, etc.) can be combined with the P-99/SRC-II data in order to add to its usefulness.

Two conclusions can be made based on the work done up to this time:

- 1) Differences in feed coals can and do cause large differences in the liquefaction product yield structure.
- 2) Care should be taken in evaluating various measures of coal reactivity when they are applied to recycle operations such as SRC-II coal liquefaction.

B. Process Cost Model

The objective of this project is to develop a mathematical model of process costs of the commercial SRC-II process that can be used for optimization studies and to guide engineering research and development on the process. The model will be applied to specific case studies to compare process design variations for their comparative economic benefits.

Work has begun on assembling a simplified flow diagram of the SRC-II process by dividing the conceptual commercial plant into processing areas. The model will consist of modular processing blocks with streams flowing into and out of each block. Within the processing blocks, the model will calculate the capital investment and operating expenses, including utilities, based on the primary flow(s) into the block.

While this design provides the basis for the choice of process blocks, some have been further partitioned by functional considerations to arrive at a more representative model. These areas include the dissolver (area 11), recycle gas treatment (area 12), and miscellaneous systems (area 54). Further partitioning may be necessary as the modeling effort progresses.

Some of the required design information is not presently available. For example, some of the flow rates around the gasifier are proprietary and hence not given. In other instances, various utility consumptions are unavailable for other reasons. And, finally, some information is simply questionable or conflicting. If missing data can not be found, estimations will be made.

C. Modeling and Simulation of SRC Reactor Systems

Effects of Coal Properties on SRC-II Yields

Progress has been made to develop comprehensive yield correlation models which include coal properties. The data base used for the correlations has been expanded to include 144 pilot plant runs, of which 81 include detailed coal properties for 17 coals. The 14 coal properties in the data include proximate, ultimate and maceral analyses, sulfur analysis and iron content. Each yield model consists of combinations of 7 process variables (temperature, pressure, ash and coal concentration, SRT, etc.) plus a series of linear coal property terms. The latter terms replace the generic coal class terms used in the updated correlation models (Appendix E).

The results of the initial development show the yields are most sensitive to the iron content followed by 'rank variables', e.g., maximum mean reflectance and volatile

matter. H/C ratio and sulfur content (organic or total sulfur) make minor contributions. Pyritic sulfur content does not make a large impact on yields after taking the iron content into account.

Increasing iron content increases yields of total distillate (1.3%/ % iron), total liquids (distillate plus naphtha) (1.1%/ % iron), water, and hydrogen consumption, drives down SRC (-1.6%/ % iron) but has very little (slightly negative) effect on byproduct gases, naphthas or IOM yields. This property presumably relates to the known catalytic effect of coal ash on the hydrogenolysis of SRC. These relationships provide further evidence that the active components of the ash involve iron compounds.

As coal rank^{*} increases (reflectance, volatile matter and C/H all decrease), there is a positive effect produced on all the yields, i.e., light gases, naphthas, distillates increase, SRC and IOM decrease and hydrogen consumption increases.

The sulfur content plays a relatively minor role in determining the above yields but is predominant for the yield of byproduct gas and water vapor. Increased organic or total sulfur content shifts the distribution of the distillate products from middle to heavy distillate but has only a minor effect on total distillate. There is also very little effect on naphtha or total liquid yields.

The model suggests that increased organic sulfur increases hydrogen consumption and increases the level of SRC and IOM products.

Yield Correlation Models

The same report (in Appendix E) also documents the results of the updated correlation models for Kentucky and Powhatan coals. The primary goal of this report was to review the effects of the principle dissolver process variables (average dissolver temperature, inlet hydrogen partial pressure, inlet coal and recycle ash concentration, nominal slurry residence time).

The effects of the variables appear consistent with the currently accepted reaction sequence: 1) fast breakup and depolymerization of coal into a spectrum of products including SRC; 2) slower, time/temperature-dependent, zero-order, hydrogenolysis of heavy distillate to lower molecular weight products. Side reactions which form IOM (higher molecular weight) are also taking place, particu-

* 'rank' has no petrographic connotation; only an ordering by reactivity in SRC-II process.

larly at lower pressures and temperatures and lower recycle ash levels. In the recycle system, at a fixed solids level, increasing coal concentration reduces distillate yield and increases SRC because of the substitution of coal for recycle ash in the feed slurry. This accounts for the effect of coal concentration on the yields in the correlations.

Increased temperature, pressure, slurry residence time and recycle ash levels have beneficial effects on gas and distillate yields and reduce SRC and IOM yields. SRC yield decreases linearly with increasing nominal slurry residence time, indicating a zero-order overall reaction rate for SRC. The implication is that overall hydrogenolysis rates do not depend on local variations in SRC concentration (however caused) but only on average reactor temperature, pressure, ash, etc.

Hydrogen consumption is essentially independent of hydrogen partial pressure below 12.5 mPa (1800 psia) and increases with pressure above this level. This indicates an effective reaction rate-limited process in which a reaction is promoted at higher pressure.

The temperature dependence of the liquid and distillate yield is practically linear with only a slight tendency to level out above 465°C. Light gas and middle distillate yields are most temperature sensitive. The models show that equivalent distillate yields can be obtained at lower average temperatures (10°F lower) provided SRT is increased by a modest amount (20%). A design based on lower temperature and higher SRT would provide additional operational flexibility for the Demonstration Plant.

Recycle IOM and SRC tend to increase net IOM yields. Thus, it would be advantageous to develop a process to selectively reduce IOM in the recycle stream or to operate the process at temperatures and pressures or with coals which reduce IOM production.

The interactive (catalytic) effects of recycle ash with temperature, residence time and pressure are apparent in the correlation plots. At higher levels of recycle ash, the effects of these other variables is more pronounced. These effects are practically absent at low levels of recycle ash.

Hydrodynamic and Kinetics Reactor Models

The comprehensive SRC reactor thermal response model was used to simulate P-99 runs in preparation for work in support of the Demonstration Plant design studies. The models now include an improved point rate model for hydrogen consumption (heat generation term), vapor liquid

equilibrium K value calculations, more comprehensive gas and slurry internal holdup calculations and calculations of thermal properties. The simulations show that the internal fluid flow and thermal behavior of the Demonstration Plant could differ significantly from that of the existing pilot plant because of a very strong effect on the overall thermal behavior of the level of fluid backmixing. The temperature dependency of the point rate hydrogen consumption rate, which is primarily responsible for the generation of heat is the second factor which links the dissolver inlet conditions and level of backmixing to the overall thermal response. In designs with inherently low levels of backmixing, the model predicts the dissolver inlet temperature must be higher (755°F) than currently specified (735°F) in order to sustain reaction at the bottom of the dissolver. For levels of backmixing comparable to that of the P-99 or Ft. Lewis pilot plants, the model predicts that the current Demonstration Plant design basis may require a higher inlet temperature to sustain reaction.

The models are now being modified to include point reaction rates for all the species in order to develop a comprehensive recycle model for the process. This model will incorporate simplified sub-models for the slurry letdown flow separation and recycle systems and should more accurately reflect the operation of the recycle process.

D. Corrosivity of SRC-II Process Water

Process water samples were taken from Process Development Unit P-99 Second Intermediate Separator and Cold Separator while charging Powhatan Coal. The Second Intermediate Separator operated at 400°-450°F and the Cold Separator at approximately 150°F. A 2000 ml process water sample was added to a 1-gallon Hastelloy B autoclave, heated to the specified test temperature, pressured to 1500 psig with nitrogen, and stirred at 500 rpm for 72 hours. Table C-7 shows the corrosion rates obtained at 150°F for four alloys; carbon steel, Type 316, Hastelloy C, and Sandvik 3RE60. Table C-8 shows the corrosion rates obtained at 400° and 450°F for five alloys; carbon steel, Type 316, Hastelloy C, Inconel 600, and Sandvik 3RE60. Table C-9 shows some of the contaminants in P-99 process water that could possibly have an effect on corrosion.

- * Process Flow Diagram of PDU P-99 is shown in DOE Report FE/496-183 Volume 1, Appendix C.

Conclusions

1. Carbon steel is a suitable material for handling SRC-II process water below 150°F.
2. Hastelloy C and Sandvik 3RE60 are best materials for SRC-II process water at temperatures 400° to 450°F. Liquid water is not expected to be present in the SRC-II process above 450°F.
3. Based on these tests, high corrosion rates were not encountered with aqueous solutions containing 1 to 2 percent phenolic compounds, approximately 0.4 percent chlorides, and 0.5 percent sulfides. These contaminants are also found in the fractionation area.

E. Coking of SRC-II Process Streams

The objective of this project is to define the critical parameters which initiate, propagate, and accelerate the formation of coke in various environments of the SRC-II process. Proper definition of these factors will help to devise specific measures preventing coking in the SRC-II demonstration plant.

It has been observed that certain streams in liquefaction processes are susceptible to coke formation. Several cases of coke formation in the dissolver, hot separator or transfer lines have been observed in pilot plant and PDU operations. The potential for coking within a Demonstration Plant is of obvious concern and a better understanding of the phenomenon is required in order to avoid conditions that could lead to coking.

A thorough and quantitative study of coke formation at various points in the SRC-II operation is being undertaken. Techniques such as thermogravimetry (TGA), pressure differential scanning calorimetry (PDSC), and low temperature ashing are used in conjunction with hot-stage microscopy, scanning electron microscopy, FT-infrared spectroscopy and X-ray determination. The effects of such process parameters as coal rank, hydrogen partial pressure, temperature histogram, heating/cooling rate, residence time, and solid content and composition on the coking of various SRC-II streams are being investigated.

Description of Technical Progress

Volatile Matter vs Fixed Carbon Measurement by TGA

The amount of volatile matter and fixed carbon in coal and various SRC-II streams are key factors influencing coke formation. A high ratio of volatile matter to fixed carbon is desirable in both the SRC-II feedstock and the products. Therefore, the thermogravimetric technique was used to measure quantitatively the amounts of the volatile matter and of fixed carbon in coal, feed slurry and various SRC-II streams.

Four different coals (LR 22366 Kentucky, LR 24001 Blacksville-II, LR 24924 Powhatan and LR 22991 Ireland Mine) that have been run on the P-99 unit were first studied by thermogravimetry. A typical TGA thermogram of Powhatan coal is given in Figure C-1. The TGA and the weight-loss rate DTG (differential thermogravimetry) thermograms show two major weight loss steps: the first is volatile matter (VM) and the second is fixed carbon (FC). The first weight loss occurred in a nitrogen atmosphere. Air was then introduced to burn off the fixed carbon from the sample causing the second weight loss. Between 350 and 600°C, the coal weight loss is significant because of the large aromatic layer molecule decomposition. We define this major coal tar release as light volatile matter (VM_L). Above 600°C the coal weight loss (VM_H) is small, as only gases are released from residue char gasification and mineral decomposition. Table C-10 summarizes the results of TGA measurements. In the table, three coal composition properties, VM/FC , VM_L/FC , VM_H/FC , and VM_L/VM_H , are calculated as variables for four different coals. Their correlation with the coal reactivity and the yield of insoluble organic matter (IOM) on P-99 unit are plotted in Figures C-2 and C-3. The coal reactivity and the yield of IOM on P-99 unit have been predicted through regression equations in an earlier study. From Figure C-2, coal reactivity increases with increase in the light volatile matter to fixed carbon ratio (VM_L/FC). Figure C-3 plots the yield of insoluble organic matter (IOM) versus total of heavy volatile matter (VM_H) and fixed carbon (FC). An increase of IOM with increasing total amount of VM_H and FC is observed. The insoluble organic matter (IOM) is one probable coke precursor. The accumulation of IOM is believed to be the first step of coke initiation.

Representative TGA thermograms for the P-99 feed slurry (P-99-50-3), dissolver effluent (P99-49-8), atmospheric flash bottom (TKI) and process solvent (TKII) are presented in Figures C-4-7. The feed slurry contained 29.7% Powhatan coal (LR 24924), 15.2% process solvent and 55.1% atmospheric

flash bottoms. Inspection of these thermograms indicates that the process solvent was entirely volatilized below 250°C in the TGA. The dissolver effluent yielded 78% distillate at 450°C and the atmospheric flash bottoms yielded 52% distillate at 500°C. Among them, feed slurry contains the highest amount of heavy volatile matter plus fixed carbon (VM_h+FC) followed by atmospheric flash bottom material (Figure C-8). The volatile matter (VM) and the ash content for various SRC-II streams are also plotted in Figure C-8. The atmospheric flash bottom, rich in mineral matter, shows the highest content of ash. The ash content or mineral matter present in the sample is believed to be one of the key components of coking. More experiments are underway to investigate the effect that minerals have on coke formation.

Pressure Differential Scanning Calorimetry

Pressure differential scanning calorimetry (PDSC) is a technique which can follow the course of the process reaction and directly measure the heat evolved under high temperature and pressure. A pressure DSC cell with the DuPont 990 thermal analyzer system was used for this study. In the PDSC system, a back pressure regulator and a pressure transducer were installed on the line for precise pressure control and pressure read-out. During the run, a slight flow of hydrogen gas (about 20 ml/min over the sample) was maintained through a digital flow controller. The solid or slurry samples were weighed, placed in sample pans, and heated to desired temperatures at linear heating rates or heated isothermally under hydrogen pressure. A graphitized carbon black or an inert char was chosen as the reference sample.

Typical coal pressure DSC thermograms (Powhatan LR 24924 coal) are shown in Figure C-9. Upon heating, the large coal aromatic-layer molecules absorb heat and soften, causing a broad endothermic peak below 425°C in the PDSC thermogram. At higher temperatures, these large coal molecules begin to condense and form a liquid crystal mesophase. This carbonaceous mesophase has only a transient existence in the temperature range where coal plastic properties are evident. As the temperature is increased, the mesophase materials begin to react with hydrogen and generate a distinct exothermic peak at the temperature range of 450-475°C. This peak is largely dependent on the hydrogen pressure. The exothermic heat evolution involves heat generated from the dehydration reactions of the coal's hydroxyl, and carbonyl functional groups. As the temperature continues to increase, a sharp endothermic peak is observed between 475 and 500°C, while the condensed aromatic molecules congeal to a semi-coke. Consequently,

at high temperature, if the unstable coal molecules continue to polymerize, more gas is produced and a hardened coke is formed, causing another dramatic exothermic curve in the PDSC thermograms.

Pressure-DSC thermograms of various SRC-II streams are shown in Figure C-10. Significant differences of thermal behavior (shown in PDSC thermograms) exist between coal and feed slurry. The exothermic hydrogenation peak observed at 460°C in the coal thermogram was shifted to lower temperatures and became broader and not well-defined around 400°C in the feed slurry thermogram (Figure C-21a). The feed endothermic peak, which represents energy required to overcome the polymerization, was also shifted from 480°C in coal to 460°C in the feed slurry thermogram. All of these indicate that hydrogen-coal interactions occurred at lower temperatures and extended to a wider temperature range in the feed slurry than in the coal itself. The mixing of coal with process solvent and atmospheric flash bottom to form feed slurry significantly change coal hydrogenation and coking behavior.

In Figure C-10c, the thermogram indicates that process solvent completely volatilized at 250°C, which is in good agreement with what was found in the TGA measurement. In the thermogram of atmospheric flash bottom (Figure C-10d), besides an endothermic peak existing about 485°C, a series of reaction peaks occurring between 300 to 450°C could be due to the effect of mineral catalytic reaction. The atmospheric flash bottom sample has the highest ash content among various SRC-II streams. The mineral particles present in the flash bottom or recycle slurry may act as a "catalyst" or "nucleating" agent in the formation of mesophase and coke at low temperatures in addition to catalyzing hydrogenolysis reactions.

The influence of hydrogen pressure on coal thermal behaviour is demonstrated in Figure C-11. A Kentucky coal (LR 22366) was measured under different hydrogen pressures. In Figure C-11, all coal reaction peaks were enhanced and greatly dependent on hydrogen pressure.

The coal transition temperature, reaction temperature and initial coking/polymerization temperature are plotted in Figure C-12 as a function of hydrogen pressure. As indicated in Figure C-11, we define the coal transition temperature as that corresponding to the mesophase onset point of the exotherms, the coal reaction temperature as the temperature corresponding to the temperature of coal mesophase hydrogenation, and the coal initial coking/polymerization temperature as that corresponding to the second onset point of the exothermic polymerization curve.

In Figure C-12, there is little effect of hydrogen pressure on the coal transition temperature (about 400°C). The reason is that molecular hydrogen is difficult to react with solid coal unless the initial thermal break-up (mesophase stage) of the organic coal matrix has begun. However, a significant increase of coal hydrogenation and initial coking temperatures occur as hydrogen pressure increases, from 460°C at 400 psi to 475°C at 900 psi of hydrogenation reaction peak and from 475°C at 400 psi to 490°C at 900 psi of initial coking temperature. This indicates that the hydrogen pressure is an important factor which can extend coal hydrogenation and inhibit or delay coal coking.

The effect of heating rates on thermal behavior of feed slurry under H_2 pressure is given in Figure C-13. An increase of the initial coking/polymerization temperature with an increase of heating rate was observed; e.g., 440°C at 5°C/min, 460°C at 20°C/min and 470°C at 100°C/min. This indicates that heating rate does have an effect on coking thermal behaviour: the higher the heating rate, the later the onset temperature of coking/polymerization was observed.

In another series of PDSC experiments, feed slurry samples were held at 460°C isothermal temperature for 60 minutes residence time under various hydrogen pressure. A small stream of hydrogen, 5 ml/min, was constantly flowing through the apparatus during the experiments. Figures C-14 and C-15 present the results of the effect of hydrogen pressure on volatile matter and fixed carbon. An increase of volatile matter and a decrease of fixed carbon occur as the hydrogen pressure increases. The results are in good agreement with what was found previously on the effect of hydrogen pressure on the initial coking temperature. Under higher hydrogen partial pressure, coal has a greater tendency to be liquefied and lesser tendency to form coke.

Characterization of SRC-II Coke Materials

In order to properly define the parameters and conditions of coke formation, it is important to characterize SRC-II solid coke materials. The characterization and identification of several key components (e.g., carbonaceous organics, inorganic minerals) existing in solid coke materials will lead to understanding coke initiation and accumulation during the SRC-II operation.

Raw coke materials obtained from the dissolver and hot separator of two P-99 runs (Runs 64 and 66) were investigated by FT-infrared spectroscopy, thermogravimetry and

elemental analysis. Preliminary results indicated that certain differences existed between the coke formed in the dissolver and the coke formed in the hot separator. The dissolver cokes gave lower H/C and O/C atomic ratios (Figure C-16) with a higher proportion of aromatic hydrocarbons (Table C-11), while the hot-separator coke had more oxygen-bonded carbonyl and phenolic groups (Figure C-17). The hot-separator cokes also contained a higher ash and a lower fixed carbon. In addition, there was little difference between the coke formed in different runs. The 20 ft-dissolver-coke (Run 64) contained a slightly higher amount of fixed carbon than that obtained from 10 ft-dissolver-coke (Run 66).

The determinations by scanning electron microscopy and x-ray diffraction indicated that inorganic minerals of pyrrhotites, calcium carbonate, kaolinite and quartz exist in solid coke materials. Pyrite was not found in coke materials. More experiments are underway for studying the effect of coal minerals on coking.

Conclusions

The present experiments have led to the following conclusions: (1) coke formation in SRC-II streams is highly dependent on hydrogen partial pressure, temperature and heating rate; (2) volatile-to-fixed-carbon ratio, transition temperature, initial coking/polymerization temperature, and ash content are believed to be the key components responsible for the coke formation; (3) mineral particles present in slurry-containing streams act as a "catalyst" or "nucleating" agent in the formation of mesophase and coke at low temperatures; and (4) instead of pyrite, pyrrhotite was found in the solid coke material.

A P P E N D I X A
SRC Pilot Plant Tables and Figures

TABLE A-1

COAL PROCESSING SUMMARY

	Coal Processed, Tons	<u>On-Stream Time</u>		Available Operating Time Adj. Hr. (a)	<u>Average Feed Rate</u>		<u>On-Stream Factor</u>		
		<u>Days</u>	<u>Hours</u>		<u>Tons per On-Stream Day</u>	<u>Pounds per On-Stream Hr</u>	<u>Days, %</u>	<u>Hours, %</u>	<u>Adjust. Hr.,</u>
<u>1980</u>									
January	334	13	304	312	25.7	2,197	41.9	40.9	97.
February	271	17	255	426	15.9	2,125	58.6	36.6	59.
March	411	21	416	675	19.6	1,976	67.7	55.9	61.
First Quarter	1,016	51	975	1,413	19.9	2,084	56.0	44.6	69.
Total 1979	6,116	200	4,108	5,142	30.6	2,981	53.8	46.0	79.

(a) Data accumulated since January 1, 1978. Available operating time is adjusted for downtime not directly related to process problems or equipment failures.

TABLE A-2

Average Raw Coal Analyses, Wt%

	<u>JANUARY</u>	<u>FEBRUARY</u>	<u>MARCH</u>
Ash	11.63	10.70	10.35
Moisture	4.08	3.49	3.95

TABLE A-3

Average Dried, Pulverized Coal Analyses, Wt%

	<u>JANUARY</u>	<u>FEBRUARY</u>	<u>MARCH</u>
Carbon	72.48	71.07	72.07
Hydrogen	5.10	5.14	5.06
Nitrogen	1.24	1.24	1.25
Sulfur	4.39	4.27	4.55
Oxygen (by difference)	5.57	6.85	6.16
Ash	11.00	10.98	10.44
Moisture	0.22	0.45	0.47

TABLE A-4

Average Analyses for Forms of Sulfur, Wt%

	<u>JANUARY</u>	<u>FEBRUARY</u>	<u>MARCH</u>
Pyritic Sulfur	2.23	2.00	2.10
Sulfate Sulfur	0.09	0.12	0.05
Organic Sulfur	2.08	2.23	2.41
Total Sulfur	4.40	4.35	4.56

TABLE A-5

Average Sieve Analyses of Dried, Pulverized Coal, Wt%

	<u>JANUARY</u>	<u>FEBRUARY</u>	<u>MARCH</u>
- 60 Mesh	97.41	97.21	97.40
-120 Mesh	94.40	93.47	95.52
-140 Mesh	88.70	86.43	91.68
-200 Mesh	76.25	74.64	79.65

TABLE A-6

Typical Analyses of Stripper Bottoms, Wt%

	<u>JANUARY</u>	<u>FEBRUARY</u>	<u>MARCH</u>
Water	0.08	0.10	0.08
Naphtha	0.05	0.10	0.05
Middle Distillate	1.56	2.62	2.25
Heavy Distillate	45.82	37.98	38.65
Vacuum Bottoms (Pyridine Insol- ubles Included)	52.49	59.20	58.97
Pyridine Insolubles (As Received)	17.57	22.38	19.78
Ash In Pyridine Insolubles	65.38	68.01	67.15

TABLE A-7

Average Fractional Analyses of Liquid Products, Vol. %

<u>Distillation Fractions:</u>	<u>Naphtha</u>	<u>Middle Distillate</u>	<u>Heavy Distillate</u>
<u>January</u>			
IBP-350°F	98	2	0
350-600°F	2	97	1
600-850°F	0	1	99
<u>February</u>			
IBP-350°F	100	0	0
350-575°F	0	99	0
575-850°F	0	1	100
<u>March</u>			
IBP-350°F	99	3	0
350-550°F	1	97	0
550-850°F	0	0	100

TABLE A-8

Average Analyses of Pilot Plant Vacuum Bottoms, Wt %

	<u>JANUARY</u>	<u>FEBRUARY</u>	<u>MARCH</u>
Carbon	69.72	68.75	68.18
Hydrogen	4.19	4.02	4.17
Nitrogen	1.45	1.35	1.39
Sulfur	2.93	3.15	3.37
Ash	20.47	22.59	22.82
Fusion Point, °F	307	318	312

TABLE A-9

Process Waste Disposal AnalysesJanuary

	<u>Bio Unit Feed</u>	<u>Bio Unit Effluent</u>	<u>Plant Effluent (Composite)</u>
pH	7.5	6.7	6.6
Phenol, ppm	51	1.25	0.25
Chemical Oxygen Demand, ppm	1170	282	62
Biological Oxygen Demand, ppm	212	25	8.5
Total Suspended Solids, ppm	72	106	24

February

	<u>Bio Unit Feed</u>	<u>Bio Unit Effluent</u>	<u>Plant Effluent (composite)</u>
pH	7.2	6.5	6.6
Phenol, ppm	58	0.45	0.21
Chemical Oxygen Demand, ppm	982	208	60.7
Biological Oxygen Demand, ppm	170	21	16.9
Total Suspended Solids, ppm	130	131	24.5

March

	<u>Bio Unit Feed</u>	<u>Bio Unit Effluent</u>	<u>Plant Effluent (composite)</u>
pH	6.9	6.8	6.8
Phenol, ppm	61	0.59	0.29
Chemical Oxygen Demand, ppm	1004	318	142
Biological Oxygen Demand, ppm	166	2.4	0.9
Total Suspended Solids, ppm	106	257	31.7

TABLE A-10

SRC II DISTILLATE INVENTORY & PRODUCTION
NOVEMBER 11, 1979 - JANUARY 14, 1980

TOTAL UNBLENDED PLANT INVENTORY, Bbl.

<u>DATE</u>	<u>TONS OF COAL PROCESSED</u>	<u>NAPHTHA</u>	<u>MIDDLE DISTILLATE</u>	<u>HEAVY DISTILLATE</u>
11/19		48	224	204
12/03	235	337	672	434
12/10	168	445	856	508
12/17	166	451	1077	431
12/24	108	382	1138	406
12/31	146	423	1870	528
01/07	149	469	2027	478
01/14	166	520	2644	474
	<u>COAL, TONS</u>	<u>NAPHTHA, Bbl</u>	<u>MID. DIST., Bbl</u>	<u>HEAVY DIST., Bbl</u>
Inventory change	(1138)	472	2420	270
Less Redistilled Oil *			1025	255
Less Major Shipments				
Production (Consumption)	(1138)	472	1395	15
Production, Bbl Oil/Ton Coal		0.41	1.23	0.01

* Fuel oil previously produced from Powhatan No. 5 coal was refractionated to new cutpoints and added to plant inventory 12/17 - 1/11.

TABLE A-11

PREHEATER BASELINE RUNSRUN COMPARISONS

Run Number	P-5B	F7-2T10 ⁽⁴⁾
Run Period	300-400	1400-1600
Run Time	11/12	1/14
Run Year	79	80
Heavy Distillate Feed Rate, lb/hr	7494	6784
Gas Feedrate, lb/hr	212	218
Gas Molecular Weight, lb/mole	3.2	3.4
Inlet Pressure, psig	1624	1949
Pressure Drop, psi	8.0 ⁽¹⁾	10.5 ⁽²⁾
Inlet Temperature, °F	160	207
Outlet Temperature, °F	497	503
Temperature Increase, °F	337	296
Ambient Temperature, °F	38	40
Firebox Temperature, °F	(3)	849
Stack Temperature, °F	1032	928
Natural Gas Consumption, lb/hr	139	105
Stack Gas Oxygen, mole %	5.8	8.4
Stack Gas Carbon Dioxide, mole %	7.1	6.7
Actual Vol. of Gas to Vol. of Slurry	2.83	3.02
Heat Transfer Coefficient, Btu/(hr)(ft ²)(°F)	196	196

(1) Pressure drops calculated as a small difference between large inlet and outlet pressures hence appreciable error is likely.

(2) Pressure drop measured directly by PT985, an overall differential pressure transmitter.

(3) Not available.

(4) Heavy distillate feed contained five percent solids.

TABLE A-12

PREHEATED BASELINE RUNS

HEAT BALANCE

Run Number	P-1	P-2A	P-2B	P-3A	P-3B	P-4	P-5A	P-5B	P-6	P-7	P-8	P-9	F7-2T10
Run time	5-7	10-12	4-5	16-17	6-7	22-24	1-2	3-4	5-7	8-10	20-22	9-10	14-16
Run Day	11/11	11/11	11/13	11/11	11/13	11/11	11/12	11/12	11/12	11/12	11/12	11/13	11/14/80
Heavy Distillate, lb/hr	5210	6956	6990	7515	7458	7495	7478	7494	7476	7036	5100	7403	6784
Gas Feed, lb/hr	0	0	0	0	0	372	205	212	77	77	76	388	232
Inlet Temp., °F	164	163	163	170	175	145	160	160	165	164	171	154	207
Outlet Temp., °F	506	496	499	498	545	497	496	497	496	497	546	544	503
Temp. Increase, °F	342	333	336	328	370	352	336	337	331	333	375	390	296
Average Skin-Bulk Temperature, °F	40	45	52	44	55	37	35	36	36	36	30	40	29
Ambient Temp., °F	35	38	36	38	36	38	38	38	38	38	38	36	40
Firebox Temp., °F	-	-	860	-	962	-	-	-	-	-	-	1042	849
Stack Gas Temp., °F	892	966	948	1000	1031	1085	1038	1032	1010	988	908	1128	928
Natural Gas Consumption, lb/hr	98	115	105	123	124	152	139	139	124	123	105	164	105
Stack Gas Oxygen, mole %	11.0	8.8	8.4	8.1	7.1	6.4	7.2	5.8	6.8	8.5	10.3	3.3	8.4
Stack Gas O ₂ , mole %	5.3	6.5	6.9	7.2	7.7	8.0	7.5	7.1	7.0	6.5	5.9	9.0	6.7
Dry Combustion Air, lb/hr	3218	3109	2722	3098	2920	3431	3316	3155	2969	3279	3170	3129	2743
Combustion Gases, lb/hr													
H ₂ O,	230	264	335	281	282	344	316	315	284	282	244	365	240
CO ₂	255	299	389	320	322	395	361	361	322	320	273	426	272
O ₂	376	287	235	255	210	223	245	208	264	296	108	60	248
N ₂	2462	2369	2075	2353	2225	2614	2527	2405	2404	2498	2414	2226	2090
Stack Gas Heat Content, Btu/lb													
H ₂ O	400	453	432	463	474	505	474	474	463	453	421	537	432
CO ₂	194	215	211	224	232	241	232	232	224	220	202	263	207
O ₂	184	201	195	207	213	225	210	213	207	204	190	243	195
N ₂	210	230	216	237	244	257	244	244	237	230	216	278	223
Natural Gas Heat of Combustion, Btu/hr	2051	2407	2198	2575	2596	3182	2910	2910	2596	2575	2198	3433	2198
Heat Loss To Stack Gas, Btu/hr	728	786	721	812	796	991	902	864	828	833	700	941	674
Heat Loss To Surrounding, Btu/hr	128	139	133	144	149	157	144	144	146	140	130	162	136
Heat Absorbed By Difference, Btu/hr	1195	1482	1344	1619	1651	2034	1864	1902	1622	1602	1368	2330	1388
Heat Absorbed By Feed Gas, Btu/hr	0	0	0	0	0	275	144	150	54	54	60	318	144
Heat Absorbed By Heavy Distillate, Btu/hr	909	1182	1198	1257	1407	1346	1281	1287	1262	1195	975	1472	1024
Heat Absorbed By Feed, Btu/hr	909	1182	1198	1257	1407	1621	1425	1437	1316	1249	1035	1790	1168
Heat Of Closure, Btu/hr	286	300	146	362	244	413	439	465	306	353	333	540	220
Average Inside Heat Transfer Coefficient (1)	110	128	112	139	124	216	200	196	178	169	168	221	196
By Heat Capacity, Btu/(hr)(Ft ²)(°F)	110	128	112	139	124	216	200	196	178	169	168	221	196

TABLE A-13
PREHEATER HIGH HEAT FLUX BASELINE RUNS
OPERATING CONDITIONS

Run Number	P-10	P-11	P-12
Date	2/22/80	2/22/80	3/03/80
Time, hrs.	0200-0400	0500-0700	0600-0900
Heavy Distillate Feed (lb/hr)	5024	6870	5085
Gas, FT 861 (lb/hr)	363	358	353
Preheater Inlet Temperature (°F)	158	173	156
Preheater Outlet Temperature (°F)	510	513	500
Preheater Inlet Pressure (psig)	1640	1640	1650
Preheater Pressure Drop (psi)	0.5	18.0	12.5
Slurry Blend Tank Temperature (°F)	206	213	210

TABLE A-14

PREHEATER HIGH HEAT FLUX BASELINE RUNSLABORATORY ANALYSIS

<u>Midrun Slurry Blend Tank Sample Analysis</u>	P-10	P-11	P-12
60/60°F Specific Gravity	1.106	1.107	1.138
Viscosity (cst)			
100°F	157.4	192.7	
200°F	6.819	7.82	
F-128 Distillation, wt %			
H ₂ O	0.06	0.18	0.14
Naphtha	0.02	0.00	0.00
Middle Distillate	0.95	0.42	1.39
Heavy Distillate	84.24	87.64	74.01
Vacuum Bottoms	14.73	11.76	24.46
<u>Gas Analysis, Mole %</u>			
H ₂	93.7	93.6	96.9
N ₂	0.3	0.3	1.3
CH ₄	1.8	1.9	0
CO	4.1	4.1	1.8
C ₂ H ₆	0.0	0.0	0.0
CO ₂	0.0	0.0	0.0
C ₃ H ₈	0.0	0.0	0.0
C ₄ H ₁₀	0.0	0.0	0.0
H ₂ S	0.0	0.0	0.0
C ₅ +	0.1	0.1	0.0
Mol. Wt.	3.5	3.5	2.8

TABLE A-15
COMPOSITION OF SYNTHETIC RECYCLE SLURRY

<u>COMPONENT</u>	<u>COMPOSITION OF SLURRY BLEND NO. 1, WT. %</u>	<u>COMPOSITION OF SLURRY BLEND NO. 2, WT. %</u>	<u>COMPOSITION OF SLURRY BLEND NO. 3, WT. %</u>
150	.074	.04	0.04
150-250	.071	.05	0.05
250-350	0.33	.25	0.25
350-450	1.73	1.31	1.31
450-550	6.47	4.90	4.90
550-650	10.57	8.01	8.01
650-750	11.10	8.62	8.62
750-850	] 10.27	] 8.71	] 8.72
850-900			
900 (SRC)	] 59.38	] 68.1	35.741
Ash			22.71] 68.1
ION			9.65]

TABLE A- 16

<u>Fraction</u>	<u>Eluent</u>	<u>SESC SOLVENT SEQUENCE</u>	<u>Eluted Functional Type</u>
1	Hexanes		Saturated Hydrocarbons
2	Hexanes/15% Benzene		Aromatic Hydrocarbons
3	Chloroform		Mildly Polar Aromatics, Non-Basic, N,O,S Hetero- cyclics
4	Chloroform/10 % Diethylether		Simple Phenols
5	Diethylether/3 % Ethanol		Basic N Compounds
6	Methanol		Polyfunctional Compounds of Increasing Functionality and Molecular Weight
7	Chloroform/3 % Ethanol		
8	Tetrahydrofuran/3 % Methanol		
9	Pyridine/3% Ethanol		

TABLE A-17

SESC ANALYSIS RESULTS BY EYRING (AREA PERCENT)

Location	P.Out	Diss.In	P.Out.	Diss.In	P.Out	P.Out.	Diss.In	Diss.Btm	Diss.Mid.
Date	11/28	11/28	12/10	12/10	12/10	12/12	12/12	12/12	12/12
Time	9:12	9:24	9:12	9:26	15:37	8:26	8:41	8:55	9:10
Residue, wt %	2.16	17.70	14.92	14.92	11.22	5.89	21.52	27.46	24.98
<u>Fraction No.*</u>									
1	41.90	24.08	11.18	15.79	33.29	23.70	20.60	3.85	1.07
2	9.36	4.40	5.73	5.11	3.26	7.08	4.36	8.92	21.12
3	31.81	21.37	30.77	31.15	31.97	25.31	44.84	37.40	29.51
4	2.76	24.03	39.20	28.25	13.44	22.44	6.99	26.60	24.98
5	2.26	1.50	0.43	1.68	0.22	2.08	0.65	1.83	1.86
6	5.10	6.72	5.11	4.82	4.07	6.42	7.72	7.20	3.64
7	0.24	1.42	2.56	2.41	2.32	2.07	2.59	0.97	1.05
8	4.56	3.09	3.19	1.60	1.55	1.48	2.98	3.55	3.09
9	<u>2.00</u>	<u>13.24</u>	<u>10.75</u>	<u>9.09</u>	<u>9.84</u>	<u>6.42</u>	<u>9.27</u>	<u>9.67</u>	<u>10.04</u>
Total	99.99	100.00	100.00	99.90	99.96	100.00	100.00	99.99	96.36

* See Table A-16 for composition of fractions

TABLE A-18

SESC ANALYSIS RESULTS BY CONOCO (AREA PERCENT)

Location Date Time	Stripper 12/12 10:00	Coal Slurry 1/08/80 12:00	Pre Outlet 1/08/80 9:20	Diss. In. 1/08/80 9:30	Diss. Mid. 1/08/80 10:02	Flush Sol. 1/18/80 9:00
<u>Fraction No. *</u>						
1	1.7	2.0	2.5	1.7	2.0	4.1
2	40.3	24.2	45.8	32.3	24.7	50.4
3	32.6	32.0	28.2	23.5	33.5	29.7
4	9.9	11.7	8.9	9.2	11.6	6.9
5	7.7	12.1	6.6	9.3	11.2	6.6
6	1.8	4.5	2.5	2.8	2.1	2.0
7	1.6	3.5	2.0	3.7	3.7	0.1
8	3.2	5.4	2.1	9.4	7.0	0.0
9	<u>1.2</u>	<u>4.6</u>	<u>1.4</u>	<u>8.0</u>	<u>4.2</u>	<u>0.3</u>
Total	100.0	100.0	100.0	99.9	100.0	100.1

* See Table A-16 for composition of fractions.

TABLE A-15

Preheater and Dissolver Sampling Conditions and Analysis

Sample Point	Preheater Outlet	Dissolver Inlet	Preheater Outlet	Dissolver Inlet	Dissolver Middle
Sample Date	3/06/80	3/06/80	3/25/80	3/25/80	3/25/80
Sample Time	0915	0935	1421	1441	1504
<u>Sample Data</u>					
Cylinder Vol., l	4	4	4	4	2
Slurry Wt., gm	1377.2	78	4050	94.5	1585.5
Gas Volume, l	59	335	35	3.5	63.8
Molecular Weight of Gas	5.64	4.97	6.18	4.95	
Gas Analysis, mol %					
H ₂	82.89	85.34	80.95	85.72	
O ₂	-	-	-	0.60	
N ₂	4.72	1.16	4.06	1.07	
CH ₄	7.28	7.62	7.76	7.25	
CO	4.24	4.27	4.50	4.38	
CO ₂	-	-	-	-	
C ₂ H ₆	0.51	0.94	0.96	0.91	
C ₃ H ₈	0.15	0.24	0.33	0.33	
iC ₄ H ₁₀	-	-	-	-	
nC ₄ H ₁₀	-	-	-	-	
H ₂ S	0.21	0.30	0.84	0.35	
C ₂ S	-	-	-	-	

Process Hydrogen Analysis*

Date	3/05/80	3/06/80	3/25/80	3/25/80
Time	0900	1000	1500	1600
Chromatograph Analysis, mol %				
H ₂ (Bendix Chromatograph)	85.74	86.64	87.14	86.95
H ₂ (Beckman Chromatograph)	86.33	85.70	86.78	85.91
O ₂	0.00	0.00	0.00	0.00
N ₂	0.67	0.76	0.89	0.82
CH ₄	6.67	7.04	6.65	7.38
CO	3.74	3.67	4.47	4.32
CO ₂	-	-	-	0.01
C ₂ H ₆	1.20	1.55	0.59	0.66
C ₃ H ₈	0.78	0.88	0.39	0.44
iC ₄ H ₁₀	0.04	0.04	0.01	0.03
nC ₄ H ₁₀	0.30	0.30	0.15	0.17
H ₂ S	0.07	0.07	0.06	0.20
C ₂ S	-	-	-	-

* Composition of process hydrogen gas to slurry preheater B by plant gas chromatographs.

TABLE A-20

REACTION AREA TRANSIT TIMES (IN MINUTES) FOR RADIOISOTOPE TRACER INJECTIONS - June 1979, SRC-I

<u>Injected Tracer</u>	<u>Preheater Plus Transfer Line</u>		<u>Dissolver</u>	
	Start of Peak	End	Start of Peak	67% Past Detector
Argon-41 (5 injections)	3.5-4.0	5.0-5.5	4.5-5.0	6.0-6.5
Bromophenanthrene	11	14	15-16*	Not Taken
	11.5	15	17	30±
	11.7	14	14	60±
Gold-198				
Colloidal	10.5	14	15*	No Peak
10-40 m	16*	20*	-No discernible peak--	

* These responses were so small that the data must be considered rough approximations.

TABLE A-21

Summary of Preheater-Dissolver Mixing Tests

Sample Date	12/12/79	12/12/79	12/13/79	12/13/79	12/13/79	12/13/79	12/13/79	12/14/79	12/14/79	12/14/79	12/15/79	12/15/79	12/15/79
Injection No.	3	4	1	2	3	4	5	1	2	4	1	2	3
Sample Time	17:25	18:10	15:50	16:48	17:30	19:30	23:17	14:00	16:07	22:13	16:22	17:05	17:46
Radioisotope	Ar-41	Ar-41	Ar-41	Ar-41	Br-82	Br-82	Au-198	Au-198	Br-82	Br-82	Br-82	Ar-41	Ar-41
Activity (MC)	0.4	0.3	2.0	1.4	0.3	0.2	0.4	0.8	0.3	0.2	0.2	1.5	1.2
Injection Point	Diss.	Preh.	Diss.	Preh.	Preh.	Diss.	Diss.	Diss.	Diss.	Preh.	Preh.	Preh.	Diss.
Chart Detectors	3 & 4		3 & 4	1,2,3	1,2,3	3,4	3,4	3,4	3,4	1,2	1,2	1,2	3,4
MCA Detectors	3 & 4		3 & 4	1,2,3	1,2,3	3,4	3,4	3,4	3,4	2	1,2	1,2	3,4
Page No. In Data Book	6-7	8-9	12-13	14-15	16-17	18-19	20-21	22-23	24-25	26-27	28-29	32-33	34-35
Raw Coal Feed, lb/hr	2550	2520	1770	1800	1800	1740	1740	2220	2250	2220	2190	2190	2190
Recycle Slurry, lb/hr	4669	4612	3397	3409	3419	3360	3397	4336	4206	4249	4208	4345	4202
Seal Flush, lb/hr	724	722	443	482	554	535	465	576	516	615	607	523	610
Total Slurry To Preheater, lb/hr	7443	7854	5610	5691	5773	5635	5602	7132	6972	7084	7005	7058	7002
H ₂ To Slurry Preheater, lb/hr	492	491	292	294	333	333	391	353	354	354	432	395	395
H ₂ To Preheater Outlet, lb/hr	291	290	462	465	427	426	354	407	408	407	321	348	348
Mol. Wt. of H ₂	5.53	5.51	5.28	5.28	5.37	5.27	5.06	5.30	5.30	5.30	5.55	5.42	5.42
Preheater Inlet Temp., °F	335	332	317	316	311	310	316	314	313	322	321	320	320
Preheater Outlet Temp., °F	788	786	792	806	788	778	787	793	799	795	764	771	764
Preheater Inlet Press., psig	2104	2092	2102	2101	2083	2083	2097	2027	2106	2029	2077	2061	2061
Preheater Outlet Press., psig	1937	1935	1934	1934	1934	1929	1928	1930	1933	1931	1927	1927	1927
Dissolver A Inlet Temp. °F	739	735	728	722	726	708	699	733	715	729	719	716	716
H ₂ Temp. To Preheater Outlet, °F	727	728	731	729	729	728	728	729	729	732	730	730	730
Dissolver A Outlet Temp. °F	859	860	852	853	849	847	836	842	849	856	853	849	849
Chart Figure No.			4	3					2	1			
Time Delay Seconds													
Initial Material			20	52					60	110			
Peak Concentration			45	60					360	140			

FIGURE A-1

SRC II LIQUIDS INVENTORY
NOVEMBER 19 THROUGH JANUARY 14, 1980

FIGURE A-2

TEMPERATURE PROFILES
BASELINE RUN P5B (PRIOR TO SLURRY
SERVICE) AND RUN T10 (AFTER
SLURRY SERVICE)

FIGURE A-3

PREHEATER HEAT TRANSFER COEFFICIENT
PROFILE FOR BASE LINE RUNS BEFORE &
AFTER SLURRY SERVICE

FIGURE A-4

VACUUM BOTTOMS VISCOSITY VS. SHEAR RATE

FIGURE A-5

VISCOSITY OF RECYCLE SLURRY BLEND NO.1 vs TEMPERATURE

VISCOSITY OF RECYCLE SLURRY BLEND NO.2 vs TEMPERATURE

FIGURE A-6

VISCOSITY OF RECYCLE SLURRY BLEND NO. 3 VS. TEMPERATURE

FIGURE A-7

CALIBRATION OF FT 1152

AGREEMENT BETWEEN NOV 1979 AND FEB 1980 CALIBRATION

FIGURE A-8

CHARGE PUMPS A & B FLOWRATE CALIBRATION
USING HEAVY DISTILLATE
FEBRUARY, 1980

FIGURE A-9

INJECTION POINT AND DETECTOR LOCATIONS

INJECTION POINT NO. 1 - 10 FEET UPSTREAM OF PREHEATER-B

INJECTION POINT NO. 2 - 16 FEET UPSTREAM OF DISSOLVER-A

DETECTOR NO. 1 - 2 FEET UPSTREAM OF PREHEATER-B

DETECTOR NO. 2 - 32 FEET DOWNSTREAM OF PREHEATER-B

DETECTOR NO. 3 - 10 FEET UPSTREAM OF DISSOLVER-A

DETECTOR NO. 4 - 65 FEET DOWNSTREAM OF DISSOLVER-A

FIGURE A-10

INJECTION AT PREHEATER INLET ONE VIAL OF BROMOPHENANTHRENE
CHART SPEED = 10 CM/MIN

FIGURE A-11

INJECTION AT DISSOLVER INLET 1/2 VIAL OF BROMOPHENANTHRENE

CHART SPEED = 0.3 CM/MIN.

FIGURE A-12

INJECTION AT PREHEATER INLET THREE AMPOULES OF ARGON
CHART SPEED = 10 CM/MIN

FIGURE A-13

INJECTION AT DISSOLVER INLET THREE AMPOULES OF ARGON

CHART SPEED = 10 CM/MIN

FIGURE A-14

LOCATION OF EROSION / CORROSION
TEST WAVE GUIDES

FIGURE A-15

ULTRASONIC INSPECTION (SHEAR WAVE)
ON AREA 02 PROCESS LINES

FIGURE A-16

ULTRASONIC INSPECTION (SHEAR WAVE)
ON AREA 02 PROCESS LINES

FIGURE A-17

ULTRASONIC INSPECTION (SHEAR WAVE)
ON AREA 02 PROCESS LINES

FIGURE A-18

PIPING INSPECTION OF LINE 2" VA-5-B3/E1

ALL UNITS ARE IN INCHES

FIGURE A-19

PIPING INSPECTION OF LINE 3" VA-22-G1

AND 6" VA-21-G1

(ALL UNITS ARE IN INCHES)

FIGURE A-20

EROSION / CORROSION INSPECTION
RECYCLE HYDROGEN COMPRESSOR SCRUBBER

ALL UNITS ARE IN INCHES

FIGURE A-21

EROSION / CORROSION INSPECTION
RECYCLE HYDROGEN SCRUBBER

ALL UNITS ARE IN INCHES

A P P E N D I X B
P-99 Tables and Figures

TABLE B-1
Operating Conditions for
Runs P99-63 to P99-66

Run No., P99	<u>63</u>	<u>64</u>	<u>65</u>	<u>66</u>
Dissolver Dimensions	20 ft x 4 1/4 in ID		10 ft x 6 in ID	
Dissolver Outlet Temp., °F	860	860	860	860
Preheater Outlet Temp., °F	792	786	748	747
Dissolver Pressure, psig	2000	2000	2000	2000
Nominal Slurry Residence Time, hr	1.0	1.0	1.0	1.0
Feed Slurry Composition, Wt%				
Coal	30	30	30	30
Recycle Solids	14	12	13	12
Dissolver Gas				
Rate, 10 ³ SCF/T of Coal	60.8	54.6	59.9	54.0
Hydrogen Content, Vol%	85	94	85	94
Hydrogen Partial Pressure at Dissolver Outlet, psia	1375	1525	1380	1510

Figure E-1

CONDITION OF PDU P-99 DISSOLVER
FOLLOWING RUN P99-64

Figure B-2

Condition of PDU P-99 Hot High Pressure
Separator Following Run P99-64

Figure B-3

COMPARISON OF AXIAL TEMPERATURE
PROFILES FOR 20 FT. AND 10 FT. DISSOLVERS

A P P E N D I X C
R&D Tables and Figures

TABLE C-1

COAL LIQUEFACTION PRODUCT YIELD STRUCTURES
(wt% maf feed coal)

RUN	DMY	DC1C4	DHY	DMH	DNAP	DMD	DMD	DL10	DO151	DSRC	D10M	DOVB
P99.15	-5.4289	19.7115	4.44885	8.74353	6.2989	17.7624	14.3266	38.3878	32.0890	26.6711	7.4772	34.1482
P99.16	-5.1536	16.9144	4.23962	8.60948	11.2212	17.8394	13.3906	42.4513	31.2300	26.4618	6.3870	32.8488
P99.17	-5.2817	18.8746	4.65808	8.60948	11.5736	15.2626	12.2123	39.0486	27.4749	25.0964	8.8537	33.9500
P99.18	-5.5280	21.8698	4.68010	9.23907	7.2129	15.6591	13.2588	36.1304	28.9175	26.6601	6.9506	33.6196
P99.20	-4.4158	15.7141	4.50391	8.62240	5.4730	14.4918	14.1284	36.0932	28.6202	31.2961	10.1971	41.4932
P99.21	-5.0986	16.2317	4.42683	9.28312	8.5343	16.2647	19.5573	44.3563	35.8220	26.1645	4.6471	30.8116
P99.22	-6.4861	23.7969	5.09856	8.72151	11.0671	21.8588	12.1352	45.0511	33.9941	17.8835	5.9355	23.8190
P99.23	-5.8065	23.2481	4.82591	8.31864	8.4839	19.2706	14.2874	42.0119	33.5280	18.2459	9.1670	27.4130
P99.24	-5.9938	23.4685	5.06831	8.67122	7.9110	19.4579	15.8330	43.2319	35.2909	17.0560	8.5280	25.5840
P99.25	-4.4524	16.6935	3.71606	5.47630	9.1694	16.5900	11.5048	37.2642	28.0948	32.5242	8.7667	41.2908
P99.26	-4.0267	17.1192	3.41694	4.63645	8.7437	13.2651	8.5481	30.5568	21.8137	32.5357	15.7616	48.2973
P99.27	-4.6480	19.5467	3.43994	4.98159	8.9162	16.8891	6.1436	31.9489	23.0327	28.9692	15.7616	44.7308
P99.28	-4.7400	17.9245	3.48598	5.29222	9.9632	17.9130	12.3217	40.1979	30.2347	28.1523	9.6871	37.8394
P99.29	-3.2329	12.2411	2.89922	4.13023	6.6038	11.8730	12.5863	31.0630	24.4593	41.2218	11.6774	52.8992
P99.31	-5.0136	19.7108	5.46403	5.85516	10.9399	17.7788	11.9474	40.6661	29.7262	26.2178	7.0760	33.2938
P99.32	-5.4759	21.0383	5.45217	6.32926	11.5562	18.7744	12.6467	42.9774	31.4211	22.7688	6.8982	29.6869
P99.33	-4.0528	16.8597	3.41593	5.60445	8.4993	13.8258	13.2816	35.6068	27.1075	31.2182	11.3478	42.5660
P99.35	-4.7056	18.4690	4.37424	6.46195	9.8310	14.9674	16.6685	41.4669	31.6359	27.9024	6.0532	33.9556
P99.36	-4.7940	18.2481	4.38529	6.56136	10.4275	18.3761	15.2657	41.0623	30.6418	28.6536	8.8765	34.5300
P99.37	-4.7277	18.2481	4.57307	6.94797	10.4496	14.3930	14.1390	38.9816	28.5320	29.1395	6.8265	35.9660
P99.38	-4.5874	18.3275	3.80817	5.84943	8.8016	18.1409	14.0694	41.0119	32.2103	27.3156	8.2748	35.5904
P99.39	-4.3459	17.5812	3.76477	6.25849	9.0650	14.9363	14.8047	38.8060	29.7410	29.1910	7.7480	37.9390
P99.41	-4.4170	17.5425	3.69883	5.73378	10.4501	14.1729	15.1903	39.8133	29.3632	28.5731	9.0496	37.6227
P99.42	-4.8121	18.3744	3.79459	6.39215	11.3000	18.7434	13.3230	43.4163	32.1164	25.4728	7.3498	32.8226
P99.43	-4.7402	18.3146	4.02203	6.44003	10.4381	17.0697	16.6507	44.1585	33.7204	24.6828	7.1223	31.8051
P99.44	-4.1657	16.5071	3.89035	5.13526	4.1214	17.1056	14.3524	40.5794	31.4580	29.7582	8.3074	38.0656
P99.45	-4.3273	16.1941	4.33891	7.01515	11.3882	13.6659	12.5498	37.6039	28.2157	31.9212	7.2543	39.1755
P99.46	-4.3275	16.5015	4.09976	6.60517	9.0992	15.7841	13.2673	38.1506	29.0514	32.6956	6.2749	38.9705
P99.47	-3.9973	14.6908	3.98588	6.85571	8.5194	15.3513	13.4495	37.3192	29.8008	35.3832	5.7511	41.1343
P99.48	-4.6973	17.1360	4.27545	8.73333	10.8901	17.9911	14.4681	42.5493	32.4592	26.1739	6.8293	32.0032
P99.49	-4.7429	19.0742	4.28685	8.85874	8.9956	16.4177	9.9305	35.3437	26.3482	29.8826	7.2854	37.1679
P99.50	-4.9823	18.6296	3.94482	9.16687	8.8701	17.0448	15.8135	41.7281	32.8883	25.9377	5.5752	31.5129
P99.51	-5.1191	18.4130	3.99042	8.93855	9.1894	17.7631	16.9194	43.8719	34.6825	24.7064	5.1647	29.8712
P99.52	-4.7429	18.6068	4.00182	8.68772	8.4369	17.0334	13.0316	38.5019	30.0650	28.1724	6.7609	34.9333
P99.53	-4.3429	17.6431	3.92445	8.31260	7.9281	16.3877	7.8828	32.1986	24.2705	34.7546	7.5096	42.2642
P99.54	-4.2861	17.6556	3.53337	7.93045	8.4577	14.5597	13.1464	36.1638	27.7061	30.4543	8.5586	39.0129
P99.55	-4.4307	17.8575	3.58946	8.10993	7.7622	16.2086	15.5693	39.5401	31.7779	27.0667	8.2670	35.3337
P99.56	-4.7358	18.2244	4.15383	7.45179	8.2164	17.2201	15.7252	41.1617	32.4453	26.8858	6.8584	33.7442
P99.57	-5.2608	18.7949	4.29077	7.58873	10.9895	16.7751	20.9403	46.6849	37.7154	22.3439	5.5460	27.8900
P99.59	-5.2493	19.2400	4.51900	7.45179	10.3146	17.4027	17.3228	45.1101	34.7256	23.9530	4.9869	28.9399
P99.60	-4.9070	17.9934	4.31359	7.16658	10.3503	18.6422	11.9251	40.9677	30.6174	29.7615	4.8043	34.5658
P99.61	-3.7412	17.4956	3.37808	6.82993	8.3326	12.2029	4.6765	24.9120	16.8794	36.3776	15.5590	51.9366
P99.62	-3.6532	16.2192	3.38908	6.31602	7.2183	13.2482	11.6857	32.1523	24.9340	28.2460	17.3305	45.5766

TABLE C-2

COAL LIQUEFACTION OPERATING CONDITIONS

RUN	COAL	TAVG	PHP	SRT	C IN	NASH	RESOLID
P99.15	KENTUCKY	460	1704.62	1.13	33.2	4.2	6.7
P99.16	KENTUCKY	460	1887.04	1.07	29.6	6.2	9.6
P99.17	KENTUCKY	465	1685.71	1.11	32.8	4.5	8.3
P99.18	KENTUCKY	460	1849.89	1.42	32.7	4.3	6.9
P99.20	KENTUCKY	460	1680.61	0.70	29.8	4.9	10.6
P99.21	KENTUCKY	460	2117.04	0.70	29.6	7.1	10.8
P99.22	KENTUCKY	460	2132.04	1.30	29.6	7.4	11.8
P99.23	KENTUCKY	460	1706.62	1.28	29.7	6.7	12.9
P99.24	KENTUCKY	460	1667.81	1.28	32.0	6.6	12.8
P99.25	BLACKSVI	460	2117.08	0.99	29.6	7.1	11.1
P99.26	BLACKSVI	460	1694.61	1.00	29.8	6.1	12.7
P99.27	BLACKSVI	460	1702.62	1.30	29.8	5.5	10.9
P99.28	BLACKSVI	460	2122.04	1.29	29.6	5.1	11.8
P99.29	BLACKSVI	460	2128.30	0.69	29.5	6.3	11.3
P99.31	IRELAND	460	1708.14	1.00	29.8	8.9	12.2
P99.32	IRELAND	460	1704.14	1.00	29.7	12.6	17.4
P99.33	BLACKSVI	455	1705.38	0.99	29.4	7.5	12.9
P99.35	POWHA-SA	455	1697.38	0.99	29.5	8.1	12.8
P99.36	POWHA-SA	455	1879.32	0.99	29.5	8.2	12.5
P99.37	POWHA-SA	455	1704.62	0.99	29.5	7.8	12.6
P99.38	VALLEY_C	455	1870.68	0.99	29.3	6.3	11.7
P99.39	VALLEY_C	455	1808.03	0.99	29.4	6.5	11.6
P99.41	ROBINSON	455	1881.32	0.99	29.4	11.1	16.0
P99.42	ROBINSON	455	1883.32	0.99	24.5	15.1	20.9
P99.43	ROBINSON	455	1801.35	0.99	24.4	15.3	21.1
P99.44	ROBINSON	455	1801.35	0.99	29.5	12.3	17.3
P99.45	POWHA-SB	455	1804.65	0.99	29.4	9.9	14.4
P99.46	POWHA-SB	455	1801.35	1.00	29.7	9.0	13.3
P99.47	POWHA-SB	450	1795.35	0.99	29.5	9.0	13.1
P99.48	POWHA-SC	460	1707.38	1.00	30.0	10.8	16.3
P99.49	POWHA-SC	457	1794.35	1.00	29.4	9.5	14.6
P99.50	POWHA-SC	455	1877.32	1.00	29.4	11.4	15.9
P99.51	POWHA-SC	455	2074.04	1.00	29.4	11.2	15.3
P99.52	POWHA-SC	457	1807.34	1.00	29.5	10.1	14.9
P99.53	POWHA-SO	455	1802.65	1.33	39.3	4.0	6.3
P99.54	POWHA-SO	455	1800.65	1.32	39.0	5.7	9.6
P99.55	POWHA-SO	455	1806.65	0.99	29.2	9.2	15.7
P99.56	POWHA-SE	455	1703.38	1.01	30.5	9.3	13.7
P99.57	POWHA-SE	455	2129.54	1.01	30.4	10.5	14.5
P99.59	POWHA-SE	458	2071.74	1.01	30.4	11.9	16.2
P99.60	POWHA-SE	457	2074.04	1.01	30.7	5.7	7.8
P99.61	POWHA-SF	458	1571.26	1.01	30.7	3.3	8.3
P99.62	POWHA-SF	458	1503.58	1.01	30.6	5.5	15.0

TABLE C-2a

Nomenclature for ModelDependent Variables (yields as wt% maf feed coal)

DBY	byproduct or "other gases" (CO , CO_2 , H_2S , NH_3)
DC1C4	C_1 - C_4 hydrocarbon gases
DDIST	liquid product (distillate) boiling between 380°F - 900°F , DDIST=DMD+DHD
DHD	heavy distillate, liquid product boiling between 550°F - 900°F
DIW	water
DHY	hydrogen consumption (represented as a negative value)
DIOM	insoluble (pyridine) organic matter
DLIQ	total liquid product, boiling range C_5 - 900°F , DLIQ=DNAP+DMD+DHD
DMD	middle distillate, liquid product boiling between 380°F - 550°F
DNAP	naphtha, boiling range C_5 - 380°F
DOVB	organic vacuum bottoms or " 900°F + organic," DOVB=DIOM+DSRC
DSRC	SRC or " 900°F + pyridine soluble"

Independent Variables

CIN	feed coal concentration in the feed slurry, wt% on feed slurry
PH2	inlet hydrogen partial pressure, psig
RASH	recycle ash concentration in the feed slurry (this does not include ash in the feed coal), wt% on feed slurry
RSOLID	recycle solids concentration in the feed slurry (recycle ash plus recycle IOM), wt% on feed slurry
SRT	nominal slurry residence time in the reactor, hours
TAVG	average reactor temperature, $^\circ\text{C}$

TABLE C-3

COALS USED ON PDU P-99

<u>Coal</u>	<u>Number</u>	<u>Runs Used</u>
Kentucky	LR-22366	15-24
Blacksville No. 2	LR-24001	25-29, 33
Ireland	LR-22991	31-32
Powhatan No. 5-a	LR-24924	35-37
Valley Camp	LR-24925	38-39
Robinson Run	LR-25447	41-44
Powhatan No. 5-b	LR-25734	45-47
Powhatan No. 5-c	LR-25844a	48-52
Powhatan No. 5-d	LR-25844b	53-55
Powhatan No. 5-e	LR-26982	56-60
Powhatan No. 5-f	LR-27383	61-62

TABLE C-4

PREDICTED RANKINGS OF TOTAL LIQUID PRODUCT (C₅-900°F)
YIELDS* VERSUS COAL TYPE

<u>Constant Recycle Ash</u>		<u>Constant Recycle Solids</u>	
Kentucky	48.5	Kentucky	45.3
Powhatan 5a	45.2	Ireland	45.0
Valley Camp	45.2	Powhatan 5a	44.1
Powhatan 5e	42.8	Valley Camp	43.4
Powhatan 5f	41.8	Powhatan 5e	42.4
Powhatan 5d	41.6	Powhatan 5c	40.3
Ireland	40.7	Powhatan 5d	39.9
Blacksville	40.3	Robinson Run	39.2
Powhatan 5b	39.0	Powhatan 5b	39.0
Powhatan 5c	38.8	Blacksville	37.3
Robinson Run	38.2	Powhatan 5f	34.2

* Rankings are given as wt% yields based on maf feed coal; the unit operating conditions TAVG=455°C, SRT=1 hour, CIN=30 wt%, Inlet PH2=1800 psig, and Recycle Ash=10 wt% or Recycle Solids=15 wt%.

TABLE C-5

**PREDICTED RANKINGS OF INSOLUBLE (PYRIDINE)
ORGANIC MATTER YIELDS* VERSUS COAL TYPE**

<u>CONSTANT RECYCLE ASH</u>		<u>CONSTANT RECYCLE SOLIDS</u>	
IRELAND	5.4	IRELAND	4.8
POWHATAN 5A	6.0	POWHATAN 5C	5.9
POWHATAN 5C	6.1	POWHATAN 5A	6.6
KENTUCKY	6.2	POWHATAN 5E	6.9
POWHATAN 5E	6.6	KENTUCKY	7.3
POWHATAN 5B	6.9	POWHATAN 5B	7.3
VALLEY CAMP	8.1	POWHATAN 5D	8.2
POWHATAN 5D	8.1	ROBINSON RUN	8.5
ROBINSON RUN	8.7	VALLEY CAMP	8.7
BLACKSVILLE	11.7	BLACKSVILLE	12.6
POWHATAN 5F	13.8	POWHATAN 5F	14.6

*RANKINGS ARE GIVEN AS WT % YIELDS BASED ON MAF FEED COAL; THE UNIT OPERATING CONDITIONS TAVG=455°C, SRT=1 HOUR, CIN=30 WT %, INLET PH2=1800 PSIG, AND RECYCLE ASH=10 WT % OR RECYCLE SOLIDS=15 WT %.

TABLE C-6

PREDICTED RANKINGS OF ORGANIC VACUUM BOTTOMS (900°F* ORGANICS)
 YIELDS* VERSUS COAL TYPE

<u>Constant Recycle Ash</u>		<u>Constant Recycle Solids</u>	
Kentucky	24.4	Kentucky	27.1
Powhatan 5a	30.8	Ireland	28.5
Valley Camp	32.2	Powhatan 5a	31.9
Powhatan 5e	32.3	Powhatan 5e	32.6
Ireland	33.1	Powhatan 5c	33.4
Powhatan 5d	33.7	Valley Camp	33.9
Powhatan 5c	35.0	Powhatan 5d	35.5
Powhatan 5f	36.3	Robinson Run	38.9
Blacksville	38.6	Powhatan 5b	39.1
Powhatan 5b	38.8	Blacksville	41.9
Robinson Run	39.9	Powhatan 5f	42.8

* Rankings are given as wt% yields based on maf feed coal; the unit operating conditions TAVG=455°C, SRT=1 hour, CIN=30 wt%, Inlet PH2=1800 psig, and Recycle Ash=10 wt% or Recycle Solids=15 wt%.

TABLE C-7

LABORATORY CORROSION TESTS OF P-99 PROCESS WATERTest Conditions

Sample: Cold Separator
Temperature: 150°F
Pressure: 1500 psig
Stirring Rate: 500 rpm
Exposure Period: 72 hrs.

<u>Alloys</u>	<u>Corrosion Rate, mpy</u>
Carbon Steel	1.5
Type 316	0.4
Hastelloy C	0.3
Sandvik 3RE60	0.2

TABLE C-8

LABORATORY CORROSION TESTS OF P-99 PROCESS WATERTest Conditions

Sample: Second Intermediate Separator
 Temperature: 400 & 450°F
 Pressure: 1500 psig
 Stirring rate: 500 rpm
 Exposure Period: 72 hrs.

<u>Alloys</u>	<u>Corrosion Rate, mpy</u>	
	<u>400°F</u>	<u>450°F</u>
Carbon Steel	49-120	53-59
Type 316	2-6	4-11
Hastelloy C	1-2	1-2
Inconel 600	23	48
Sandvik 3RE60	2	2

TABLE C-9

TYPICAL P-99 PROCESS WATER ANALYSIS

<u>COMPONENT</u>	<u>CONCENTRATION, PPM</u>	
	<u>COLD SEPARATOR</u>	<u>2ND INTERMEDIATE SEPARATOR</u>
PH	8.8	9.2
CHLORIDE	100	3960
SULFIDE	23880	4100
TOTAL NITROGEN	22600	9800
FIXED NH ₃	10580	4650
FREE NH ₃	6620	4700
PHENOLIC COMPOUNDS	9380	16480

TABLE C-10

Thermogravimetric Coal Measurements*

<u>Coal</u>	<u>Powhatan</u>	<u>Kentucky</u>	<u>Ireland Mine</u>	<u>Blacksville-II</u>
Sample Number	LR 24924	LR 22366	LR 22991	LR 24001
Volatile Matter (VM), %	35.8	40.7	36.2	36.2
Light-Volatile Matter (VM _L), %	24.6	29.4	23.4	17.4
Heavy-Volatile Matter (VM _H), %	11.2	11.3	12.8	10.8
Fixed Carbon (FC), %	55.4	51.3	49.9	52.9
Ash, %	8.8	8.0	13.9	11.4
VM/FC	0.65	0.79	0.73	0.69
VM _L /FC	0.44	0.57	0.47	0.33
VM _H +FC, %	66.6	62.6	62.7	71.2
VM _L /VM _H	2.20	2.60	1.83	0.93

*Based on moisture-free

TABLE C-11

Fraction of Hydrogen Atoms on Aromatic Carbon (%)¹

P99-66 Dissolver Btm	0.86
P99-64 Dissolver Btm	0.55
P99-64 Dissolver Top	0.53
P99-66 Dissolver Top	0.47
P99-66 Hot Separator	0.23
P99-64 Hot Separator	0.08

¹Determined by FT-Infrared

FIGURE C-1
TGA and DTG thermograms of Powhatan coal (LR 24924)

FIGURE C-2 Relation between coal reactivity and light volatile matter to fixed carbon ratio.

FIGURE C-3 Relation between yield of insoluble organic matter (IOM) and total of heavy volatile matter (VM_H) plus fixed carbon(FC).

FIGURE C-4 TGA and DTG thermograms of feed slurry (P99-50-3).

FIGURE C-5 TGA and DTG thermograms of dissolver effluent (P99-49-8).

FIGURE C-6 TGA and DTG thermograms of atmospheric flash bottom product.

% Wt
Loss

% Wt
Loss Rate

FIGURE C-7 TGA and DTG thermograms of P99 process Solvent.

FIGURE C-8

The volatile matter, heavy volatile matter plus fixed carbon ratio ($VM_H + FC$), and ash content of various SRC-II streams.

FIGURE C-9 Pressure-DSC thermogram of Powhatan coal (LR 24924) under 900 psi H_2 and 20°C/min.

FIGURE C-10 Pressure-DSC thermograms of SRC-II streams. (A) feed slurry(P99-50-3), (B) Powhatan coal(LR-24924), (C) Process solvent, and (D) atm. flash btm. (900 psi Hydrogen and 20 °C/min)

FIGURE C-11 Hydrogen Pressure Effect on Kentucky #9 Coal by HP-DSC Technique

FIGURE C-12 Effect of hydrogen pressure on coal transition temperature, reaction temperature and initial coking/polymerization temperature.

- transition temperature
- × reaction temperature
- initial coking/polymerization temperature

(Kentucky coal LR 22366)

FIGURE C-13

Heating Rate Effect on Phase Transfer of P-99
Feed Slurry (P99-50-3) at 900 psi H_2 (a) 5°C/min,
(b) 20°C/min, and (c) 100°C/min

FIGURE C-14 Effect of hydrogen pressure on light volatile matter of feed slurry(P99-50-3) at 460°C(860°F) for 60 min.

FIGURE C-15 Effect of hydrogen pressure on fixed carbon of feed slurry(P99-50-3) at 460°C (860°F) for 60 min.

Figure C-16
Characterization
of SRC-II solid coke
materials.

FIGURE C-17 Infrared characterization of
SRC-II solid coke material
(P99-66-8 Hot Separator)

A P P E N D I X D

SRC-II PROCESSING OF PITTSBURGH SEAM
(POWHATAN NO. 5 MINE) COAL IN PROCESS DEVELOPMENT UNIT P-99

Interim Report for the Period
December 1978 to June 1979

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ABSTRACT

This report presents the results of eight SRC-II runs on Process Development Unit P-99 feeding Pittsburgh Seam coal from the Powhatan No. 5 Mine. This work provided further evidence that Powhatan coal is a satisfactory feedstock for the SRC-II process. Increasing hydrogen partial pressure from 1300 to 1500 psia improved distillate yield, particularly fuel oil yield. Increasing recycle solids level in the feed slurry also improved the distillate yield. Operation at 40% coal in the feed slurry and 1.33 hr slurry residence time gave slightly poorer distillate yields than operation at 30% coal and 1 hr slurry residence time, even though the weight of coal fed per hour per unit volume of dissolver remained unchanged in both operations. This was probably due, at least in part, to the lower recycle solids level in the 40% coal runs.

I. SUMMARY

This report covers work on the SRC-II processing in Process Development Unit P-99 of a third shipment of Pittsburgh Seam coal from the Powhatan No. 5 Mine. This work has provided further evidence that satisfactory yields of distillates can be produced from Powhatan No.5 Mine coal under typical SRC-II conditions (851°F, 2000 psig, 1 hour slurry residence time, and 30 wt% coal in the feed slurry). These yields are comparable to those obtained from Kentucky, Ireland and Valley Camp coals; better than those obtained from Robinson Run coal; and much better than those obtained from Blacksville coal.

Increasing hydrogen partial pressure improved C₅-900°F distillate yield, particularly fuel oil yield, and reduced the yields of 900°F+ pyridine solubles and IOM (pyridine insoluble organic matter). Increasing recycle solids concentration in the feed slurry also had a beneficial effect on yields, with more distillate being produced and less 900°F+ pyridine solubles and IOM.

Operation at 40% coal in the feed slurry and 1.33 hours slurry residence time gave slightly poorer distillate yields than operation at 30% coal and 1 hour slurry residence time, even though both operations fed the same weight of coal per hour per unit volume of dissolver. Because of operating limits on the total solids level of the feed slurry, the recycle ash level of the 40% coal slurry was much lower than that of the 30% coal slurry, and this probably accounts, at least in part, for the lower yields with the 40% coal slurry.

II. INTRODUCTION

This is the fifth in a series of reports⁽²⁻⁵⁾ on the SRC-II processing of Pittsburgh Seam coals in Process Development Unit P-99 located at the Gulf Research Center, Harmarville, PA. The work discussed here involves eight runs (Runs 48 through 55) feeding coal from North American Coal Company's Powhatan No. 5 Mine. This particular shipment of coal was part of a supply that was ordered by the Ft. Lewis SRC-II Pilot Plant. After having been received at Ft. Lewis, a carload of this coal was later sent to Empire Coke, where it was dried, ground, and loaded into Tote bins for shipment to Harmarville. This was the third sample of Powhatan No. 5 Mine coal run in P-99, and it will be referred to as the "third shipment." The first shipment of Powhatan No. 5 Mine coal was used for Runs 35, 36, and 37⁽⁴⁾; and the second shipment was used in Runs 45, 46, and 47⁽⁶⁾. Because it is typical of the type of coal found in the West Virginia panhandle, coal from the Powhatan No. 5 Mine was selected for further studies of the effects of process variables on SRC-II yields. Other Pittsburgh Seam coals run in P-99 came from the Ireland, Blacksville, Valley Camp No. 3, and Robinson Run Mines.

III. EXPERIMENTAL

This section describes the coal, operating conditions, and process flow used for the runs discussed in this report. The method used to work-up the data is the same as described in detail in Reference 4 and is, therefore, not discussed in this report.

A. Coal

The Powhatan coal (LR-25844) used in this work is of high volatile bituminous (A) rank from the Pittsburgh Seam. It was a washed coal from North American Coal Company's Powhatan No. 5 Mine at Powhatan Point, Ohio. This shipment of Powhatan No. 5 Mine coal was originally purchased by the Ft. Lewis Pilot Plant. In order that P-99 could operate on the same coal as Ft. Lewis, a carload of this coal was later shipped to Empire Coke Company, Holt,

Alabama. Two batches from this shipment were dried and ground by Empire Coke and shipped to Harmarville. The first batch arrived at Harmarville in November, 1978, and the second batch arrived in May, 1979.

Four analyses were obtained on each batch; the results of these analyses are given in Table I. The two batches had slightly different analyses, the most significant difference being the lower sulfur and ash contents of the second batch. That this difference was real became apparent when performing elemental balances during data work-up. Much better elemental balances were obtained when the appropriate analysis for each run was used rather than trying to fit all runs to a single average analysis. The two analyses used in the data work-up are given in Table I.*

In Tables II and III, the third shipment of Powhatan coal (LR-25844) is compared to the first (LR-24924) and second (LR-25734) shipments of Powhatan, to Kentucky, and to other Pittsburgh Seam coals run in P-99. Table II gives the elemental and proximate analyses, and Table III gives maceral compositions. Since maceral analyses were not obtained on the actual batches of Kentucky and Ireland coals run in P-99, the maceral composition of the Kentucky coal run at Ft. Lewis and that of a sample of Ireland coal directly from the mine are given in Table III. Comparisons of the coals are discussed in the following sections.

1. Comparison of the Three Shipments of Powhatan Coal

The differences in elemental analyses between the first and second batches of the third shipment of Powhatan No. 5 Mine coal can all be explained by the difference in ash content. Since the ash is rich in sulfur, oxygen, and iron, the concentrations of these three elements are lower in the second batch than in the first batch. In particular, the lower sulfur and iron

* Run 53 was a transition run, the feed being a mixture of coals from the two batches. Therefore, the average of the analyses for the first and second batches were used in working up the data for this run.

TABLE I
ANALYSIS OF PITTSBURGH SEAM COAL FROM THE POMMAYAN No. 5 MINE
(LA-25844)

Coal Sample	First Batch					Second Batch				
	11-27-78 Bin #30 As Rec'd	12-5-78 Bin #24 As Rec'd	12-5-78 Bin #19 As Rec'd	Comm. Test. 1/31/79 Dry	Used in Data Work-Up Dry, Normalized to 100%	5-18-79 Bin #7 As Rec'd	5-18-79 Bin #8 As Rec'd	5-18-79 Bin #9 As Rec'd	8-30-79 From Coal Belt As Rec'd	Used in Data Dry, Normalized to 100%
sis										
Elemental Analysis, Wt%										
Carbon	68.88	68.39	67.37	72.52	69.03	71.15	70.90	70.09	70.52	71.62
Hydrogen	4.78	4.40	4.79	5.08	4.98	5.16	5.12	4.85	4.83	5.26
Nitrogen	1.24	1.31	1.24	1.11	1.23	1.26	1.26	1.03	1.23	1.27
Sulfur	3.36	2.19	3.38	3.26	3.35	2.85	2.83	2.89	2.89	2.71
Oxygen	—	15.0	14.80	—	14.65	14.90	13.0	13.6	13.8	13.16
Chlorine	0.03	0.06	0.06	0.06	0.05	0.04	0.065	0.05	0.04	0.05
Metals				—	6.72					5.93
Ash, Wt%	11.9	11.6	11.7	10.31	12.29	10.2	10.6	10.3	10.8	10.84
Sulfur, Wt% of Ash	1.54	1.51	1.47	—	0.5	—	—	—	—	0.5
Oxygen, Wt% of Ash	—	53.2	45.5	—	44.8	—	—	—	—	44.8
Moisture, Wt%	1.82	1.73	1.71	(1.19)	1.72	1.24	1.30	1.32	0.98	1.72
Spectral Ash Analysis										
Metals, Wt% of Ash										
Al	10	10	10	12.3	—	15	15	10	15	—
Ba	0.2	Tr	Tr	—	—	Tr	Tr	Tr	Tr	—
B	0.07	0.1	0.1	—	—	0.1	0.1	0.1	0.09	—
Ca	1	0.9	1	1.5	—	0.7	0.7	0.7	1	—
Cr	0.03	—	—	—	—	0.02	0.02	0.02	0.1	—
Cu	0.006	0.004	0.004	—	—	0.003	0.003	0.003	0.004	—
Fe	10	15	15	17	—	10	10	10	10	—
Mg	1	1	1	0.4	—	0.9	0.9	1.0	1	—
Mn	0.1	0.1	0.1	0.02	—	0.06	0.06	0.07	0.2	—
Ni	0.01	—	—	—	—	—	—	—	0.03	—
P	—	—	—	0.1	—	—	—	—	—	—
K	1.0	1.0	0.9	1.5	—	1.0	1.0	1.0	1.2	—
Si	25	25	25	21	—	25	25	25	2.0	—
Na	0.2	0.2	0.2	0.2	—	0.2	0.2	0.2	0.3	—
Sr	0.09	—	—	—	—	0.06	0.06	0.05	0.1	—
Ti	1	1	1	0.6	—	1	1	0.9	1	—
V	0.1	—	—	—	—	—	—	—	—	—
Zn	—	—	—	—	—	—	—	—	—	—
Proximate Analysis, Wt% of As Rec'd Coal										
Moisture	2.08	1.73	1.98	1.19	—	1.24	1.30	1.32	0.13	—
Ash	11.81	12.69	11.68	10.19	—	10.8	11.0	10.7	11.02	—
Volatile	34.0	32.18	38.15	40.03	—	35.1	35.6	34.4	33.24	—
Sulfur Types, Wt%										
Pyritic Sulfur	1.08	0.92	1.01	1.44	—	1.55	0.83	0.97	0.88	—
Sulfate Sulfur	0.59	0.55	0.33	0.16	—	0.20	0.21	0.14	0.22	—
Inorganic Sulfur	1.67	1.47	1.54	1.60	—	1.75	1.04	1.11	1.10	—
Organic Sulfur	1.69	0.72	1.84	1.76	—	1.10	1.79	1.78	1.79	—
Total Sulfur	3.36	2.19	3.30	3.36	—	2.85	2.83	2.89	2.89	—
Particle Size Distribution, on 80 Mesh	0	0	0	—	—	0	0	0	0	—
thru 80 on 200	8.4	30.7	8.8	—	—	5.5	6.3	5.6	5.4	—
thru 200 on 325	49.0	20.9	28.5	—	—	26.6	27.6	21.9	21.2	—
thru 325 on 625	35.8	26.8	34.7	—	—	35.1	32.4	38.6	35.4	—
thru 625 mesh	6.8	21.6	28.0	—	—	32.7	33.7	33.9	38.0	—
Iron, Wt%	1.65	—	(1.72)*	—	—	—	0.81	—	1.11	—

*Sampled from coal feed on 3-26-79

TABLE 11
PROPERTIES OF COALS RUN IN P-99

Coal Sample No., LR-	Kentucky #9 & #14 22366	Blacksville 24001	Ireland 22991	First Powhatan 24924	Valley Camp 24925	Robinson Run 24925	Second Powhatan 25734	Third Powhatan First Batch 25844	Second Batch 25844
Elemental Analyses, Wt% of Moisture-Free Coal									
Carbon	71.16	72.50	67.55	73.41	74.03	68.30	70.96	69.23	71.62
Hydrogen	5.11	4.63	4.60	5.10	5.19	4.94	4.92	4.94	5.26
Pyritic Sulfur	1.21	1.48	2.29	1.73	1.54	2.49	1.51	1.08	0.88
Organic Sulfur	2.03	1.10	2.09	1.64	1.34	0.62	1.65	2.08	1.63
Sulfate Sulfur	--	--	--	--	--	0.07	0.04	0.20	0.20
Total Sulfur	3.24	2.58	4.38	3.37	2.88	3.18	3.20	3.36	2.71
Nitrogen	1.53	1.46	1.20	1.29	1.43	1.28	1.29	1.23	1.27
Oxygen	13.80	12.05	14.07	11.62	11.19	13.69	12.97	14.69	13.16
Metals	5.16	6.77	8.20	5.21	5.28	8.61	6.67	6.48	5.93
Iron	1.0	0.82	2.14	1.76	1.58	1.91	1.89	1.46	0.81
H/C Atomic Ratio	0.86	0.77	0.82	0.83	0.84	0.87	0.83	0.86	0.86
Moisture Content, Wt% of As Received Coal	2.0	0.7	0.5	0.8	0.7	1.0	0.8	1.7	1.7
Volatile, Wt% of As-Received Coal	37.0	34.0	34.9	38.1	37.8	34.4	38.7	34.5	34.5
Ash, Wt% of Moisture-Free Coal	9.1	13.1	15.6	9.5	8.9	16.5	12.2	12.3	10.8
Analysis of Coal Substance, Wt% Moisture Mineral-Free Coal*									
Volatile	41.3	40.0	42.3	42.9	42.2	42.6	45.0	40.0	39.5
Carbon	79.5	85.2	82.5	82.7	82.7	84.5	82.5	80.3	81.6
Hydrogen	5.7	5.4	5.6	5.7	5.8	6.0	5.7	5.8	6.0
Nitrogen	1.7	1.7	1.5	1.5	1.6	1.6	1.5	1.4	1.4
Oxygen**	10.8	6.3	7.9	8.3	8.4	7.0	8.3	10.0	9.0
Sulfur	2.3	1.4	2.5	1.8	1.5	0.9	2.0	2.5	2.0

*Mineral Matter = 1.08 x ash content + 0.55 x pyritic sulfur content.

**By difference

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TABLE III
COAL MACERAL AND REFLECTANCE ANALYSES

Coal Sample, No. LR-	Blacksville 24001	First Powhatan 24924	Valley Camp 24925	Robinson Run 25447	Second Powhatan 25734	Kentucky* LS-8629-A	Ireland** LS-8628	Third Powhatan First Batch 25844	
Vitrinite									
Type 5	--	--	--	--	--	--	--	--	0.8
6	--	19.3	26.9	5.8	29.6	26.8	44.2	29.6	48.3
7	17.7	52.3	43.5	45.2	48.2	51.9	34.8	54.1	28.8
8	59.3	8.9	8.7	20.4	--	--	--	0.9	--
9	--	--	--	--	--	--	--	--	--
	77.0	80.5	79.0	72.9	77.8	78.7	79.0	84.6	77.9
Exinite									
Exinite	6.1	5.2	6.0	6.9	3.8	7.6	5.3	3.1	4.3
Resinite	0.5	0.9	0.6	1.7	1.0	0.9	1.2	0.8	1.1
	6.6	6.1	6.6	8.6	4.8	8.5	6.5	3.9	5.4
Inertinite									
Semi-Fusinite	3.2	3.2	3.0	5.5	4.1	5.0	5.6	4.9	3.8
Semi-Macrinite	0.6	0.6	0.5	0.8	0.6	0.2	0.5	0.3	0.4
Fusinite	4.9	3.0	4.3	2.4	2.7	3.5	4.1	2.9	4.2
Macrinite	1.9	1.9	1.1	1.8	1.7	0.3	0.9	0.1	1.2
Micrinite	5.8	4.7	5.1	8.0	8.3	3.8	3.4	3.3	7.1
	16.4	13.4	14.4	18.5	17.4	12.8	14.5	11.5	16.7
Mean Max Reflectance of Vitrinite	0.82	0.73	0.73	0.77	0.70	0.71	0.71	0.71	0.68

*Sample from Fort Lewis

**Sample from Mine

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levels indicate a significantly lower pyrite level for the second batch. The higher carbon content of the second batch merely reflects its lower ash content. On a moisture, mineral free basis, the elemental analyses of the two batches are quite similar.

Three different shipments of coal from the Powhatan No. 5 Mine have been run in P-99. Inspections for the three shipments are given in Tables II and III. On a moisture, mineral free basis, the elemental analyses of the first and second shipments of Powhatan coal are very similar, while the third shipment is somewhat different. The third shipment contains less carbon, and its hydrogen-to-carbon ratio is slightly higher than the previous two shipments. The organic sulfur and oxygen contents also appear to be slightly higher. The ash content is approximately equal to that of the second shipment and much higher than that of the first shipment. The iron content is probably lower, however.

No maceral analysis was obtained for the second batch of the third shipment of Powhatan coal, while two samples of the first batch were submitted for maceral analysis. These two samples show a significant difference in maceral composition (see Table III). One analysis is similar to the first shipment while the other analysis is similar to the second shipment. Specifically, one analysis shows more vitrinite, while the other shows more inertinite. The vitrinite in both samples appears to be of lower rank than the vitrinite in the first and second shipments. The differences in maceral analyses between the two samples may be due to either analytical error or non-homogeneous sampling of the lump coal.

2. Comparison to Other Pittsburgh Seam Coals

In addition to the Powhatan No. 5 Mine, Pittsburgh Seam coals from the following mines have been run in P-99: Valley Camp No. 3, Ireland, Blacksville No. 2, and Robinson Run. The Powhatan, Valley Camp, and Ireland coals are similar in elemental analyses on a moisture-mineral-free basis, except that the third shipment of Powhatan coal has a slightly lower carbon

content and a slightly higher hydrogen-to-carbon ratio (see Table II). The maceral analyses of these three coals (Powhatan, Valley Camp and Ireland) are similar and indicate the coals are of about the same rank. The iron content of the Powhatan coal is about the same as that of the Valley Camp coal but significantly lower than that of the Ireland coal. Therefore, the Powhatan coal is expected to be as reactive as the Valley Camp coal and might be slightly less reactive than the Ireland coal in SRC-II processing.

Compared to Blacksville coal, the Powhatan coal is of lower rank; it contains less carbon and more oxygen; and its hydrogen-to-carbon ratio and iron content are higher. In addition, its vitrinite is mainly of types 6 and 7 while that of the Blacksville is mainly of type 8 (types 6 and 7 are of lower rank than type 8). The Powhatan coal is also of lower rank than Robinson Run coal; its carbon content is lower. Furthermore, it contains much less vitrinite of type 8 but more of types 6 and 7. Based on the above analyses, the Powhatan coal should have a reactivity slightly higher than the Robinson Run coal and much higher than the Blacksville coal.

8. Process Flow

Figure 1 presents a simplified flow diagram of P-99. The only difference between this flow diagram and that described in Reference 4 is in the high pressure separator system. The new separator system was installed after completion of Run 48. In the new system, there are two intermediate separators, rather than one, between the hot separator and the cold separator. Approximate operating temperatures for the four separators are 750-800°F for the hot separator, 575-625°F for the first intermediate separator, 400°F for the second intermediate separator, and 120°F for the cold separator. For Runs 49 through 55 steam condensate was injected at the outlet of the second intermediate separator and recycled water was injected after the first intermediate separator. The recycled water was obtained by combining the water removed from the second intermediate and cold separators.

Figure 1

SIMPLIFIED FLOW DIAGRAM OF PROCESS DEVELOPMENT UNIT P-99

C. Description of Runs

Eight runs were made on the third shipment of Powhatan coal. The first five runs (Runs 48, 49, 50, 51, and 52) were made on the first batch of this coal. About the beginning of Run 53, coal from the second batch was added to the coal hopper and used for Runs 53, 54, and 55. The operating conditions for these runs are summarized in Table IV and cover the following ranges:

Average Dissolver Temperature: 851 to 860°F

Dissolver Pressure: 2000 psig

Nominal Slurry Residence Time: 1 to 1.33 hr

Coal Concentration in Feed Slurry: 30 to 40 wt%

Hydrogen Partial Pressure at Dissolver Outlet: 1300 to 1500 psia

As discussed in Reference 5, the second shipment of Powhatan No. 5 Mine coal had proven to be less reactive than the first shipment. Therefore, as soon as the strike at Empire Coke was settled, a batch of coal from the third shipment was dried, ground, and shipped to Harmarville. The coal hopper was then emptied of the remaining second shipment coal, and the third shipment coal was loaded into the hopper.

The first run made on this new (third) Powhatan coal shipment was Run 48. Conditions for this run were chosen to duplicate as nearly as possible those of Ft. Lewis Run 78SR-25. This explains why the pounds of coal per hour per cubic foot of dissolver volume are slightly higher for this run than for the other runs reported here. After Run 48, P-99 was shut down for a turnaround.

Runs 49, 50 and 51 constitute a three-run series to investigate the effect of dissolver outlet hydrogen partial pressure on SRC-II yields. For Run 50, dissolver gas rate and purity were increased from the Run 49 values to raise dissolver outlet hydrogen partial pressure from 1285 to 1410 psia. For Run 51, gas rate and purity were returned to Run 49 values, but dissolver

TABLE IV
SUMMARY OF OPERATING CONDITIONS

Run No. P99-	<u>48</u>	<u>49</u>	<u>50</u>	<u>51</u>	<u>52</u>	<u>53</u>	<u>54</u>	<u>55</u>
Temperature, °F								
Dissolver Average	860	855	851	851	855	851	851	851
Preheater Outlet	730	740	734	734	738	734	734	754
Pressure, psig	2000	2000	2000	2300	2000	2000	2000	2000
WHSV, lb/hr/ft ³								
Slurry	74.9	74.9	74.9	74.9	74.9	56.2	56.8	75.5
As-Received Coal	22.5	21.8	21.8	21.8	21.8	21.8	21.8	21.8
Nominal Slurry Residence time, hr	1.0	1.0	1.0	1.0	1.0	1.33	1.33	1.0
Slurry Composition, Wt%								
Coal (moisture-free)	30.0	29.4	29.4	29.4	29.5	39.3	39.1	29.3
Distillate	31.6	33.5	31.7	33.5	33.7	42.4	35.1	28.8
900°F+ Pyridine Soluble	22.1	22.4	23.0	21.8	21.9	11.9	16.3	26.2
Pyridine Insolubles	16.3	14.6	15.9	15.9	14.9	6.3	9.5	15.7
Dissolver Gas								
10 ³ SCF/Ton Slurry	17.9	14.7	16.2	14.7	14.8	22.2	22.2	15.5
10 ³ SCF/Ton Feed Coal	59.6	50.2	55.2	50.0	50.2	56.7	56.9	53.1
Hydrogen Content, Vol%	85.5	89.8	93.9	90.2	90.1	90.1	90.0	89.9
H ₂ Partial Pressure at Dissolver Outlet, psia ⁽⁶⁾	1285	1286	1410	1483	1298	1398	1380	1350

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pressure was increased to raise outlet hydrogen partial pressure to 1485 psia. Other operating conditions were kept the same except that, due to a data logger programming error, the average dissolver temperature for Run 49 was a few degrees higher than for Runs 50 and 51. Run 52 was a repeat of Run 49, to see how closely yields could be duplicated.

Runs 53 and 54 were made to determine the effect of yields on increasing coal concentration in the feed slurry from 30 to 40 wt% while simultaneously increasing slurry residence time from 1.0 to 1.33 hr to keep the pounds of coal per hour per cubic foot of dissolver volume constant. Total feed solids level, pressure, and temperature for Run 53 were the same as for Run 50. Run 54 was made to determine the effect of increasing solids recycle on yields, and the only difference between Runs 53 and 54 was a higher recycle solids level in Run 54.

Run 55 was made at conditions close to those being considered for the demonstration plant. The objective of this run was to provide additional data to support the demonstration plant design.

Results from Runs 48 to 55 are summarized in Table V.

IV. DISCUSSION

Average yields for Runs 48 to 55 are summarized in Table V, while complete data for these runs are given in Appendix A. Detailed results for the individual material balance periods are given in Appendix C. The run average yields were calculated for each run condition by adding together all the hours from all the acceptable periods for that run, as if they were part of one long period, and using average values of the analytical data from the individual periods for that run.

TABLE V
SUMMARY OF SRC-II YIELDS WHEN FEEDING PITTSBURGH SEAM COAL
FROM THE POWHATAN NO. 5 MINE (THIRD SHIPMENT) (LP-25844)

RUN NO., P99-	48	49	50	51	52	53	54	55
Nominal Operating Conditions								
Dissolver Temperature, °F	860	855	851	851	855	851	851	851
Pressure, psig	2000	2000	2000	2300	2000	2000	2000	2000
Slurry Residence Time, hr	1.0	1.0	1.0	1.0	1.0	1.33	1.33	1.0
Coal in Feed Slurry, wt%	30	30	30	30	30	40	40	30
Recycle Pyridine Insolubles in Feed Slurry, wt%	16	15	16	15	15	6	10	16
H ₂ Partial Pressure at Dissolver Outlet, psia	1290	1290	1410	1480	1300	1400	1380	1350
Yield, Wt% Moisture Free Coal								
Hydrogen	-4.1	-4.2	-4.4	-4.5	-4.2	-3.8	-3.8	-3.9
Methane	5.5	5.8	5.3	5.1	5.5	5.5	5.4	5.5
Ethane	3.9	4.4	4.3	4.2	4.34	4.2	4.2	4.3
Propane	3.7	4.3	4.3	4.4	4.2	3.9	4.0	4.0
Isobutane	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.1
N-Butane	1.7	2.0	2.2	2.2	2.0	1.8	1.9	2.0
Total C ₁ to C ₄	15.0	16.7	16.3	16.2	16.3	15.6	15.7	15.9
Ammonia	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Hydrogen Sulfide	2.2	2.2	2.1	2.1	2.0	2.1	1.8	1.8
Carbon Dioxide	1.0	1.0	0.8	0.8	0.9	0.8	0.9	0.9
Carbon Monoxide	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Hydrogen Chloride	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
Total Other Gases	3.8	3.8	3.5	3.5	3.5	3.4	3.2	3.2
Water	7.6	7.8	8.0	7.8	7.6	7.4	7.1	7.3
C ₅ - 380°F	8.8	7.9	7.8	8.1	7.4	7.0	7.5	6.9
380 - 550°F	15.8	14.4	14.9	15.6	15.0	14.5	13.0	14.4
550 - 900°F	12.7	8.7	13.9	14.8	11.4	7.0	11.7	13.9
Total C ₅ + Distillate	37.3	31.0	36.6	38.5	33.8	28.5	32.2	35.2
900°F+ Pyridine Solubles	22.1	26.2	22.8	21.7	24.7	30.7	27.2	24.1
Insoluble Organic Matter	6.0	6.4	4.9	4.5	6.0	6.6	7.6	7.4
Ash	12.3	12.3	12.3	12.3	12.3	11.6	10.8	10.8
Total 900°F+ Product	40.4	44.9	40.0	38.5	43.0	48.9	45.6	42.3
380 - 900°F	28.5	23.1	28.8	30.4	26.4	21.5	24.7	28.3

A. Reliability of Data

Unit operation for Runs 48 to 55 was relatively smooth, and most of the upsets were minor. In general, the data appear to be of acceptable quality. Run 48 was made before the installation of the new separator system, while Runs 49 to 55 were made after its installation. Numerous problems were encountered initially with the new system; however, most of these problems occurred because of lack of experience with the new separator and recycle water system. These problems were solved before the on-stream periods for Run 49 started, and Run 49 went smoothly. Some high pressure drops across the dissolver preheater coil were experienced in Run 52, and the feed rate to the dissolver was slightly irregular as a result. Run 52 was a relatively short run and may not have reached steady state. This may explain in part the difference in yields between the duplicate Runs 49 and 52. A brief chronology of operations for Runs 48 to 55 is given in Appendix B.

Because of minor operating problems, a number of small adjustments to the data were made in this series of runs to obtain improved overall consistency. These adjustments are summarized below.

Run 48

It was necessary to estimate amine and naphtha gas analyses for Periods 48-3 and 48-4, due to chromatograph problems during the time these periods were being run.

Run 49

Periods 49-3 and 49-4 showed inconsistently high gas yields. Therefore, these periods were not included when calculating the run average yields.

Run 50

Data logger problems were experienced during Periods 50-6 and 50-7. Therefore, data for these periods are not reported. Also, problems with the debutanizer gas meter were experienced during Run 50, and it was necessary to adjust debutanizer gas rates.

Run 52

Debutanizer gas rate problems were also experienced during Run 52. For Periods 52-2 and 52-3, a new meter was used which did not function properly, and for Period 52-4 the chromatograph was not working properly and showed too much nitrogen in the debutanizer gas, thus indicating too low a rate when normalized to a nitrogen free basis. Naphtha gas rates for Periods 52-1 to 52-3 were also slightly adjusted as a result of recalibrating the naphtha gas meter during the run. Period 52-4 was only a 12 hr period, which showed an inconsistently high gas yield; therefore, it was omitted from the run average calculation.

Run 53

Problems with the first intermediate separator were experienced during Periods 53-7 and 53-8 which resulted in a large quantity of water being fed to the fractionator. The resulting steam distillation effect carried a higher than normal portion of the fractionator feed overhead, thus drastically reducing the yield of process solvent. Since Periods 53-7 and 53-8, thus, represent atypical operation, they were not included when calculating run average yields.

Run 54

There was a unit upset during Period 54-3, and it appears that the unit was not completely recovered by Period 54-4. Therefore, these periods are omitted from the data. For an unknown reason, distillate yield for Period 54-10 was much lower than for the other periods. Therefore, this period is also omitted.

Run 55

Many problems were experienced with the chromatographs during Period 55-6; therefore, gas analyses from Period 55-5 were used for Period 55-6. Flush oil usage during Period 55-7 was unusually high; therefore, it was decided to omit this period from the run average calculation.

B. Reproducibility

Run 52 was made at the same conditions as Run 49. The results (see Table V) indicate that slightly (approximately 3%) more distillate was produced in Run 52 than in Run 49. Most of the difference in overall distillate yield occurs in the heavy distillate. There is a corresponding decrease in 900°F+ pyridine solubles yield for Run 52 compared to Run 49. The yields of gases, water, and IOM are in good agreement for these replicate runs.

The conditions for Run 49 and 52 were similar to those used in Run 48 except that the average dissolver temperature was 9°F lower. However, for some reason not fully understood, the results for Run 48 were much better than those for Runs 49 and 52. Distillate yield was 3.5-6% greater with a corresponding decrease in bottoms yield. Gas yield was also about 1% lower. In fact, Run 48 yields most closely match those from Run 50, which was made at a 120 psia higher hydrogen partial pressure.

C. Effects of Process Variables on Yields

The major process variables examined in the work presented in this report are hydrogen partial pressure and coal/recycle solids concentration in the feed slurry. Hydrogen partial pressure, however, is not a directly controlled unit variable, since it depends upon total dissolver gas rate and purity, unit pressure, and, to a smaller extent, process yields. Therefore, in order to obtain the desired hydrogen partial pressure, dissolver pressure, total gas rate, and hydrogen purity were adjusted as needed.

The recycle solids concentration in the feed slurry cannot be varied at will, because unit operating problems result when operation is attempted at a total solids level greater than about 45-48%. Accordingly, the recycle solids concentrations in Runs 53 and 54 feeding a 40% coal slurry were considerably lower than for runs feeding a 30% coal slurry. In addition, the nominal slurry residence time in Runs 53 and 54 was increased from 1.0 to 1.33 hr in order to maintain the same pounds of coal per hour per cubic foot of dissolver volume.

To permit comparisons of the work reported here with previous results, Table VI gives the average yields for Runs 35 to 37 on the first shipment of Powhatan coal, together with results from Runs 48 to 55. Runs 45 to 47 on the second shipment are not included because the second shipment was found to be significantly less reactive, and the yields from these runs are not believed to be representative of what can be obtained from SRC-II processing of Powhatan No. 5 Mine coal (see Reference 5). A brief discussion of the effects of process variables on the yields from SRC-II processing of Powhatan coal (first and third shipments) is given in the following sections. Yields in these discussions are based on moisture-mineral-free coal because of the difference in ash contents between the shipments.

1. Effect of Hydrogen Partial Pressure

Previous work has shown mixed results on the effect of hydrogen partial pressure on yields. In some cases^(1,4), a significant effect has been found; in other cases⁽⁵⁾, little effect of hydrogen partial pressure is apparent. In the work reported here, a significant effect of hydrogen partial pressure was observed. Figures 2 and 3 show that the effect of hydrogen partial pressure determined from Runs 49, 50, 51, 52 and 55 made on the third shipment of Powhatan coal is generally in line with that determined from Runs 35, 36 and 37 made on the first shipment. More distillate and less 900°F+ pyridine solubles and IOM (on a moisture-mineral-free coal basis) are obtained as hydrogen partial pressure increases. The beneficial effect of increasing hydrogen partial pressure on total distillate and fuel oil yields

TABLE VI
SRC-II YIELDS FROM POMMATAN NO. 5 MINE COAL

Run No., P99 -	48	49	50	51	52	53	54	55	35	36	3.
Coal Sample No.	LR-25844								LR-24924		
Nominal Operating Conditions											
Dissolver Temperature, °F	860	855	851	851	855	851	851	851	851	851	851
Pressure, psig	2000	2000	2000	2300	2000	2000	2000	2000	2000	2000	2000
Slurry Residence Time, hr	1.0	1.0	1.0	1.0	1.0	1.3	1.3	1.0	1.0	1.0	1.0
Coal in Feed Slurry, wt%	30	30	30	30	30	40	40	30	30	30	30
Recycle Solids, wt% of Slurry	16	15	16	15	15	6	10	16	13	13	13
Dissolver Gas, 10 ³ SCF/T											
Feed coal	60	50	55	50	50	57	57	53	70	50	50
H ₂ Content, Vol%	86	90	94	90	90	90	90	90	85	94	85
Hydrogen Partial Pressure, psia	1290	1290	1410	1480	1300	1400	1380	1350	1330	1330	1150
Yields, Wt% of Moisture-Free Coal											
H ₂ Consumption	-4.1	-4.2	-4.4	-4.5	-4.2	-3.8	-3.8	-3.9	-4.3	-4.3	-4.3
C ₁ -C ₄	15.0	16.7	16.3	16.2	16.3	15.6	15.7	15.9	16.7	16.5	16.5
Other Gases	3.8	3.8	3.5	3.5	3.5	3.4	3.2	3.2	4.0	4.0	4.1
Water	7.6	7.8	8.0	7.8	7.6	7.4	7.1	7.3	5.9	5.9	6.3
C ₅ -380°F	8.8	7.9	7.8	8.1	7.4	7.0	7.5	6.9	8.9	9.4	9.5
380-550°F	15.8	14.4	14.9	15.6	15.0	14.5	13.0	14.4	13.6	13.9	13.0
550-900°F	12.7	8.7	13.9	14.8	11.4	7.0	11.7	13.9	15.0	13.8	12.9
C ₅ -900°F	37.3	31.0	36.6	38.5	33.8	28.5	32.2	35.2	37.5	37.1	35.3
900°F+ Pyridine Solubles	22.1	26.2	22.8	21.7	24.7	30.7	27.2	24.1	25.3	26.0	26.4
ION ^a	6.0	6.4	4.9	4.5	6.0	6.6	7.6	7.4	5.4	5.3	6.2
Ash	12.3	12.3	12.3	12.3	12.3	11.6	10.8	10.8	9.5	9.5	9.5
Total 900°F+ Product	40.4	44.9	40.0	38.5	43.0	48.9	45.6	42.3	40.2	40.8	42.1
380-900°F	28.5	23.1	28.8	30.4	26.4	21.5	24.7	28.3	28.6	27.7	25.8
Yields, Wt% of Moisture-Mineral-Free Coal ^b											
H ₂ Consumption	-4.8	-4.9	-5.1	-5.2	-4.8	-4.4	-4.4	-4.5	-4.8	-4.9	-4.8
C ₁ -C ₄	17.5	19.4	19.0	18.8	19.0	18.0	18.0	18.2	18.8	18.6	18.6
Other Gases	4.4	4.4	4.0	4.1	4.1	4.0	3.6	3.7	4.5	4.5	4.7
Water	8.8	9.1	9.3	9.1	8.8	8.5	8.1	8.2	6.6	6.7	7.1
C ₅ -380°F	10.3	9.2	9.0	9.4	8.6	8.1	8.6	7.9	10.0	10.6	10.6
380-550°F	18.3	16.7	17.4	18.1	17.3	16.7	14.8	16.5	15.3	15.7	14.7
550-900°F	14.7	10.1	16.1	17.3	13.3	8.0	13.4	15.8	17.0	15.6	14.4
Total C ₅ -900°F	43.3	36.0	42.5	44.8	39.2	32.8	36.8	40.2	42.3	41.9	39.7
900°F+ Pyridine Solubles	25.7	30.4	26.4	25.2	28.7	35.4	31.0	27.5	28.4	29.2	29.7
ION ^a	5.7	6.2	4.5	4.1	5.7	6.5	7.6	7.4	5.2	5.0	6.0
Total 900°F+ Organic Product	31.4	36.6	30.9	29.2	34.4	41.9	38.6	34.9	33.6	34.2	35.7
380-900°F	33.0	26.8	33.5	35.4	30.6	24.7	28.2	32.3	32.3	31.3	29.1

^a When yields are expressed on a mineral matter basis, IOM is defined as vacuum column bottoms pyridine insolubles minus mineral matter; when yields are expressed on an ash basis, IOM is defined as vacuum column bottoms pyridine insolubles minus ash. Mineral matter in vacuum column bottoms is defined as coal mineral matter minus half the coal pyritic sulfur.

^b Yields add up to more than 100% because the pyrites in coal mineral matter are converted to sulfides during processing and the resultant sulfur appears in the products.

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FIGURE 2
EFFECT OF H₂ PARTIAL PRESSURE ON SRC-II YIELDS

FIGURE 3

EFFECT OF HYDROGEN PARTIAL PRESSURE ON SRC-II YIELDS

appears to be more pronounced for the third shipment than for the first shipment. This may be attributable to the higher recycle solids level in the feed slurry (by 2-3 wt% of moisture-free coal) for the runs on the third shipment. At higher recycle solids level, hydrogen transfer should be more efficient. However, it should be noted that the average dissolver temperature for Runs 49 and 52 was 9°F higher than for the other runs. At present, there is insufficient data to accurately predict how temperature affects SRC-II yields for Powhatan coal (see Section IV. C.3). Increasing hydrogen partial pressure appears to have little effect on hydrogen consumption and gas yields.

2. Effect of Feed Slurry Recycle Solids Concentration at Constant Coal Space Velocity

For the work presented here, a direct comparison of the effect of recycle solids level with all other variables unchanged is possible only between Runs 53 and 54, which were made at 40% coal in the feed slurry and 1.33 hr slurry residence time. However, Runs 50 and 55 at 30% coal in the feed slurry and 1.0 hr residence time were made at the same coal space velocity (21.8 lb of coal/hr/ft³ of dissolver) as Runs 53 and 54 with other operating conditions being essentially the same, except for a small variation in dissolver outlet hydrogen partial pressure.

A comparison of Runs 53 and 54 shows that 4% more C₅-900°F distillate and 4% less 900°F+ pyridine solubles on a moisture-mineral-free basis were obtained as the recycle solids concentration in the feed slurry was increased from 6% to 10% (see Table VI). Figure 4 is a plot of total distillate, fuel oil, 900°F+ pyridine solubles, and IOM yields as a function of recycled solids level at constant coal space velocity. This figure indicates that the total distillate and fuel oil yields increase, while the 900°F+ pyridine solubles yield decreases as the recycle solids concentration increases from 6 to 16% at constant coal space velocity.

FIGURE 4

EFFECT OF FEED SLURRY RECYCLED SOLIDS CONCENTRATION ON SRC-II YIELDS AT CONSTANT COAL SPACE VELOCITY

3. Effect of Temperature

Among the runs (Runs 48 to 55) covered in detail in this report, there is only a modest variation (851 to 860°F) in temperature, and in most cases at least one other processing condition is also different, making direct determination of temperature effects difficult. Runs 48, 49, 52 and 55 on the third shipment of Powhatan coal and Run 36 on the first shipment were made at the most nearly similar conditions except for temperature. There was still some variation in the dissolver outlet hydrogen partial pressure among these runs, the lowest value being 1290 psia for Runs 48 and 49 and the highest value being 1350 psia for Run 55. A comparison of the results from these runs shows that the distillate yield obtained in Run 48 is unusually high relative to the distillate yields obtained in the other runs. Since it seems unlikely that the better results of Run 48 can be explained solely on the basis of temperature, no attempt will be made to draw any conclusion on the temperature effect based on the data presented in this report.

C. Comparison of SRC-II Yields From Various Coals

This section compares the SRC-II yields from Powhatan coal with those from other Pittsburgh Seam coals run in P-99. The process conditions for the runs used in this comparison are:

Temperature: 851-860°F
Dissolver Pressure: 2000 psia
Nominal Slurry Residence Time: 1.0 hour
Coal Concentration in Feed Slurry: 30 wt%
Hydrogen Partial Pressure at
Dissolver Outlet: 1300-1400 psia

Discussions on the effects of coal properties on yields are speculative at this time because our understanding of coal liquefaction chemistry is not sufficiently precise to permit definitive conclusions to be drawn.

1. The Third Shipment vs the First Two Shipments of Powhatan Coal

Run 50 made feeding the first batch of the third shipment of Powhatan coal and Run 55 made on the second batch of the third shipment are compared in Table VII with Runs 35 and 36 on the first shipment and Runs 45 and 46 on the second shipment. The yields, except the water yield, from Runs 50 and 55 are similar to those of Runs 35 and 36. More water was produced in Runs 50 and 55 because the third shipment contained more oxygen. Taking into account the improvement in yields expected from the higher partial pressure of hydrogen in Run 50, it appears that the third shipment gave slightly poorer yields than the first shipment.

In contrast, the C_5 -900°F distillate yields on a moisture-mineral-free basis are 2% to 4% higher for Runs 50 and 55 (third shipment) than for Runs 45 and 46 (second shipment). The yields of the individual C_1 - C_4 gases and water are 1% to 2% higher, and the 900°F+ pyridine solubles yields are 5 to 7% lower. Thus, the yields from the third shipment are more in line with those from the first shipment than with those from the second shipment. The possible reasons for the poorer yields from the second shipment have been discussed in a previous report.⁽⁵⁾

2. Powhatan Coal vs Other Pittsburgh Seam Coals

As discussed above, the yields from the third shipment of Powhatan coal are similar to those from the first shipment. Since the SRC-II yields from runs feeding the first shipment of Powhatan coal have been compared in detail with those from runs feeding Pittsburgh Seam coal from the Valley Camp⁽⁴⁾, Ireland⁽⁴⁾, Blacksville⁽⁴⁾, and Robinson Run⁽⁵⁾ Mines, this subject is only briefly discussed here.

Generally speaking, the Powhatan coal is as reactive as the Valley Camp and Ireland coals. The C_5 -900°F distillate yields on a moisture-mineral-free basis are approximately the same for these three coals. The distribution of the distillate is slightly different: more heavy distillate for Powhatan

TABLE VII
COMPARISON OF SRC-II YIELDS FROM VARIOUS COALS RUN IN P-99

Run No., P-99 - Coal	31 Ireland	33 Blacksville	35 Pondatan (First Ship.)	36 Pondatan (First Ship.)	38 Valley Camp	41 Robinson Run	44	45 Pondatan (Second Ship.)	46 Pondatan (Second Ship.)	50 Pondatan First Batch	55 Pondatan (Third Ship. Se. Ba.
Nominal Operating Conditions											
Dissolver Temperature, °F	860	851	851	851	851	851	851	851	851	851	851
Pressure, psig	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Slurry Residence Time, hr	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Coal in Feed Slurry, Wt%	30	30	30	30	30	30	30	30	30	30	30
Recycle Solids, Wt% of Slurry	12	13	13	13	13	16	17	14	13	16	16
Dissolver Gas, 10 ³ SCF/T											
Feed Coal	72	70	70	69	50	50	46	50	50	55	53
H ₂ Content, Vol%	86	85	89	94	94	94	90	90	90	94	90
Hydrogen Partial Pressure, psia	1323	1288	1325	1334	1378	1430	1300	1310	1316	1419	1357
Feed Coal mesh size	200	200	700	200	200	200	200	60	60	200	200
Yields, Wt% of Moisture-Free Coal											
H ₂ Consumption	-4.2	-3.5	-4.3	-4.3	-4.2	-3.7	-3.5	-3.8	-3.8	-4.4	-3.9
C ₁ -C ₄	16.6	14.6	16.7	16.5	16.7	14.7	13.8	14.2	14.5	16.3	15.9
Other Gases	4.6	3.0	4.0	4.0	3.5	3.1	3.3	3.8	3.6	3.5	3.2
Water	4.9	4.8	5.9	5.9	5.3	4.6	4.3	6.2	5.8	8.0	7.3
C ₅ -380°F	9.3	7.3	8.9	9.4	8.0	8.7	7.6	10.0	8.0	7.8	6.9
380-550°F	15.0	11.9	13.6	13.9	16.6	11.8	14.3	12.0	13.9	14.9	14.4
550-900°F	10.1	11.5	15.0	13.8	12.8	12.7	12.0	11.0	11.6	12.9	13.9
C ₅ -900°F	34.6	30.7	37.5	37.1	27.4	33.2	33.9	33.0	33.3	36.5	35.2
900°F+ Pyridine Solubles (OM) ^a	22.1	27.0	25.3	26.0	24.9	23.9	24.9	28.0	28.7	22.8	24.1
Ash	6.0	9.8	5.4	5.3	7.5	7.5	6.9	6.4	6.5	4.9	7.4
Total 900°F+ Product	43.7	52.1	40.2	40.8	41.3	47.9	48.3	48.6	48.8	40.0	42.3
380-900°F	25.1	20.5	28.6	27.7	29.4	24.5	26.3	23.0	25.5	28.8	28.3
Yields, Wt% of Moisture-Mineral-Free Coal ^b											
H ₂ Consumption	-5.1	-4.1	-4.8	-4.8	-4.7	-4.6	-4.3	-4.4	-4.4	-5.1	-4.5
C ₁ -C ₄	20.3	17.2	18.8	18.6	18.7	18.1	17.0	16.5	16.9	19.0	18.2
Other Gases	5.6	3.5	4.6	4.5	3.9	3.8	4.0	4.4	4.2	4.0	2.7
Water	6.0	5.7	6.6	6.6	6.0	5.9	5.3	7.2	6.7	9.4	8.3
C ₅ -380°F	11.4	8.7	10.0	10.6	9.0	10.8	9.4	11.8	9.3	9.0	7.9
380-550°F	18.3	14.1	15.3	15.6	18.5	14.6	17.7	14.0	16.1	17.4	16.9
550-900°F	12.3	13.6	17.0	15.5	14.3	15.7	14.8	12.8	13.5	16.1	15.8
Total C ₅ -900°F	42.0	36.4	42.3	41.7	41.8	41.1	41.9	38.6	38.9	42.5	40.2
900°F+ Pyridine Solubles	27.0	31.9	28.4	29.2	27.8	29.5	30.8	32.6	33.4	26.4	27.5
(OM) ^a	5.6	10.2	5.2	5.0	7.5	7.6	6.8	6.2	5.2	4.4	7.4
Total 900°F+ Organic Product	32.6	42.1	33.6	34.2	35.3	37.1	37.6	38.8	38.6	30.8	34.9
380-900°F	30.6	27.7	32.2	31.3	32.8	30.3	32.5	26.8	29.6	33.5	32.3

^a When yields are expressed on a mineral matter basis, OM is defined as vacuum column bottoms pyridine insolubles minus mineral matter; when yields are expressed on an ash basis, OM is defined as vacuum column bottoms pyridine insolubles minus ash. Mineral matter in vacuum column bottoms is defined as coal mineral matter minus half the coal pyritic sulfur.

^b Yields add up to more than 100% because the pyrites in coal mineral matter are converted to sulfides during processing, and the resultant H₂S appears in the products.

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coal, more middle distillate for Valley Camp coal, and more naphtha for Ireland coal. The water yield from the Powhatan coal is higher than for the other Pittsburgh Seam coals. The IOM yield is about 2% lower for the Powhatan and Ireland coals than for the Valley Camp coal.

When compared to Blacksville coal, the Powhatan coal is more reactive and, therefore, constitutes a more desirable feed for the SRC-II process. Based on moisture-mineral-free feed coal, about 1% more C_1-C_4 gas, about 4% more $C_5-900^\circ\text{F}$ distillate, about 2% more water and about 7% less total $900^\circ\text{F}+$ products were produced when feeding Powhatan coal (compare Runs 33 and 55 in Table VII).

The reactivity of Robinson Run coal lies between those of Powhatan and Blacksville coals. About 1% more C_1-C_4 gas, 3% more water, 1% more $C_5-900^\circ\text{F}$ distillate, 3% less $900^\circ\text{F}+$ pyridine solubles and 1-2% less IOM on a moisture-mineral-free basis were produced from the Powhatan coal than from the Robinson Run coal.

V. CONCLUSIONS

This work has provided further evidence that satisfactory yields of distillates can be achieved with Pittsburgh Seam coal from the Powhatan No. 5 Mine. The SRC-II yields obtained from the third shipment of Powhatan coal are similar to those obtained from the first shipment and better than those obtained from the second shipment. Yields are also comparable to those achieved with Kentucky, Ireland and Valley Camp coals, better than those obtained from Robinson Run coal, and much better than those obtained from Blacksville coal.

Increasing hydrogen partial pressure improves $C_5-900^\circ\text{F}$ distillate yield, particularly fuel oil yield, and reduces the yields of $900^\circ\text{F}+$ pyridine solubles and IOM. Increasing recycle solids level in the feed slurry has a beneficial effect on yields, with more distillate and less $900^\circ\text{F}+$ pyridine solubles and IOM being produced.

Operation at 40% coal in the feed slurry and a 1.33 hr slurry residence time gave slightly poorer distillate yields (most likely because of the lower recycle solids level) than operation at 30% coal and 1 hr residence time, even though both operations fed the same weight of coal per hour per unit volume of dissolver. The effect of temperature is difficult to assess based on the data presented in this report because these runs were not specifically designed to study temperature.

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6. Private communication from J. L. Stephenson, Technology and Materials Department.

APPENDIX A

**COMPUTER PRINTOUTS OF RUN AVERAGE YIELDS FOR
THE THIRD SHIPMENT OF POWHATAN COAL**

SFC-II RUN DATA, MATERIAL BALANCES, AND PRODUCT PROPERTIES

RUN NUMBER	P99-48AVG	P99-49AVG	P99-50AVG	P99-51AVG	P99-52AVG
DATE (START OF PERIOD)	12- 6-78	3-24-79	4- 2-79	4-16-79	4-28-79
TIME & DATE CODE (START & END OF PERIOD)	0815 3408	0815 0839	0815 0929	0815 1069	0815 1189
RUN HOURS INCLUDED IN PERIOD	116-275	282-373	113-300	137-300	113-228
COAL CHARGE	POWHATAN	POWHATAN	POWHATAN	POWHATAN	POWHATAN
	LR-25844	LR-25844	LR-25844	LR-25844	LR-25844
OPERATING CONDITIONS					
RECYCLE SLURRY/WF COAL RATIO	2.33	2.40	2.40	2.41	2.39
OIL TO SOLIDS RATIO	1.16	1.27	1.21	1.24	1.25
SLURRY COMPOSITION, WTX					
COAL (MOISTURE FREE)	30.0	29.4	29.4	29.4	29.5
DISTILLATE	31.6	33.5	31.7	33.6	33.7
402 C+ (900 F+) PYRIDINE SOL.	22.1	22.4	23.0	21.8	21.9
PYRIDINE INSOLUABLES	16.3	14.6	15.9	15.3	14.9
TOTAL RX PRESSURE, MPA	13.79	13.79	13.79	15.86	13.79
PRESS X 2H2 IN INLET GAS, MPA	11.80	12.41	12.95	14.31	12.46
OUTLET H2 PARTIAL PRESS, MPA	8.85	8.86	9.71	10.22	8.93
DISSOLVER TEMPERATURES, C					
ZONE 4 (TOP)	462	459	458	458	459
ZONE 3	461	458	456	456	458
ZONE 2	460	456	454	454	456
ZONE 1 (BTM)	457	454	452	452	454
AVERAGE	460	457	455	455	457
PREHEATER OUTLET	388	393	390	390	391
NOMINAL SLURRY RES. TIME, HR	1.00	1.00	1.00	1.00	1.00
CHSV, KG/HR/DM3					
SLURRY	1.20	1.20	1.20	1.20	1.20
COAL (MOISTURE FREE)	0.36	0.38	0.35	0.35	0.35
DISSOLVER GAS					
DM3/KG SLURRY	559	462	508	458	463
DM3/KG WF FEED COAL	1860	1571	1715	1560	1570
HYDROGEN CONTENT, VOL%	85.5	90.0	93.9	90.2	90.4

THE FOLLOWING WEIGHT BALANCE AND HYDROGEN CONSUMPTION DATA WERE CALCULATED FROM MEASURED UNIT DATA

RUN NUMBER P99-48AVG P99-49AVG P99-50AVG P99-51AVG P99-52AVG

WATER IN THE FEED COAL ASSUMED

LOST FROM FEED TANK, %	100.0	100.0	100.0	100.0	100.0
WEIGHT BALANCE, O/I, WT%	99.2	99.0	99.6	98.2	97.1

THE FOLLOWING DATA THROUGH AND INCLUDING ELEMENTAL BALANCES HAVE BEEN CORRECTED TO A 100% WT BALANCE

YIELDS, WT% FEED COAL

	HYDROGEN	-4.02	-3.97	-4.23	-4.50	-4.48
	METHANE	5.48	5.76	5.29	5.11	5.54
	ETHANE	3.90	4.41	4.24	4.17	4.30
	PROPANE	3.70	4.35	4.32	4.35	4.25
	I-BUTANE	0.16	0.23	0.22	0.27	0.26
	N-BUTANE	1.77	1.98	2.22	2.23	2.03
	TOTAL C1 TO C4	15.02	16.73	16.30	16.13	16.38
144	AMMONIA	0.46	0.38	0.44	0.47	0.48
	HYDROGEN SULFIDE	1.78	2.21	2.17	2.06	2.00
	CARBON DIOXIDE	1.02	1.03	0.82	0.78	0.89
	CARBON MONOXIDE	0.07	0.10	0.07	0.10	0.09
	HYDROGEN CHLORIDE	0.05	0.05	0.03	0.04	0.05
	TOTAL OTHER GASES	3.38	3.77	3.52	3.45	3.50
	WATER	8.16	7.64	7.96	8.01	7.60
	DEBUTANIZER LIQUID	22.68	20.77	19.16	19.58	19.54
	PROCESS SOLVENT	19.33	6.33	13.89	15.35	9.88
112	TOTAL C5+ DISTILLATE	33.00	27.10	33.05	34.92	29.42
	VACUUM TOWER BOTTOMS	44.46	48.74	43.40	41.98	47.58
	CHEMICAL H2 CONSUMPTION BY UNIT GAS BALANCE					
	DM3/KG FEED COAL	471	466	496	528	526
	CONVERSIONS, WT% FEED COAL					
	HYDROCRACKING	67.1	62.6	68.0	69.3	64.4
	DESULFURIZATION	60.8	60.9	58.5	59.1	57.5
	DENITROGENATION	30.0	27.5	29.7	31.8	28.8
		52.1	52.0	51.6	52.2	51.2

RUN NUMBER

P99-48AVG P99-49AVG P99-50AVG P99-51AVG P99-52AVG

GAS RATES, DM3/KG FEED COAL

DISSOLVER INLET GAS	1473.3	974.0	1066.6	958.2	968.7
TOTAL QUENCH GAS	401.5	613.1	655.9	631.0	648.3
TOTAL DISSOLVER GAS	1874.8	1587.2	1722.4	1589.2	1617.0
MAKEUP GAS TO DISSOLVER	396.1	416.2	618.6	481.2	473.7
MAKEUP GAS TO SEP. SPARGE	58.9	82.4	114.5	113.7	102.9
MAKEUP GAS TO INSTRUMENT TAPS	256.8	261.6	260.0	264.6	267.1
TOTAL MAKEUP GAS	711.9	760.2	993.1	859.5	843.7
DISSOLVER OUTLET GAS	1562.5	1296.6	1393.6	1224.3	1259.0
GAS LEAVING SCRUBBERS	1953.8	1711.8	1801.9	1687.7	1711.5
SEPARATOR SPARGE GAS	278.7	314.1	318.7	375.3	351.2
PRODUCT GASES					
BLEED OFF GAS	249.2	284.9	487.6	311.1	314.1
DEBUTANIZER GAS	58.0	46.9	49.4	52.8	50.7
AMINE REACTIVATOR GAS	13.1	18.0	18.7	19.1	16.5
NAPHTHA REACTIVATOR GAS	73.2	95.6	102.3	104.6	98.7
CHROMATOGRAPH BLEED GAS	6.1	20.1	6.2	7.0	5.8

ELEMENTAL BALANCES

WATER IN THE FEED COAL ASSUMED LOST FROM FEED TANK, X	100.0	100.0	100.0	100.0	100.0
CARBON, O/I	1.00	1.00	1.00	1.00	1.00
HYDROGEN, O/I	1.02	1.02	1.01	1.00	0.97
NITROGEN, O/I	1.00	0.98	1.00	1.00	1.03
SULFUR, O/I	0.89	1.01	1.02	0.99	0.99
OXYGEN, O/I	1.03	0.99	0.99	1.01	1.00
CHLORINE, O/I	1.06	1.02	0.64	0.84	0.98
METALS, O/I	0.98	0.99	1.01	1.00	1.01
ASH, O/I	0.98	0.99	1.01	1.00	1.01

THE FOLLOWING DATA WERE BALANCED FOR CARBON, HYDROGEN, SULFUR, NITROGEN, OXYGEN, CHLORINE, AND METALS

RUN NUMBER

P99-48AVG P99-49AVG P99-50AVG P99-51AVG P99-52AVG

YIELDS, WT% MOISTURE FREE COAL

HYDROGEN (BY H BALANCE)	-4.12	-4.16	-4.37	-4.49	-4.16
METHANE	5.49	5.76	5.31	5.12	5.52
ETHANE	3.91	4.41	4.25	4.17	4.29
PROPANE	3.70	4.35	4.33	4.35	4.24
I-BUTANE	0.16	0.23	0.22	0.27	0.26
N-BUTANE	1.77	1.98	2.23	2.24	2.02
TOTAL C1 TO C4	15.03	16.73	16.34	16.15	16.32

AMMONIA (BY N BALANCE)	0.45	0.41	0.44	0.47	0.43
HYDROGEN SULFIDE (BY S BAL)	2.17	2.17	2.08	2.10	2.05
CARBON DIOXIDE	1.02	1.03	0.82	0.78	0.89
CARBON MONOXIDE	0.07	0.10	0.07	0.10	0.09
HYDROGEN CHLORIDE (BY CL BAL)	0.05	0.04	0.05	0.05	0.05
TOTAL OTHER GASES	3.75	3.76	3.46	3.50	3.51

WATER (BY OXYGEN BALANCE)	7.66	7.77	8.04	7.84	7.62
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DERUTANIZER LIQUID	22.70	20.77	19.20	19.60	19.47
PROCESS SOLVENT	10.34	6.33	13.92	15.37	9.84
TOTAL C5+ DISTILLATE	33.03	27.10	33.12	34.96	29.32

VTH PYRIDINE SOLVABLES	26.37	30.12	25.23	25.20	29.17
INSOLUBLE ORGANIC MATTER	5.99	6.39	4.89	4.53	5.93
ASH	12.29	12.29	12.29	12.29	12.29
VACUUM TOWER BOTTOMS	44.65	48.80	43.42	42.03	47.39

CHEMICAL H2 CONSUMPTION, DM3/KG MOISTURE FREE COAL

BY HYDROGEN BALANCE	484	488	513	526	488
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CONVERSIONS, WT% MF COAL

HYDROCRACKING	67.1	62.6	67.9	69.3	64.5
DESULFURIZATION	60.8	60.9	58.4	59.0	57.6
DENITROGENATION	29.9	27.5	29.5	31.7	29.0
OXYGEN REMOVAL	51.8	52.6	53.1	51.8	50.9

RUN NUMBER

P99-48AVG P99-49AVG P99-50AVG P99-51AVG P99-52AVG

GAS COMPOSITIONS, VOL%

REACTOR INLET GAS

HYDROGEN	85.52	89.96	93.86	90.21	90.39
METHANE	12.30	8.83	5.33	8.43	8.35
ETHANE	1.88	1.17	0.75	1.26	1.17
PROPANE	0.18	0.00	0.00	0.01	0.01
I-BUTANE	0.00	0.00	0.00	0.00	0.00
N-BUTANE	0.00	0.01	0.02	0.02	0.03
PENTANES	0.00	0.00	0.00	0.00	0.00
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00	0.00
CARBON MONOXIDE	0.13	0.03	0.02	0.08	0.05
CARBON DIOXIDE	0.00	0.00	0.00	0.00	0.00

REACTOR OUTLET GAS (BUTANES AND LIGHTER ONLY)

HYDROGEN	67.47	68.56	74.51	67.81	68.49
METHANE	18.61	16.08	11.34	15.70	15.88
ETHANE	3.96	3.83	3.12	3.97	3.88
PROPANE	1.41	1.69	1.57	1.77	1.70
I-BUTANE	0.08	0.10	0.09	0.10	0.10
N-BUTANE	0.43	0.59	0.63	0.71	0.64
HYDROGEN SULFIDE	0.74	1.09	1.00	1.07	1.02
CARBON MONOXIDE	0.18	0.10	0.06	0.16	0.11
CARBON DIOXIDE	0.33	0.40	0.30	0.31	0.36
AMMONIA	0.38	0.38	0.41	0.49	0.49
WATER	6.40	7.15	6.96	7.89	7.32
HYDROGEN CHLORIDE	0.02	0.02	0.01	0.02	0.02

BLEED OFF GAS

HYDROGEN	78.58	80.78	88.43	85.00	83.06
METHANE	17.99	16.65	9.98	12.75	14.60
ETHANE	2.74	2.26	1.46	1.90	2.00
PROPANE	0.46	0.02	0.01	0.07	0.09
I-BUTANE	0.00	0.00	0.00	0.00	0.00
N-BUTANE	0.00	0.00	0.01	0.01	0.00
PENTANES	0.00	0.00	0.00	0.00	0.00
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00	0.00
CARBON MONOXIDE	0.24	0.28	0.11	0.27	0.24
CARBON DIOXIDE	0.00	0.00	0.00	0.00	0.00

RUN NUMBER

P99-48AVG P99-49AVG P99-50AVG P99-51AVG P99-52AVG

GAS COMPOSITIONS, VOL%

AMINE REACTIVATOR GAS

HYDROGEN	12.03	13.17	16.61	20.62	17.81
METHANE	2.55	1.64	1.09	2.14	2.30
ETHANE	0.46	0.33	0.24	0.43	0.53
PROPANE	0.00	0.02	0.02	0.03	0.08
I-BUTANE	0.00	0.00	0.00	0.00	0.00
N-BUTANE	0.00	0.02	0.01	0.02	0.04
PENTANES	0.00	0.00	0.00	0.00	0.00
HYDROGEN SULFIDE	53.57	63.25	66.13	61.68	60.27
CARBON MONOXIDE	0.02	0.02	0.06	0.05	0.02
CARBON DIOXIDE	31.37	21.55	15.86	14.99	18.95

NAPHTHA REACTIVATOR GAS

HYDROGEN	17.56	19.16	27.49	25.86	22.92
METHANE	31.25	25.91	21.05	23.98	25.54
ETHANE	23.65	24.48	21.97	21.30	23.14
PROPANE	18.57	20.77	19.45	18.86	19.08
I-BUTANE	1.11	1.10	1.04	1.01	0.99
N-BUTANE	6.10	6.51	6.84	6.85	6.29
PENTANES	1.51	1.94	1.95	1.93	1.77
HYDROGEN SULFIDE	0.00	0.05	0.01	0.00	0.07
CARBON MONOXIDE	0.01	0.00	0.00	0.00	0.00
CARBON DIOXIDE	0.14	0.08	0.19	0.13	0.19

DEBUTANIZER GAS

HYDROGEN	43.69	47.20	57.64	56.58	52.23
METHANE	22.13	22.57	16.13	18.98	19.89
ETHANE	12.02	10.49	8.43	8.85	9.54
PROPANE	9.60	8.00	7.23	6.74	7.66
I-BUTANE	0.77	0.70	0.66	0.57	0.67
N-BUTANE	4.86	4.02	4.24	3.66	4.10
PENTANES	1.87	1.62	1.70	1.44	1.58
HYDROGEN SULFIDE	4.66	4.41	3.75	3.08	3.78
CARBON MONOXIDE	0.00	0.00	0.00	0.00	0.00
CARBON DIOXIDE	0.40	1.00	0.20	0.09	0.53

COAL INSPECTIONS

RUN NUMBER P99-4JAVG P99-4JAVG P99-50AVG P99-51AVG P99-52AVG

FEED COAL

ELEMENTAL ANALYSIS (MOISTURE FREE, NORMALIZED TO 100%)

CARBON, SEMI-MICRO, WTX	69.03	69.03	69.03	69.03	69.03
HYDROGEN, SEMI-MICRO, WTX	4.96	4.96	4.96	4.96	4.96
NITROGEN, GB11, WTX	1.23	1.23	1.23	1.23	1.23
SULFUR, TOTAL, GRM1159, WTX	3.35	3.35	3.35	3.35	3.35
SULFUR, ORGANIC, WTX	2.07	2.07	2.07	2.07	2.07
SULFUR, PYRITIC, WTX	1.08	1.08	1.08	1.08	1.08
SULFUR, SULFATE, WTX	0.20	0.20	0.20	0.20	0.20
OXYGEN, GRM1117, WTX	14.65	14.65	14.65	14.65	14.65
OXYGEN, ORGANIC, WTX	8.79	8.79	8.79	8.79	8.79
OXYGEN, INORGANIC, WTX	5.87	5.87	5.87	5.87	5.87
CHLORINE, GRM1117, WTX	0.05	0.05	0.05	0.05	0.05
METALS, BY SPEC ASH, WTX	6.72	6.72	6.72	6.72	6.72

MINERAL MATTER, WTX*	13.87	13.87	13.87	13.87	13.87
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MOISTURE, D271, WTX	1.72	1.72	1.72	1.72	1.72
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VOLATILE MATTER, WTX	34.50	34.50	34.50	34.50	34.50
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ASH, D271, WTX	12.29	12.29	12.29	12.29	12.29
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SULFUR, WTX OF ASH	0.50	0.50	0.50	0.50	0.50
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OXYGEN, WTX OF ASH	44.80	44.80	44.80	44.80	44.80
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ALUMINUM, WTX OF ASH	12.0	12.0	12.0	12.0	12.0
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CALCIUM, WTX OF ASH	1.5	1.5	1.5	1.5	1.5
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IRON, WTX OF ASH	16.6	16.6	16.6	16.6	16.6
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MAGNESIUM, WTX OF ASH	.4	.4	.4	.4	.4
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POTASSIUM, WTX OF ASH	1.5	1.5	1.5	1.5	1.5
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SILICON, WTX OF ASH	20.4	20.4	20.4	20.4	20.4
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SODIUM, WTX OF ASH	.2	.2	.2	.2	.2
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TITANIUM, WTX OF ASH	.6	.6	.6	.6	.6
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TRACE METALS, WTX OF ASH	.1	.1	.1	.1	.1
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PARTICLE SIZE DISTRIBUTION, WTX

ON 80 MESH

THRU 80 ON 200 MESH	8.8	8.8	8.8	8.8	8.8
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THRU 200 ON 325 MESH	28.5	28.5	28.5	28.5	28.5
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THRU 325 ON 625 MESH	34.7	34.7	34.7	34.7	34.7
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THRU 625 MESH	28.0	28.0	28.0	28.0	28.0
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* BY PARR'S EQUATION: MINERAL MATTER = 1.08 X ASH + 0.55 X PYRITIC SULFUR

PRODUCT INSPECTIONS

RUN NUMBER

P99-48AVG P99-49AVG P99-50AVG P99-51AVG P99-52AVG

DEBUTANIZER BOTTOMS

GRAVITY, D287, API	26.4	24.8	25.5	25.3	24.7
ELEMENTAL ANALYSIS (NORMALIZED TO 100%)					
CARBON, SEMI-MICRO, WT%	84.82	84.52	84.33	83.99	84.62
HYDROGEN, SEMI-MICRO, WT%	10.53	10.36	10.51	10.51	10.28
NITROGEN, GB11, WT%	0.73	0.78	0.83	0.85	0.77
SULFUR, GRM1156, WT%	0.12	0.12	0.15	0.13	0.13
OXYGEN, GRM1117, WT%	3.80	4.21	4.18	4.52	4.20
VISCOSITY, KIN. D445, CS					
-35C	14.70	13.69			17.51
OC	3.54	3.71	3.80	3.73	4.04
WATER, G525, PPM	7513	7931	8215	8468	8044
HEAT OF COMB., D240, BTU/LB	17788	17725	17761	17634	17645
POUR POINT, D97, C	-54	-54	-54	-54	-65
DISTILLATION, D86, C					
INITIAL BOILING POINT	60	65	65	67	62
5 VOL %	74	76	76	77	78
10 VOL %	98	107	105	101	109
30 VOL %	167	170	168	167	169
50 VOL %	196	197	195	194	197
70 VOL %	214	215	214	211	213
90 VOL %	241	238	238	233	236
95 VOL %	255	249	251	246	249
END POINT	275	262	260	257	257

WATER (INCLUDES FLUSH WATER)

TOTAL CARBON, PPM	12700	16650	18533	18629	13600
ORGANIC CARBON, PPM	10163	13275	15142	15385	11100
NITROGEN, GB11, WT%	1.80	1.85	2.10	2.16	1.60
SULFUR, GRM1156, WT%	1.72	1.48	0.65	0.70	1.06
CHLORINE, APHA, PPM	2500*	2800	1695	2250	1900

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

PRODUCT INSPECTIONS

RUN NUMBER. P99-48AVG P99-49AVG P99-50AVG P99-51AVG P99-52AVG

PROCESS SOLVENT

GRAVITY, D287, API 7.0 6.2 7.2 7.0 7.0

ELEMENTAL ANALYSIS (NORMALIZED TO 100%)

CARBON, SEMI-MICRO, WT% 88.38 88.33 87.80 87.72 88.22

HYDROGEN, SEMI-MICRO, WT% 8.39 8.25 8.57 8.61 8.40

NITROGEN, GBII, WT% 0.99 0.96 1.02 1.03 1.00

SULFUR, GRM1156, WT% 0.25 0.27 0.28 0.26 0.26

OXYGEN, GRM1117, WT% 1.99 2.20 2.33 2.38 2.13

VISCOSITY, KIN, D445, CS

25 C 23.95 20.64 23.00 25.45 19.23

50 C 7.81 7.00 7.58 8.06 6.66

100 C 2.25 2.12 2.22 2.28 2.05

WATER, G325, PPM

HEAT OF COMB., D240, BTU/LB 282 690 381 426 653

HEAT OF COMB., D240, BTU/LB

POUR POINT, D97, C -15 -23 -15 -26 -23

DISTILLATION, CUSHMAN, C

CORRECTED TO 760 MM HG USING K10 FACTOR

INITIAL BOILING POINT 231 199 160 183 182

10 VOL % 266 257 253 254 249

20 VOL % 280 276 275 273 267

30 VOL % 293 292 293 291 282

40 VOL % 306 304 306 304 296

50 VOL % 321 319 323 321 312

60 VOL % 334 333 339 337 328

70 VOL % 351 351 363 359 346

80 VOL % 371 374 384 385 372

90 VOL % 409 404 417 416 407

END POINT 462 489 482 481 475

151

39

120

PRODUCT INSPECTIONS

RUN NUMBER		P99-48AVG	P99-49AVG	P99-50AVG	P99-51AVG	P99-52AVG
VACUUM TOWER BOTTOMS						
SPECIFIC GRAVITY, D70, G/CC	1.44	1.47	1.51	1.51	1.50	
ELEMENTAL ANALYSIS (NORMALIZED TO 100%)						
CARBON, SEMI-MICRO, WTX	64.46	66.67	63.51	62.22	64.96	
HYDROGEN, SEMI-MICRO, WTX	3.74	3.90	3.81	3.87	3.85	
NITROGEN, GRILL, WTX	1.29	1.35	1.27	1.22	1.31	
SULFUR, TOTAL, D1552, WTX	2.79	2.58	3.01	3.10	2.87	
SULFUR, SULFIDE, WTX	1.88	0.44	1.88	1.74		
SULFUR, PYRITIC, WTX	0.34			0.27	0.28	
OXYGEN, GRM117, WTX	13.13	11.95*	12.92	13.66*	12.85	
CHLORINE, D2361, WTX	0.01*	0.01	0.01	0.01*	0.01*	
METALS, WTX	14.58	13.55	15.47	15.92	14.15	
ASH, G599, WTX	26.65	24.76	28.28	29.11	25.87	
SULFUR, WTX OF ASH	0.50*	0.50*	0.50*	0.50*	0.50*	
OXYGEN, WTX OF ASH	44.80*	44.80*	44.80*	44.80*	44.80*	
METALS, WTX OF ASH (BY DIFF)	54.70	54.70	54.70	54.70	54.70	
PYRIDINE INSOLUABLES, WTX	40.2	37.9	39.3	39.8	38.3	
MELTING POINT, G898, C	138	141	138	134	141	
HEAT OF COMD., D240, BTU/LB	11617	12139	11551	11337	11778	
CONCARBON RSD, D189, WTX	79.2	76.9	76.7	75.6	77.1	
DISTILLATION, CUSHMAN, C						
CONVERTED TO 760 MM HG USING K10 FACTOR						
INITIAL BOILING POINT	408	414	407	440	406	
INTERMEDIATE BOILING POINT						
END POINT	479	483	476	476	477	
OVER AT INTERMED BP, WTX						
RESIDUE, WTX	90.7	91.6	92.3	92.9	91.2	

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

IN THE FOLLOWING DATA, DISTILLATE YIELDS HAVE BEEN ADJUSTED TO THE BOILING RANGES INDICATED

RUN NUMBER

P99-48AVG P99-49AVG P99-50AVG P99-51AVG P99-52AVG

YIELDS, WT% MOISTURE FREE COAL

HYDROGEN (BY H BALANCE)	-4.12	-4.16	-4.37	-4.49	-4.16
METHANE	5.49	5.76	5.31	5.12	5.52
ETHANE	3.91	4.41	4.25	4.17	4.29
PROPANE	3.70	4.35	4.33	4.35	4.24
I-BUTANE	0.16	0.23	0.22	0.27	0.26
N-BUTANE	1.77	1.98	2.23	2.24	2.02
TOTAL C1 TO C4	15.03	16.73	16.34	16.15	16.32
AMMONIA (BY N BALANCE)	0.45	0.41	0.44	0.47	0.43
HYDROGEN SULFIDE (BY S BAL)	2.17	2.17	2.08	2.10	2.05
CARBON DIOXIDE	1.02	1.03	0.82	0.78	0.89
CARBON MONOXIDE	0.07	0.10	0.07	0.10	0.09
HYDROGEN CHLORIDE (BY CL BAL)	0.05	0.04	0.05	0.05	0.05
TOTAL OTHER GASES	3.75	3.76	3.46	3.50	3.51
WATER (BY OXYGEN BALANCE)	7.66	7.77	8.04	7.84	7.62
C5 - 193 C (C5 - 380 F)	8.85	7.89	7.78	8.06	7.40
193 - 288 C (380 - 550 F)	15.78	14.40	14.95	15.58	14.94
288 - 482 C (550 - 900 F)	12.69	8.71	13.87	14.85	11.43
TOTAL C5+ DISTILLATE*	37.32	31.00	36.59	38.49	33.77
482 C+ (900 F+) PYRIDINE SOL.	22.08	20.21	22.75	21.67	24.71
INSOLUBLE ORGANIC MATTER	5.99	6.39	4.89	4.53	5.93
ASH	12.29	12.29	12.29	12.29	12.29
TOTAL 482 C+ (900 F+) PROD	40.36	44.90	39.94	38.50	42.94

* THE QUANTITY OF DISTILLATE SHOWN MAY NOT BE RECOVERABLE COMMERCIALY, IF THE TOTAL 482 C+ (900 F+) PRODUCT IS NOT FLUID ENOUGH TO BE EASILY REMOVED FROM THE VACUUM COLUMN

IN THE FOLLOWING DATA, DISTILLATE YIELDS HAVE BEEN ADJUSTED TO THE BOILING RANGES INDICATED

RUN NUMBER P99-4MAVG P99-49AVG P99-50AVG P99-51AVG P99-52AVG

YIELDS, WTK MOISTURE AND ASH FREE COAL

HYDROGEN (BY H BALANCE)	-4.70	-4.74	-4.98	-5.12	-4.74
METHANE	6.26	6.57	6.05	5.84	6.29
ETHANE	4.46	5.03	4.85	4.76	4.89
PROPANE	4.22	4.96	4.93	4.96	4.83
I-BUTANE	0.19	0.26	0.26	0.31	0.30
N-BUTANE	2.02	2.26	2.54	2.55	2.31
TOTAL C1 TO C4	17.14	19.08	18.63	18.42	18.61
AMMONIA (BY N BALANCE)	0.51	0.47	0.50	0.54	0.49
HYDROGEN SULFIDE (BY S BAL)	2.47	2.47	2.37	2.40	2.34
CARBON DIOXIDE	1.16	1.18	0.94	0.89	1.01
CARBON MONOXIDE	0.08	0.11	0.07	0.11	0.10
HYDROGEN CHLORIDE (BY CL BAL)	0.05	0.05	0.05	0.05	0.05
TOTAL OTHER GASES	4.28	4.28	3.94	3.99	4.01
WATER (BY OXYGEN BALANCE)	8.73	8.86	9.17	8.94	8.68
C5 - 193 C (C5 - 380 F)	10.09	9.00	8.87	9.18	8.44
193 - 288 C (380 - 550 F)	17.99	16.42	17.04	17.77	17.03
288 - 482 C (550 - 900 F)	14.47	9.93	15.82	16.94	13.04
TOTAL C5+ DISTILLATE*	42.55	35.35	41.72	43.89	38.50
482 C+ (900 F+) PYRIDINE SOL.	25.18	29.89	25.94	24.71	28.18
INSOLUBLE ORGANIC MATTER	6.83	7.29	5.58	5.17	6.76
TOTAL 482 C+ ORGANIC PROD	32.01	37.17	31.52	29.88	34.94

* THE QUANTITY OF DISTILLATE SHOWN MAY NOT BE RECOVERABLE COMMERCIALY, IF THE TOTAL 482 C+ (900 F+) PRODUCT IS NOT FLUID ENOUGH TO BE EASILY REMOVED FROM THE VACUUM COLUMN

IN THE FOLLOWING DATA, DISTILLATE YIELDS HAVE BEEN ADJUSTED TO THE BOILING RANGES INDICATED

RUN NUMBER

P99-48AVG P99-49AVG P99-50AVG P99-51AVG P99-52AVG

YIELDS**, WT% MOISTURE AND MINERAL FREE COAL

HYDROGEN (BY H BALANCE)	-4.79	-4.83	-5.07	-5.21	-4.83
METHANE	6.37	6.69	6.16	5.94	6.40
ETHANE	4.54	5.12	4.94	4.84	4.98
PROPANE	4.30	5.05	5.02	5.05	4.92
I-BUTANE	0.19	0.27	0.26	0.32	0.30
N-BUTANE	2.05	2.30	2.58	2.60	2.35
TOTAL C1 TO C4	17.45	19.43	18.97	18.76	18.95
AMMONIA (BY N BALANCE)	0.52	0.48	0.51	0.55	0.50
HYDROGEN SULFIDE (BY S BAL)	2.51	2.52	2.42	2.44	2.39
CARBON DIOXIDE	1.18	1.20	0.95	0.90	1.03
CARBON MONOXIDE	0.08	0.11	0.08	0.12	0.11
HYDROGEN CHLORIDE (BY CL BAL)	0.05	0.05	0.05	0.05	0.05
TOTAL OTHER GASES	4.36	4.36	4.01	4.07	4.08
WATER (BY OXYGEN BALANCE)	8.89	9.02	9.34	9.10	8.84
C5 - 193 C (C5 - 380 F)	10.28	9.16	9.03	9.35	8.59
193 - 288 C (380 - 550 F)	18.32	16.72	17.35	18.09	17.34
288 - 482 C (550 - 900 F)	14.73	10.11	16.11	17.25	13.27
TOTAL C5+ DISTILLATE*	43.33	35.99	42.49	44.69	39.21
482 C+ (900 F+) PYRIDINE SOL.	25.64	30.43	26.42	25.16	28.69
INSOLUBLE ORGANIC MATTER	5.75	6.22	4.48	4.06	5.68
TOTAL 482 C+ ORGANIC PROD	31.39	36.65	30.90	29.22	34.37

* THE QUANTITY OF DISTILLATE SHOWN MAY NOT BE RECOVERABLE COMMERCIALY, IF THE TOTAL 482 C+ (900 F+) PRODUCT IS NOT FLUID ENOUGH TO BE EASILY REMOVED FROM THE VACUUM COLUMN

** YIELDS ON A MINERAL FREE COAL BASIS ADD UP TO MORE THAN 100% DUE TO THE PRODUCTION OF HYDROGEN SULFIDE FROM THE CONVERSION OF PYRITES TO SULFIDES

MINERAL MATTER	15.48	15.48	15.48	15.48	15.48
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SRC-11 RUN DATA, MATERIAL BALANCES, AND PRODUCT PROPERTIES

RUN NUMBER	P99-53AVG	P99-54AVG	P99-55AVG
DATE (START OF PERIOD)	5-23-79	6- 3-79	6-17-79
TIME & DATE CODE (START & END OF PERIOD)	0815 1439 0415 1499	0815 1549 0415 1659	0815 1689 0415 1759
RUN HOURS INCLUDED IN PERIOD	65-204	60-319	80-243
COAL CHARGE	PUNHATAN LR-25044	PONHATAN LR-25044	PONHATAN LR-25044
OPERATING CONDITIONS			
RECYCLE SLURRY/MF COAL RATIO	1.54	1.56	2.42
OIL TO SOLIDS RATIO	1.19	1.06	1.22
SLURRY COMPOSITION, WT%			
COAL (MOISTURE FREE)	39.3	39.1	29.3
DISTILLATE	42.4	35.1	28.8
482 C+ (900 F+) PYRIDINE SOL.	11.9	16.3	26.2
PYRIDINE INSOLUABLES	6.3	9.5	15.7
TOTAL RX PRESSURE, MPA	13.80	13.80	13.80
PRESS X H ₂ IN INLET GAS, MPA	12.43	12.42	12.47
OUTLET H ₂ PARTIAL PRESS, MPA	9.63	9.51	9.30
DISSOLVER TEMPERATURES, C			
ZONE 4 (TOP)	458	458	458
ZONE 3	456	456	456
ZONE 2	454	454	454
ZONE 1 (BTM)	452	452	452
AVERAGE	455	455	455
PREHEATER OUTLET	390	390	401
NOMINAL SLURRY RES. TIME, HR	1.33	1.32	0.99
WHSV, KG/HR/DN3			
SLURRY	0.90	0.91	1.21
COAL (MOISTURE FREE)	0.35	0.36	0.36
DISSOLVER GAS			
DN3/KG SLURRY	694	691	484
DN3/KG MF FEED COAL	1764	1766	1653
HYDROGEN CONTENT, VOL%	90.1	90.0	90.3
FLUSH H ₂ O, % OF PRODUCT H ₂ O	160.4	153.7	145.7

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THE FOLLOWING WEIGHT BALANCE AND HYDROGEN CONSUMPTION DATA WERE CALCULATED FROM MEASURED UNIT DATA

RUN NUMBER P99-53AVG P99-54AVG P99-55AVG

WATER IN THE FEED COAL ASSUMED

LOST FROM FEED TANK, %	100.0	100.0	100.0
WEIGHT BALANCE, O/I, WTX	95.3	98.8	99.1

THE FOLLOWING DATA THROUGH AND INCLUDING ELEMENTAL BALANCES HAVE BEEN CORRECTED TO A 100% WT BALANCE

YIELDS, WTX FEED COAL

HYDROGEN	-3.77	-3.88	-3.82
METHANE	5.55	5.44	5.51
ETHANE	4.18	4.21	4.27
PROPANE	3.92	3.97	4.03
I-BUTANE	0.23	0.20	0.14
N-BUTANE	1.83	1.90	1.97
TOTAL C1 TO C4	15.71	15.72	15.93

AMMONIA	0.40	0.39	0.39
HYDROGEN SULFIDE	2.09	1.76	1.86
CARBON DIOXIDE	0.83	0.87	0.86
CARBON MONOXIDE	0.12	0.09	0.08
HYDROGEN CHLORIDE	0.03	0.02	0.03
TOTAL OTHER GASES	3.47	3.13	3.22

WATER	6.72	7.18	7.16
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DEHUTANIZER LIQUID	20.15	17.15	17.34
PROCESS SOLVENT	5.42	12.48	16.02
TOTAL C5+ DISTILLATE	25.58	29.64	33.37

VACUUM TOWER BOTTOMS	52.30	48.21	44.15
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CHEMICAL H2 CONSUMPTION BY UNIT GAS BALANCE

DM3/KG FEED COAL	443	455	448
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CONVERSIONS, WTX FEED COAL

HYDROCRACKING	58.8	62.3	65.1
DESULFURIZATION	65.9	61.8	63.8
DENITROGENATION	23.5	24.5	25.3
OXYGEN REMOVAL	51.9	53.4	54.1

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RUN NUMBER

P99-53AVG P99-54AVG P99-55AVG

GAS RATES. DM3/KG FEED COAL

DISSOLVER INLET GAS	1225.1	1125.1	1032.9
TOTAL QUENCH GAS	625.6	663.1	635.7
TOTAL DISSOLVER GAS	1850.7	1788.2	1668.7
MAKEUP GAS TO DISSOLVER	472.6	498.5	499.5
MAKEUP GAS TO SEP. SPARGE	84.8	77.8	91.1
MAKEUP GAS TO INSTRUMENT TAPS	271.5	261.1	260.6
TOTAL MAKEUP GAS	828.9	837.4	851.3
DISSOLVER OUTLET GAS	1571.1	1496.1	1386.6
GAS LEAVING SCRUBBERS	2022.1	1890.0	1796.4
SEPARATOR SPARGE GAS	331.9	279.1	304.3
PRODUCT GASES			
BLEED OFF GAS	392.4	388.1	401.6
DEBUTANIZER GAS	37.9	31.6	40.4
AMINE REACTIVATOR GAS	15.2	16.9	16.8
NAPTHA REACTIVATOR GAS	94.2	97.8	97.9
CHROMATOGRAPH BLEED GAS	4.6	10.9	12.4

ELEMENTAL BALANCES

WATER IN THE FEED COAL ASSUMED
LUST FROM FEED TANK, %

100.0	100.0	100.0
1.01	1.00	1.00
1.00	0.99	1.01
1.03	1.01	1.00
0.99	0.99	1.01
0.96	1.01	0.99
0.95	0.79	0.86
1.00	1.02	0.98
1.00	1.02	0.98

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THE FOLLOWING DATA WERE BALANCED FOR CARBON, HYDROGEN, SULFUR, NITROGEN, OXYGEN, CHLORINE, AND METALS

RUN NUMBER P99-53AVG P99-54AVG P99-55AVG

YIELDS, WT% MOISTURE FREE COAL

HYDROGEN (BY H BALANCE)	-3.83	-3.80	-3.93
METHANE	5.51	5.45	5.51
ETHANE	4.15	4.22	4.27
PROPANE	3.89	3.97	4.03
I-BUTANE	0.23	0.20	0.14
N-BUTANE	1.82	1.90	1.97
TOTAL C1 TO C4	15.60	15.74	15.91

AMMONIA (BY N BALANCE)	0.36	0.38	0.39
HYDROGEN SULFIDE (BY S BAL)	2.13	1.78	1.84
CARBON DIOXIDE	0.82	0.87	0.86
CARBON MONOXIDE	0.12	0.09	0.08
HYDROGEN CHLORIDE (BY CL BAL)	0.03	0.03	0.03
TOTAL OTHER GASES	3.47	3.15	3.20

WATER (BY OXYGEN BALANCE)	7.37	7.10	7.25
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DEBUTANIZER LIQUID	20.01	17.17	17.33
PROCESS SOLVENT	5.38	12.50	16.01
TOTAL C5+ DISTILLATE	25.39	29.67	33.33

VTB PYRIDINE SOLUABLES	33.79	29.69	26.02
INSOLUABLE ORGANIC MATTER	6.64	7.62	7.37
ASH	11.57	10.84	10.84
VACUUM TOWER BOTTOMS	52.00	48.15	44.23

CHEMICAL H2 CONSUMPTION, DM3/KG MOISTURE FREE COAL
BY HYDROGEN BALANCE

	449	445	460
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CONVERSIONS, WT% MF COAL

HYDROCRACKING	59.1	62.3	65.1
DESULFURIZATION	66.2	61.7	63.8
DENITROGENATION	24.0	24.4	25.4
OXYGEN REMOVAL	51.8	53.1	54.0

1.59

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RUN NUMBER

P99-53AVG P99-54AVG P99-55AVG

GAS COMPOSITIONS, VOL%

REACTOR INLET GAS

HYDROGEN	90.06	89.98	90.35
METHANE	8.54	8.42	8.12
ETHANE	1.35	1.54	1.52
PROPANE	0.00	0.00	0.00
I-BUTANE	0.00	0.00	0.00
N-BUTANE	0.01	0.00	0.00
PENTANES	0.00	0.00	0.00
HYDROGEN SULFIDE	0.00	0.00	0.00
CARBON MONOXIDE	0.04	0.06	0.01
CARBON DIOXIDE	0.00	0.00	0.00

REACTOR OUTLET GAS (HUTANES AND LIGHTER ONLY)

HYDROGEN	73.41	72.32	71.27
METHANE	14.41	14.50	14.64
ETHANE	3.49	3.82	4.01
PROPANE	1.28	1.36	1.49
I-BUTANE	0.07	0.08	0.09
N-BUTANE	0.45	0.49	0.55
HYDROGEN SULFIDE	0.87	0.76	0.87
CARBON MONOXIDE	0.11	0.11	0.06
CARBON DIOXIDE	0.27	0.30	0.32
AMMONIA	0.33	0.34	0.37
WATER	5.30	5.91	6.33
HYDROGEN CHLORIDE	0.01	0.01	0.01

BLEED OFF GAS

HYDROGEN	84.86	84.74	85.20
METHANE	12.89	12.92	12.52
ETHANE	1.97	2.11	2.05
PROPANE	0.01	0.03	0.05
I-BUTANE	0.00	0.00	0.00
N-BUTANE	0.00	0.01	0.00
PENTANES	0.00	0.00	0.00
HYDROGEN SULFIDE	0.00	0.00	0.00
CARBON MONOXIDE	0.26	0.19	0.17
CARBON DIOXIDE	0.00	0.00	0.00

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RUN NUMBER

P99-53AVG P99-54AVG P99-55AVG

GAS COMPOSITIONS, VOL%

AMINE REACTIVATOR GAS

HYDROGEN	18.26	16.51	17.97
METHANE	2.01	2.06	1.93
ETHANE	0.39	0.59	0.55
PROPANE	0.02	0.14	0.08
I-BUTANE	0.00	0.00	0.00
N-BUTANE	0.01	0.11	0.11
PENTANES	0.00	0.02	0.00
HYDROGEN SULFIDE	60.12	61.09	60.69
CARBON MONOXIDE	0.03	0.06	0.03
CARBON DIOXIDE	19.17	19.42	18.63

NAPHTHA REACTIVATOR GAS

HYDROGEN	25.14	23.85	24.88
METHANE	24.24	23.95	23.19
ETHANE	22.20	22.51	22.28
PROPANE	19.08	19.79	19.63
I-BUTANE	1.02	1.07	1.08
N-BUTANE	6.27	6.71	6.79
PENTANES	1.87	2.00	2.03
HYDROGEN SULFIDE	0.03	0.00	0.00
CARBON MONOXIDE	0.00	0.00	0.00
CARBON DIOXIDE	0.14	0.12	0.12

DEBUTANIZER GAS

HYDROGEN	56.82	56.40	56.21
METHANE	18.90	19.01	19.49
ETHANE	9.35	9.69	9.78
PROPANE	6.49	6.75	6.77
I-BUTANE	0.55	0.58	0.56
N-BUTANE	3.48	3.75	3.61
PENTANES	0.99	0.42	0.33
HYDROGEN SULFIDE	3.18	3.20	3.03
CARBON MONOXIDE	0.00	0.00	0.00
CARBON DIOXIDE	0.25	0.19	0.22

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COAL INSPECTIONS

RUN NUMBER

P99-53AVG P99-54AVG P99-55AVG

FEED COAL

ELEMENTAL ANALYSIS (MOISTURE FREE, NORMALIZED TO 100%)

CARBON, SEMI-MICRO, WTX	70.32	71.62	71.62
HYDROGEN, SEMI-MICRO, WTX	5.10	5.26	5.26
NITROGEN, GULL, WTX	1.24	1.27	1.27
SULFUR, TOTAL, GRM1159, WTX	3.03	2.71	2.71
SULFUR, ORGANIC, WTX	1.95	1.63	1.63
SULFUR, PYRITIC, WTX	0.88	0.88	0.88
SULFUR, SULFATE, WTX	0.20	0.20	0.20
OXYGEN, GRM1117, WTX	13.92	13.16	13.16
OXYGEN, ORGANIC, WTX	8.35	7.98	7.98
OXYGEN, INORGANIC, WTX	5.57	5.18	5.18
CHLORINE, GRM1117, WTX	0.05	0.05	0.05
METALS, BY SPEC ASH, WTX	6.33	5.93	5.93

MINERAL MATTER, WTX	12.98	12.19	12.19
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MOISTURE, D271, WTX	1.51	1.30	1.30
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VOLATILE MATTER, WTX	34.50	34.50	34.50
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ASH, D271, WTX	11.57	10.84	10.84
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SULFUR, WTX OF ASH	0.50	0.50	0.50
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OXYGEN, WTX OF ASH	44.80	44.80	44.80
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ALUMINUM, WTX OF ASH	12.0	12.0	12.0
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CALCIUM, WTX OF ASH	1.5	1.5	1.5
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IRON, WTX OF ASH	16.6	16.6	16.6
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MAGNESIUM, WTX OF ASH	.4	.4	.4
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POTASSIUM, WTX OF ASH	1.5	1.5	1.5
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SILICON, WTX OF ASH	20.4	20.4	20.4
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SODIUM, WTX OF ASH	.2	.2	.2
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TITANIUM, WTX OF ASH	.6	.6	.6
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TRACE METALS, WTX OF ASH	.1	.1	.1
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PARTICLE SIZE DISTRIBUTION, WTX

ON 80 MESH			
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THRU 80 ON 200 MESH	5.6	5.6	5.6
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THRU 200 ON 325 MESH	26.6	26.6	26.6
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THRU 325 ON 625 MESH	35.1	35.1	35.1
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THRU 625 MESH	32.7	32.7	32.7
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PRODUCT INSPECTIONS

RUN NUMBER P99-53AVG P99-54AVG P99-55AVG

DEBUTANIZER BOTTOMS

GRAVITY, D287, API	23.8	24.9	25.9
ELEMENTAL ANALYSIS (NORMALIZED TO 100%)			
CARBON, SEMI-MICRO, WTX	84.33	84.27	84.15
HYDROGEN, SEMI-MICRO, WTX	10.31	10.45	10.56
NITROGEN, GH11, WTX	0.74	0.80	0.80
SULFUR, GRM1156, WTX	0.15	0.19	0.19
OXYGEN, GRM1117, WTX	4.48	4.30*	4.29*
VISCOSITY, KIN, D445, CS			
-35C	16.79	15.83	
0C	4.15	7.76	3.97
WATER, G525, PPM	8684	8242	7139
HEAT OF COMB., D240, BTU/LB	17621	17354	17215
POUR POINT, D97, C	-54	-54	-54
DISTILLATION, D86, C			
INITIAL BOILING POINT	69	73	66
5 VOL %	79	83	83
10 VOL %	118	108	109
30 VOL %	177	165	170
50 VOL %	199	188	195
70 VOL %	215	206	216
90 VOL %	239	231	241
95 VOL %	248	244	254
END POINT	261	257	263

WATER (INCLUDES FLUSH WATER)

TOTAL CARBON, PPM	15760	11171	8120
ORGANIC CARBON, PPM	12920	7864	4680
NITROGEN, GB11, WTX	1.62	1.68	1.74
SULFUR, GRM1156, WTX	2.40*	0.63	1.07
CHLORINE, APHA, PPM	1444	1158	1404

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

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PRODUCT INSPECTIONS

RUN NUMBER		P49-53AVG	P49-54AVG	P49-55AVG
PROCESS SOLVENT				
GRAVITY, D287, API		6.7	7.1	7.5
ELEMENTAL ANALYSIS (NORMALIZED TO 100X)				
CARBON, SEMI-MICRO, WT%		88.00	87.93	87.81
HYDROGEN, SEMI-MICRO, WT%		8.43	8.53	8.67
NITROGEN, GRM11, WT%		0.94	1.00	1.02
SULFUR, GRM1156, WT%		0.31	0.34	0.31
OXYGEN, GRM1117, WT%		2.32	2.20*	2.20*
VISCOSITY, KIN. D445, CS				
25 C		19.08	21.86	22.69
50 C		6.64	7.30	7.53
100 C		2.05	2.19	2.21
WATER, G525, PPM		773	879	498
HEAT OF CUMB., D240, BTU/LB		17313	17332	17020
POUR POINT, D97, C		-15	-7	-9
DISTILLATION, CUSHMAN, C				
CORRECTED TO 760 MM HG USING K10 FACTOR				
INITIAL BOILING POINT		190	188	165
10 VOL %		246	253	252
20 VOL %		270	270	271
30 VOL %		287	287	290
40 VOL %		303	300	306
50 VOL %		321	314	321
60 VOL %		337	329	337
70 VOL %		358	348	353
80 VOL %		382	370	378
90 VOL %		410	405	411
END POINT		499	479	504

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

PRODUCT INSPECTIONS

RUN NUMBER P99-53AVG P99-54AVG P99-55AVG

VACUUM TOWER BOTTOMS

SPECIFIC GRAVITY, D70, G/CC	1.46	1.47	1.47
ELEMENTAL ANALYSIS (NORMALIZED TO 100X)			
CARBON, SEMI-MICRO, WTX	69.74	69.56	68.78
HYDROGEN, SEMI-MICRO, WTX	4.11	4.09	3.92
NITROGEN, GULL, WTX	1.43	1.42	1.40
SULFUR, TOTAL, DISS2, WTX	1.87	1.97	1.99
SULFUR, SULFIDE, WTX	1.49	0.33	0.28
SULFUR, PYRITIC, WTX		0.13	0.14
OXYGEN, GRM1117, WTX	10.80*	10.50*	10.90*
CHLORINE, D2361, WTX	0.04	0.04	0.04
METALS, WTX	12.00	12.42	12.97

ASH, G599, WTX	21.94	22.71	23.71
SULFUR, WTX OF ASH	0.50*	0.50*	0.50*
OXYGEN, WTX OF ASH	44.80*	44.80*	44.80*
METALS, WTX OF ASH (BY DIFF)	54.70	54.70	54.70

PYRIDINE INSOLUABLES, WTX	34.6	38.2	40.4
MELTING POINT, G898, C	149	165	164
HEAT OF COMB., D240, BTU/LB	12486	1225d	
CONCARBON RSD, D189, WTX	76.7	79.1	78.5

DISTILLATION, CUSHMAN, C

CONVERTED TO 760 MM HG USING K10 FACTOR

INITIAL BOILING POINT	400	424	435
INTERMEDIATE BOILING POINT	474	480	
END POINT	498	495	507
OVER AT INTERMED BP, WTX	5.5	5.2	
RESIDUE, WTX	91.2	91.9	93.2

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

53
165

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IN THE FOLLOWING DATA, DISTILLATE YIELDS HAVE BEEN ADJUSTED TO THE BOILING RANGES INDICATED

RUN NUMBER P99-53AVG P99-54AVG P99-55AVG

YIELDS, WT% MOISTURE FREE COAL

	HYDROGEN (BY H BALANCE)	-3.83	-3.80	-3.93
	METHANE	5.51	5.45	5.51
	ETHANE	4.15	4.22	4.27
	PROPANE	3.89	3.97	4.03
	I-BUTANE	0.23	0.20	0.14
	N-BUTANE	1.82	1.90	1.97
	TOTAL C1 TO C4	15.60	15.74	15.91
166	AMMONIA (BY N BALANCE)	0.36	0.38	0.39
	HYDROGEN SULFIDE (BY S BAL)	2.13	1.78	1.84
	CARBON DIOXIDE	0.82	0.87	0.86
	CARBON MONOXIDE	0.12	0.09	0.08
54	HYDROGEN CHLORIDE (BY CL BAL)	0.03	0.03	0.03
	TOTAL OTHER GASES	3.47	3.15	3.20
	WATER (BY OXYGEN BALANCE)	7.37	7.10	7.25
	C5 - 193 C (C5 - 380 F)	7.00	7.54	6.91
	193 - 288 C (380 - 550 F)	14.49	12.97	14.45
	288 - 482 C (550 - 900 F)	6.97	11.71	13.87
	TOTAL C5+ DISTILLATE*	28.46	32.22	35.24
	482 C+ (900 F+) PYRIDINE SOL.	30.72	27.14	24.12
135	INSOLUABLE ORGANIC MATTER	6.64	7.62	7.37
	ASH	11.57	10.84	10.84
	TOTAL 482 C+ (900 F+) PHOD	48.93	45.60	42.33

* THE QUANTITY OF DISTILLATE SHOWN MAY NOT BE RECOVERABLE COMMERCIALY, IF THE TOTAL 482 C+ (900 F+) PRODUCT IS NOT FLUID ENOUGH TO BE EASILY REMOVED FROM THE VACUUM COLUMN

IN THE FOLLOWING DATA, DISTILLATE YIELDS HAVE BEEN ADJUSTED TO THE BOILING RANGES INDICATED

RUN NUMBER P99-53AVG P99-54AVG P99-55AVG

YIELDS, WT% MOISTURE AND ASH FREE COAL

	HYDROGEN (BY H BALANCE)	-4.33	-4.26	-4.40
	METHANE	6.23	6.11	6.18
	ETHANE	4.70	4.73	4.79
	PROPANE	4.40	4.46	4.52
	I-BUTANE	0.26	0.22	0.15
	N-BUTANE	2.05	2.13	2.21
	TOTAL C1 TO C4	17.64	17.65	17.85
167	AMMONIA (BY N BALANCE)	0.41	0.42	0.44
	HYDROGEN SULFIDE (BY S BAL)	2.41	1.99	2.06
	CARBON DIOXIDE	0.93	0.98	0.96
	CARBON MONOXIDE	0.14	0.10	0.09
55	HYDROGEN CHLORIDE (BY CL BAL)	0.03	0.04	0.04
	TOTAL OTHER GASES	3.93	3.53	3.59
	WATER (BY OXYGEN BALANCE)	8.33	7.96	8.13
	C5 - 193 C (C5 - 380 F)	7.92	8.46	7.75
	193 - 288 C (380 - 550 F)	16.38	14.55	16.20
	288 - 482 C (550 - 900 F)	7.88	13.14	15.56
	TOTAL C5+ DISTILLATE*	32.19	36.14	39.52
136	482 C+ (900 F+) PYRIDINE SOL.	34.74	30.44	27.05
	INSOLUBLE ORGANIC MATTER	7.51	8.55	8.26
	TOTAL 482 C+ ORGANIC PROD	42.25	38.98	35.32

* THE QUANTITY OF DISTILLATE SHOWN MAY NOT BE RECOVERABLE COMMERCIALY. IF THE TOTAL 482 C+ (900 F+) PRODUCT IS NOT FLUID ENOUGH TO BE EASILY REMOVED FROM THE VACUUM COLUMN

IN THE FOLLOWING DATA, DISTILLATE YIELDS HAVE BEEN ADJUSTED TO THE BOILING RANGES INDICATED

RUN NUMBER P99-53AVG P99-54AVG P99-55AVG

YIELDS**, WTX MOISTURE AND MINERAL FREE COAL

HYDROGEN (BY H BALANCE)	-4.41	-4.33	-4.48
METHANE	6.34	6.21	6.28
ETHANE	4.78	4.81	4.87
PROPANE	4.47	4.53	4.59
I-BUTANE	0.26	0.23	0.16
N-BUTANE	2.09	2.17	2.25
TOTAL C1 TO C4	17.95	17.94	18.15
AMMONIA (BY N BALANCE)	0.42	0.43	0.45
HYDROGEN SULFIDE (BY S BAL)	2.45	2.03	2.09
CARBON DIOXIDE	0.95	1.00	0.98
CARBON MONOXIDE	0.14	0.10	0.09
HYDROGEN CHLORIDE (BY CL BAL)	0.04	0.04	0.04
TOTAL OTHER GASES	4.00	3.59	3.65
WATER (BY OXYGEN BALANCE)	8.48	8.09	8.27
C5 - 193 C (C5 - 380 F)	8.06	8.60	7.88
193 - 288 C (380 - 550 F)	16.57	14.79	16.47
288 - 482 C (550 - 900 F)	8.02	13.35	15.82
TOTAL C5+ DISTILLATE*	32.75	36.74	40.18
482 C+ (900 F+) PYRIDINE SOL.	35.35	30.94	27.51
INSOLUBLE ORGANIC MATTER	6.51	7.64	7.35
TOTAL 482 C+ ORGANIC PROD	41.86	38.58	34.85

* THE QUANTITY OF DISTILLATE SHOWN MAY NOT BE RECOVERABLE COMMERCIALY. IF THE TOTAL 482 C+ (900 F+) PRODUCT IS NOT FLUID ENOUGH TO BE EASILY REMOVED FROM THE VACUUM COLUMN

** YIELDS ON A MINERAL FREE COAL BASIS ADD UP TO MORE THAN 100% DUE TO THE PRODUCTION OF HYDROGEN SULFIDE FROM THE CONVERSION OF PYRITES TO SULFIDES

MINERAL MATTER	14.44	13.41	13.41
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APPENDIX B
CHRONICLE OF SRC-II OPERATIONS ON P-99 FOR
RUNS 48 TO 55

APPENDIX B

CHRONICLE OF SRC-II OPERATIONS ON P-99 FOR RUNS 48 TO 55

Introduction

This appendix presents a brief chronicle of SRC-II operations on P-99 while feeding the third shipment of Powhatan No. 5 Mine coal. It is divided into two parts. The first section discusses the chronology of operations, giving an indication of the problems encountered and the smoothness of each run. The second section discusses the nature of the solids removed from the dissolver and hot separator following each operating period. A chronology of the operation in graphic form is given in Figures B-1 and B-2.

Run P99-48 December 1 to December 13, 1978

This run was started after a short turn-around during which the dissolver was removed and cleaned. The unit ran very well on the new shipment of Powhatan coal from Fort Lewis. On December 12, the unit was upset when a plug developed in the flash tower system. A restriction was found at the internal thermowell near the outlet of the flash column preheater. Because of the scheduled December shutdown, it was decided to terminate the run.

Unit Turn-Around December 14, 1978 to February 27, 1979

Upon removing and opening the dissolver, it was found to be in very good condition. Only 3 kg of solids were found which were estimated to occupy less than 5% of the dissolver volume. A fourth high pressure separator was installed in the dissolver off gas system during this turn-around. A description of the new separator system is given in Section III.B (Process

FIGURE B-1

Chronology of Runs P99-49 through P99-52

* Time periods when material balance data were obtained.

FIGURE B-2

Chronology of Runs P99-53 Through P99-55

Number of Days Since Coal Feed Started

*Time periods when material balance data were obtained.

Flow) and Figure 1 (Simplified Flow Diagram of Process Development Unit P-99). Several minor modifications were also made during this turn-around.

Run P99-49 February 28 to March 28, 1979

Numerous problems were encountered with the new high pressure separator system. Initially, most of the problems occurred in the liquid level control systems and recycle water pump. After achieving satisfactory operation of the new separator system, several days of good operation were obtained, but then the dissolver pressure began to increase due to a restriction in the off gas line after the hot separator. Water flushing this line only temporarily relieved the plug. After the transfer line was raised from 240°C to 293°C, no more plugging occurred. Six good run periods were obtained. A series of special samples were taken before the run conditions were changed.

Run P99-50 March 29 to April 9, 1979

After four on-stream periods were obtained, the computer went down for seven hours which upset operations. On the next day, a seven-minute power failure resulted in another operating upset. The run was extended for four more days to verify the initial data.

Run P99-51 April 10 to April 23, 1979

On April 12, overheating of the hydraulic oil for the high pressure feed pump forced a discontinuance of its use, with a consequent coal outage. Flush oil was circulated to the dissolver while the pump was being repaired. Once coal feed was restarted, seven good periods were obtained before changing conditions. Several pressure buildups in the dissolver occurred during this run, apparently due to salts depositing in the hot separator off-gas cooler. Continuous water injection after the hot separator alleviated this problem. Also, a plugged vent line in the new separator system caused product water draw-off to cycle badly.

Run P99-52 April 24 to May 4, 1979

Some pressure buildup across the dissolver preheater coil was experienced over this entire run, and feed rates to the dissolver were slightly irregular because of this. After five on-stream periods were obtained, the unit was shut down for required maintenance. Because of the short run duration, the unit may not have reached completely lined-out conditions.

Unit Turnaround May 5 to May 19, 1979

Inspection of the unit after shutdown showed it to be in generally good condition. Significant erosion had occurred only in the let-down valve manifold. The dissolver and hot high pressure separator were removed, opened, inspected, cleaned, and reassembled. The dissolver contained only a small amount of coke, but a significant amount of coke was found in the hot separator, which had operated at 780°F. A number of minor modifications to the unit were made during this shutdown.

Run P99-53 May 20 to May 31, 1979

Unit operation was relatively smooth over the run period. A number of short coal outages resulted from an electrical problem in the Thayer weigh belt feeder.

Run P99-54 June 1 to June 15, 1979

Some minor upsets were experienced, but the unit ran reasonably well over most of this run period. Coal feed was stopped for eight hours on June 4 due to problems with the amine scrubber. On June 13, feed tank viscosity began to increase. This was traced to a malfunction of the weigh belt feeder caused by a buildup of coal. This resulted in an actual feed rate higher than that indicated.

The desired 48% total feed solids could not be reached due to the high viscosity of the feed slurry. However, several good run periods were obtained at 46% total feed solids. The amine scrubber malfunctioned during the last three days of operation. The liquid level was difficult to control due to a defective differential pressure cell. The vacuum column temperature was raised to 380°C during the last two days of operation without any problems.

ANALYSES OF SOLIDS REMOVED FROM THE DISSOLVER
AND HOT SEPARATOR AFTER RUNS 48, 52, AND 55

After Run P99-48

The dissolver was removed and found to contain about 3 kg of solids, of which 2 kg was located at the bottom and the rest located in a ring near the outlet port. These solids occupied less than 5% of the reaction volume. The material at the bottom contained about 31% ash and 69% coke (see Table B-I), while the solids near the outlet contained 23% ash and 77% coke.

After Run P99-52

The dissolver contained about six inches of solids in the bottom, in the usual cone-shaped deposit. These solids occupied only 3% of the reaction volume which is quite good following 62 days of operation. The solids were approximately 20% ash and 80% coke (see Table B-II). The solids removed from the dissolver walls contained only 56% coke.

The hot separator contained a considerable amount of solids. These solids consisted of 5% pyridine solubles, 60% ash, and 35% coke (see Table B-II). The separator had operated at 780°F for 62 days. These solids may have collected partly because of the high temperature and partly because of the large surface area available for deposits due to the presence of several metal corrosion-test coupons located in the bottom of the vessel. A drawing of the hot separator showing the location of the coke deposit is shown in Figure B-3.

After Run P99-55

About four inches of solids were found in the bottom of the dissolver after Run 55. These solids were approximately 84% coke and 16% ash (see Table B-III). The metals analysis of the ash was similar to that of the feed coal. A one-inch ring of solids was observed at the dissolver outlet port,

Table B-1

ANALYSES OF SOLIDS FOUND IN P-99 DISSOLVER FOLLOWING RUN P99-48

<u>Location</u>	<u>Bottom Head</u>	<u>Near Outlet Port at Middle of Dissolver</u>
Analyses		
Ash, wt%	28.0	18.3
Specific Gravity, 77°F	1.643	1.517
Pyridine Insolubles, wt%	93.20	82.68
Ash, wt% of PI	31.3	22.8
Carbon, wt% of PI	57.62	70.11
Hydrogen, wt% of PI	1.95	2.47
Spectral Ash, wt% of Ash		
Al	10	10
Ba	tr	tr
B	0.2	0.5
Ca	3	2
Cr	0.1	0.05
Cu	0.01	0.01
Fe	15	15
Mg	1	1
Mn	2	0.8
Ni	6	3
K	0.8	0.8
Si	20	20
Na	0.2	0.3
Sr	0.1	0.1
Ti	2	5.0

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Table B-II

ANALYSES OF SOLIDS FOUND IN P-99 VESSELS FOLLOWING RUN P99-52

<u>Location</u>	<u>Dissolver Bottom</u>	<u>Dissolver Walls</u>	<u>Hot High Pressure Separator</u>
Analyses			
Pyridine Insolubles, wt%	97.57	77.94	94.81
Ash, wt% of PI	19.5	28.0	63.9
Carbon, wt% of PI	78.14	69.94	29.44
Hydrogen, wt% of PI	2.63	3.06	1.05
Spectral Ash, wt% of Ash			
Al	10	10	7
Ba	tr	tr	tr
B	0.1	0.08	0.4
Ca	0.8	0.6	0.4
Cr	0.03	0.02	0.02
Cu	0.003	0.003	0.007
Fe	20	15	20
Mg	0.6	0.7	1
Mn	0.3	0.2	0.3
Ni	0.3	0.01	6
K	0.2	0.08	0.2
Si	20	20	20
Na	0.01	0.2	0.2
Sr	--	0.01	0.05
Ti	2	1	2
Va	--	--	0.1

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Figure B-3

P-99 HOT HIGH PRESSURE SEPARATOR

Table B-III). The metals analysis of the ash was similar to that of the feed coal. A one-inch ring of solids was observed at the dissolver outlet port, and the outlet port was partially restricted. Those solids were 65% coke and 35% ash, the ash containing a larger amount of nickel and titanium than the feed coal. The total solids occupied less than 3% of the reactor volume.

Table B-III

SOLIDS FOUND IN P-99 DISSOLVER FOLLOWING RUN P99-55

<u>Location</u>	<u>Dissolver Bottom</u>	<u>Dissolver Outlet</u>
Analyses		
Pyridine Insolubles, wt%	96.04	95.72
Ash, wt% of PI	16.5	34.4
Spectrographic Ash, wt% of Ash		
Al	10	9
Ba	tr	tr
B	0.1	0.6
Ca	1	0.6
Cr	0.05	0.04
Cu	0.007	0.01
Fe	15	10
Mg	1	0.4
Mn	0.2	0.2
Ni	0.2	6
K	0.7	0.4
Si	20	7
Na	<0.08	0.07
Sr	0.05	0.05
Ti	0.7	25
V	-	0.2
Weight of Solids, g	1737	990

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APPENDIX C

**COMPUTER PRINTOUTS OF INDIVIDUAL YIELD PERIODS FOR
THE THIRD SHIPMENT OF POWHATAN COAL**

SRC-11 RUN DATA, MATERIAL BALANCES, AND PRODUCT PROPERTIES

RUN NUMBER	P99-48-2	P99-48-3	P99-48-4	P99-48-5	P99-48-6	P99-48-7	P99-48-8
DATE (START OF PERIOD)	12- 6-78	12- 7-78	12- 8-78	12- 9-78	12-10-78	12-11-78	12-12-78
TIME & DATE CODE (START & END OF PERIOD)	0815 3408 0215 3418	1215 3418 0415 3428	0915 3428 0415 3438	0815 3438 0415 3448	0815 3448 0415 3458	0815 3458 0415 3468	0815 3468 0015 3478
RUN HOURS INCLUDED IN PERIOD	116-133	144-159	164-183	188-207	212-231	236-255	260-275
COAL CHARGE	POWHATAN LR-25844	POWHATAN LR-25844	POWHATAN LR-25844	POWHATAN LR-25844	POWHATAN LR-25844	POWHATAN LR-25844	POWHATAN LR-25844
OPERATING CONDITIONS							
RECYCLE SLURRY/MF COAL RATIO	2.32	2.30	2.37	2.31	2.34	2.34	2.31
OIL TO SOLIDS RATIO	1.20	1.17	1.18	1.15	1.14	1.13	1.13
SLURRY COMPOSITION, WTX							
COAL (MOISTURE FREE)	30.1	30.3	29.7	30.2	29.9	30.0	30.2
DISTILLATE	33.3	31.9	31.9	31.6	31.2	30.6	30.6
482 C+ (900 F+) PYRIDINE SOL.	21.3	21.9	22.3	21.9	22.1	22.4	22.5
PYRIDINE INSOLUABLES	15.3	15.8	16.1	16.2	16.8	17.0	16.7
TOTAL RX PRESSURE, MPA	13.80	13.80	13.80	13.79	13.74	13.79	13.80
PRESS X H2 IN INLET GAS, MPA	11.73	11.75	11.84	11.84	11.89	11.78	11.71
OUTLET H2 PARTIAL PRESS, MPA	8.85	8.85	8.85	8.85	8.85	8.85	8.85
DISSOLVER TEMPERATURES, C							
ZONE 4 (TOP)	462	462	462	462	462	462	462
ZONE 3	461	461	461	461	461	461	461
ZONE 2	460	460	460	460	460	460	460
ZONE 1 (BTM)	457	457	457	457	457	457	457
AVERAGE	460	460	460	460	460	460	460
PREHEATER OUTLET	388	388	388	388	389	389	389
NOMINAL SLURRY RES. TIME, HR	1.00	1.01	1.00	1.01	1.00	0.99	1.01
WHSV, KG/HR/DM3							
SLURRY	1.20	1.18	1.20	1.19	1.20	1.21	1.19
COAL (MOISTURE FREE)	0.36	0.36	0.36	0.36	0.36	0.36	0.36
DISSOLVER GAS							
DM3/KG SLURRY	558	566	564	564	558	546	559
DM3/KG MF FEED COAL	1856	1868	1900	1864	1862	1822	1850
HYDROGEN CONTENT, VOL%	85.0	85.2	85.8	85.9	86.2	85.4	84.9
FLUSH H2O, % OF PRODUCT H2O	127.8	165.0	145.8	135.7	160.1	154.5	147.9

THE FOLLOWING WEIGHT BALANCE AND HYDROGEN CONSUMPTION DATA WERE CALCULATED FROM MEASURED UNIT DATA

RUN NUMBER	P99-48-2	P99-48-3	P99-48-4	P99-48-5	P99-48-6	P99-48-7	P99-48-8
WATER IN THE FEED COAL ASSUMED							
LOST FROM FEED TANK, %	100.0	100.0	100.0	100.0	100.0	100.0	100.0
WEIGHT BALANCE, O/I, WT%	101.2	98.0	101.4	99.7	97.7	98.3	97.9

THE FOLLOWING DATA THROUGH AND INCLUDING ELEMENTAL BALANCES HAVE BEEN CORRECTED TO A 100% WT BALANCE

YIELDS, WT% FEED COAL

HYDROGEN	-3.95	-4.06	-3.97	-4.00	-4.11	-4.00	-4.03
METHANE	5.57	5.68	5.43	5.37	5.39	5.44	5.54
ETHANE	3.90	4.14	3.97	3.87	3.82	3.79	3.89
PROPANE	3.72	3.93	3.79	3.69	3.60	3.56	3.65
I-BUTANE	0.20	0.18	0.15	0.17	0.13	0.14	0.16
N-BUTANE	1.76	1.83	1.76	1.78	1.74	1.74	1.76
TOTAL C1 TO C4	15.15	15.76	15.11	14.90	14.68	14.68	15.00
AMMONIA	0.43	0.46	0.46	0.45	0.46	0.46	0.47
HYDROGEN SULFIDE	1.73	1.82	1.73	1.79	1.80	1.73	1.85
CARBON DIOXIDE	0.99	1.02	0.99	1.01	1.09	1.05	1.09
CARBON MONOXIDE	0.11	0.13	0.13	0.05	0.05	0.02	0.03
HYDROGEN CHLORIDE	0.05	0.05	0.05	0.05	0.05	0.05	0.05
TOTAL OTHER GASES	3.31	3.49	3.35	3.35	3.46	3.32	3.49
WATER	7.72	8.25	7.93	8.43	8.46	8.07	8.21
DEBUTANIZER LIQUID	23.24	22.89	22.52	23.05	22.79	21.99	22.23
PROCESS SOLVENT	10.56	8.46	10.84	10.37	9.33	11.25	11.26
TOTAL C5+ DISTILLATE	33.80	31.34	33.37	33.42	32.12	33.25	33.49
VACUUM TOWER BOTTOMS	43.97	45.21	44.22	43.90	45.38	44.68	43.84
CHEMICAL H2 CONSUMPTION BY UNIT GAS BALANCE							
DM3/KG FEED COAL	464	476	466	469	482	469	473
CONVERSIONS, WT% FEED COAL							
HYDROCRACKING	72.2	65.8	66.8	66.8	65.6	65.9	66.4
DESULFURIZATION	61.2	62.6	61.8	61.9	67.9	60.1	60.1
DENITROGENATION	29.9	30.2	29.7	30.4	30.9	29.7	29.7
OXYGEN REMOVAL	64.2	61.7	62.2	62.1	60.2	61.3	62.4

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RUN NUMBER	P99-48-2	P99-48-3	P99-48-4	P99-48-5	P99-48-6	P99-48-7	P99-48-8
GAS RATES, DM3/KG FEED COAL							
DISSOLVER INLET GAS	1459.1	1498.3	1500.9	1467.4	1481.8	1438.7	1470.3
TOTAL QUENCH GAS	374.7	407.3	372.5	401.7	424.1	414.1	419.5
TOTAL DISSOLVER GAS	1833.8	1905.6	1873.4	1869.2	1906.0	1852.7	1889.8
MAKEUP GAS TO DISSOLVER	394.3	406.3	405.3	396.2	405.4	384.8	378.9
MAKEUP GAS TO SEP. SPARGE	59.2	58.4	60.9	59.8	60.7	57.3	55.2
MAKEUP GAS TO INSTRUMENT TAPS	250.9	261.2	253.5	255.2	260.6	257.6	260.0
TOTAL MAKEUP GAS	704.5	725.9	719.7	711.2	726.6	699.7	694.1
DISSOLVER OUTLET GAS	1529.7	1595.1	1566.7	1556.8	1580.8	1539.7	1576.4
GAS LEAVING SCRUBBERS	1913.0	1982.9	1957.8	1951.2	1980.7	1930.6	1966.1
SEPARATOR SPARGE GAS	275.3	273.7	281.5	282.0	285.3	276.1	275.4
PRODUCT GASES	1						
BLEED OFF GAS	251.1	262.5	262.8	249.9	249.2	238.0	229.3
DEBUTANIZER GAS	58.4	58.5	57.9	58.1	59.5	56.6	56.9
AMINE REACTIVATOR GAS	12.8	13.2	12.7	13.0	13.3	13.3	13.5
NAPHTHA REACTIVATOR GAS	71.7	75.3	73.2	71.7	73.2	73.0	75.2
CHROMATOGRAPH BLEED GAS	6.3	5.8	6.3	6.1	6.2	5.9	5.7
ELEMENTAL BALANCES							
WATER IN THE FEED COAL ASSUMED							
LUST FROM FEED TANK, %	100.0	100.0	100.0	100.0	100.0	100.0	100.0
CARBON, O/I	1.01	1.00	1.00	1.00	0.99	1.00	1.00
HYDROGEN, O/I	1.03	1.02	1.03	1.03	0.99	1.01	1.01
NITROGEN, O/I	0.99	1.01	1.01	1.00	1.00	1.01	1.02
SULFUR, O/I	0.87	0.89	0.87	0.88	0.93	0.89	0.92
OXYGEN, O/I	0.98	1.04	1.02	1.05	1.07	1.03	1.03
CHLORINE, O/I	1.00	1.12	1.05	1.03	1.09	1.08	1.07
METALS, O/I	0.96	0.98	0.97	0.97	0.99	0.98	0.97
ASH, O/I	0.96	0.98	0.97	0.97	0.99	0.98	0.97

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THE FOLLOWING DATA WERE BALANCED FOR CARBON, HYDROGEN, SULFUR, NITROGEN, OXYGEN, CHLORINE, AND METALS

RUN NUMBER	P99-48-2	P99-48-3	P99-48-4	P99-48-5	P99-48-6	P99-48-7	P99-48-8
YIELDS, WT% MOISTURE FREE COAL							
HYDROGEN (BY H BALANCE)	-4.23	-4.23	-4.20	-4.20	-3.95	-4.02	-4.06
METHANE	5.52	5.71	5.42	5.40	5.44	5.44	5.54
ETHANE	3.86	4.16	3.97	3.89	3.85	3.79	3.89
PROPANE	3.68	3.94	3.78	3.71	3.63	3.57	3.65
I-BUTANE	0.20	0.18	0.15	0.17	0.13	0.14	0.16
N-BUTANE	1.74	1.84	1.76	1.79	1.76	1.75	1.76
TOTAL C1 TO C4	15.00	15.84	15.08	14.96	14.82	14.68	15.00
AMMONIA (BY N BALANCE)	0.46	0.45	0.45	0.45	0.45	0.44	0.44
HYDROGEN SULFIDE (BY S BAL)	2.19	2.22	2.21	2.20	2.05	2.14	2.14
CARBON DIOXIDE	0.98	1.03	0.98	1.01	1.10	1.05	1.10
CARBON MONOXIDE	0.11	0.13	0.13	0.05	0.05	0.02	0.03
HYDROGEN CHLORIDE (BY CL BAL)	0.05	0.05	0.05	0.05	0.05	0.05	0.05
TOTAL OTHER GASES	3.79	3.88	3.81	3.76	3.70	3.71	3.75
WATER (BY OXYGEN BALANCE)	8.10	7.81	7.68	7.65	7.23	7.53	7.74
DEBUTANIZER LIQUID	23.01	23.00	22.48	23.15	22.99	22.00	22.24
PROCESS SOLVENT	10.45	8.60	10.82	10.42	9.42	11.26	11.27
TOTAL C5+ DISTILLATE	33.46	31.49	33.30	33.57	32.41	33.26	33.50
VTB PYRIDINE SOLUABLES	26.35	27.27	26.19	25.81	27.14	25.75	26.10
INSOLUABLE ORGANIC MATTER	5.22	5.95	5.84	6.17	6.36	6.79	5.67
ASH	12.29	12.29	12.29	12.29	12.29	12.29	12.29
VACUUM TOWER BOTTOMS	43.87	45.81	44.33	44.27	45.80	44.84	44.06
CHEMICAL H2 CONSUMPTION, DM3/KG MOISTURE FREE COAL							
BY HYDROGEN BALANCE	496	496	492	493	464	472	476
CONVERSIONS, WT% MF COAL							
HYDROCRACKING	72.5	65.6	66.9	66.7	65.3	65.9	66.4
DESULFURIZATION	61.6	62.4	61.9	61.7	57.6	60.0	60.1
DENITROGENATION	30.6	29.9	29.9	30.1	30.2	29.7	29.7
OXYGEN REMOVAL	54.4	51.1	51.9	51.6	49.4	51.0	52.4

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RUN NUMBER		P99-48-2	P99-48-3	P99-48-4	P99-48-5	P99-48-6	P99-48-7	P99-48-8
GAS COMPOSITIONS, VOL%								
REACTOR INLET GAS								
HYDROGEN		85.04	85.17	85.77	85.91	86.20	85.39	84.89
METHANE		12.54	12.35	11.85	12.08	11.96	12.51	12.98
ETHANE		1.92	2.02	1.94	1.85	1.74	1.82	1.88
PROPANE		0.25	0.27	0.30	0.10	0.08	0.15	0.10
I-BUTANE		0.00	0.00	0.00	0.00	0.00	0.00	0.00
N-BUTANE		0.00	0.00	0.00	0.00	0.00	0.00	0.00
PENTANES		0.00	0.00	0.00	0.00	0.00	0.00	0.00
HYDROGEN SULFIDE		0.00	0.00	0.00	0.00	0.00	0.00	0.00
CARBON MONOXIDE		0.24	0.19	0.14	0.06	0.02	0.14	0.15
CARBON DIOXIDE		0.00	0.00	0.00	0.00	0.00	0.00	0.00
REACTOR OUTLET GAS (BUTANES AND LIGHTER ONLY)								
HYDROGEN		66.87	66.98	67.97	67.83	68.29	67.28	66.83
METHANE		19.09	18.69	18.03	18.24	18.13	18.91	19.36
ETHANE		4.05	4.18	4.07	3.92	3.75	3.87	3.94
PROPANE		1.52	1.56	1.57	1.32	1.26	1.35	1.30
I-BUTANE		0.08	0.08	0.08	0.08	0.07	0.08	0.07
N-BUTANE		0.44	0.44	0.43	0.44	0.42	0.44	0.43
HYDROGEN SULFIDE		0.73	0.74	0.72	0.74	0.74	0.73	0.76
CARBON MONOXIDE		0.33	0.28	0.22	0.09	0.05	0.17	0.18
CARBON DIOXIDE		0.33	0.32	0.32	0.32	0.34	0.34	0.35
AMMONIA		0.37	0.38	0.38	0.37	0.38	0.39	0.38
WATER		6.20	6.34	6.21	6.61	6.54	6.42	6.38
HYDROGEN CHLORIDE		0.02	0.02	0.02	0.02	0.02	0.02	0.02
BLEED OFF GAS								
HYDROGEN		77.79	77.99	79.12	78.91	79.44	78.55	77.91
METHANE		18.52	18.08	17.18	17.76	17.47	18.33	18.84
ETHANE		2.83	2.96	2.79	2.74	2.55	2.64	2.74
PROPANE		0.51	0.55	0.50	0.44	0.37	0.41	0.43
I-BUTANE		0.00	0.00	0.00	0.00	0.00	0.00	0.00
N-BUTANE		0.00	0.00	0.00	0.00	0.00	0.00	0.00
PENTANES		0.00	0.00	0.00	0.00	0.00	0.00	0.00
HYDROGEN SULFIDE		0.00	0.00	0.00	0.00	0.00	0.00	0.00
CARBON MONOXIDE		0.36	0.42	0.41	0.16	0.18	0.07	0.08
CARBON DIOXIDE		0.00	0.00	0.00	0.00	0.00	0.00	0.00

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RUN NUMBER P99-48-2 P99-48-3 P99-48-4 P99-48-5 P99-48-6 P99-48-7 P99-48-8

GAS COMPOSITIONS, VOL%

AMINE REACTIVATOR GAS

HYDROGEN	12.14	12.15	12.15	12.13	12.45	11.72	11.39
METHANE	2.32	2.45	2.45	2.57	2.54	2.75	2.75
ETHANE	0.43	0.45	0.45	0.47	0.45	0.48	0.47
PROPANE	0.00	0.00	0.00	0.01	0.01	0.00	0.00
I-BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
N-BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PENTANES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HYDROGEN SULFIDE	53.63	53.60	53.60	53.59	53.02	53.66	53.98
CARBON MONOXIDE	0.00	0.01	0.01	0.01	0.02	0.06	0.03
CARBON DIOXIDE	31.48	31.34	31.34	31.22	31.52	31.30	31.38

NAPHTHA REACTIVATOR GAS

HYDROGEN	17.92	17.65	17.65	17.37	18.36	17.51	17.02
METHANE	30.65	30.80	30.80	30.88	31.32	31.91	32.51
ETHANE	23.61	23.70	23.70	23.85	23.59	23.56	23.54
PROPANE	18.77	18.85	18.85	18.91	18.24	18.25	18.10
I-BUTANE	1.13	1.13	1.13	1.13	1.07	1.10	1.10
N-BUTANE	6.25	6.23	6.23	6.21	5.80	6.01	6.01
PENTANES	1.51	1.50	1.50	1.50	1.48	1.52	1.55
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CARBON MONOXIDE	0.02	0.01	0.01	0.01	0.00	0.01	0.01
CARBON DIOXIDE	0.13	0.13	0.13	0.14	0.14	0.13	0.15

DEBUTANIZER GAS

HYDROGEN	43.79	42.80	45.22	44.35	44.65	42.89	41.51
METHANE	22.55	21.96	20.86	21.29	21.64	23.06	23.95
ETHANE	11.85	12.51	12.09	11.89	11.63	11.99	12.32
PROPANE	9.50	10.00	9.78	9.54	9.34	9.45	9.55
I-BUTANE	0.74	0.79	0.75	0.80	0.78	0.78	0.76
N-BUTANE	4.69	4.88	4.70	4.97	4.94	4.99	4.83
PENTANES	1.83	1.97	1.72	1.91	1.87	1.90	1.89
HYDROGEN SULFIDE	4.61	4.80	4.52	4.77	4.62	4.64	4.67
CARBON MONOXIDE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CARBON DIOXIDE	0.43	0.30	0.37	0.38	0.53	0.30	0.51

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COAL INSPECTIONS

RUN NUMBER	P99-48-2	P99-48-3	P99-48-4	P99-48-5	P99-48-6	P99-48-7	P99-48-8
FEED COAL							
ELEMENTAL ANALYSIS (MOISTURE FREE, NORMALIZED TO 100%)							
CARBON, SEMI-MICRO, WTX	69.03	69.03	69.03	69.03	69.03	69.03	69.03
HYDROGEN, SEMI-MICRO, WTX	4.96	4.96	4.96	4.96	4.96	4.96	4.96
NITROGEN, GULI, WTX	1.23	1.23	1.23	1.23	1.23	1.23	1.23
SULFUR, TOTAL, GRM1159, WTX	3.35	3.35	3.35	3.35	3.35	3.35	3.35
SULFUR, ORGANIC, WTX	2.07	2.07	2.07	2.07	2.07	2.07	2.07
SULFUR, PYRITIC, WTX	1.08	1.08	1.08	1.08	1.08	1.08	1.08
SULFUR, SULFATE, WTX	0.20	0.20	0.20	0.20	0.20	0.20	0.20
OXYGEN, GRM1117, WTX	14.65	14.65	14.65	14.65	14.65	14.65	14.65
OXYGEN, ORGANIC, WTX	8.79	8.79	8.79	8.79	8.79	8.79	8.79
OXYGEN, INORGANIC, WTX	5.87	5.87	5.87	5.87	5.87	5.87	5.87
CHLORINE, GRM1117, WTX	0.05	0.05	0.05	0.05	0.05	0.05	0.05
METALS, BY SPEC ASH, WTX	6.72	6.72	6.72	6.72	6.72	6.72	6.72
MINERAL MATTER, WTX*	13.87	13.87	13.87	13.87	13.87	13.87	13.87
MOISTURE, D271, WTX	1.72	1.72	1.72	1.72	1.72	1.72	1.72
VOLATILE MATTER, WTX	34.50	34.50	34.50	34.50	34.50	34.50	34.50
ASH, D271, WTX	12.29	12.29	12.29	12.29	12.29	12.29	12.29
SULFUR, WTX OF ASH	0.50	0.50	0.50	0.50	0.50	0.50	0.50
OXYGEN, WTX OF ASH	44.80	44.80	44.80	44.80	44.80	44.80	44.80
ALUMINUM, WTX OF ASH	12.0	12.0	12.0	12.0	12.0	12.0	12.0
CALCIUM, WTX OF ASH	1.5	1.5	1.5	1.5	1.5	1.5	1.5
IRON, WTX OF ASH	16.6	16.6	16.6	16.6	16.6	16.6	16.6
MAGNESIUM, WTX OF ASH	.4	.4	.4	.4	.4	.4	.4
POTASSIUM, WTX OF ASH	1.5	1.5	1.5	1.5	1.5	1.5	1.5
SILICON, WTX OF ASH	20.4	20.4	20.4	20.4	20.4	20.4	20.4
SODIUM, WTX OF ASH	.2	.2	.2	.2	.2	.2	.2
TITANIUM, WTX OF ASH	.6	.6	.6	.6	.6	.6	.6
TRACE METALS, WTX OF ASH	.1	.1	.1	.1	.1	.1	.1
PARTICLE SIZE DISTRIBUTION, WTX							
ON 80 MESH							
THRU 80 ON 200 MESH	8.8	8.8	8.8	8.8	8.8	8.8	8.8
THRU 200 ON 325 MESH	28.5	28.5	28.5	28.5	28.5	28.5	28.5
THRU 325 ON 625 MESH	34.7	34.7	34.7	34.7	34.7	34.7	34.7
THRU 625 MESH	28.0	28.0	28.0	28.0	28.0	28.0	28.0

* BY PARR'S EQUATION: MINERAL MATTER = 1.08 X ASH + 0.55 X PYRITIC SULFUR

PRODUCT INSPECTIONS

RUN NUMBER	P99-48-2	P99-48-3	P99-48-4	P99-48-5	P99-48-6	P99-48-7	P99-48-8
DEBUTANIZER BOTTOMS							
GRAVITY, D287, API	25.6	26.0	26.5	26.4	27.1	26.7	26.5
ELEMENTAL ANALYSIS (NORMALIZED TO 100%)							
CARBON, SEMI-MICRO, WT%	84.92	84.80	84.75	84.78	84.86	84.81	84.79
HYDROGEN, SEMI-MICRO, WT%	10.48	10.52	10.59	10.60	10.54	10.49	10.47
NITROGEN, GB11, WT%	0.68	0.74	0.75	0.74	0.71	0.73	0.75
SULFUR, GRM1156, WT%	0.11	0.15*	0.11	0.10	0.10	0.14	0.18
OXYGEN, GRM1117, WT%	3.81	3.79	3.81*	3.78*	3.80*	3.83*	3.80*
VISCOSITY, KIN, D445, CS							
-35C							14.70
OC							3.54
WATER, G525, PPM	7313	7342	7997	7457	7215	7534	7735
HEAT OF CUMB., D240, BTU/LB							17788
POUR POINT, D97, C							-54
DISTILLATION, D86, C							
INITIAL BOILING POINT	57	61	72	EB	60	57	58
5 VOL %	73	75	75	74	74	71	73
10 VOL %	95	101	97	100	99	98	97
30 VOL %	169	171	167	167	164	162	166
50 VOL %	197	197	194	196	195	194	196
70 VOL %	214	214	214	214	214	215	214
90 VOL %	238	241	238	243	241	242	243
95 VOL %	252	259	252	257	257	254	259
END POINT	272	272	272	276	279	277	274
WATER (INCLUDES FLUSH WATER)							
TOTAL CARBON, PPM	13000	12400	12800	12600	13000*	13000*	13000*
ORGANIC CARBON, PPM	10500	9900	10300	9950	10000*	10000*	10000*
NITROGEN, GB11, WT%	1.82	1.73	1.83	1.84	1.79	1.80	1.82
SULFUR, GRM1156, WT%	1.70*	1.70*	1.70*	1.84	1.73	1.47	1.86
CHLORINE, APHA, PPM	2500*	2500*	2500*	2500*	2500*	2500*	2500*

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

PRODUCT INSPECTIONS

RUN NUMBER	P99-48-2	P99-48-3	P99-48-4	P99-48-5	P99-48-6	P99-48-7	P99-48-8
PROCESS SOLVENT							
GRAVITY, D287, API	7.3	7.2	7.1	7.1	7.0	7.1	6.8
ELEMENTAL ANALYSIS (NORMALIZED TO 100X)							
CARBON, SEMI-MICRO, WT%	88.54	88.46	88.22	88.37	88.43	88.30	88.35
HYDROGEN, SEMI-MICRO, WT%	8.34	8.39*	8.54	8.42	8.34	8.33	8.31
NITROGEN, GRM11, WT%	0.98	0.99	0.99*	1.00	0.99	0.98	1.02
SULFUR, GRM1156, WT%	0.26	0.26	0.26	0.21	0.24	0.21	0.33
OXYGEN, GRM1117, WT%	1.88	1.90	1.99*	2.00*	2.00*	2.18	1.99*
VISCOSITY, KIN. D445, CS							
25 C							23.95
50 C							7.81
100 C							2.25
WATER, G525, PPM	257	268	334	201	240	398	270
HEAT OF CUMD., D240, BTU/LB							17432
POUR POINT, D97, C							-15
DISTILLATION, CUSHMAN, C							
CORRECTED TO 760 MM HG USING K10 FACTOR							
INITIAL BOILING POINT	226	209	243	233	234	236	235
10 VOL %	262	254	272	262	274	266	273
20 VOL %	276	271	283	279	280	286	285
30 VOL %	290	288	298	291	296	293	294
40 VOL %	302	298	309	306	307	304	313
50 VOL %	316	317	326	324	324	320	320
60 VOL %	327	329	337	336	335	343	332
70 VOL %	341	351	354	362	347	351	354
80 VOL %	356	376	377	382	361	373	374
90 VOL %	382	421	409	433	392	407	421
END POINT	444	444	468	482	467	464	467

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

PRODUCT INSPECTIONS

RUN NUMBER	P99-48-2	P99-48-3	P99-48-4	P99-48-5	P99-48-6	P99-48-7	P99-48-8
VACUUM TOWER BOTTOMS							
SPECIFIC GRAVITY, D70, G/CC	1.43	1.49	1.44	1.50	1.41	1.44	1.42
ELEMENTAL ANALYSIS (NORMALIZED TO 100%)							
CARBON, SEMI-MICRO, WTX	64.87*	64.66	64.40	64.17	64.24	64.37	64.50
HYDROGEN, SEMI-MICRO, WTX	3.81*	3.83	3.82	3.80	3.62	3.74	3.61
NITROGEN, G811, WTX	1.33	1.30	1.28*	1.28	1.26	1.27	1.28
SULFUR, TOTAL, D1552, WTX	2.81*	2.61	2.73	2.77	2.96	2.83	2.83
SULFUR, SULFIDE, WTX							1.88
SULFUR, PYRITIC, WTX							0.34
OXYGEN, GRM1117, WTX	12.63	13.15*	13.15*	13.30*	13.46	13.24	13.10*
CHLORINE, D2361, WTX	0.01*	0.01*	0.01*	0.01*	0.01*	0.01*	0.01*
METALS, WTX	14.53	14.44	14.61	14.66	14.45	14.54	14.66
ASH, G599, WTX	26.57*	26.41	26.71	26.80	26.42	26.58	26.80
SULFUR, WTX OF ASH	0.50*	0.50*	0.50*	0.50*	0.50*	0.50*	0.50*
OXYGEN, WTX OF ASH	44.80*	44.80*	44.80*	44.80*	44.80*	44.80*	44.80*
METALS, WTX OF ASH (BY DIFF)	54.70	54.70	54.70	54.70	54.70	54.70	54.70
PYRIDINE INSOLUABLES, WTX	39.1	39.5	40.1	41.0	40.1	41.8	40.0
MELTING POINT, G898, C	132	140	135	135	135	140	150
HEAT OF COMB., D240, BTU/LB							11617
CONCARBON RSD, D189, WTX							79.2
DISTILLATION, CUSHMAN, C							
CONVERTED TO 760 MM HG USING K10 FACTOR							
INITIAL BOILING POINT	385	398	413	405	406	407	441
INTERMEDIATE BOILING POINT							
END POINT	514	473	482	462	468	479	478
OVER AT INTERMED BP, WTX							
RESIDUE, WTX	81.5	92.0	91.6	92.3	91.9	92.5	93.1

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

IN THE FOLLOWING DATA, DISTILLATE YIELDS HAVE BEEN ADJUSTED TO THE BOILING RANGES INDICATED

RUN NUMBER	P99-48-2	P99-48-3	P99-48-4	P99-48-5	P99-48-6	P99-48-7	P99-48-8
YIELDS, WT% MOISTURE FREE COAL							
HYDROGEN (BY H BALANCE)	-4.23	-4.23	-4.20	-4.20	-3.95	-4.02	-4.06
METHANE	5.52	5.71	5.42	5.40	5.44	5.44	5.54
ETHANE	3.86	4.16	3.97	3.89	3.85	3.79	3.89
PROPANE	3.68	3.94	3.78	3.71	3.63	3.57	3.65
I-BUTANE	0.20	0.18	0.15	0.17	0.13	0.14	0.16
N-BUTANE	1.74	1.84	1.76	1.79	1.76	1.75	1.76
TOTAL C1 TO C4	15.00	15.84	15.08	14.96	14.82	14.68	15.00
AMMONIA (BY N BALANCE)	0.46	0.45	0.45	0.45	0.45	0.44	0.44
HYDROGEN SULFIDE (BY S BAL)	2.19	2.22	2.21	2.20	2.05	2.14	2.14
CARBON DIOXIDE	0.98	1.03	0.98	1.01	1.10	1.05	1.10
CARBON MONOXIDE	0.11	0.13	0.13	0.05	0.05	0.02	0.03
HYDROGEN CHLORIDE (BY CL BAL)	0.05	0.05	0.05	0.05	0.05	0.05	0.05
TOTAL OTHER GASES	3.79	3.88	3.81	3.76	3.70	3.71	3.75
WATER (BY OXYGEN BALANCE)	8.10	7.51	7.68	7.65	7.23	7.53	7.74
C5 - 193 C (C5 - 380 F)	8.97	8.74	9.44	9.03	9.20	9.02	8.87
193 - 288 C (380 - 550 F)	16.21	16.36	14.96	16.02	14.75	14.88	15.03
288 - 482 C (550 - 900 F)	12.67	10.45	12.53	12.99	12.91	12.81	12.95
TOTAL C5+ DISTILLATE*	37.85	35.54	36.93	38.04	36.85	36.71	36.85
482 C+ (900 F+) PYRIDINE SOL.	21.97	23.22	22.56	21.34	22.70	22.30	22.75
INSOLUABLE ORGANIC MATTER	5.22	5.95	5.84	6.17	6.36	6.79	5.67
ASH	12.29	12.29	12.29	12.29	12.29	12.29	12.29
TOTAL 482 C+ (900 F+) PROD	39.48	41.46	40.69	39.80	41.36	41.38	40.71

* THE QUANTITY OF DISTILLATE SHOWN MAY NOT BE RECOVERABLE COMMERCIALY, IF THE TOTAL 482 C+ (900 F+) PRODUCT IS NOT FLUID ENOUGH TO BE EASILY REMOVED FROM THE VACUUM COLUMN

IN THE FOLLOWING DATA, DISTILLATE YIELDS HAVE BEEN ADJUSTED TO THE BOILING RANGES INDICATED

RUN NUMBER	P99-48-2	P99-48-3	P99-48-4	P99-48-5	P99-48-6	P99-48-7	P99-48-8
YIELDS, WT% MOISTURE AND ASH FREE COAL							
HYDROGEN (BY H BALANCE)	-4.82	-4.83	-4.78	-4.79	-4.51	-4.59	-4.62
METHANE	6.29	6.51	6.17	6.15	6.21	6.20	6.31
ETHANE	4.40	4.74	4.52	4.44	4.39	4.32	4.44
PROPANE	4.20	4.50	4.31	4.23	4.14	4.07	4.16
I-BUTANE	0.23	0.21	0.18	0.20	0.15	0.16	0.18
N-BUTANE	1.98	2.10	2.01	2.04	2.00	1.99	2.01
TOTAL C1 TO C4	17.10	18.06	17.19	17.06	16.89	16.74	17.11
AMMONIA (BY N BALANCE)	0.52	0.51	0.51	0.51	0.52	0.51	0.51
HYDROGEN SULFIDE (BY S BAL)	2.50	2.54	2.51	2.51	2.34	2.44	2.44
CARBON DIOXIDE	1.12	1.17	1.12	1.15	1.25	1.20	1.25
CARBON MONOXIDE	0.12	0.15	0.15	0.06	0.06	0.03	0.03
HYDROGEN CHLORIDE (BY CL BAL)	0.05	0.05	0.05	0.05	0.05	0.05	0.05
TOTAL OTHER GASES	4.32	4.42	4.35	4.28	4.22	4.23	4.28
WATER (BY OXYGEN BALANCE)	9.24	8.56	8.76	8.72	8.24	8.59	8.82
C5 - 193 C (C5 - 380 F)	10.23	9.96	10.76	10.29	10.49	10.29	10.12
193 - 288 C (380 - 550 F)	18.48	18.65	17.06	18.26	16.81	16.97	17.14
288 - 482 C (550 - 900 F)	14.44	11.91	14.29	14.81	14.72	14.60	14.76
TOTAL C5+ DISTILLATE*	43.16	40.53	42.11	43.37	42.02	41.86	42.02
482 C+ (900 F+) PYRIDINE SOL.	25.05	26.47	25.72	24.33	25.88	25.42	25.94
INSOLUBLE ORGANIC MATTER	5.96	6.79	6.66	7.03	7.25	7.75	6.46
TOTAL 482 C+ ORGANIC PROD	31.00	33.26	32.38	31.36	33.14	33.17	32.40

* THE QUANTITY OF DISTILLATE SHOWN MAY NOT BE RECOVERABLE COMMERCIALY, IF THE TOTAL 482 C+ (900 F+) PRODUCT IS NOT FLUID ENOUGH TO BE EASILY REMOVED FROM THE VACUUM COLUMN

SRC-II RUN DATA, MATERIAL BALANCES, AND PRODUCT PROPERTIES

RUN NUMBER	P99-49-3	P99-49-4	P99-49-5	P99-49-6	P99-49-7	P99-49-8
DATE (START OF PERIOD)	3-22-79	3-23-79	3-24-79	3-25-79	3-26-79	3-27-79
TIME & DATE CODE (START & END OF PERIOD)	0815 0819 0415 0829	0815 0829 0415 0839	0815 0839 0415 0849	0815 0849 0415 8598	0815 0859 0415 0869	0815 0869 0415 0879
RUN HOURS INCLUDED IN PERIOD	234-253	258-277	282-301	306-325	330-349	354-373
COAL CHARGE	POWHATAN LR-25844	POWHATAN LR-25844	POWHATAN LR-25844	POWHATAN LR-25844	POWHATAN LR-25844	POWHATAN LR-25844
OPERATING CONDITIONS						
RECYCLE SLURRY/MF COAL RATIO	2.39	2.41	2.40	2.39	2.40	2.39
OIL TO SOLIDS RATIO	1.28	1.27	1.26	1.27	1.27	1.28
SLURRY COMPOSITION, WT%						
COAL (MOISTURE FREE)	29.5	29.4	29.4	29.5	29.4	29.5
DISTILLATE	34.7	32.8	33.6	34.2	33.3	33.0
482 C+ (900 F+) PYRIDINE SOL.	21.5	23.0	22.2	21.7	22.6	23.1
PYRIDINE INSOLUABLES	14.4	14.8	14.8	14.6	14.6	14.4
TOTAL RX PRESSURE, MPA	13.79	13.78	13.78	13.80	13.80	13.79
PRESS X XH2 IN INLET GAS, MPA	12.36	12.33	12.43	12.42	12.49	12.29
OUTLET H2 PARTIAL PRESS, MPA	8.86	8.86	8.86	8.86	8.86	8.86
DISSOLVER TEMPERATURES, C						
ZONE 4 (TOP)	460	460	460	460	459	459
ZONE 3	459	458	458	458	458	458
ZONE 2	457	456	456	456	456	456
ZONE 1 (BTM)	455	454	453	454	454	454
AVERAGE	458	457	457	457	457	457
PREHEATER OUTLET	392	391	393	393	393	394
NOMINAL SLURRY RES. TIME, HR	1.00	0.99	1.00	1.00	1.00	1.00
WHSV, KG/HR/DM3						
SLURRY	1.20	1.21	1.21	1.20	1.21	1.20
COAL (MOISTURE FREE)	0.35	0.35	0.35	0.35	0.35	0.35
DISSOLVER GAS						
DM3/KG SLURRY	450	461	462	462	463	463
DM3/KG MF FEED COAL	1529	1571	1572	1567	1575	1570
HYDROGEN CONTENT, VOL%	89.6	89.5	90.2	90.0	90.5	89.1
FLUSH H2O, % OF PRODUCT H2O	103.1	106.4	108.3	102.0	111.1	103.6

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THE FOLLOWING WEIGHT BALANCE AND HYDROGEN CONSUMPTION DATA WERE CALCULATED FROM MEASURED UNIT DATA

RUN NUMBER	P99-49-3	P99-49-4	P99-49-5	P99-49-6	P99-49-7	P99-49-8
WATER IN THE FEED COAL ASSUMED						
LOST FROM FEED TANK, %	100.0	100.0	100.0	100.0	100.0	100.0
WEIGHT BALANCE, O/I, WTX	97.1	97.7	97.2	99.3	99.3	100.1

THE FOLLOWING DATA THROUGH AND INCLUDING ELEMENTAL BALANCES HAVE BEEN CORRECTED TO A 100% WT BALANCE

YIELDS, WTX FEED COAL

HYDROGEN	-4.32	-4.27	-4.10	-3.96	-3.90	-3.93
METHANE	5.98	5.92	5.72	5.73	5.83	5.74
ETHANE	4.75	4.67	4.42	4.42	4.44	4.38
PROPANE	4.72	4.73	4.41	4.39	4.29	4.31
I-BUTANE	0.27	0.28	0.24	0.25	0.20	0.23
N-BUTANE	2.19	2.24	2.04	1.98	1.94	1.95
TOTAL C1 TO C4	17.92	17.84	16.84	16.76	16.70	16.61
AMMONIA	0.42	0.43	0.41	0.38	0.37	0.38
HYDROGEN SULFIDE	2.16	2.28	2.22	2.22	2.21	2.19
CARBON DIOXIDE	1.09	0.90	0.96	1.03	1.08	1.06
CARBON MONOXIDE	0.11	0.10	0.10	0.10	0.09	0.11
HYDROGEN CHLORIDE	0.05	0.05	0.05	0.05	0.05	0.05
TOTAL OTHER GASES	3.84	3.76	3.73	3.78	3.79	3.78
WATER	7.72	7.74	7.87	7.46	7.49	7.72
DEBUTANIZER LIQUID	22.26	21.50	21.06	20.81	21.02	20.22
PROCESS SOLVENT	6.41	5.11	5.32	8.52	4.00	7.44
TOTAL C5+ DISTILLATE	28.67	26.60	26.37	29.33	25.02	27.66
VACUUM TOWER BOTTOMS	46.17	48.33	49.28	46.63	50.89	48.16
CHEMICAL H2 CONSUMPTION BY UNIT GAS BALANCE						
DM3/KG FEED COAL	507	501	481	464	458	461
CONVERSIONS, WTX FEED COAL						
HYDROCRACKING	66.4	62.0	61.9	66.4	58.7	63.0
DESULFURIZATION	61.0	62.3	61.1	62.4	60.2	59.9
DENITROGENATION	31.0	29.4	28.0	28.4	25.2	28.4
OXYGEN REMOVAL	54.8	53.4	52.8	54.3	51.2	53.5

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RUN NUMBER	P99-49-3	P99-49-4	P99-49-5	P99-49-6	P99-49-7	P99-49-8
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GAS RATES, DM3/KG FEED COAL

DISSOLVER INLET GAS	948.2	1014.5	1022.6	989.6	965.0	920.6
TOTAL QUENCH GAS	626.4	593.4	594.9	588.2	620.8	648.1
TOTAL DISSOLVER GAS	1574.6	1607.9	1617.5	1577.8	1585.9	1568.7
MAKEUP GAS TO DISSOLVER	475.9	490.2	442.9	413.2	409.8	399.3
MAKEUP GAS TO SEP. SPARGE	88.3	95.0	94.4	87.3	81.2	67.5
MAKEUP GAS TO INSTRUMENT TAPS	266.6	264.9	266.3	260.7	260.8	258.7
TOTAL MAKEUP GAS	830.8	850.2	803.6	761.2	751.7	725.5
DISSOLVER OUTLET GAS	1251.7	1289.5	1311.6	1288.5	1304.4	1282.6
GAS LEAVING SCRUBBERS	1639.9	1704.6	1764.5	1722.1	1717.5	1645.1
SEPARATOR SPARGE GAS	292.2	311.6	344.6	333.6	314.3	265.2
PRODUCT GASES						
BLEED OFF GAS	310.6	343.3	312.1	284.0	288.8	271.6
DEBUTANIZER GAS	47.2	44.8	45.8	47.2	47.4	47.2
AMINE REACTIVATOR GAS	17.5	17.3	17.6	18.2	18.2	17.9
NAPTHA REACTIVATOR GAS	106.0	99.3	94.6	95.3	96.4	96.3
CHROMATOGRAPH BLEED GAS	26.7	27.1	27.6	27.2	19.5	6.4

ELEMENTAL BALANCES

WATER IN THE FEED COAL ASSUMED LOST FROM FEED TANK, %	100.0	100.0	100.0	100.0	100.0	100.0
CARBON, O/I	1.01	1.00	0.99	1.01	1.00	1.00
HYDROGEN, O/I	1.01	1.01	1.01	1.03	1.01	1.03
NITROGEN, O/I	0.97	0.99	0.99	0.97	1.00	0.97
SULFUR, O/I	1.00	1.02	1.01	1.00	1.02	1.01
OXYGEN, O/I	0.98	0.99	1.00	0.97	1.00	0.99
CHLORINE, O/I	1.01	1.04	1.04	1.01	1.02	1.02
METALS, O/I	0.97	1.03	1.03	0.96	1.02	0.95
ASH, O/I	0.97	1.03	1.03	0.96	1.02	0.95

THE FOLLOWING DATA WERE BALANCED FOR CARBON, HYDROGEN, SULFUR, NITROGEN, OXYGEN, CHLORINE, AND METALS

RUN NUMBER P99-49-3 P99-49-4 P99-49-5 P99-49-6 P99-49-7 P99-49-8

YIELDS, WTX MOISTURE FREE COAL

HYDROGEN (BY H BALANCE)	-4.41	-4.39	-4.24	-4.29	-3.99	-4.21
METHANE	5.95	5.94	5.75	5.68	5.86	5.73
ETHANE	4.73	4.68	4.45	4.38	4.46	4.37
PROPANE	4.69	4.74	4.44	4.35	4.30	4.30
I-BUTANE	0.27	0.28	0.24	0.25	0.21	0.23
N-BUTANE	2.18	2.24	2.06	1.97	1.95	1.95
TOTAL C1 TO C4	17.82	17.88	16.94	16.63	16.77	16.58
AMMONIA (BY N BALANCE)	0.47	0.44	0.41	0.43	0.37	0.43
HYDROGEN SULFIDE (BY S BAL)	2.18	2.22	2.17	2.24	2.14	2.14
CARBON DIOXIDE	1.09	0.90	0.97	1.02	1.08	1.06
CARBON MONOXIDE	0.11	0.10	0.10	0.10	0.09	0.11
HYDROGEN CHLORIDE (BY CL BAL)	0.05	0.04	0.04	0.05	0.04	0.04
TOTAL OTHER GASES	3.90	3.70	3.69	3.83	3.73	3.78
WATER (BY OXYGEN BALANCE)	8.05	7.93	7.74	8.06	7.41	7.85
DEBUTANIZER LIQUID	22.13	21.54	21.19	20.64	21.11	20.18
PROCESS SOLVENT	6.38	5.12	5.35	8.45	4.02	7.42
TOTAL C5+ DISTILLATE	28.51	26.66	26.53	29.08	25.13	27.61
VTD PYRIDINE SOLUABLES	28.21	28.77	30.51	28.63	31.66	29.65
INSOLUBLE ORGANIC MATTER	5.64	7.16	6.52	5.67	7.00	6.45
ASH	12.29	12.29	12.29	12.29	12.29	12.29
VACUUM TOWER BOTTOMS	46.14	48.22	49.33	46.59	50.95	48.40

CHEMICAL H2 CONSUMPTION, DM3/KG MOISTURE FREE COAL

BY HYDROGEN BALANCE 518 514 497 492 468 494

CONVERSIONS, WTX MF COAL

HYDROCRACKING	66.6	62.0	61.6	66.7	58.5	63.1
DESULFURIZATION	41.2	62.2	60.9	62.7	60.1	59.9
DENITROGENATION	31.4	29.2	27.5	29.0	24.9	28.5
OXYGEN REMOVAL	54.6	52.9	52.1	54.3	50.6	53.3

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RUN NUMBER		P99-49-3	P99-49-4	P99-49-5	P99-49-6	P99-49-7	P99-49-8
GAS COMPOSITIONS, VOL%							
REACTOR INLET GAS							
HYDROGEN		89.59	89.50	90.22	90.01	90.52	89.08
METHANE		9.03	9.07	8.53	8.75	8.42	9.60
ETHANE		1.27	1.41	1.23	1.16	1.04	1.24
PROPANE		0.00	0.01	0.00	0.00	0.00	0.01
I-BUTANE		0.00	0.00	0.00	0.00	0.00	0.00
N-BUTANE		0.00	0.00	0.01	0.02	0.02	0.00
PENTANES		0.00	0.00	0.00	0.00	0.00	0.00
HYDROGEN SULFIDE		0.00	0.00	0.00	0.00	0.00	0.00
CARBON MONOXIDE		0.10	0.01	0.01	0.06	0.00	0.07
CARBON DIOXIDE		0.00	0.00	0.00	0.00	0.00	0.00
REACTOR OUTLET GAS (BUTANES AND LIGHTER ONLY)							
HYDROGEN		66.47	67.12	68.83	68.65	69.39	67.40
METHANE		16.97	16.72	15.67	16.02	15.64	16.97
ETHANE		4.25	4.27	3.87	3.84	3.68	3.91
PROPANE		1.89	1.84	1.69	1.71	1.67	1.70
I-BUTANE		0.11	0.10	0.10	0.10	0.10	0.10
N-BUTANE		0.66	0.66	0.61	0.60	0.59	0.58
HYDROGEN SULFIDE		1.10	1.14	1.08	1.11	1.09	1.09
CARBON MONOXIDE		0.19	0.08	0.08	0.12	0.05	0.14
CARBON DIOXIDE		0.43	0.35	0.36	0.40	0.41	0.41
AMMONIA		0.43	0.43	0.40	0.38	0.37	0.38
WATER		7.47	7.28	7.28	7.04	6.99	7.30
HYDROGEN CHLORIDE		0.02	0.02	0.02	0.02	0.02	0.02
BLEED OFF GAS							
HYDROGEN		81.82	82.39	81.58	80.90	80.76	79.86
METHANE		15.66	14.88	15.74	16.57	16.81	17.49
ETHANE		2.21	2.36	2.33	2.22	2.17	2.30
PROPANE		0.00	0.11	0.06	0.02	0.00	0.01
I-BUTANE		0.00	0.00	0.00	0.00	0.00	0.00
N-BUTANE		0.00	0.02	0.00	0.01	0.00	0.00
PENTANES		0.00	0.00	0.00	0.00	0.00	0.00
HYDROGEN SULFIDE		0.00	0.00	0.00	0.00	0.00	0.00
CARBON MONOXIDE		0.30	0.24	0.27	0.28	0.25	0.33
CARBON DIOXIDE		0.00	0.00	0.00	0.00	0.00	0.00

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RUN NUMBER		P99-49-3	P99-49-4	P99-49-5	P99-49-6	P99-49-7	P99-49-8
GAS COMPOSITIONS, VOL%							
ANINE REACTIVATOR GAS							
	HYDROGEN	14.07	13.03	13.06	13.51	13.16	12.97
	METHANE	1.19	1.26	1.54	1.83	1.67	1.50
	ETHANE	0.24	0.24	0.32	0.34	0.34	0.31
	PROPANE	0.00	0.01	0.00	0.00	0.04	0.05
	I-BUTANE	0.00	0.00	0.00	0.00	0.00	0.00
	N-BUTANE	0.00	0.00	0.00	0.00	0.04	0.02
	PENTANES	0.00	0.00	0.00	0.00	0.01	0.00
	HYDROGEN SULFIDE	61.90	66.27	66.23	62.94	62.46	62.36
	CARBON MONOXIDE	0.02	0.00	0.02	0.02	0.00	0.05
	CARBON DIOXIDE	22.59	19.19	19.84	21.35	22.27	22.74
NAPHTHA REACTIVATOR GAS							
	HYDROGEN	20.62	19.24	19.74	19.14	19.09	18.66
	METHANE	24.88	24.07	24.50	25.79	26.44	26.90
	ETHANE	23.91	23.72	24.06	24.54	24.86	24.47
	PROPANE	20.62	21.83	21.38	20.87	20.29	20.52
	I-BUTANE	1.06	1.14	1.12	1.10	1.07	1.08
	N-BUTANE	6.70	7.27	6.92	6.50	6.24	6.39
	PENTANES	1.84	2.08	1.99	1.94	1.91	1.91
	HYDROGEN SULFIDE	0.31	0.56	0.17	0.31	0.00	0.01
	CARBON MONOXIDE	0.00	0.00	0.00	0.00	0.01	0.00
	CARBON DIOXIDE	0.07	0.10	0.11	0.09	0.07	0.05
DEBUTANIZER GAS							
	HYDROGEN	46.35	46.57	48.91	46.67	46.63	46.61
	METHANE	23.55	22.72	21.75	22.66	22.61	23.25
	ETHANE	10.96	11.06	10.38	10.72	10.41	10.44
	PROPANE	7.92	8.04	7.80	8.26	8.13	7.80
	I-BUTANE	0.68	0.70	0.66	0.12	0.72	0.71
	N-BUTANE	4.00	4.19	3.96	4.03	4.14	3.94
	PENTANES	1.69	1.69	1.46	1.55	1.72	1.75
	HYDROGEN SULFIDE	4.02	4.22	4.16	4.46	4.55	4.46
	CARBON MONOXIDE	0.00	0.00	0.00	0.00	0.00	0.00
	CARBON DIOXIDE	0.82	0.81	0.92	0.93	1.10	1.03

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COAL INSPECTIONS

RUN NUMBER	P99-49-3	P99-49-4	P99-49-5	P99-49-6	P99-49-7	P99-49-8
FEED COAL						
ELEMENTAL ANALYSIS (MOISTURE FREE, NORMALIZED TO 100X)						
CARBON, SEMI-MICRO, WTX	69.03	69.03	69.03	69.03	69.03	69.03
HYDROGEN, SEMI-MICRO, WTX	4.96	4.96	4.96	4.96	4.96	4.96
NITROGEN, GBII, WTX	1.23	1.23	1.23	1.23	1.23	1.23
SULFUR, TOTAL, GRM1159, WTX	3.35	3.35	3.35	3.35	3.35	3.35
SULFUR, ORGANIC, WTX	2.07	2.07	2.07	2.07	2.07	2.07
SULFUR, PYRITIC, WTX	1.08	1.08	1.08	1.08	1.08	1.08
SULFUR, SULFATE, WTX	0.20	0.20	0.20	0.20	0.20	0.20
OXYGEN, GRM1117, WTX	14.65	14.65	14.65	14.65	14.65	14.65
OXYGEN, ORGANIC, WTX	8.79	8.79	8.79	8.79	8.79	8.79
OXYGEN, INORGANIC, WTX	5.87	5.87	5.87	5.87	5.87	5.87
CHLORINE, GRM1117, WTX	0.05	0.05	0.05	0.05	0.05	0.05
METALS, BY SPEC ASH, WTX	6.72	6.72	6.72	6.72	6.72	6.72
MINERAL MATTER, WTX*	13.87	13.87	13.87	13.87	13.87	13.87
MOISTURE, D271, WTX	1.72	1.72	1.72	1.72	1.72	1.72
VOLATILE MATTER, WTX	34.50	34.50	34.50	34.50	34.50	34.50
ASH, D271, WTX	12.29	12.29	12.29	12.29	12.29	12.29
SULFUR, WTX OF ASH	0.50	0.50	0.50	0.50	0.50	0.50
OXYGEN, WTX OF ASH	44.80	44.80	44.80	44.80	44.80	44.80
ALUMINUM, WTX OF ASH	12.0	12.0	12.0	12.0	12.0	12.0
CALCIUM, WTX OF ASH	1.5	1.5	1.5	1.5	1.5	1.5
IRON, WTX OF ASH	16.6	16.6	16.6	16.6	16.6	16.6
MAGNESIUM, WTX OF ASH	.4	.4	.4	.4	.4	.4
POTASSIUM, WTX OF ASH	1.5	1.5	1.5	1.5	1.5	1.5
SILICON, WTX OF ASH	20.4	20.4	20.4	20.4	20.4	20.4
SODIUM, WTX OF ASH	.2	.2	.2	.2	.2	.2
TITANIUM, WTX OF ASH	.6	.6	.6	.6	.6	.6
TRACE METALS, WTX OF ASH	.1	.1	.1	.1	.1	.1
PARTICLE SIZE DISTRIBUTION, WTX						
UN 80 MESH						
THRU 80 ON 200 MESH	8.8	8.8	8.8	8.8	8.8	8.8
THRU 200 ON 325 MESH	28.5	28.5	28.5	28.5	28.5	28.5
THRU 325 ON 625 MESH	34.7	34.7	34.7	34.7	34.7	34.7
THRU 625 MESH	28.0	28.0	28.0	28.0	28.0	28.0

* BY PARR'S EQUATION: MINERAL MATTER = 1.08 X ASH + 0.55 X PYRITIC SULFUR

PRODUCT INSPECTIONS

RUN NUMBER	P99-49-3	P99-49-4	P99-49-5	P99-49-6	P99-49-7	P99-49-8
DEBUTANIZER BOTTOMS						
GRAVITY, D287, API	24.3	23.8	24.5	24.8	25.2	24.9
ELEMENTAL ANALYSIS (NORMALIZED TO 100%)						
CARBON, SEMI-MICRO, WT%	84.53	84.48	84.56	84.48	84.61	84.50
HYDROGEN, SEMI-MICRO, WT%	10.34	10.26	10.37	10.38	10.26	10.44
NITROGEN, GB11, WT%	0.82	0.83	0.79	0.79	0.77	0.77
SULFUR, GRM1156, WT%	0.11	0.15	0.10	0.12	0.16	0.11
OXYGEN, GRM1117, WT%	4.20	4.28	4.17	4.29	4.20	4.18
VISCOSITY, KIN, D445, CS						
-35C						13.69
OC						3.71
WATER, G525, PPM	7821	8104	7387	7731	8256	8351
HEAT OF COMB., D240, BTU/LB						17725
POUR POINT, D97, C						-54
DISTILLATION, D86, C						
INITIAL BOILING POINT	64	63	67	65	65	61
5 VOL %	76	76	77	75	75	77
10 VOL %	102	104	111	103	106	102
30 VOL %	172	170	171	170	169	170
50 VOL %	199	198	197	197	197	197
70 VOL %	217	216	215	215	214	214
90 VOL %	241	239	239	239	238	237
95 VOL %	251	250	251	250	248	246
END POINT	267	264	261	262	262	261
WATER (INCLUDES FLUSH WATER)						
TOTAL CARBON, PPM	19900	18000	16250	16750	16800	16800
ORGANIC CARBON, PPM	15630	14950	12900	13400	13300	13500
NITROGEN, GB11, WT%	1.99	2.03	1.92	1.86	1.81	1.81
SULFUR, GRM1156, WT%	1.50*	1.54	1.44	1.50	1.49	1.50*
CHLORINE, APHA, PPM	2800*	2800*	2800*	2800*	2800*	2800

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

PRODUCT INSPECTIONS

RUN NUMBER	P99-49-3	P99-49-4	P99-49-5	P99-49-6	P99-49-7	P99-49-8
PROCESS SOLVENT						
GRAVITY, D287, API	6.8	6.5	6.4	6.3	6.0	6.2
ELEMENTAL ANALYSIS (NORMALIZED TO 100%)						
CARBON, SEMI-MICRO, WT%	88.16	88.18	88.28	88.33	88.39	88.30
HYDROGEN, SEMI-MICRO, WT%	8.47	8.27	8.30	8.29	8.13	8.26
NITROGEN, GILL, WT%	0.95	1.00*	0.97	0.94	0.96	0.97
SULFUR, GRM1156, WT%	0.22	0.25	0.26	0.24	0.31	0.25
OXYGEN, GRM1117, WT%	2.20	2.30	2.19	2.20	2.21	2.21
VISCOSITY, KIN. D445, CS.						
25 C						20.69
50 C						7.00
100 C						2.12
WATER, G525, PPM	773	588	802	840	551	565
HEAT OF COMB., D240, BTU/LB						17266
POUR POINT, D97, C						-23
DISTILLATION, CUSHMAN, C						
CORRECTED TO 760 MM HG USING K10 FACTOR						
INITIAL BOILING POINT	207	189	191	195	193	218
10 VOL %	255	257	258	246	262	263
20 VOL %	274	280	277	268	274	283
30 VOL %	291	292	292	284	291	301
40 VOL %	302	302	307	297	302	310
50 VOL %	326	322	322	312	319	323
60 VOL %	336	336	331	326	335	339
70 VOL %	351	352	353	343	351	355
80 VOL %	376	376	376	364	379	375
90 VOL %	404	398	410	392	406	408
END POINT	489	503	478	493	496	487

♦ FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

PRODUCT INSPECTIONS

RUN NUMBER	P99-49-3	P99-49-4	P99-49-5	P99-49-6	P99-49-7	P99-49-8
VACUUM TOWER BOTTOMS						
SPECIFIC GRAVITY, D70, G/CC	1.48	1.49	1.48	1.46	1.46	1.47
ELEMENTAL ANALYSIS (NORMALIZED TO 100%)						
CARBON, SEMI-MICRO, WTX	66.21*	66.09*	66.24	66.65	66.95	66.84
HYDROGEN, SEMI-MICRO, WTX	3.75	3.91*	3.97	3.77	3.84	4.00
NITROGEN, G811, WTX	1.29	1.31	1.33	1.35	1.38	1.33
SULFUR, TOTAL, D1552, WTX	2.73	2.50	2.55	2.58	2.50	2.68
SULFUR, SULFIDE, WTX						0.44
SULFUR, PYRITIC, WTX						
OXYGEN, GRM1117, WTX	11.95*	11.93*	11.92*	11.96*	11.98*	11.92*
CHLORINE, D2381, WTX	0.01*	0.01*	0.01*	0.01*	0.01*	0.01
METALS, WTX	14.05	14.24	13.97	13.68	13.33	13.20
ASH, G599, WTX	25.69	26.04	25.53	25.01	24.37	24.14
SULFUR, WTX OF ASH	0.50*	0.50*	0.50*	0.50*	0.50*	0.50*
OXYGEN, WTX OF ASH	44.80*	44.80*	44.80*	44.80*	44.80*	44.80*
METALS, WTX OF ASH (BY DIFF)	54.70	54.70	54.70	54.70	54.70	54.70
PYRIDINE INSOLUABLES, WTX	38.3	40.4	38.2	37.8	37.7	38.0*
MELTING POINT, G898, C	145	135	135	140	145	145
HEAT OF COMB., D240, BTU/LB						12139
CONCARBON RSD, D189, WTX						76.9
DISTILLATION, CUSHMAN, C						
CONVERTED TO 760 MM HG USING K10 FACTOR						
INITIAL BOILING POINT	417	410	406	421	404	423
INTERMEDIATE BOILING POINT						487
END POINT	510	461	464	504	457	506
OVER AT INTERMED BP, WTX						6.0
RESIDUE, WTX	89.0	94.5	92.9	87.7	94.8	90.9

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

IN THE FOLLOWING DATA, DISTILLATE YIELDS HAVE BEEN ADJUSTED TO THE BOILING RANGES INDICATED

RUN NUMBER P99-49-3 P99-49-4 P99-49-5 P99-49-6 P99-49-7 P99-49-8

YIELDS, WT% MOISTURE FREE COAL

HYDROGEN (BY H BALANCE)	-4.41	-4.39	-4.24	-4.20	-3.99	-4.21
METHANE	5.95	5.94	5.78	5.68	5.86	5.73
ETHANE	4.73	4.68	4.45	4.38	4.46	4.37
PROPANE	4.69	4.74	4.44	4.35	4.30	4.30
I-BUTANE	0.27	0.28	0.24	0.25	0.21	0.23
N-BUTANE	2.18	2.24	2.06	1.97	1.95	1.95
TOTAL C1 TO C4	17.82	17.88	16.94	16.63	16.77	16.58
AMMONIA (BY N BALANCE)	0.47	0.44	0.41	0.43	0.37	0.43
HYDROGEN SULFIDE (BY S BAL)	2.18	2.22	2.17	2.24	2.14	2.14
CARBON DIOXIDE	1.09	0.90	0.97	1.02	1.08	1.06
CARBON MONOXIDE	0.11	0.10	0.10	0.10	0.09	0.11
HYDROGEN CHLORIDE (BY CL BAL)	0.05	0.04	0.04	0.05	0.04	0.04
TOTAL OTHER GASES	3.90	3.70	3.69	3.83	3.73	3.78
WATER (BY OXYGEN BALANCE)	8.08	7.93	7.74	8.06	7.41	7.85
C5 - 193 C (C5 - 380 F)	8.17	8.19	8.05	7.84	8.02	7.67
193 - 288 C (380 - 550 F)	15.47	14.54	14.45	15.16	14.06	14.10
288 - 482 C (550 - 900 F)	8.38	7.50	8.62	10.18	6.86	8.94
TOTAL C5+ DISTILLATE*	32.01	30.23	31.12	33.18	28.95	30.71
482 C+ (900 F+) PYRIDINE SOL.	24.70	25.20	25.93	24.53	27.84	26.55
INSOLUBLE ORGANIC MATTER	5.64	7.16	6.52	5.67	7.00	6.45
ASH	12.29	12.29	12.29	12.29	12.29	12.29
TOTAL 482 C+ (900 F+) PROD	42.63	44.65	44.74	42.49	47.13	45.30

* THE QUANTITY OF DISTILLATE SHOWN MAY NOT BE RECOVERABLE COMMERCIALY, IF THE TOTAL 482 C+ (900 F+) PRODUCT IS NOT FLUID ENOUGH TO BE EASILY REMOVED FROM THE VACUUM COLUMN

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IN THE FOLLOWING DATA, DISTILLATE YIELDS HAVE BEEN ADJUSTED TO THE BOILING RANGES INDICATED

RUN NUMBER P99-49-3 P99-49-4 P99-49-5 P99-49-6 P99-49-7 P99-49-8

YIELDS, WTK MOISTURE AND ASH FREE COAL

HYDROGEN (BY H BALANCE)	-5.03	-5.00	-4.83	-4.79	-4.55	-4.80
METHANE	6.78	6.77	6.56	6.48	6.68	6.53
ETHANE	5.39	5.33	5.07	4.99	5.08	4.98
PROPANE	5.35	5.41	5.06	4.96	4.91	4.91
I-BUTANE	0.31	0.32	0.27	0.28	0.23	0.26
N-BUTANE	2.49	2.56	2.34	2.24	2.23	2.22
TOTAL C1 TO C4	20.31	20.38	19.31	18.96	19.12	18.90
AMMONIA (BY N BALANCE)	0.54	0.50	0.47	0.49	0.42	0.49
HYDROGEN SULFIDE (BY S BAL)	2.49	2.53	2.47	2.55	2.44	2.44
CARBON DIOXIDE	1.24	1.03	1.10	1.16	1.24	1.21
CARBON MONOXIDE	0.13	0.11	0.12	0.11	0.10	0.12
HYDROGEN CHLORIDE (BY CL BAL)	0.05	0.05	0.05	0.05	0.05	0.05
TOTAL OTHER GASES	4.45	4.22	4.21	4.37	4.25	4.31
WATER (BY OXYGEN BALANCE)	9.18	9.04	8.83	9.19	8.45	8.95
C5 - 193 C (C5 - 380 F)	9.31	9.33	9.18	8.94	9.15	8.74
193 - 288 C (380 - 550 F)	17.64	16.58	16.48	17.28	16.04	16.07
288 - 482 C (550 - 900 F)	9.55	8.56	9.83	11.61	7.82	10.19
TOTAL C5+ DISTILLATE*	36.50	34.47	35.48	37.84	33.00	35.01
482 C+ (900 F+) PYRIDINE SOL.	28.16	28.73	29.56	27.96	31.74	30.27
INSOLUABLE ORGANIC MATTER	6.43	8.16	7.43	6.47	7.98	7.36
TOTAL 482 C+ ORGANIC PROD	34.59	36.89	36.99	34.43	39.72	37.63

* THE QUANTITY OF DISTILLATE SHOWN MAY NOT BE RECOVERABLE COMMERCIALY, IF THE TOTAL 482 C+ (900 F+) PRODUCT IS NOT FLUID ENOUGH TO BE EASILY REMOVED FROM THE VACUUM COLUMN

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SRC-11 RUN DATA, MATERIAL BALANCES, AND PRODUCT PROPERTIES

RUN NUMBER	P99-50-3	P99-50-4	P99-50-5	P99-50-8	P99-50-9	P99-50-10
DATE (START OF PERIOD)	4- 2-79	4- 3-79	4- 4-79	4- 7-79	4- 8-79	4- 9-79
TIME & DATE CODE (START & END OF PERIOD)	0815 0929	0815 0939	0815 0949	0815 0979	0815 0989	1215 0999
RUN HOURS INCLUDED IN PERIOD	113-132	137-156	161-180	233-252	257-276	285-300
COAL CHARGE	POWHATAN	POWHATAN	POWHATAN	POWHATAN	POWHATAN	POWHATAN
	LR-25844	LR-25844	LR-25844	LR-25844	LR-25844	LR-25844
OPERATING CONDITIONS						
RECYCLE SLURRY/MF COAL RATIO	2.38	2.41	2.40	2.41	2.39	2.39
OIL TO SOLIDS RATIO	1.22	1.21	1.20	1.20	1.19	1.21
SLURRY COMPOSITION, WTX						
COAL (MOISTURE FREE)	29.6	29.3	29.4	29.4	29.5	29.5
DISTILLATE	31.8	31.6	32.3	31.1	31.4	31.7
482 C+ (900 F+) PYRIDINE SOL.	23.3	23.1	22.3	23.4	23.0	23.2
PYRIDINE INSOLUABLES	15.4	16.0	15.9	16.1	16.1	15.7
TOTAL RX PRESSURE, MPA	13.79	13.81	13.79	13.79	13.79	13.80
PRESS X XH2 IN INLET GAS, MPA	12.90	12.95	12.98	12.98	12.96	12.90
OUTLET H2 PARTIAL PRESS, MPA	9.71	9.71	9.71	9.71	9.71	9.71
DISSOLVER TEMPERATURES, C						
ZONE 4 (TOP)	458	458	458	457	457	457
ZONE 3	456	456	456	456	456	456
ZONE 2	454	454	454	454	454	454
ZONE 1 (BTM)	452	452	452	452	452	452
AVERAGE	455	455	455	455	455	455
PREHEATER OUTLET	390	390	390	390	390	390
NOMINAL SLURRY RES. TIME, HR	1.00	0.99	1.00	0.99	1.00	1.00
WHSV, KG/HR/DM3						
SLURRY	1.20	1.21	1.20	1.21	1.20	1.20
COAL (MOISTURE FREE)	0.35	0.35	0.35	0.35	0.35	0.35
DISSOLVER GAS						
DM3/KG SLURRY	507	501	512	509	504	497
DM3/KG MF FEED COAL	1714	1710	1738	1733	1710	1686
HYDROGEN CONTENT, VOL%	93.6	93.8	94.1	94.1	94.0	93.5
FLUSH H2O, % OF PRODUCT H2O	105.8	104.1	103.8	97.6	108.1	95.0

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THE FOLLOWING WEIGHT BALANCE AND HYDROGEN CONSUMPTION DATA WERE CALCULATED FROM MEASURED UNIT DATA

RUN NUMBER	P99-50-3	P99-50-4	P99-50-5	P99-50-8	P99-50-9	P99-50-10
WATER IN THE FEED COAL ASSUMED						
LOST FROM FEED TANK, %	100.0	100.0	100.0	100.0	100.0	100.0
WEIGHT BALANCE, O/I, WTX	99.1	99.0	98.7	100.1	100.3	100.2

THE FOLLOWING DATA THROUGH AND INCLUDING ELEMENTAL BALANCES HAVE BEEN CORRECTED TO A 100% WT BALANCE

YIELDS, WTX FEED COAL

HYDROGEN	-4.40	-4.42	-4.31	-4.15	-4.07	-4.06
METHANE	5.29	5.22	5.31	5.36	5.35	5.23
ETHANE	4.27	4.19	4.24	4.28	4.25	4.23
PROPANE	4.37	4.25	4.30	4.34	4.32	4.32
I-BUTANE	0.20	0.17	0.28	0.23	0.22	0.23
N-BUTANE	2.25	2.20	2.19	2.21	2.22	2.27
TOTAL C1 TO C4	16.38	16.04	16.32	16.43	16.37	16.27
AMMONIA	0.45	0.45	0.45	0.43	0.43	0.44
HYDROGEN SULFIDE	2.15	2.21	2.19	2.30	2.15	2.04
CARBON DIOXIDE	0.80	0.81	0.82	0.91	0.81	0.77
CARBON MONOXIDE	0.06	0.08	0.11	0.04	0.02	0.08
HYDROGEN CHLORIDE	0.03	0.03	0.03	0.03	0.03	0.03
TOTAL OTHER GASES	3.49	3.58	3.60	3.71	3.45	3.36
WATER	8.08	8.15	8.32	7.65	7.74	7.80
DEBUTANIZER LIQUID	18.88	19.27	19.75	19.20	19.04	18.82
PROCESS SOLVENT	13.63	13.46	12.31	16.78	10.96	16.17
TOTAL C5+ DISTILLATE	32.51	32.73	32.06	35.98	30.00	35.00
VACUUM TOWER BOTTOMS	43.93	43.92	44.01	40.38	46.52	41.63
CHEMICAL H2 CONSUMPTION BY UNIT GAS BALANCE						
DM3/KG FEED COAL	515	519	505	486	477	476
CONVERSIONS, WTX FEED COAL						
HYDROCRACKING	66.9	67.7	67.8	70.8	65.2	69.6
DESULFURIZATION	58.0	59.6	57.1	59.9	56.1	60.2
DENITROGENATION	29.9	28.8	31.0	30.1	28.1	29.8
OXYGEN REMOVAL	52.9	53.0	53.4	55.6	51.1	54.8

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RUN NUMBER	P99-50-3	P99-50-4	P99-50-5	P99-50-8	P99-50-9	P99-50-10
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GAS RATES, DM3/KG FEED COAL

DISSOLVER INLET GAS	1069.8	1065.0	1058.8	1087.8	1054.5	1063.7
TOTAL QUENCH GAS	658.8	662.4	702.2	644.1	650.3	618.3
TOTAL DISSOLVER GAS	1728.6	1727.4	1760.6	1731.8	1704.8	1682.0
MAKEUP GAS TO DISSOLVER	634.0	648.1	652.8	605.3	579.0	594.9
MAKEUP GAS TO SEP. SPARGE	116.0	120.7	96.3	121.1	118.1	113.0
MAKEUP GAS TO INSTRUMENT TAPS	261.2	261.5	262.2	258.7	258.2	258.3
TOTAL MAKEUP GAS	1011.2	1030.2	1011.3	985.2	955.3	966.1
DISSOLVER OUTLET GAS	1380.9	1374.8	1423.1	1415.5	1395.6	1371.9
GAS LEAVING SCRUBBERS	1787.0	1788.6	1777.0	1849.5	1831.5	1776.8
SEPARATOR SPARGE GAS	316.3	321.6	259.7	346.6	347.6	319.5
PRODUCT GASES						
BLEED OFF GAS	485.8	502.1	499.4	491.5	470.3	477.1
DEBUTANIZER GAS	49.6	49.7	49.8	49.1	49.1	49.1
AMINE REACTIVATOR GAS	18.3	18.8	18.6	20.0	18.7	17.8
NAPHTHA REACTIVATOR GAS	103.4	100.8	99.6	102.2	102.1	106.0
CHROMATOGRAPH BLEED GAS	6.4	6.3	6.3	6.1	6.0	6.0

ELEMENTAL BALANCES

WATER IN THE FEED COAL ASSUMED LOST FROM FEED TANK, %	100.0	100.0	100.0	100.0	100.0	100.0
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CARBON, O/I	1.00	0.99	0.99	1.01	0.99	1.01
HYDROGEN, O/I	0.99	0.99	1.01	1.04	1.01	1.04
NITROGEN, O/I	1.00	1.01	0.99	0.99	1.01	0.99
SULFUR, O/I	1.02	1.02	1.04	1.05	1.04	0.97
OXYGEN, O/I	1.01	1.01	1.02	0.96	1.00	0.97
CHLORINE, O/I	0.65	0.65	0.65	0.63	0.64	0.63
METALS, O/I	1.02	1.03	1.04	0.94	1.07	0.95
ASH, O/I	1.02	1.03	1.04	0.94	1.07	0.95

THE FOLLOWING DATA WERE BALANCED FOR CARBON, HYDROGEN, SULFUR, NITROGEN, OXYGEN, CHLORINE, AND METALS

RUN NUMBER P99-50-3 P99-50-4 P99-50-5 P99-50-8 P99-50-9 P99-50-10

YIELDS, WT% MOISTURE FREE COAL

HYDROGEN (BY H BALANCE)	-4.36	-4.36	-4.45	-4.54	-4.19	-4.38
METHANE	5.31	5.26	5.37	5.32	5.41	5.19
ETHANE	4.29	4.22	4.29	4.25	4.30	4.19
PROPANE	4.38	4.27	4.35	4.31	4.37	4.29
I-BUTANE	0.20	0.18	0.28	0.23	0.23	0.22
N-BUTANE	2.26	2.21	2.21	2.20	2.24	2.25
TOTAL C1 TO C4	16.44	16.13	16.50	16.30	16.54	16.13
AMMONIA (BY N BALANCE)	0.44	0.42	0.45	0.45	0.41	0.45
HYDROGEN SULFIDE (BY S BAL)	2.06	2.12	2.02	2.15	1.98	2.16
CARBON DIOXIDE	0.80	0.82	0.83	0.90	0.82	0.77
CARBON MONOXIDE	0.06	0.08	0.11	0.04	0.02	0.07
HYDROGEN CHLORIDE (BY CL BAL)	0.05	0.05	0.05	0.05	0.05	0.05
TOTAL OTHER GASES	3.42	3.49	3.46	3.59	3.28	3.50
WATER (BY OXYGEN BALANCE)	7.93	7.91	7.91	8.41	7.60	8.36
DEBUTANIZER LIQUID	18.95	19.39	19.96	19.05	19.24	18.66
PROCESS SOLVENT	13.68	13.54	12.45	16.66	11.08	16.03
TOTAL C5+ DISTILLATE	32.63	32.93	32.41	35.71	30.32	34.69
VTB PYRIDINE SOLUABLES	26.39	26.22	26.88	24.10	28.63	25.26
INSOLUABLE ORGANIC MATTER	5.25	5.39	5.00	4.14	5.52	4.14
ASH	12.29	12.29	12.29	12.29	12.29	12.29
VACUUM TOWER BOTTOMS	43.93	43.90	44.18	40.53	46.44	41.69

CHEMICAL H2 CONSUMPTION, DM3/KG MOISTURE FREE COAL
BY HYDROGEN BALANCE

511 511 522 533 491 514

CONVERSIONS, WT% MF COAL

HYDROCRACKING	66.8	67.5	67.4	70.7	64.8	69.9
DESULFURIZATION	57.8	59.4	56.7	60.2	55.7	60.5
DENITROGENATION	29.6	28.4	30.2	30.6	27.4	30.4
OXYGEN REMOVAL	52.3	52.3	52.5	55.6	50.2	54.8

RUN NUMBER

P99-50-3 P99-50-4 P99-50-5 P99-50-8 P99-50-9 P99-50-10

GAS COMPOSITIONS, VOL%

REACTOR INLET GAS

HYDROGEN	93.58	93.79	94.13	94.12	94.04	93.52
METHANE	5.58	5.33	5.12	5.15	5.22	5.59
ETHANE	0.80	0.80	0.73	0.70	0.69	0.80
PROPANE	0.00	0.00	0.00	0.00	0.00	0.00
I-BUTANE	0.00	0.00	0.00	0.00	0.00	0.00
N-BUTANE	0.02	0.04	0.02	0.01	0.00	0.05
PENTANES	0.00	0.00	0.00	0.00	0.00	0.00
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00	0.00	0.00
CARBON MONOXIDE	0.01	0.03	0.00	0.02	0.05	0.03
CARBON DIOXIDE	0.00	0.00	0.00	0.00	0.00	0.01

REACTOR OUTLET GAS (BUTANES AND LIGHTER ONLY)

HYDROGEN	73.83	74.02	74.92	75.18	74.92	74.15
METHANE	11.73	11.42	10.98	11.09	11.22	11.61
ETHANE	3.22	3.19	3.02	3.04	3.05	3.18
PROPANE	1.60	1.57	1.52	1.56	1.57	1.59
I-BUTANE	0.09	0.09	0.09	0.09	0.09	0.10
N-BUTANE	0.65	0.66	0.61	0.60	0.61	0.69
HYDROGEN SULFIDE	1.00	1.03	0.99	1.05	1.00	0.96
CARBON MONOXIDE	0.05	0.08	0.06	0.05	0.06	0.08
CARBON DIOXIDE	0.29	0.29	0.29	0.32	0.29	0.29
AMMONIA	0.42	0.42	0.41	0.40	0.40	0.41
WATER	7.12	7.21	7.11	6.61	6.77	6.92
HYDROGEN CHLORIDE	0.01	0.01	0.01	0.01	0.01	0.01

BLEED OFF GAS

HYDROGEN	88.41	88.62	88.35	88.49	88.14	88.57
METHANE	9.96	9.72	9.97	10.01	10.38	9.85
ETHANE	1.50	1.49	1.48	1.42	1.42	1.45
PROPANE	0.02	0.02	0.02	0.02	0.02	0.00
I-BUTANE	0.00	0.00	0.00	0.00	0.00	0.00
N-BUTANE	0.01	0.01	0.00	0.00	0.01	0.01
PENTANES	0.00	0.00	0.00	0.00	0.00	0.00
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00	0.00	0.00
CARBON MONOXIDE	0.11	0.14	0.18	0.07	0.03	0.13
CARBON DIOXIDE	0.00	0.00	0.00	0.00	0.00	0.00

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RUN NUMBER	P99-50-3	P99-50-4	P99-50-5	P99-50-8	P99-50-9	P99-50-10
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GAS COMPOSITIONS, VOL%

AMINE REACTIVATOR GAS

HYDROGEN	16.69	16.28	15.41	15.75	16.75	18.77
METHANE	1.18	0.86	1.16	1.03	1.22	1.07
ETHANE	0.29	0.20	0.32	0.19	0.27	0.15
PROPANE	0.05	0.02	0.01	0.00	0.02	0.00
I-BUTANE	0.00	0.00	0.00	0.00	0.00	0.00
N-BUTANE	0.04	0.00	0.01	0.00	0.02	0.00
PENTANES	0.00	0.00	0.00	0.00	0.00	0.00
HYDROGEN SULFIDE	65.75	66.85	66.83	66.11	66.08	65.12
CARBON MONOXIDE	0.01	0.00	0.03	0.11	0.11	0.08
CARBON DIOXIDE	15.99	15.78	16.24	16.82	15.53	14.81

NAPHTHA REACTIVATOR GAS

HYDROGEN	27.90	28.14	27.62	27.01	26.46	27.80
METHANE	20.92	20.50	20.63	21.26	21.72	21.28
ETHANE	21.75	21.68	22.02	22.27	22.47	21.61
PROPANE	19.44	19.56	19.69	19.46	19.36	19.21
I-BUTANE	1.03	1.04	1.05	1.05	1.06	1.04
N-BUTANE	6.86	6.94	6.84	6.78	6.75	6.86
PENTANES	1.89	1.94	1.95	1.95	1.99	1.99
HYDROGEN SULFIDE	0.03	0.02	0.01	0.01	0.00	0.00
CARBON MONOXIDE	0.00	0.00	0.00	0.00	0.00	0.00
CARBON DIOXIDE	0.18	0.18	0.18	0.20	0.19	0.20

DEBUTANIZER GAS

HYDROGEN	57.17	58.41	57.84	56.30	56.20	59.96
METHANE	16.33	15.92	15.70	16.64	16.46	15.73
ETHANE	8.59	8.44	8.44	8.73	8.61	7.80
PROPANE	7.45	7.03	7.25	7.50	7.61	6.56
I-BUTANE	0.67	0.64	0.67	0.67	0.71	0.62
N-BUTANE	4.27	3.99	4.28	4.37	4.44	4.07
PENTANES	1.56	1.75	1.86	1.68	1.67	1.72
HYDROGEN SULFIDE	3.79	3.62	3.84	3.93	3.94	3.38
CARBON MONOXIDE	0.00	0.00	0.00	0.00	0.00	0.00
CARBON DIOXIDE	0.18	0.20	0.12	0.18	0.37	0.15

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COAL INSPECTIONS

RUN NUMBER		P99-50-3	P99-50-4	P99-50-5	P99-50-8	P99-50-9	P99-50-10
FEED COAL							
ELEMENTAL ANALYSIS (MOISTURE FREE, NORMALIZED TO 100%)							
CARBON, SEMI-MICRO, WTX		69.03	69.03	69.03	69.03	69.03	69.03
HYDROGEN, SEMI-MICRO, WTX		4.96	4.96	4.96	4.96	4.96	4.96
NITROGEN, GBII, WTX		1.23	1.23	1.23	1.23	1.23	1.23
SULFUR, TOTAL, GRM1159, WTX		3.35	3.35	3.35	3.35	3.35	3.35
SULFUR, ORGANIC, WTX		2.07	2.07	2.07	2.07	2.07	2.07
SULFUR, PYRITIC, WTX		1.08	1.08	1.08	1.08	1.08	1.08
SULFUR, SULFATE, WTX		0.20	0.20	0.20	0.20	0.20	0.20
OXYGEN, GRM1117, WTX		14.65	14.65	14.65	14.65	14.65	14.65
OXYGEN, ORGANIC, WTX		8.79	8.79	8.79	8.79	8.79	8.79
OXYGEN, INORGANIC, WTX		5.87	5.87	5.87	5.87	5.87	5.87
CHLORINE, GRM1117, WTX		0.05	0.05	0.05	0.05	0.05	0.05
METALS, BY SPEC ASH, WTX		6.72	6.72	6.72	6.72	6.72	6.72
MINERAL MATTER, WTX*		13.87	13.87	13.87	13.87	13.87	13.87
MOISTURE, D271, WTX		1.72	1.72	1.72	1.72	1.72	1.72
VOLATILE MATTER, WTX		34.50	34.50	34.50	34.50	34.50	34.50
ASH, D271, WTX		12.29	12.29	12.29	12.29	12.29	12.29
SULFUR, WTX OF ASH		0.50	0.50	0.50	0.50	0.50	0.50
OXYGEN, WTX OF ASH		44.80	44.80	44.80	44.80	44.80	44.80
ALUMINUM, WTX OF ASH		12.0	12.0	12.0	12.0	12.0	12.0
CALCIUM, WTX OF ASH		1.5	1.5	1.5	1.5	1.5	1.5
IRON, WTX OF ASH		16.6	16.6	16.6	16.6	16.6	16.6
MAGNESIUM, WTX OF ASH		.4	.4	.4	.4	.4	.4
POTASSIUM, WTX OF ASH		1.5	1.5	1.5	1.5	1.5	1.5
SILICON, WTX OF ASH		20.4	20.4	20.4	20.4	20.4	20.4
SODIUM, WTX OF ASH		.2	.2	.2	.2	.2	.2
TITANIUM, WTX OF ASH		.6	.6	.6	.6	.6	.6
TRACE METALS, WTX OF ASH		.1	.1	.1	.1	.1	.1
PARTICLE SIZE DISTRIBUTION, WTX							
ON 80 MESH							
THRU 80 ON 200 MESH		8.8	8.8	8.8	8.8	8.8	8.8
THRU 200 ON 325 MESH		28.5	28.5	28.5	28.5	28.5	28.5
THRU 325 ON 625 MESH		34.7	34.7	34.7	34.7	34.7	34.7
THRU 625 MESH		28.0	28.0	28.0	28.0	28.0	28.0

* BY PARR'S EQUATION: MINERAL MATTER = 1.08 X ASH + 0.55 X PYRITIC SULFUR

PRODUCT INSPECTIONS

RUN NUMBER	P99-50-3	P99-50-4	P99-50-5	P99-50-8	P99-50-9	P99-50-10
DEBUTANIZER BOTTOMS						
GRAVITY, D287, API	25.2	25.6	26.0	25.4	25.8	25.4
ELEMENTAL ANALYSIS (NORMALIZED TO 100%)						
CARBON, SEMI-MICRO, WT%	84.32	84.33	84.34*	84.28	84.47*	84.10*
HYDROGEN, SEMI-MICRO, WT%	10.50	10.55	10.53	10.48	10.37	10.72
NITROGEN, GB11, WT%	0.83	0.84*	0.81	0.85	0.83	0.84
SULFUR, GRM156, WT%	0.18	0.11	0.13	0.20	0.13	0.17
OXYGEN, GRM117, WT%	4.18*	4.17*	4.19	4.19*	4.20*	4.18*
VISCOSITY, KIN, D445, CS						
-35C						
0C						3.80
WATER, G525, PPM	8425	8351	8449	8381	8097	7587
HEAT OF COMB., D240, BTU/LB						17761
POUR POINT, D97, C						-54
DISTILLATION, D86, C						
INITIAL BOILING POINT	63	64	69	67	61	66
5 VOL %	72	76	77	77	77	79
10 VOL %	97	100	110	110	104	110
30 VOL %	171	163	167	171	167	167
50 VOL %	196	196	194	194	194	194
70 VOL %	216	216	212	214	212	212
90 VOL %	242	239	237	239	236	237
95 VOL %	254	253	247	253	246	250
END POINT	266	262	259	260	259	256
WATER (INCLUDES FLUSH WATER)						
TOTAL CARBON, PPM	20400	20000	17600	16100	17600	19200
ORGANIC CARBON, PPM	17250	16800	14300	12700	14300	15500
NITROGEN, GB11, WT%	2.09	2.10*	2.10*	2.09	2.10*	2.11
SULFUR, GRM156, WT%	0.75*	0.75*	0.65	0.66	0.54	0.75
CHLORINE, APHA, PPM	1695*	1695*	1695*	1695*	1695*	1695

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

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PRODUCT INSPECTIONS

RUN NUMBER	P99-50-3	P99-50-4	P99-50-5	P99-50-6	P99-50-9	P99-50-10
PROCESS SOLVENT						
GRAVITY, D287, API	7.2	7.4	7.4	7.0	6.8	7.4
ELEMENTAL ANALYSIS (NORMALIZED TO 100%)						
CARBON, SEMI-MICRO, WT%	87.83	87.67	87.92*	87.52	88.05	87.82
HYDROGEN, SEMI-MICRO, WT%	8.56	8.79	8.59	8.65	8.29	8.56
NITROGEN, GRM, WT%	1.00	1.00*	1.00	1.04	1.03	1.02
SULFUR, GRM, WT%	0.30	0.26	0.29	0.29	0.24	0.31
OXYGEN, GRM, WT%	2.30	2.29	2.20	2.50	2.40	2.29
VISCOSITY, KIN, D445, CS						
25 C						23.00
50 C						7.58
100 C						2.22
WATER, G525, PPM	340	396	330	495	355	372
HEAT OF COMB., D240, BTU/LB						17398
POUR POINT, D97, C						-15
DISTILLATION, CUSHMAN, C						
CORRECTED TO 760 MM HG USING K10 FACTOR						
INITIAL BOILING POINT	163	149	152	164	149	182
10 VOL %	251	258	244	256	247	259
20 VOL %	275	277	273	277	273	274
30 VOL %	294	294	292	292	293	293
40 VOL %	306	309	310	304	302	306
50 VOL %	328	324	324	317	322	320
60 VOL %	346	339	338	337	337	338
70 VOL %	365	365	359	363	359	366
80 VOL %	379	382	383	387	383	391
90 VOL %	412	422	406	419	421	419
END POINT	477	487	473	482	493	479

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

PRODUCT INSPECTIONS

RUN NUMBER		P99-50-3	P99-50-4	P99-50-5	P99-50-8	P99-50-9	P99-50-10
VACUUM TOWER BOTTOMS							
SPECIFIC GRAVITY, D70, G/CC		1.50	1.50	1.52	1.49	1.52	1.51
ELEMENTAL ANALYSIS (NORMALIZED TO 100%)							
CARBON, SEMI-MICRO, WTX		63.44	63.44	63.02	63.39	63.58	64.02
HYDROGEN, SEMI-MICRO, WTX		3.86	3.87	3.86	3.87*	3.81	3.65
NITROGEN, G811, WTX		1.26	1.27	1.28	1.25	1.28	1.27
SULFUR, TOTAL, D1552, WTX		2.99	2.91	3.11	3.03	3.02	2.97
SULFUR, SULFIDE, WTX							1.88
SULFUR, PYRITIC, WTX							
OXYGEN, G81117, WTX		12.98	12.89	12.99*	12.91*	12.94*	12.97*
CHLORINE, D2361, WTX		0.01*	0.01*	0.01*	0.01*	0.01*	0.01
METALS, WTX		15.45	15.63	15.74	15.48	15.36	15.11
ASH, G599, WTX		28.25	28.57	28.77	28.30	28.07	27.63
SULFUR, WTX OF ASH		0.50*	0.50*	0.50*	0.50*	0.50*	0.50*
OXYGEN, WTX OF ASH		44.80*	44.80*	44.80*	44.80*	44.80*	44.80*
METALS, WTX OF ASH (BY DIFF)		54.70	54.70	54.70	54.70	54.70	54.70
PYRIDINE INSOLUABLES, WTX		39.7	40.1	39.4	39.4	38.7	38.4
MELTING POINT, G898, C		135	133	140	143	140	137
HEAT OF COMB., D240, BTU/LB							11551
CONCARBON ASD, D189, WTX							76.7
DISTILLATION, CUSHMAN, C							
CONVERTED TO 760 MM HG USING K10 FACTOR							
INITIAL BOILING POINT		421	400	388	450	406	375
INTERMEDIATE BOILING POINT				465	473		446
END POINT		474	477	472	479	474	477
OVER AT INTERMED BP, WTX				5.5	6.0		5.5
RESIDUE, WTX		93.5	92.2	92.7	91.6	93.1	90.9

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

IN THE FOLLOWING DATA, DISTILLATE YIELDS HAVE BEEN ADJUSTED TO THE BOILING RANGES INDICATED

RUN NUMBER P99-50-3 P99-50-4 P99-50-5 P99-50-8 P99-50-9 P99-50-10

YIELDS, WTX MOISTURE FREE COAL

HYDROGEN (BY H BALANCE)	-4.36	-4.36	-4.45	-4.54	-4.19	-4.38
METHANE	5.31	5.26	5.37	5.32	5.41	5.19
ETHANE	4.29	4.22	4.29	4.25	4.30	4.19
PROPANE	4.38	4.27	4.35	4.31	4.37	4.29
I-BUTANE	0.20	0.18	0.28	0.23	0.23	0.22
N-BUTANE	2.26	2.21	2.21	2.20	2.24	2.25
TOTAL C1 TO C4	16.44	16.13	16.50	16.30	16.54	16.13
AMMONIA (BY N BALANCE)	0.44	0.42	0.45	0.46	0.41	0.45
HYDROGEN SULFIDE (BY S BAL)	2.06	2.12	2.02	2.15	1.98	2.16
CARBON DIOXIDE	0.80	0.82	0.83	0.90	0.82	0.77
CARBON MONOXIDE	0.06	0.08	0.11	0.04	0.02	0.07
HYDROGEN CHLORIDE (BY CL BAL)	0.05	0.05	0.05	0.05	0.05	0.05
TOTAL OTHER GASES	3.42	3.49	3.46	3.59	3.28	3.50
WATER (BY OXYGEN BALANCE)	7.93	7.91	7.91	8.41	7.60	8.36
C5 - 193 C (C5 - 380 F)	7.66	8.14	8.30	7.56	8.14	7.48
193 - 288 C (380 - 550 F)	14.58	14.47	14.81	15.62	13.88	15.22
288 - 482 C (550 - 900 F)	13.61	13.68	12.26	15.73	11.59	15.45
TOTAL C5+ DISTILLATE*	35.84	36.26	35.37	38.91	33.62	38.15
482 C+ (900 F+) PYRIDINE SOL.	23.18	22.89	23.92	20.90	25.33	21.80
INSOLUBLE ORGANIC MATTER	5.28	5.39	5.00	4.14	5.52	4.14
ASH	12.29	12.29	12.29	12.29	12.29	12.29
TOTAL 482 C+ (900 F+) PROD	40.72	40.57	41.22	37.32	43.14	38.23

* THE QUANTITY OF DISTILLATE SHOWN MAY NOT BE RECOVERABLE COMMERCIALY, IF THE TOTAL 482 C+ (900 F+) PRODUCT IS NOT FLUID ENOUGH TO BE EASILY REMOVED FROM THE VACUUM COLUMN

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IN THE FOLLOWING DATA, DISTILLATE YIELDS HAVE BEEN ADJUSTED TO THE BOILING RANGES INDICATED

RUN NUMBER P99-50-3 P99-50-4 P99-50-5 P99-50-8 P99-50-9 P99-50-10

YIELDS, WTX MOISTURE AND ASH FREE COAL

HYDROGEN (BY H BALANCE)	-4.97	-4.97	-5.08	-5.18	-4.77	-4.99
METHANE	6.05	5.99	6.12	6.06	6.17	5.91
ETHANE	4.89	4.81	4.09	4.84	4.90	4.78
PROPANE	5.00	4.87	4.96	4.91	4.98	4.89
I-BUTANE	0.23	0.20	0.32	0.27	0.26	0.25
N-BUTANE	2.58	2.52	2.52	2.50	2.55	2.56
TOTAL C1 TO C4	18.75	18.40	18.81	18.59	18.86	18.40
AMMONIA (BY N BALANCE)	0.50	0.48	0.52	0.52	0.47	0.52
HYDROGEN SULFIDE (BY S BAL)	2.35	2.41	2.30	2.45	2.26	2.46
CARBON DIOXIDE	0.92	0.93	0.95	1.03	0.94	0.87
CARBON MONOXIDE	0.07	0.10	0.12	0.05	0.02	0.09
HYDROGEN CHLORIDE (BY CL BAL)	0.36	0.05	0.05	0.05	0.05	0.05
TOTAL OTHER GASES	3.89	3.98	3.94	4.10	3.74	3.99
WATER (BY OXYGEN BALANCE)	9.04	9.02	9.02	9.59	8.67	9.53
C5 - 193 C (C5 - 380 F)	8.73	9.28	9.47	8.62	9.28	8.53
193 - 288 C (380 - 550 F)	16.62	16.49	16.88	17.81	15.83	17.35
288 - 482 C (550 - 900 F)	15.51	15.57	13.97	17.93	13.22	17.62
TOTAL C5+ DISTILLATE*	40.86	41.34	40.32	44.36	38.33	43.50
482 C+ (900 F+) PYRIDINE SOL.	26.43	26.10	27.28	23.82	28.88	24.86
INSOLUBLE ORGANIC MATTER	5.99	6.14	5.70	4.72	6.29	4.72
TOTAL 482 C+ ORGANIC PROD	32.41	32.24	32.98	28.54	35.18	29.57

* THE QUANTITY OF DISTILLATE SHOWN MAY NOT BE RECOVERABLE COMMERCIALY, IF THE TOTAL 482 C+ (900 F+) PRODUCT IS NOT FLUID ENOUGH TO BE EASILY REMOVED FROM THE VACUUM COLUMN

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SRC-11 RUN DATA, MATERIAL BALANCES, AND PRODUCT PROPERTIES

RUN NUMBER	P99-51-1	P99-51-2	P99-51-3	P99-51-4	P99-51-5	P99-51-6	P99-51-7
DATE (START OF PERIOD)	4-16-79	4-17-79	4-18-79	4-19-79	4-20-79	4-21-79	4-22-79
TIME & DATE CODE (START & END OF PERIOD)	0815 1069	0815 1079	1015 1089	0815 1099	0815 1109	0815 1119	0815 1129
RUN HOURS INCLUDED IN PERIOD	137-156	161-180	187-204	209-228	233-252	257-276	281-300
COAL CHARGE	POWHATAN	POWHATAN	POWHATAN	POWHATAN	POWHATAN	POWHATAN	POWHATAN
OPERATING CONDITIONS	LR-25844	LR-25844	LR-25844	LR-25844	LR-25844	LR-25844	LR-25844
RECYCLE SLURRY/MF COAL RATIO	2.38	2.39	2.41	2.40	2.40	2.43	2.42
UIL TO SOLIDS RATIO	1.24	1.25	1.27	1.24	1.22	1.22	1.23
SLURRY COMPOSITION, WT%							
COAL (MOISTURE FREE)	29.6	29.5	29.3	29.4	29.4	29.1	29.2
DISTILLATE	33.1	32.7	34.1	34.3	33.6	33.5	33.8
482 C+ (900 F+) PYRIDINE SOL.	22.3	22.9	21.9	21.1	21.4	21.5	21.3
PYRIDINE INSOLUABLES	15.0	15.0	14.8	15.1	15.6	15.8	15.7
TOTAL RX PRESSURE, MPA	15.87	15.86	15.86	15.86	15.87	15.85	15.84
PRESS X XM2 IN INLET GAS, MPA	14.31	14.29	14.23	14.33	14.32	14.35	14.31
OUTLET H2 PARTIAL PRESS, MPA	10.22	10.22	10.22	10.22	10.22	10.22	10.22
DISSOLVER TEMPERATURES, C							
ZONE 4 (TOP)	458	458	458	458	458	458	458
ZONE 3	456	456	456	456	456	456	456
ZONE 2	454	454	454	454	454	454	454
ZONE 1 (BTM)	452	452	452	452	452	452	452
AVERAGE	455	455	455	455	455	455	455
PREHEATER OUTLET	389	388	389	390	390	390	391
NOMINAL SLURRY RES. TIME, HR	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MHSV, KG/HR/DN3							
SLURRY	1.20	1.20	1.20	1.21	1.21	1.20	1.20
COAL (MOISTURE FREE)	0.35	0.35	0.35	0.35	0.35	0.35	0.35
DISSOLVER GAS							
DN3/KG SLURRY	459	453	454	466	458	460	456
DN3/KG MF FEED COAL	1551	1538	1548	1585	1559	1580	1561
HYDROGEN CONTENT, VOL%	90.1	90.1	89.7	90.3	90.3	90.5	90.3
FLUSH H2O, % OF PRODUCT H2O	104.8	108.0	97.7	121.9	101.8	126.9	115.0

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THE FOLLOWING WEIGHT BALANCE AND HYDROGEN CONSUMPTION DATA WERE CALCULATED FROM MEASURED UNIT DATA

RUN NUMBER	P99-51-1	P99-51-2	P99-51-3	P99-51-4	P99-51-5	P99-51-6	P99-51-7
WATER IN THE FEED COAL ASSUMED							
LOST FROM FEED TANK, %	100.0	100.0	100.0	100.0	100.0	100.0	100.0
WEIGHT BALANCE, O/I, WT%	96.5	97.6	96.2	99.6	100.4	99.4	97.8

THE FOLLOWING DATA THROUGH AND INCLUDING ELEMENTAL BALANCES HAVE BEEN CORRECTED TO A 100% WT BALANCE

YIELDS, WT% FEED COAL

HYDROGEN	-4.60	-4.48	-4.57	-4.39	-4.38	-4.49	-4.62
METHANE	5.13	5.04	5.24	5.11	5.02	5.13	5.12
ETHANE	4.00	4.00	4.24	4.17	4.15	4.28	4.26
PROPANE	4.21	4.11	4.43	4.34	4.34	4.52	4.47
I-BUTANE	0.28	0.25	0.27	0.25	0.27	0.29	0.31
N-BUTANE	2.22	2.12	2.28	2.24	2.21	2.29	2.28
TOTAL C1 TO C4	15.93	15.51	16.46	16.11	16.00	16.52	16.44
AMMONIA	0.47	0.48	0.48	0.50	0.44	0.47	0.46
HYDROGEN SULFIDE	2.14	2.04	2.09	2.03	2.00	2.07	2.08
CARBON DIOXIDE	0.75	0.81	0.74	0.79	0.74	0.86	0.75
CARBON MONOXIDE	0.08	0.11	0.12	0.10	0.12	0.09	0.08
HYDROGEN CHLORIDE	0.04	0.04	0.04	0.04	0.04	0.04	0.04
TOTAL OTHER GASES	3.50	3.47	3.46	3.47	3.34	3.52	3.40
WATER	8.13	8.80	8.08	7.93	7.87	7.56	7.72
DEBUTANIZER LIQUID	19.70	19.26	19.73	18.88	20.44	19.47	19.57
PROCESS SOLVENT	14.25	14.63	17.48	16.10	15.55	13.88	15.76
TOTAL C5+ DISTILLATE	33.95	33.89	37.20	34.98	35.99	33.35	35.33
VACUUM TOWER BOTTOMS	43.09	42.81	39.36	41.91	41.17	43.54	41.72
CHEMICAL H2 CONSUMPTION BY UNIT GAS BALANCE							
DM3/KG FEED COAL	539	526	536	515	513	527	541
CONVERSIONS, WT% FEED COAL							
HYDROCRACKING	68.4	68.9	69.0	70.6	70.5	68.9	69.1
DESULFURIZATION	58.7	58.4	61.3	58.8	59.8	57.4	59.3
DENITROGENATION	32.5	31.3	32.8	30.8	32.3	31.1	31.5

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RUN NUMBER P99-51-1 P99-51-2 P99-51-3 P99-51-4 P99-51-5 P99-51-6 P99-51-7

GAS RATES, DM3/KG FEED COAL

DISSOLVER INLET GAS	971.0	962.0	1009.9	968.8	929.2	938.5	934.9
TOTAL QUENCH GAS	636.5	615.4	600.2	624.7	624.3	651.5	661.4
TOTAL DISSOLVER GAS	1607.4	1577.4	1610.0	1593.4	1553.5	1590.0	1596.3
MAKEUP GAS TO DISSOLVER	495.7	478.3	489.9	478.3	469.0	471.7	487.7
MAKEUP GAS TO SEP. SPARGE	114.0	114.7	113.6	108.2	116.8	111.7	116.5
MAKEUP GAS TO INSTRUMENT TAPS	268.4	265.6	270.7	260.1	258.0	264.1	266.8
TOTAL MAKEUP GAS	878.1	858.5	874.2	846.6	843.8	847.5	871.1
DISSOLVER OUTLET GAS	1230.7	1210.9	1240.0	1241.1	1201.2	1229.1	1219.1
GAS LEAVING SCRUBBERS	1696.0	1685.9	1707.5	1685.7	1670.5	1685.9	1685.5
SEPARATOR SPARGE GAS	369.7	378.4	373.4	360.5	387.1	376.6	381.3
PRODUCT GASES							
BLEED OFF GAS	321.3	316.0	320.4	311.4	309.0	295.8	305.2
DEBUTANIZER GAS	52.9	54.1	51.4	49.8	52.0	54.7	54.9
AMINE REACTIVATOR GAS	19.5	19.2	19.0	18.9	18.8	19.3	18.9
NAPHTHA REACTIVATOR GAS	100.5	95.8	106.2	107.3	104.9	109.9	108.0
CHROMATOGRAPH BLEED GAS	7.2	7.1	7.2	6.9	6.8	6.9	6.9

ELEMENTAL BALANCES

WATER IN THE FEED COAL ASSUMED							
LOST FROM FEED TANK, %	100.0	100.0	100.0	100.0	100.0	100.0	100.0
CARBON, O/I	0.99	0.99	1.01	1.00	1.00	1.00	1.01
HYDROGEN, O/I	0.99	1.00	1.00	1.00	1.02	0.99	0.99
NITROGEN, O/I	0.99	1.00	0.99	1.03	0.97	1.00	0.99
SULFUR, O/I	1.01	0.99	0.97	0.98	0.96	1.01	0.99
OXYGEN, O/I	1.02	1.06	0.99	1.01	1.00	1.00	0.99
CHLORINE, O/I	0.82	0.85	0.82	0.87	0.80	0.87	0.83
METALS, O/I	1.02	1.01	0.94	1.02	0.99	1.03	0.98
ASH, O/I	1.02	1.01	0.94	1.02	0.99	1.03	0.98

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THE FOLLOWING DATA WERE BALANCED FOR CARBON, HYDROGEN, SULFUR, NITROGEN, OXYGEN, CHLORINE, AND METALS

RUN NUMBER P99-51-1 P99-51-2 P99-51-3 P99-51-4 P99-51-5 P99-51-6 P99-51-7

YIELDS, WTX MOISTURE FREE COAL

HYDROGEN (BY H BALANCE)	-4.54	-4.46	-4.57	-4.43	-4.53	-4.45	-4.48
METHANE	5.16	5.11	5.19	5.13	5.02	5.14	5.09
ETHANE	4.11	4.05	4.20	4.18	4.15	4.29	4.23
PROPANE	4.23	4.17	4.39	4.35	4.33	4.53	4.44
I-BUTANE	0.28	0.25	0.27	0.25	0.27	0.29	0.31
N-BUTANE	2.23	2.15	2.25	2.24	2.21	2.30	2.27
TOTAL C1 TO C4	16.02	15.73	16.30	16.15	15.98	16.55	16.33

AMMONIA (BY N BALANCE)	0.48	0.45	0.50	0.46	0.48	0.46	0.48
HYDROGEN SULFIDE (BY S BAL)	2.08	2.06	2.20	2.09	2.13	2.04	2.12
CARBON DIOXIDE	0.76	0.82	0.73	0.80	0.74	0.86	0.74
CARBON MONOXIDE	0.09	0.11	0.12	0.10	0.12	0.09	0.08
HYDROGEN CHLORIDE (BY CL BAL)	0.05	0.05	0.05	0.05	0.05	0.05	0.05
TOTAL OTHER GASES	3.46	3.49	3.59	3.50	3.52	3.50	3.47

WATER (BY OXYGEN BALANCE)	7.79	7.62	8.38	7.81	7.90	7.62	7.98
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DEBUTANIZER LIQUID	19.81	19.53	19.53	18.93	20.41	19.50	19.44
PROCESS SOLVENT	14.33	14.84	17.30	16.14	15.53	13.90	15.65
TOTAL C5+ DISTILLATE	34.14	34.37	36.83	35.07	35.94	33.41	35.10

VTB PYRIDINE SOLUABLES	25.63	25.81	23.44	25.59	24.71	26.30	24.71
INSOLUABLE ORGANIC MATTER	5.21	5.14	3.73	4.02	4.20	4.78	4.60
ASH	12.29	12.29	12.29	12.29	12.29	12.29	12.29
VACUUM TOWER BOTTOMS	43.14	43.25	39.46	41.90	41.20	43.38	41.60

CHEMICAL H2 CONSUMPTION, DM3/KG MOISTURE FREE COAL

BY HYDROGEN BALANCE	533	523	536	519	531	522	525
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CONVERSIONS, WTX MF COAL

HYDROCRACKING	68.2	68.5	69.3	70.6	70.6	68.8	69.3
DESULFURIZATION	58.5	57.8	61.7	58.7	59.9	57.4	59.6
DENITROGENATION	32.2	30.3	33.5	30.5	32.4	31.0	32.0
OXYGEN REMOVAL	51.3	50.7	54.8	51.7	52.0	50.8	52.3

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[illegible]

RUN NUMBER	P99-51-1	P99-51-2	P99-51-3	P99-51-4	P99-51-5	P99-51-6	P99-51-7
GAS COMPOSITIONS, VOL%							
AMINE REACTIVATOR GAS							
HYDROGEN	20.03	20.73	21.33	20.38	20.34	20.52	21.13
METHANE	2.10	2.17	2.04	1.99	2.08	2.39	2.24
ETHANE	0.41	0.42	0.46	0.40	0.37	0.54	0.43
PROPANE	0.01	0.01	0.07	0.05	0.00	0.09	0.01
I-BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
N-BUTANE	0.01	0.00	0.02	0.03	0.01	0.07	0.00
PENTANES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HYDROGEN SULFIDE	62.47	60.92	62.71	61.54	62.55	59.92	61.73
CARBON MONOXIDE	0.04	0.05	0.03	0.04	0.08	0.04	0.04
CARBON DIOXIDE	14.93	15.71	13.35	15.57	14.58	16.44	14.22
NAPHTHA REACTIVATOR GAS							
HYDROGEN	25.50	25.65	26.09	26.03	26.11	25.55	26.12
METHANE	23.60	23.85	23.95	24.14	23.80	24.46	24.03
ETHANE	21.22	21.30	21.15	21.24	21.22	21.68	21.25
PROPANE	19.10	19.06	18.84	18.72	18.88	18.67	18.75
I-BUTANE	1.00	1.04	1.01	1.80	1.02	1.01	1.02
N-BUTANE	7.00	6.95	6.93	6.84	6.88	6.62	6.75
PENTANES	2.00	2.01	1.89	1.89	1.92	1.87	1.91
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00	0.00	0.01	0.00
CARBON MONOXIDE	0.00	0.00	0.80	0.00	0.01	0.00	0.00
CARBON DIOXIDE	0.01	0.15	0.15	0.14	0.16	0.13	0.15
DEBUTANIZER GAS							
HYDROGEN	56.36	55.43	55.28	56.73	57.95	56.58	57.62
METHANE	19.07	19.34	19.67	19.12	18.71	18.47	18.54
ETHANE	8.74	9.23	9.17	8.85	8.80	8.61	8.56
PROPANE	6.55	7.05	6.97	6.61	6.54	6.92	6.56
I-BUTANE	0.59	0.59	0.60	0.53	0.52	0.61	0.57
N-BUTANE	3.83	3.67	3.76	3.60	3.41	3.79	3.60
PENTANES	1.51	1.80	1.38	1.43	1.38	1.49	1.38
HYDROGEN SULFIDE	3.29	3.15	3.01	3.07	2.69	3.32	3.06
CARBON MONOXIDE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CARBON DIOXIDE	0.03	0.03	0.16	0.05	0.01	0.23	0.11

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COAL INSPECTIONS

RUN NUMBER	P99-51-1	P99-51-2	P99-51-3	P99-51-4	P99-51-5	P99-51-6	P99-51-7
FEED COAL							
ELEMENTAL ANALYSIS (MOISTURE FREE, NORMALIZED TO 100%)							
CARBON, SEMI-MICRO, WTX	69.03	69.03	69.03	69.03	69.03	69.03	69.03
HYDROGEN, SEMI-MICRO, WTX	4.96	4.96	4.96	4.96	4.96	4.96	4.96
NITROGEN, GB11, WTX	1.23	1.23	1.23	1.23	1.23	1.23	1.23
SULFUR, TOTAL, GRM159, WTX	3.35	3.35	3.35	3.35	3.35	3.35	3.35
SULFUR, ORGANIC, WTX	2.07	2.07	2.07	2.07	2.07	2.07	2.07
SULFUR, PYRITIC, WTX	1.08	1.08	1.08	1.08	1.08	1.08	1.08
SULFUR, SULFATE, WTX	0.20	0.20	0.20	0.20	0.20	0.20	0.20
OXYGEN, GRM117, WTX	14.65	14.65	14.65	14.65	14.65	14.65	14.65
OXYGEN, ORGANIC, WTX	8.79	8.79	8.79	8.79	8.79	8.79	8.79
OXYGEN, INORGANIC, WTX	5.87	5.87	5.87	5.87	5.87	5.87	5.87
CHLORINE, GRM117, WTX	0.05	0.05	0.05	0.05	0.05	0.05	0.05
METALS, BY SPEC ASH, WTX	6.72	6.72	6.72	6.72	6.72	6.72	6.72
MINERAL MATTER, WTX*	13.87	13.87	13.87	13.87	13.87	13.87	13.87
MOISTURE, D271, WTX	1.72	1.72	1.72	1.72	1.72	1.72	1.72
VOLATILE MATTER, WTX	34.50	34.50	34.50	34.50	34.50	34.50	34.50
ASH, D271, WTX	12.29	12.29	12.29	12.29	12.29	12.29	12.29
SULFUR, WTX OF ASH	0.50	0.50	0.50	0.50	0.50	0.50	0.50
OXYGEN, WTX OF ASH	44.80	44.80	44.80	44.80	44.80	44.80	44.80
ALUMINUM, WTX OF ASH	12.0	12.0	12.0	12.0	12.0	12.0	12.0
CALCIUM, WTX OF ASH	1.5	1.5	1.5	1.5	1.5	1.5	1.5
IRON, WTX OF ASH	16.6	16.6	16.6	16.6	16.6	16.6	16.6
MAGNESIUM, WTX OF ASH	.4	.4	.4	.4	.4	.4	.4
POTASSIUM, WTX OF ASH	1.5	1.5	1.5	1.5	1.5	1.5	1.5
SILICON, WTX OF ASH	20.4	20.4	20.4	20.4	20.4	20.4	20.4
SODIUM, WTX OF ASH	.2	.2	.2	.2	.2	.2	.2
TITANIUM, WTX OF ASH	.6	.6	.6	.6	.6	.6	.6
TRACE METALS, WTX OF ASH	.1	.1	.1	.1	.1	.1	.1
PARTICLE SIZE DISTRIBUTION, WTX							
ON 80 MESH							
THRU 80 ON 200 MESH	8.8	8.8	8.8	8.8	8.8	8.8	8.8
THRU 200 ON 325 MESH	28.5	28.5	28.5	28.5	28.5	28.5	28.5
THRU 325 ON 625 MESH	34.7	34.7	34.7	34.7	34.7	34.7	34.7
THRU 625 MESH	28.0	28.0	28.0	28.0	28.0	28.0	28.0

* BY PARR'S EQUATION: MINERAL MATTER = 1.08 X ASH + 0.65 X PYRITIC SULFUR

PRODUCT INSPECTIONS

RUN NUMBER	P99-51-1	P99-51-2	P99-51-3	P99-51-4	P99-51-5	P99-51-6	P99-51-7
DEBUTANIZER BOTTOMS							
GRAVITY, D287, API	25.5	25.4	25.2	25.2	24.8	25.7	25.6
ELEMENTAL ANALYSIS (NORMALIZED TO 100%)							
CARBON, SEMI-MICRO, WT%	83.94	84.06	84.23	84.14	83.95	84.22	84.10
HYDROGEN, SEMI-MICRO, WT%	10.71	10.47	10.59	10.15	10.47	10.51	10.42
NITROGEN, G811, WT%	0.82	0.85	0.87	0.88	0.86	0.84	0.85
SULFUR, GRM1156, WT%	0.13*	0.13	0.13	0.13	0.12	0.13	0.13*
OXYGEN, GRM1117, WT%	4.39*	4.49	4.19*	4.40*	4.60	4.30*	4.50
VISCOSITY, KIN, D445, CS							
-35C							
OC							3.73
WATER, G525, PPM	8603	7980	8271	8727	8756	8394	8543
HEAT OF COMB., D240, BTU/LB							17634
POUR POINT, D97, C							-54
DISTILLATION, D86, C							
INITIAL BOILING POINT	67	63	66	69	69	68	66
5 VOL %	80	72	77	78	77	77	81
10 VOL %	107	103	107	97	96	100	96
30 VOL %	169	168	169	166	167	162	166
50 VOL %	193	194	194	193	196	192	196
70 VOL %	212	211	212	211	211	209	211
90 VOL %	235	236	234	232	232	231	232
95 VOL %	251	249	248	243	247	241	244
END POINT	262	257	256	257	258	254	254
WATER (INCLUDES FLUSH WATER)							
TOTAL CARBON, PPM	22400	17600	17200	21600	17200	17200	17200
ORGANIC CARBON, PPM	19100	14300	13700	18500	14000	14000	14100
NITROGEN, G811, WT%	2.22	2.16	2.23	2.19	2.13	2.09	2.07
SULFUR, GRM1156, WT%	0.76	0.58	0.82	0.66	0.58	0.73	0.80
CHLORINE, APHA, PPM	2250*	2250*	2250*	2250*	2250*	2250*	2250

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

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PRODUCT INSPECTIONS

RUN NUMBER	P99-51-1	P99-51-2	P99-51-3	P99-51-4	P99-51-5	P99-51-6	P99-51-7
PROCESS SOLVENT							
GRAVITY, D287, API	7.2	7.0	7.2	7.1	6.8	6.8	6.9
ELEMENTAL ANALYSIS (NORMALIZED TO 100%)							
CARBON, SEMI-MICRO, WT%	87.71	87.70	87.74	87.84	87.61*	87.75	87.70
HYDROGEN, SEMI-MICRO, WT%	8.63	8.58	8.59	8.57	8.61*	8.67	8.61
NITROGEN, GB11, WT%	1.03	1.04	1.01	1.04	1.03	1.04	1.04
SULFUR, GRM1156, WT%	0.24	0.28	0.27	0.25	0.27	0.25	0.25
OXYGEN, GRM1117, WT%	2.39	2.40	2.39	2.30	2.49	2.29	2.40
VISCOSITY, KIN, D445, CS							
25 C							25.45
50 C							8.06
100 C							2.28
WATER, G525, PPM	440	411	429	450*	444	465	368
HEAT OF COMB., D240, BTU/LB							18574
POUR POINT, D97, C							-26
DISTILLATION, CUSHMAN, C							
CORRECTED TO 760 MM HG USING K10 FACTOR							
INITIAL BOILING POINT	185	179	192	183	172	203	164
10 VOL %	254	254	255	255	257	245	258
20 VOL %	273	273	273	269	274	275	274
30 VOL %	290	286	291	292	291	293	293
40 VOL %	298	303	307	304	301	309	308
50 VOL %	319	319	319	321	326	323	320
60 VOL %	338	334	333	343	338	343	332
70 VOL %	356	353	360	361	367	361	353
80 VOL %	387	381	388	388	387	386	377
90 VOL %	416	416	411	428	416	421	405
END POINT	493	500	489	474	479	474	461

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

PRODUCT INSPECTIONS

RUN NUMBER	P99-51-1	P99-51-2	P99-51-3	P99-51-4	P99-51-5	P99-51-6	P99-51-7
VACUUM TOWER BOTTOMS							
SPECIFIC GRAVITY, D70, G/CC	1.49	1.55	1.51	1.52	1.51	1.49	1.51
ELEMENTAL ANALYSIS (NORMALIZED TO 100%)							
CARBON, SEMI-MICRO, WTX	62.32	62.21	62.50	61.90	62.00	62.23	62.39
HYDROGEN, SEMI-MICRO, WTX	3.98	4.11	3.67	3.82	3.89	3.83	3.74
NITROGEN, GR11, WTX	1.21	1.22	1.21	1.22	1.20	1.23	1.23
SULFUR, TOTAL, D1552, WTX	3.06	3.08	3.09*	3.12	3.10	3.12	3.11
SULFUR, SULFIDE, WTX							1.74
SULFUR, PYRITIC, WTX							0.27
OXYGEN, GR1117, WTX	13.51*	13.59*	13.63*	13.74*	13.74*	13.71*	13.73*
CHLORINE, D2361, WTX	0.01*	0.01*	0.01*	0.01*	0.01*	0.01*	0.01*
METALS, WTX	15.90	15.78	15.88	16.18	16.06	15.87	15.79
ASH, G599, WTX	29.07	28.85	29.04	29.52	29.36	29.00	28.86
SULFUR, WTX OF ASH	0.50*	0.50*	0.50*	0.50*	0.50*	0.50*	0.50*
OXYGEN, WTX OF ASH	44.80*	44.80*	44.80*	44.80*	44.80*	44.80*	44.80*
METALS, WTX OF ASH (BY DIFF)	54.70	54.70	54.70	54.70	54.70	54.70	54.70
PYRIDINE INSOLUABLES, WTX	40.7	40.3	39.6	38.8	39.7	39.5	40.3
MELTING POINT, G898, C	145	132	135	135	130	135	132
HEAT OF COMB., D240, BTU/LB							11337
CONCARBON RSD, D189, WTX							75.6
DISTILLATION, CUSHMAN, C							
CONVERTED TO 760 MM HG USING K10 FACTOR							
INITIAL BOILING POINT	456	414	431	454	451	419	454
INTERMEDIATE BOILING POINT		479		473	460	473	
END POINT	481	481	464	486	473	489	461
OVER AT INTERMED BP, WTX		5.3		6.0	5.6	5.9	
RESIDUE, WTX	93.2	92.1	97.6	98.6	91.8	91.3	93.6

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

IN THE FOLLOWING DATA, DISTILLATE YIELDS HAVE BEEN ADJUSTED TO THE BOILING RANGES INDICATED

RUN NUMBER	P99-51-1	P99-51-2	P99-51-3	P99-51-4	P99-51-5	P99-51-6	P99-51-7
YIELDS, WTX MOISTURE FREE COAL							
HYDROGEN (BY H BALANCE)	-4.54	-4.46	-4.57	-4.43	-4.53	-4.45	-4.48
METHANE	5.16	5.11	5.19	5.13	5.02	5.14	5.09
ETHANE	4.11	4.05	4.20	4.18	4.15	4.29	4.23
PROPANE	4.23	4.17	4.39	4.35	4.33	4.53	4.44
I-BUTANE	0.28	0.25	0.27	0.25	0.27	0.29	0.31
N-BUTANE	2.23	2.15	2.25	2.24	2.21	2.30	2.27
TOTAL C1 TO C4	16.02	15.73	16.30	16.15	15.98	16.55	16.33
AMMONIA (BY N BALANCE)	0.48	0.45	0.50	0.46	0.48	0.46	0.48
HYDROGEN SULFIDE (BY S BAL)	2.08	2.06	2.20	2.09	2.13	2.04	2.12
CARBON DIOXIDE	0.76	0.82	0.73	0.80	0.74	0.86	0.74
CARBON MONOXIDE	0.09	0.11	0.12	0.10	0.12	0.09	0.08
HYDROGEN CHLORIDE (BY CL BAL)	0.05	0.05	0.05	0.05	0.05	0.05	0.05
TOTAL OTHER GASES	3.46	3.49	3.59	3.50	3.52	3.50	3.47
WATER (BY OXYGEN BALANCE)	7.79	7.62	8.38	7.81	7.90	7.62	7.98
C5 - 193 C (C5 - 380 F)	7.92	7.81	7.62	7.95	8.53	8.39	8.28
193 - 288 C (380 - 550 F)	15.63	15.58	16.43	15.37	15.95	14.72	15.09
288 - 482 C (550 - 900 F)	13.35	13.01	14.05	15.44	15.13	13.69	15.22
TOTAL C5+ DISTILLATE+	36.90	36.41	38.10	38.76	39.60	36.79	38.59
482 C+ (900 F+) PYRIDINE SOL.	22.87	23.78	22.18	21.90	21.04	22.92	21.21
INSOLUBLE ORGANIC MATTER	5.21	5.14	3.73	4.02	4.20	4.78	4.60
ASH	12.29	12.29	12.29	12.29	12.29	12.29	12.29
TOTAL 482 C+ (900 F+) PROD	40.38	41.21	38.20	38.21	37.53	40.00	38.11

* THE QUANTITY OF DISTILLATE SHOWN MAY NOT BE RECOVERABLE COMMERCIALY, IF THE TOTAL 482 C+ (900 F+) PRODUCT IS NOT FLUID ENOUGH TO BE EASILY REMOVED FROM THE VACUUM COLUMN

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IN THE FOLLOWING DATA, DISTILLATE YIELDS HAVE BEEN ADJUSTED TO THE BOILING RANGES INDICATED

RUN NUMBER	P99-51-1	P99-51-2	P99-51-3	P99-51-4	P99-51-5	P99-51-6	P99-51-7
YIELDS, WT% MOISTURE AND ASH FREE COAL							
HYDROGEN (BY H BALANCE)	-5.18	-5.09	-5.21	-5.05	-5.17	-5.08	-5.10
METHANE	5.88	5.83	5.92	5.85	5.72	5.86	5.80
ETHANE	4.69	4.62	4.79	4.77	4.73	4.89	4.82
PROPANE	4.83	4.75	5.00	4.96	4.94	5.17	5.06
I-BUTANE	0.32	0.29	0.31	0.29	0.31	0.33	0.35
N-BUTANE	2.54	2.45	2.57	2.56	2.52	2.62	2.58
TOTAL C1 TO C4	18.26	17.93	18.56	18.42	18.22	18.86	18.62
AMMONIA (BY N BALANCE)	0.55	0.52	0.57	0.52	0.55	0.53	0.54
HYDROGEN SULFIDE (BY S BAL)	2.38	2.35	2.51	2.39	2.43	2.33	2.42
CARBON DIOXIDE	0.87	0.93	0.84	0.91	0.84	0.98	0.85
CARBON MONOXIDE	0.10	0.12	0.13	0.12	0.13	0.10	0.09
HYDROGEN CHLORIDE (BY CL BAL)	0.05	0.05	0.05	0.05	0.05	0.05	0.05
TOTAL OTHER GASES	3.95	3.98	4.10	3.99	4.02	3.99	3.96
WATER (BY OXYGEN BALANCE)	8.88	8.69	9.55	8.90	9.00	8.69	9.10
C5 - 193 C (C5 - 380 F)	9.03	8.91	8.68	9.06	9.73	9.56	9.44
193 - 288 C (380 - 550 F)	17.82	17.76	18.73	17.52	18.18	16.78	17.20
288 - 482 C (550 - 900 F)	15.23	14.84	16.02	17.60	17.25	15.61	17.35
TOTAL C5+ DISTILLATE	42.07	41.51	43.44	44.19	45.15	41.95	44.00
482 C+ (900 F+) PYRIDINE SOL.	26.08	27.11	25.29	24.97	23.99	26.13	24.19
INSOLUBLE ORGANIC MATTER	5.94	5.86	4.25	4.58	4.78	5.45	5.25
TOTAL 482 C+ ORGANIC PROD	32.02	32.97	29.54	29.55	28.77	31.59	29.43

* THE QUANTITY OF DISTILLATE SHOWN MAY NOT BE RECOVERABLE COMMERCIALY. IF THE TOTAL 482 C+ (900 F+) PRODUCT IS NOT FLUID ENOUGH TO BE EASILY REMOVED FROM THE VACUUM COLUMN

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SRC-II RUN DATA, MATERIAL BALANCES, AND PRODUCT PROPERTIES

RUN NUMBER	P99-52-0	P99-52-1	P99-52-2	P99-52-3	P99-52-4
DATE (START OF PERIOD)	4-28-79	4-29-79	4-30-79	5- 2-79	5- 3-79
TIME & DATE CODE (START & END OF PERIOD)	0815 1189	0815 1199	0815 1209	1015 1229	1215 1239
RUN HOURS INCLUDED IN PERIOD	113-132	137-156	161-180	211-228	237-248
COAL CHARGE	POWHATAN LR-25844	POWHATAN LR-25844	POWHATAN LR-25844	POWHATAN LR-25844	POWHATAN LR-25844
OPERATING CONDITIONS					
RECYCLE SLURRY/MF COAL RATIO	2.40	2.40	2.38	2.40	2.41
OIL TO SOLIDS RATIO	1.21	1.23	1.25	1.32	1.34
SLURRY COMPOSITION, WT%					
COAL (MOISTURE FREE)	29.4	29.4	29.6	29.5	29.3
DISTILLATE	34.1	32.4	33.2	35.2	36.0
482 C+ (900 F+) PYRIDINE SOL.	20.7	22.7	22.4	21.8	21.4
PYRIDINE INSOLUABLES	15.8	15.5	14.8	13.6	13.4
TOTAL HX PRESSURE, MPA	13.80	13.78	13.79	13.78	13.79
PRESS X NH2 IN INLET GAS, MPA	12.44	12.80	12.55	12.35	12.17
OUTLET H2 PARTIAL PRESS, MPA	8.93	8.93	8.93	8.93	8.93
DISSOLVER TEMPERATURES, C					
ZONE 4 (TOP)	459	459	459	459	459
ZONE 3	458	458	458	458	458
ZONE 2	456	456	456	456	456
ZONE 1 (BTM)	454	454	454	454	454
AVERAGE	457	457	457	457	457
PREHEATER OUTLET	391	390	390	394	395
NOMINAL SLURRY RES. TIME, HR	1.00	1.00	1.00	1.00	0.99
WHSV, KG/HR/DM3					
SLURRY	1.20	1.20	1.20	1.19	1.21
COAL (MOISTURE FREE)	0.35	0.35	0.38	0.35	0.35
DISSOLVER GAS					
DM3/KG SLURRY	461	462	469	458	455
DM3/KG MF FEED COAL	1564	1572	1584	1557	1551
HYDROGEN CONTENT, VOL%	90.2	90.7	91.0	89.6	88.3
FLUSH H2O, % OF PRODUCT H2O	220.0	161.7	197.9	236.7	173.6

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THE FOLLOWING WEIGHT BALANCE AND HYDROGEN CONSUMPTION DATA WERE CALCULATED FROM MEASURED UNIT DATA

NUM NUMBER	P99-52-0	P99-52-1	P99-52-2	P99-52-3	P99-52-4
WATER IN THE FEED COAL ASSUMED					
LOST FROM FEED TANK, %	100.0	100.0	100.0	100.0	100.0
WEIGHT BALANCE, O/I, WT%	97.1	98.2	94.7	98.4	97.4

THE FOLLOWING DATA THROUGH AND INCLUDING ELEMENTAL BALANCES HAVE BEEN CORRECTED TO A 100% WT BALANCE

YIELDS, WT% FEED COAL

HYDROGEN	-4.51	-4.36	-4.56	-4.49	-4.64
METHANE	5.55	5.52	5.57	5.49	5.59
ETHANE	4.27	4.28	4.37	4.31	4.49
PROPANE	4.19	4.23	4.28	4.31	4.59
I-BUTANE	0.26	0.28	0.24	0.27	0.30
N-BUTANE	2.00	2.02	2.03	2.05	2.18
TOTAL C1 TO C4	16.28	16.33	16.50	16.43	17.16
AMMONIA	0.54	0.44	0.48	0.48	0.45
HYDROGEN SULFIDE	2.16	2.05	2.05	1.84	1.97
CARBON DIOXIDE	0.95	0.91	0.90	0.79	0.75
CARBON MONOXIDE	0.08	0.11	0.08	0.09	0.16
HYDROGEN CHLORIDE	0.05	0.04	0.04	0.05	0.04
TOTAL OTHER GASES	3.78	3.55	3.56	3.25	3.36
WATER	7.33	7.57	7.77	7.60	7.28
DEBUTANIZER LIQUID	19.57	19.79	20.17	18.53	17.15
PROCESS SOLVENT	10.62	10.52	7.93	10.44	9.92
TOTAL C5+ DISTILLATE	30.19	30.31	28.10	28.98	27.07
VACUUM TOWER BOTTOMS	46.94	46.60	48.64	48.23	49.77

CHEMICAL H2 CONSUMPTION BY UNIT GAS BALANCE
DN3/KG FEED COAL

529	511	535	527	545
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CONVERSIONS, WT% FEED COAL

HYDROCRACKING	65.3	65.7	63.4	63.1	62.8
DESULFURIZATION	57.9	59.3	57.0	55.7	56.1
DENITROGENATION	29.8	29.5	27.5	28.1	27.3
OXYGEN REMOVAL	52.2	51.5	49.7	51.1	50.2

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RUN NUMBER	P99-52-0	P99-52-1	P99-52-2	P99-52-3	P99-52-4
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GAS RATES, DM3/KG FEED COAL

DISSOLVER INLET GAS	968.7	966.9	1012.1	923.7	927.6
TOTAL QUENCH GAS	642.4	634.0	660.3	657.9	665.5
TOTAL DISSOLVER GAS	1611.1	1600.9	1672.4	1581.6	1593.1
MAKEUP GAS TO DISSOLVER	465.0	442.7	484.1	507.5	536.7
MAKEUP GAS TO SEP. SPARGE	103.6	104.6	99.9	102.4	90.9
MAKEUP GAS TO INSTRUMENT TAPS	266.7	263.7	273.2	264.9	265.9
TOTAL MAKEUP GAS	835.3	811.1	857.1	874.8	893.4
DISSOLVER OUTLET GAS	1249.6	1257.1	1306.2	1220.8	1219.9
GAS LEAVING SCRUBBERS	1708.9	1730.4	1753.4	1648.0	1600.6
SEPARATOR SPARGE GAS	359.0	378.2	345.0	319.1	269.7
PRODUCT GASES					
BLEED OFF GAS	301.6	292.9	314.1	351.4	359.5
DEBUTANIZER GAS	49.8	50.9	51.9	50.3	50.5
AMINE REACTIVATOR GAS	17.4	17.0	16.4	15.1	15.4
NAPHTHA REACTIVATOR GAS	99.2	100.7	102.7	91.4	89.0
CHROMATOGRAPH BLEED GAS	5.8	5.7	5.8	5.7	5.8

ELEMENTAL BALANCES

WATER IN THE FEED COAL ASSUMED LOST FROM FEED TANK, %	100.0	100.0	100.0	100.0	100.0
CARBON, O/I	1.01	1.01	1.00	1.01	1.00
HYDROGEN, O/I	0.97	0.99	0.95	0.97	0.95
NITROGEN, O/I	1.06	1.00	1.05	1.04	1.03
SULFUR, O/I	1.03	0.98	1.01	0.96	0.99
OXYGEN, O/I	0.98	1.00	1.03	1.00	0.99
CHLORINE, O/I	1.03	0.86	0.95	1.09	0.88
METALS, O/I	1.01	0.98	1.04	1.00	1.09
ASH, O/I	1.01	0.98	1.04	1.00	1.09

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THE FOLLOWING DATA WERE BALANCED FOR CARBON, HYDROGEN, SULFUR, NITROGEN, OXYGEN, CHLORINE, AND METALS

RUN NUMBER P99-52-0 P99-52-1 P99-52-2 P99-52-3 P99-52-4

YIELDS, WTX MOISTURE FREE COAL

HYDROGEN (BY H BALANCE)	-4.21	-4.21	-4.09	-4.13	-4.14
METHANE	5.52	5.49	5.59	5.46	5.58
ETHANE	4.25	4.26	4.39	4.29	4.48
PROPANE	4.17	4.20	4.30	4.28	4.59
I-BUTANE	0.26	0.27	0.24	0.27	0.30
N-BUTANE	1.99	2.01	2.04	2.04	2.18
TOTAL C1 TO C4	16.18	16.24	16.56	16.33	17.13
AMMONIA (BY N BALANCE)	0.45	0.45	0.41	0.43	0.41
HYDROGEN SULFIDE (BY S BAL)	2.07	2.12	2.02	2.09	2.00
CARBON DIOXIDE	0.98	0.90	0.91	0.79	0.75
CARBON MONOXIDE	0.08	0.11	0.08	0.09	0.16
HYDROGEN CHLORIDE (BY CL BAL)	0.05	0.05	0.05	0.05	0.05
TOTAL OTHER GASES	3.60	3.62	3.46	3.34	3.37
WATER (BY OXYGEN BALANCE)	7.77	7.67	7.31	7.71	7.51
DEBUTANIZER LIQUID	19.45	19.69	20.25	18.42	17.13
PROCESS SOLVENT	10.55	10.46	7.96	10.38	9.90
TOTAL C5+ DISTILLATE	30.00	30.15	28.21	28.80	27.03
VTR PYRIDINE SOLUABLES	28.13	28.63	30.28	29.73	29.86
INSOLUABLE ORGANIC MATTER	6.23	5.59	5.98	5.93	6.95
ASH	12.29	12.29	12.29	12.29	12.29
VACUUM TOWER BOTTOMS	46.65	46.52	48.55	47.95	49.10

CHEMICAL H2 CONSUMPTION, DM3/KG MOISTURE FREE COAL

BY HYDROGEN BALANCE 493 494 479 485 485

CONVERSIONS, WTX MF COAL

HYDROCRACKING	65.5	65.9	63.3	63.3	62.8
DESULFURIZATION	58.1	59.5	56.8	56.0	56.2
DENITROGENATION	30.2	29.9	27.3	28.5	27.4
OXYGEN REMOVAL	52.1	51.4	49.1	51.0	49.8

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RUN NUMBER

P99-52-0 P99-52-1 P99-52-2 P99-52-3 P99-52-4

GAS COMPOSITIONS, VOL%

REACTOR INLET GAS

HYDROGEN	90.16	90.70	90.99	89.63	88.25
METHANE	8.55	8.23	7.94	8.69	9.56
ETHANE	1.13	1.02	1.04	1.53	1.91
PROPANE	0.00	0.00	0.00	0.06	0.24
I-BUTANE	0.00	0.00	0.00	0.00	0.00
N-BUTANE	0.04	0.00	0.03	0.06	0.01
PENTANES	0.00	0.00	0.00	0.00	0.00
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00	0.00
CARBON MONOXIDE	0.12	0.04	0.00	0.03	0.03
CARBON DIOXIDE	0.00	0.01	0.00	0.00	0.00

REACTOR OUTLET GAS (BUTANES AND LIGHTER ONLY)

HYDROGEN	68.13	68.98	69.65	67.07	65.11
METHANE	16.24	15.66	15.21	16.48	17.77
ETHANE	3.84	3.68	3.68	4.40	4.98
PROPANE	1.67	1.68	1.65	1.82	2.16
I-BUTANE	0.09	0.10	0.09	0.10	0.10
N-BUTANE	0.66	0.61	0.62	0.70	0.69
HYDROGEN SULFIDE	1.11	1.04	1.01	0.96	1.03
CARBON MONOXIDE	0.19	0.11	0.05	0.09	0.13
CARBON DIOXIDE	0.38	0.37	0.35	0.32	0.31
AMMONIA	0.55	0.45	0.47	0.50	0.47
WATER	7.11	7.30	7.21	7.53	7.23
HYDROGEN CHLORIDE	0.02	0.02	0.02	0.02	0.02

BLEED OFF GAS

HYDROGEN	82.75	82.83	83.70	82.95	81.57
METHANE	14.98	14.98	14.23	14.18	14.60
ETHANE	1.97	1.84	1.80	2.42	2.89
PROPANE	0.07	0.02	0.05	0.24	0.52
I-BUTANE	0.00	0.00	0.00	0.00	0.01
N-BUTANE	0.00	0.01	0.00	0.00	0.03
PENTANES	0.00	0.00	0.00	0.00	0.00
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00	0.00
CARBON MONOXIDE	0.23	0.31	0.21	0.21	0.37
CARBON DIOXIDE	0.00	0.00	0.01	0.00	0.00

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RUN NUMBER P99-52-0 P99-52-1 P99-52-2 P99-52-3 P99-52-4

GAS COMPOSITIONS, VOL%

AMINE REACTIVATOR GAS

HYDROGEN	17.06	17.25	17.56	17.54	19.76
METHANE	2.43	2.62	2.41	1.70	1.37
ETHANE	0.57	0.64	0.54	0.37	0.33
PROPANE	0.06	0.18	0.07	0.00	0.01
I-BUTANE	0.00	0.00	0.00	0.00	0.00
N-BUTANE	0.05	0.09	0.00	0.00	0.00
PENTANES	0.00	0.00	0.00	0.00	0.00
HYDROGEN SULFIDE	60.26	59.51	60.35	61.03	62.84
CARBON MONOXIDE	0.01	0.01	0.01	0.03	0.00
CARBON DIOXIDE	19.54	19.70	19.06	17.33	15.70

NAPHTHA REACTIVATOR GAS

HYDROGEN	22.83	22.60	22.93	23.35	22.69
METHANE	26.24	26.52	26.07	23.09	21.92
ETHANE	23.17	23.45	23.50	22.36	22.08
PROPANE	18.74	18.65	18.63	20.43	21.49
I-BUTANE	0.97	0.96	0.96	1.06	1.15
N-BUTANE	6.15	5.98	6.07	7.05	7.87
PENTANES	1.76	1.71	1.72	1.89	2.04
HYDROGEN SULFIDE	0.00	0.00	0.00	0.31	0.21
CARBON MONOXIDE	0.01	0.00	0.00	0.01	0.01
CARBON DIOXIDE	0.12	0.11	0.11	0.45	0.53

DEBUTANIZER GAS

HYDROGEN	51.28	51.61	52.52	53.68	53.51
METHANE	20.31	20.09	19.92	19.19	19.71
ETHANE	9.56	9.33	9.26	10.07	10.44
PROPANE	7.77	7.81	7.62	7.44	7.48
I-BUTANE	0.65	0.71	0.66	0.64	0.57
N-BUTANE	4.15	4.31	4.03	3.89	3.54
PENTANES	1.65	1.68	1.50	1.49	1.21
HYDROGEN SULFIDE	3.87	3.98	3.87	3.37	3.30
CARBON MONOXIDE	0.00	0.00	0.00	0.00	0.00
CARBON DIOXIDE	0.77	0.49	0.63	0.21	0.24

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COAL INSPECTIONS

RUN NUMBER P99-52-0 P99-52-1 P99-52-2 P99-52-3 P99-52-4

FEED COAL

ELEMENTAL ANALYSIS (MOISTURE FREE, NORMALIZED TO 100%)

CARBON, SEMI-MICRO, WTX	69.03	69.03	69.03	69.03	69.03
HYDROGEN, SEMI-MICRO, WTX	4.96	4.96	4.96	4.96	4.96
NITROGEN, G811, WTX	1.23	1.23	1.23	1.23	1.23
SULFUR, TOTAL, GRM1159, WTX	3.35	3.35	3.35	3.35	3.35
SULFUR, ORGANIC, WTX	2.07	2.07	2.07	2.07	2.07
SULFUR, PYRITIC, WTX	1.08	1.08	1.08	1.08	1.08
SULFUR, SULFATE, WTX	0.20	0.20	0.20	0.20	0.20
OXYGEN, GRM1117, WTX	14.65	14.65	14.65	14.65	14.65
OXYGEN, ORGANIC, WTX	8.79	8.79	8.79	8.79	8.79
OXYGEN, INORGANIC, WTX	5.87	5.87	5.87	5.87	5.87
CHLORINE, GRM1117, WTX	0.05	0.05	0.05	0.05	0.05
METALS, BY SPEC ASH, WTX	6.72	6.72	6.72	6.72	6.72

MINERAL MATTER, WTX*	13.87	13.87	13.87	13.87	13.87
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MOISTURE, D271, WTX	1.72	1.72	1.72	1.72	1.72
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VOLATILE MATTER, WTX	34.50	34.50	34.50	34.50	34.50
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ASH, D271, WTX	12.29	12.29	12.29	12.29	12.29
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SULFUR, WTX OF ASH	0.50	0.50	0.50	0.50	0.50
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OXYGEN, WTX OF ASH	44.80	44.80	44.80	44.80	44.80
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ALUMINUM, WTX OF ASH	12.0	12.0	12.0	12.0	12.0
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CALCIUM, WTX OF ASH	1.5	1.5	1.5	1.5	1.5
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IRON, WTX OF ASH	16.6	16.6	16.6	16.6	16.6
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MAGNESIUM, WTX OF ASH	.4	.4	.4	.4	.4
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POTASSIUM, WTX OF ASH	1.5	1.5	1.5	1.5	1.5
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SILICON, WTX OF ASH	20.4	20.4	20.4	20.4	20.4
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SODIUM, WTX OF ASH	.2	.2	.2	.2	.2
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TITANIUM, WTX OF ASH	.6	.6	.6	.6	.6
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TRACE METALS, WTX OF ASH	.1	.1	.1	.1	.1
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PARTICLE SIZE DISTRIBUTION, WTX.

ON 80 MESH

THRU 80 ON 200 MESH	8.8	8.8	8.8	8.8	8.8
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THRU 200 ON 325 MESH	28.5	28.5	28.5	28.5	28.5
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THRU 325 ON 625 MESH	34.7	34.7	34.7	34.7	34.7
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THRU 625 MESH	28.0	28.0	28.0	28.0	28.0
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* BY PARR'S EQUATION: MINERAL MATTER = 1.08 X ASH + 0.55 X PYRITIC SULFUR

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PRODUCT INSPECTIONS

RUN NUMBER	P99-52-0	P99-52-1	P99-52-2	P99-52-3	P99-52-4
DEBUTANIZER BOTTOMS					
GRAVITY, D287, API	25.3	25.1	24.4	24.0	23.4
ELEMENTAL ANALYSIS (NORMALIZED TO 100%)					
CARBON, SEMI-MICRO, WTX	84.73	84.55	84.54	84.64	84.62
HYDROGEN, SEMI-MICRO, WTX	10.38	10.34	10.29	10.11	10.24
NITROGEN, G811, WTX	0.78*	0.76	0.78	0.78	0.80
SULFUR, GRM156, WTX	0.13	0.14	0.10	0.15	0.12
OXYGEN, GRM117, WTX	3.98	4.21	4.29	4.32	4.22*
VISCOSITY, KIN. D445, CS					
-35C				17.51	
OC				4.04	
WATER, G525, PPM	8175	7931	8138	7933	8120
HEAT OF COMB., D240, BTU/LB				17645	
POUR POINT, D97, C				-65	
DISTILLATION, D86, C					
INITIAL BOILING POINT	61	64	61	62	70
5 VOL %	77	78	79	78	83
10 VOL %	107	110	107	110	113
30 VOL %	162	169	172	172	173
50 VOL %	193	197	198	199	198
70 VOL %	211	212	214	214	216
90 VOL %	233	234	237	239	243
95 VOL %	247	247	250	250	264
END POINT	254	257	258	258	277
WATER (INCLUDES FLUSH WATER)					
TOTAL CARBON, PPM	12800	14400	14400	12800	14400
ORGANIC CARBON, PPM	10400	11600	11700	10700	12000
NITROGEN, G811, WTX	1.70*	1.70	1.67	1.44	1.70
SULFUR, GRM156, WTX	1.33	1.33*	1.33*	0.80	1.33*
CHLORINE, APHA, PPM	1900*	1900*	1900*	1900	1900*

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

PRODUCT INSPECTIONS

RUN NUMBER		P99-52-0	P99-52-1	P99-52-2	P99-52-3	P99-52-4
PROCESS SOLVENT						
GRAVITY, D207, AP1		7.6	7.0	6.8	6.6	6.7
ELEMENTAL ANALYSIS (NORMALIZED TO 100X)						
CARBON, SEMI-MICRO, WT%		88.25	88.04	88.35	88.23	88.15
HYDROGEN, SEMI-MICRO, WT%		8.41*	8.44	8.38	8.38	8.47
NITROGEN, GB11, WT%		1.00	0.98	1.01	1.00	1.01
SULFUR, GRM1156, WT%		0.24	0.25	0.26	0.28	0.26
OXYGEN, GRM1117, WT%		2.10	2.30	2.00	2.11	2.11*
VISCOSITY, KIN. D445, CS						
25 C					19.23	
50 C					6.66	
100 C					2.05	
WATER, GS25, PPM		663	592	945	410	593
HEAT OF COMB., D240, BTU/LB					17313	
POUR POINT, D97, C					-23	
DISTILLATION, CUSHMAN, C						
CORRECTED TO 760 MM HG USING K10 FACTOR						
INITIAL BOILING POINT		185	173	191	179	146
10 VOL %		250	248	256	241	251
20 VOL %		267	264	276	261	261
30 VOL %		281	276	289	281	286
40 VOL %		297	292	301	294	299
50 VOL %		317	306	315	311	317
60 VOL %		326	322	337	326	328
70 VOL %		347	334	354	349	353
80 VOL %		372	359	378	377	378
90 VOL %		413	400	411	402	413
END POINT		474	461	482	483	492

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

PRODUCT INSPECTIONS

RUN NUMBER	P99-52-0	P99-52-1	P99-52-2	P99-52-3	P99-52-4
VACUUM TOWER BOTTOMS					
SPECIFIC GRAVITY, D70, G/CC	1.51	1.51	1.51	1.47	1.49
ELEMENTAL ANALYSIS (NORMALIZED TO 100X)					
CARBON, SEMI-MICRO, WTX	64.88	65.01	64.82	65.11	64.50
HYDROGEN, SEMI-MICRO, WTX	3.85	3.85	3.77	3.93	3.79
NITROGEN, GB11, WTX	1.29	1.31	1.33	1.31	1.32
SULFUR, TOTAL, D1552, WTX	2.89	2.80	2.86	2.95	2.85
SULFUR, SULFIDE, WTX					
SULFUR, PYRITIC, WTX				0.28	
OXYGEN, GRM1117, WTX	12.76	12.93	12.97	12.74	12.83
CHLORINE, D2361, WTX	0.01*	0.01*	0.01*	0.01*	0.01*
METALS, WTX	14.33	14.09	14.24	13.64	14.69
ASH, G599, WTX	26.20	25.76	26.03	25.48	26.85
SULFUR, WTX OF ASH	0.50*	0.50*	0.50*	0.50*	0.50*
OXYGEN, WTX OF ASH	44.80*	44.80*	44.80*	44.80*	44.80*
METALS, WTX OF ASH (BY DIFF)	54.70	54.70	54.70	54.70	54.70
PYRIDINE INSOLUABLES, WTX	39.5	38.1	37.7	37.9	39.8
MELTING POINT, G898, C	138	155	137	135	155
HEAT OF COMB., D240, BTU/LB				11778	
CONCARBON RSD, D189, WTX				77.1	
DISTILLATION, CUSHMAN, C					
CONVERTED TO 760 MM HG USING K10 FACTOR					
INITIAL BOILING POINT	427	433	383	379	374
INTERMEDIATE BOILING POINT	490	489	444		436
END POINT	506	500	462	436	439
OVER AT INTERMED BP, WTX	6.0	7.1	5.8		5.4
RESIDUE, WTX	90.8	90.0	91.6	92.4	92.8

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

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IN THE FOLLOWING DATA, DISTILLATE YIELDS HAVE BEEN ADJUSTED TO THE BOILING RANGES INDICATED.

RUN NUMBER	P99-52-0	P99-52-1	P99-52-2	P99-52-3	P99-52-4
YIELDS, WT% MOISTURE FREE COAL					
HYDROGEN (BY H BALANCE)	-4.21	-4.21	-4.09	-4.13	-4.14
METHANE	5.52	5.49	5.59	5.46	5.58
ETHANE	4.25	4.26	4.39	4.29	4.48
PROPANE	4.17	4.20	4.30	4.28	4.59
I-BUTANE	0.26	0.27	0.24	0.27	0.30
N-BUTANE	1.99	2.01	2.04	2.04	2.18
TOTAL C1 TO C4	16.18	16.24	16.56	16.33	17.13
AMMONIA (BY H BALANCE)	0.45	0.45	0.41	0.43	0.41
HYDROGEN SULFIDE (BY S BAL)	2.07	2.12	2.02	2.00	2.00
CARBON DIOXIDE	0.95	0.90	0.91	0.79	0.75
CARBON MONOXIDE	0.08	0.11	0.08	0.09	0.16
HYDROGEN CHLORIDE (BY CL BAL)	0.05	0.05	0.05	0.05	0.05
TOTAL OTHER GASES	3.60	3.62	3.46	3.34	3.37
WATER (BY OXYGEN BALANCE)	7.77	7.67	7.31	7.71	7.51
C5 - 193 C (C5 - 380 F)	7.97	7.58	7.49	6.93	6.73
193 - 288 C (380 - 550 F)	14.57	15.44	14.84	14.70	12.53
288 - 482 C (550 - 900 F)	10.49	10.49	10.44	13.50	13.36
TOTAL C5+ DISTILLATE+	33.03	33.50	32.77	35.13	32.63
482 C+ (900 F+) PYRIDINE SOL.	25.10	25.28	25.71	23.40	24.26
INSOLUABLE ORGANIC MATTER	6.23	5.59	5.98	5.93	6.95
ASH	12.29	12.29	12.29	12.29	12.29
TOTAL 482 C+ (900 F+) PROD	43.62	43.17	43.98	41.62	43.51

* THE QUANTITY OF DISTILLATE SHOWN MAY NOT BE RECOVERABLE COMMERCIALY, IF THE TOTAL 482 C+ (900 F+) PRODUCT IS NOT FLUID ENOUGH TO BE EASILY REMOVED FROM THE VACUUM COLUMN

IN THE FOLLOWING DATA, DISTILLATE YIELDS HAVE BEEN ADJUSTED TO THE BOILING RANGES INDICATED

RUN NUMBER P99-52-0 P99-52-1 P99-52-2 P99-52-3 P99-52-4

YIELDS, WTX MOISTURE AND ASH FREE COAL

HYDROGEN (BY H BALANCE)	-4.80	-4.81	-4.66	-4.71	-4.72
METHANE	6.29	6.26	6.38	6.22	6.37
ETHANE	4.84	4.86	5.00	4.89	5.11
PROPANE	4.75	4.79	4.90	4.88	5.23
I-BUTANE	0.30	0.31	0.27	0.30	0.34
N-BUTANE	2.27	2.29	2.33	2.33	2.48
TOTAL C1 TO C4	18.44	18.52	18.88	18.62	19.53
AMMONIA (BY N BALANCE)	0.51	0.51	0.46	0.49	0.47
HYDROGEN SULFIDE (BY S BAL)	2.36	2.42	2.31	2.28	2.28
CARBON DIOXIDE	1.08	1.03	1.03	0.90	0.85
CARBON MONOXIDE	0.10	0.12	0.09	0.10	0.18
HYDROGEN CHLORIDE (BY CL BAL)	0.05	0.05	0.05	0.05	0.05
TOTAL OTHER GASES	4.11	4.13	3.95	3.81	3.84
WATER (BY OXYGEN BALANCE)	8.86	8.75	8.33	8.79	8.56
C5 - 193 C (C5 - 380 F)	9.09	8.64	8.54	7.90	7.67
193 - 288 C (380 - 550 F)	16.61	17.60	16.91	16.76	14.29
288 - 482 C (550 - 900 F)	11.96	11.96	11.91	15.39	15.24
TOTAL C5+ DISTILLATE*	37.66	38.20	37.37	40.05	37.20
482 C+ (900 F+) PYRIDINE SOL.	28.61	28.83	29.32	26.68	27.66
INSOLUBLE ORGANIC MATTER	7.11	6.38	6.82	6.76	7.92
TOTAL 482 C+ ORGANIC PROD	35.72	35.20	36.13	33.44	35.59

* THE QUANTITY OF DISTILLATE SHOWN MAY NOT BE RECOVERABLE COMMERCIALY, IF THE TOTAL 482 C+ (900 F+) PRODUCT IS NOT FLUID ENOUGH TO BE EASILY REMOVED FROM THE VACUUM COLUMN

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SHC-11 RUN DATA, MATERIAL BALANCES, AND PRODUCT PROPERTIES

RUN NUMBER	P99-53-1	P99-53-2	P99-53-3	P99-53-5	P99-53-6	P99-53-7	P99-53-8
DATE (START OF PERIOD)	5-23-79	5-24-79	5-25-79	5-27-79	5-28-79	5-29-79	5-30-79
TIME & DATE CODE (START & END OF PERIOD)	0815 1439	0815 1449	0815 1459	0815 1479	0815 1469	0815 1499	0815 1509
RUN HOURS INCLUDED IN PERIOD	65-84	89-108	113-132	161-180	185-204	209-228	233-252
COAL CHARGE	POWHATAN LR-25844	POWHATAN LR-25844	POWHATAN LR-25844	POWHATAN LR-25844	POWHATAN LR-25844	POWHATAN LR-25844	POWHATAN LR-25844
OPERATING CONDITIONS							
RECYCLE SLURRY/MF COAL RATIO	1.54	1.55	1.56	1.52	1.54	1.55	1.56
OIL TO SOLIDS RATIO	1.19	1.20	1.22	1.17	1.17	1.15	1.18
SLURRY COMPOSITION, WTX							
COAL (MOISTURE FREE)	39.4	39.3	39.1	39.6	39.3	39.2	39.1
DISTILLATE	42.7	42.4	43.9	41.6	41.6	39.6	40.6
482 C+ (900 F+) PYRIDINE SOL.	11.7	12.1	11.1	12.3	12.4	13.8	13.6
PYRIDINE INSOLUABLES	6.3	6.3	5.9	6.4	6.7	7.3	6.7
TOTAL RX PRESSURE, MPA	13.79	13.80	13.81	13.80	13.81	13.80	13.79
PRESS X XH2 IN INLET GAS, MPA	12.46	12.41	12.38	12.43	12.47	12.45	12.49
OUTLET H2 PARTIAL PRESS, MPA	9.63	9.63	9.63	9.63	9.63	9.63	9.63
DISSOLVER TEMPERATURES, C							
ZONE 4 (TOP)	458	457	457	458	458	458	458
ZONE 3	456	456	456	456	456	456	456
ZONE 2	454	454	454	454	454	455	455
ZONE 1 (BTM)	452	452	452	452	452	452	452
AVERAGE	455	455	455	455	455	455	455
PREHEATER OUTLET	388	389	391	392	391	391	390
NOMINAL SLURRY RES. TIME, MIN	1.33	1.33	1.32	1.34	1.33	1.33	1.32
WHSV, KG/HR/DM3							
SLURRY	0.90	0.90	0.91	0.90	0.90	0.90	0.91
COAL (MOISTURE FREE)	0.35	0.35	0.35	0.36	0.36	0.36	0.35
DISSOLVER GAS							
DM3/KG SLURRY	692	685	690	704	699	696	701
DM3/KG MF FEED COAL	1758	1744	1766	1776	1777	1774	1794
HYDROGEN CONTENT, VOL%	90.4	89.9	89.7	90.0	90.3	90.3	90.6
GENERAL PRODUCT PROPERTIES							

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THE FOLLOWING WEIGHT BALANCE AND HYDROGEN CONSUMPTION DATA WERE CALCULATED FROM MEASURED UNIT DATA

UN NUMBER	P99-53-1	P99-53-2	P99-53-3	P99-53-5	P99-53-6	P99-53-7	P99-53-8
ATER IN THE FEED COAL ASSUMED							
LOST FROM FEED TANK, %	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EIGHT BALANCE, O/I, WTX	95.1	93.7	97.5	94.4	95.9	95.9	98.1

THE FOLLOWING DATA THROUGH AND INCLUDING ELEMENTAL BALANCES HAVE BEEN CORRECTED TO A 100% WT BALANCE

IELDS, WTX FEED COAL

HYDROGEN	-3.86	-3.86	-3.72	-3.72	-3.70	-3.77	-3.85
METHANE	5.48	5.65	5.52	5.52	5.49	5.54	5.35
ETHANE	4.19	4.26	4.10	4.24	4.13	4.12	4.03
PROPANE	3.98	4.01	3.83	3.90	3.86	3.85	3.82
I-BUTANE	0.24	0.23	0.23	0.22	0.23	0.23	0.21
N-BUTANE	1.87	1.87	1.81	1.83	1.76	1.79	1.79
244 TOTAL C1 TO C4	15.76	16.02	15.50	15.80	15.48	15.52	15.20
AMMONIA	0.40	0.41	0.38	0.40	0.39	0.34	0.35
HYDROGEN SULFIDE	2.12	2.11	2.07	2.14	2.03	2.09	2.18
CARBON DIOXIDE	0.82	0.88	0.80	0.87	0.78	0.82	0.80
CARBON MONOXIDE	0.16	0.13	0.12	0.09	0.11	0.12	0.08
HYDROGEN CHLORIDE	0.03	0.02	0.03	0.03	0.02	0.02	0.01
TOTAL OTHER GASES	3.53	3.54	3.40	3.53	3.34	3.38	3.43
WATER	6.71	7.20	6.77	6.52	6.39	6.92	7.43
DEBUTANIZER LIQUID	20.47	20.59	18.55	19.69	21.49	28.79	27.71
PROCESS SOLVENT	4.86	5.70	4.74	5.38	5.95	-2.99	0.49
TOTAL C5+ DISTILLATE	25.34	26.30	23.29	25.57	27.44	25.80	28.20
VACUUM TOWER BOTTOMS	52.52	50.81	54.75	52.30	51.06	52.15	49.59

CHEMICAL H2 CONSUMPTION BY UNIT GAS BALANCE

DM3/KG FEED COAL	453	453	436	437	434	443	451
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CONVERSIONS, WTX FEED COAL

HYDROCRACKING	57.7	59.8	58.2	58.2	59.9	60.9	62.7
DESULFURIZATION	62.9	66.4	66.6	67.0	68.1	65.9	62.5
DENITROGENATION	23.7	24.5	21.8	23.3	26.3	24.1	26.9
OVERALL REMOVAL	44.2	46.4	48.2	48.5	50.1	48.7	51.1

RUN NUMBER	P99-53-1	P99-53-2	P99-53-3	P99-53-5	P99-53-6	P99-53-7	P99-53-8
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GAS RATES, DM3/KG FEED COAL

DISSOLVER INLET GAS	1246.7	1242.2	1217.6	1214.3	1205.3	1197.6	1153.5
TOTAL QUENCH GAS	601.1	619.7	594.3	667.1	646.8	651.9	676.0
TOTAL DISSOLVER GAS	1847.7	1861.9	1811.9	1881.4	1852.1	1849.6	1829.6
MAKEUP GAS TO DISSOLVER	479.9	462.8	444.1	481.5	497.0	481.9	501.8
MAKEUP GAS TO SEP. SPARGE	77.0	89.6	99.7	86.8	68.8	70.9	65.1
MAKEUP GAS TO INSTRUMENT TAPS	272.4	276.5	265.8	273.7	269.4	269.4	264.0
TOTAL MAKEUP GAS	829.2	828.8	809.6	842.0	835.1	822.1	830.8
DISSOLVER OUTLET GAS	1557.6	1575.1	1537.1	1608.9	1577.7	1568.4	1536.5
GAS LEAVING SCRUBBERS	1973.6	2055.1	2060.3	2070.8	1951.8	1957.6	1887.1
SEPARATOR SPARGE GAS	296.5	360.2	406.7	339.1	256.4	272.0	237.2
PRODUCT GASES							
BLEED OFF GAS	381.5	380.7	381.1	414.1	404.6	384.3	382.8
DERUTANIZER GAS	38.0	39.7	37.2	37.5	37.0	34.9	33.4
AMINE REACTIVATOR GAS	16.1	16.1	16.3	16.6	16.0	16.7	17.2
NAPTHA REACTIVATOR GAS	98.7	100.9	95.9	96.9	98.7	100.7	99.9
CHROMATOGRAPH BLEED GAS	4.8	4.7	4.4	4.5	4.5	4.4	4.4

ELEMENTAL BALANCES

WATER IN THE FEED COAL ASSUMED LOST FROM FEED TANK, %	100.0	100.0	100.0	100.0	100.0	100.0	100.0
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CARBON, O/I	1.00	1.00	1.00	1.00	1.01	1.00	1.00
HYDROGEN, O/I	1.00	1.01	0.99	1.01	1.01	1.02	1.02
NITROGEN, O/I	1.03	1.02	1.03	1.03	1.00	0.98	0.96
SULFUR, O/I	1.03	0.99	0.98	0.99	0.95	0.99	1.05
OXYGEN, O/I	0.99	1.01	1.00	0.98	0.96	1.01	1.01
CHLORINE, O/I	1.01	0.72	0.97	1.03	1.00	0.76	0.79
METALS, O/I	1.03	0.96	1.01	0.98	0.96	0.97	0.98
ASH, O/I	1.03	0.96	1.01	0.98	0.96	0.97	0.98

THE FOLLOWING DATA WERE BALANCED FOR CARBON, HYDROGEN, SULFUR, NITROGEN, OXYGEN, CHLORINE, AND METALS

RUN NUMBER	P99-53-1	P99-53-2	P99-53-3	P99-53-5	P99-53-6	P99-53-7	P99-53-8
YIELDS, MTX MOISTURE FREE COAL							
HYDROGEN (BY H BALANCE)	-3.86	-3.94	-3.59	-3.81	-3.78	-3.98	-4.04
METHANE	5.50	5.64	5.51	5.50	5.41	5.54	5.37
ETHANE	4.28	4.26	4.10	4.23	4.08	4.12	4.05
PROPANE	3.99	4.01	3.83	3.98	3.81	3.85	3.84
I-BUTANE	0.24	0.23	0.23	0.21	0.23	0.23	0.21
N-BUTANE	1.87	1.87	1.81	1.82	1.74	1.79	1.80
TOTAL C1 TO C4	15.80	16.02	15.48	15.74	15.27	15.53	15.27
AMMONIA (BY N BALANCE)	0.36	0.37	0.33	0.36	0.41	0.36	0.40
HYDROGEN SULFIDE (BY S BAL)	2.02	2.14	2.15	2.16	2.21	2.12	2.01
CARBON DIOXIDE	0.82	0.88	0.80	0.87	0.77	0.82	0.80
CARBON MONOXIDE	0.16	0.13	0.12	0.08	0.11	0.12	0.08
HYDROGEN CHLORIDE (BY CL BAL)	0.03	0.04	0.03	0.03	0.02	0.03	0.02
TOTAL OTHER GASES	3.39	3.55	3.43	3.50	3.53	3.45	3.32
WATER (BY OXYGEN BALANCE)	6.83	7.05	6.77	6.84	7.19	6.82	7.21
DEBUTANIZER LIQUID	20.53	20.59	18.53	19.62	21.20	28.82	27.83
PROCESS SOLVENT	4.88	5.70	4.73	5.86	5.87	-2.99	0.49
TOTAL C5+ DISTILLATE	25.40	26.29	23.27	25.48	27.07	25.82	28.32
VTB PYRIDINE SOLUABLES	33.60	33.11	35.80	34.09	32.98	33.05	31.50
INSOLUABLE ORGANIC MATTER	7.25	6.36	7.27	6.62	6.18	7.74	6.84
ASH	11.57	11.57	11.57	11.57	11.57	11.57	11.57
VACUUM TOWER BOTTOMS	52.42	51.04	54.65	52.28	50.73	52.36	49.92
CHEMICAL H2 CONSUMPTION, DM3/KG MOISTURE FREE COAL							
BY HYDROGEN BALANCE	452	462	422	447	444	467	474
CONVERSIONS, MTX MF-COAL							
HYDROCRACKING	57.6	59.8	58.3	58.4	60.4	60.9	62.6
DESULFURIZATION	62.8	66.4	66.7	67.1	68.5	68.8	62.3
DENITROGENATION	23.5	24.8	21.8	23.5	27.3	24.1	26.6
OXYGEN REMOVAL	48.5	50.1	47.8	48.3	50.4	48.3	50.5

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RUN NUMBER	P99-53-1	P99-53-2	P99-53-3	P99-53-5	P99-53-6	P99-53-7	P99-53-8
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GAS COMPOSITIONS, VOL%

REACTOR INLET GAS

HYDROGEN	90.38	89.90	89.70	90.03	90.29	90.27	90.56
METHANE	0.35	0.77	0.80	0.45	0.31	0.43	0.15
ETHANE	1.24	1.28	1.43	1.50	1.30	1.25	1.23
PROPANE	0.00	0.00	0.01	0.00	0.00	0.01	0.00
I-BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
N-BUTANE	0.00	0.02	0.00	0.00	0.00	0.00	0.00
PENTANES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CARBON MONOXIDE	0.02	0.04	0.05	0.02	0.09	0.04	0.05
CARBON DIOXIDE	0.00	0.00	0.02	0.00	0.00	0.00	0.00

REACTOR OUTLET GAS (BUTANES AND LIGHTER ONLY)

HYDROGEN	73.57	72.75	72.79	73.80	74.12	73.61	73.43
METHANE	14.23	14.72	14.76	14.23	14.09	14.28	13.92
ETHANE	3.40	3.44	3.58	3.63	3.41	3.35	3.33
PROPANE	1.31	1.30	1.28	1.24	1.26	1.26	1.27
I-BUTANE	0.07	0.07	0.07	0.07	0.07	0.07	0.07
N-BUTANE	0.47	0.48	0.45	0.44	0.43	0.44	0.45
HYDROGEN SULFIDE	0.89	0.87	0.88	0.87	0.84	0.87	0.92
CARBON MONOXIDE	0.10	0.10	0.12	0.06	0.16	0.10	0.10
CARBON DIOXIDE	0.27	0.28	0.28	0.28	0.25	0.27	0.26
AMMONIA	0.34	0.34	0.32	0.33	0.33	0.28	0.30
WATER	5.33	5.64	5.45	5.04	5.03	5.46	5.95
HYDROGEN CHLORIDE	0.01	0.01	0.01	0.01	0.01	0.01	0.00

BLEED OFF GAS

HYDROGEN	84.80	84.65	84.52	84.96	85.39	84.78	85.30
METHANE	12.90	13.14	13.19	12.75	12.47	13.06	12.66
ETHANE	1.92	1.92	2.00	2.10	1.89	1.90	1.87
PROPANE	0.02	0.00	0.01	0.00	0.01	0.00	0.00
I-BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
N-BUTANE	0.00	0.00	0.01	0.00	0.00	0.00	0.00
PENTANES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CARBON MONOXIDE	0.35	0.28	0.27	0.17	0.24	0.25	0.18
CARBON DIOXIDE	0.00	0.01	0.00	0.00	0.00	0.00	0.00

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RUN NUMBER		P99-53-1	P99-53-2	P99-53-3	P99-53-5	P99-53-6	P99-53-7	P99-53-8
GAS COMPOSITIONS, VOL%								
AMINE REACTIVATOR GAS								
	HYDROGEN	17.23	17.02	18.14	18.49	20.40	17.67	16.86
	METHANE	2.13	2.08	2.15	1.82	1.86	2.02	1.88
	ETHANE	0.32	0.43	0.40	0.41	0.39	0.37	0.38
	PROPANE	0.07	0.01	0.00	0.00	0.03	0.01	0.02
	I-BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	N-BUTANE	0.03	0.01	0.00	0.00	0.00	0.00	0.00
	PENTANES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	HYDROGEN SULFIDE	61.21	60.48	60.17	60.58	58.15	60.71	62.39
	CARBON MONOXIDE	0.03	0.07	0.04	0.01	0.00	0.02	0.03
	CARBON DIOXIDE	18.98	19.89	19.10	18.69	19.17	19.20	18.43
NAPHTHA REACTIVATOR GAS								
	HYDROGEN	24.69	24.22	24.18	25.71	26.91	25.47	25.40
	METHANE	24.31	24.95	24.59	23.61	23.76	24.64	24.08
	ETHANE	22.45	22.46	22.41	21.90	21.79	22.13	22.01
	PROPANE	19.21	19.02	19.23	19.28	18.67	18.64	18.89
	I-BUTANE	1.02	1.02	1.05	1.03	0.96	0.99	1.01
	N-BUTANE	6.29	6.25	6.38	6.39	6.06	6.09	6.29
	PENTANES	1.85	1.90	1.97	1.92	1.73	1.82	1.85
	HYDROGEN SULFIDE	0.03	0.05	0.07	0.00	0.00	0.07	0.28
	CARBON MONOXIDE	0.01	0.00	0.00	0.00	0.00	0.00	0.01
	CARBON DIOXIDE	0.16	0.14	0.13	0.14	0.12	0.15	0.20
DEBUTANIZER GAS								
	HYDROGEN	55.50	55.70	58.20	56.92	57.76	60.77	61.49
	METHANE	19.05	19.55	19.24	18.53	18.11	18.31	18.25
	ETHANE	9.52	9.37	8.89	9.63	9.34	8.52	8.31
	PROPANE	6.64	6.52	6.08	6.55	6.66	5.92	5.62
	I-BUTANE	0.56	0.54	0.53	0.55	0.58	0.55	0.49
	N-BUTANE	3.73	3.45	3.44	3.42	3.34	3.37	3.15
	PENTANES	1.29	1.26	0.41	0.85	1.14	0.84	0.94
	HYDROGEN SULFIDE	3.36	3.16	3.08	3.40	2.93	1.68	1.63
	CARBON MONOXIDE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CARBON DIOXIDE	0.35	0.45	0.13	0.16	0.14	0.04	0.12

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COAL INSPECTIONS

RUN NUMBER		P99-53-1	P99-53-2	P99-53-3	P99-53-5	P99-53-6	P99-53-7	P99-53-8
FEED COAL								
ELEMENTAL ANALYSIS (MOISTURE FREE, NORMALIZED TO 100%)								
CARBON, SEMI-MICRO, WT%		70.32	70.32	70.32	70.32	70.32	70.32	70.32
HYDROGEN, SEMI-MICRO, WT%		5.10	5.10	5.10	5.10	5.10	5.10	5.10
NITROGEN, GRM, WT%		1.24	1.24	1.24	1.24	1.24	1.24	1.24
SULFUR, TOTAL, GRM159, WT%		3.03	3.03	3.03	3.03	3.03	3.03	3.03
SULFUR, ORGANIC, WT%		1.75	1.75	1.75	1.75	1.75	1.75	1.75
SULFUR, PYRITIC, WT%		1.08	1.08	1.08	1.08	1.08	1.08	1.08
SULFUR, SULFATE, WT%		0.20	0.20	0.20	0.20	0.20	0.20	0.20
OXYGEN, GRM117, WT%		13.92	13.92	13.92	13.92	13.92	13.92	13.92
OXYGEN, ORGANIC, WT%		8.44	8.44	8.44	8.44	8.44	8.44	8.44
OXYGEN, INORGANIC, WT%		5.48	5.48	5.48	5.48	5.48	5.48	5.48
CHLORINE, GRM117, WT%		0.05	0.05	0.05	0.05	0.05	0.05	0.05
METALS, BY SPEC ASH, WT%		6.33	6.33	6.33	6.33	6.33	6.33	6.33
MINERAL MATTER, WT%		13.09	13.09	13.09	13.09	13.09	13.09	13.09
137 249	MOISTURE, D271, WT%	1.51	1.51	1.51	1.51	1.51	1.51	1.51
	VOLATILE MATTER, WT%	34.50	34.50	34.50	34.50	34.50	34.50	34.50
	ASH, D271, WT%	11.57	11.57	11.57	11.57	11.57	11.57	11.57
	SULFUR, WT% OF ASH	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	OXYGEN, WT% OF ASH	44.80	44.80	44.80	44.80	44.80	44.80	44.80
	ALUMINUM, WT% OF ASH	12.0	12.0	12.0	12.0	12.0	12.0	12.0
	CALCIUM, WT% OF ASH	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	IRON, WT% OF ASH	16.6	16.6	16.6	16.6	16.6	16.6	16.6
	MAGNESIUM, WT% OF ASH	.4	.4	.4	.4	.4	.4	.4
	POTASSIUM, WT% OF ASH	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	SILICON, WT% OF ASH	20.4	20.4	20.4	20.4	20.4	20.4	20.4
	SODIUM, WT% OF ASH	.2	.2	.2	.2	.2	.2	.2
	TITANIUM, WT% OF ASH	.6	.6	.6	.6	.6	.6	.6
	TRACE METALS, WT% OF ASH	.1	.1	.1	.1	.1	.1	.1
218	PARTICLE SIZE DISTRIBUTION, WT%							
	ON 80 MESH							
	THRU 80 ON 200 MESH	8.8	8.8	8.8	8.8	8.8	8.8	8.8
	THRU 200 ON 325 MESH	28.5	28.5	28.5	28.5	28.5	28.5	28.5
	THRU 325 ON 625 MESH	34.7	34.7	34.7	34.7	34.7	34.7	34.7
	THRU 625 MESH	28.0	28.0	28.0	28.0	28.0	28.0	28.0

* BY PAHR'S EQUATION: MINERAL MATTER = 1.08 X ASH + 0.55 X PYRITIC SULFUR

PRODUCT INSPECTIONS

M-NUMBER	P99-53-1	P99-53-2	P99-53-3	P99-53-5	P99-53-6	P99-53-7	P99-53-8
BUTANIZER BOTTOMS							
GRAVITY, D287, API	23.27	23.9	24.0	24.0	23.5	21.6	21.6
ELEMENTAL ANALYSIS (NORMALIZED TO 100%)							
CARBON, SEMI-MICRO, WT%	84.17	84.43	84.32	84.27	84.44	84.39	84.51
HYDROGEN, SEMI-MICRO, WT%	10.47	10.25	10.29	10.37	10.16	10.12	10.10
NITROGEN, GB11, WT%	0.74*	0.73	0.74	0.74	0.74	0.80	0.82
SULFUR, GRM156, WT%	0.13	0.12	0.16	0.14	0.18	0.22	0.16
OXYGEN, GRM117, WT%	4.49	4.47	4.89*	4.48*	4.48*	4.48*	4.41
VISCOSITY, KIN. D445, CS							
-35C					16.79		
OC					4.15		
WATER, GS25, PPM	7729	8950	9928	8719	8092	8022	7823
HEAT OF COND., D240, BTU/LB					17621		
POUR POINT, D97, °C					-54		
DISTILLATION, D86, °C							
INITIAL BOILING POINT	69	71	67	70	70	68	69
5 VOL %	78	77	79	80	80	78	78
10 VOL %	118	116	117	119	120	136	124
30 VOL %	179	176	177	174	181	191	191
50 VOL %	202	198	198	197	202	210	212
70 VOL %	218	214	213	211	218	227	230
90 VOL %	242	241	234	234	242	250	252
95 VOL %	252	252	243	244	251	259	260
END POINT	268	261	257	261	259	270	272
WATER (INCLUDES FLUSH WATER)							
TOTAL CARBON, PPM	18000	15200	16800	13200	15600	13200	12000
ORGANIC CARBON, PPM	15300	12300	14100	9700	13200	10700	9750
NITROGEN, GB11, WT%	1.64	1.66	1.62	1.64	1.55	1.30	1.40
SULFUR, GRM156, WT%	2.40*	2.40*	2.43*	2.40*	2.40*	2.40*	2.40*
CHLORINE, ALPHA, PPM	1675	1212	1622	1649	1063	798	532

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

PRODUCT INSPECTIONS

RUN NUMBER	P99-53-1	P99-53-2	P99-53-3	P99-53-5	P99-53-6	P99-53-7	P99-53-8
PROCESS SOLVENT							
GRAVITY, D287, API	6.8	6.9	6.8	6.6	6.6	6.4	6.5
ELEMENTAL ANALYSIS (NORMALIZED TO 100%)							
CARBON, SEMI-MICRO, WTX	87.97	88.16	88.02	87.93	87.90	87.82*	87.92
HYDROGEN, SEMI-MICRO, WTX	8.55	8.30	8.43	8.45	8.39	8.44*	8.42
NITROGEN, SEMI-MICRO, WTX	0.92	0.93	0.95*	0.96	0.96	0.98	0.93
SULFUR, GRM1156, WTX	0.27	0.29	0.32	0.33	0.36	0.31	0.32
OXYGEN, GRM1117, WTX	2.28	2.31	2.29	2.32	2.39	2.38	2.41*
VISCOSITY, KIN, D445, CS							
25 C					19.08		
50 C					6.64		
100 C					2.05		
WATER, G529, PPM	655	1170	854	515	671	706	625
HEAT OF COMB., D240, BTU/LB					17313		
POUR POINT, D97, C					-15		
DISTILLATION, CUSHMAN, C							
CORRECTED TO 760 MM HG USING K10 FACTOR							
INITIAL BOILING POINT	196	169	193	199	192	179	185
10 VOL %	254	258	208	252	256	256	258
20 VOL %	270	266	274	270	272	269	277
30 VOL %	292	280	287	288	288	292	292
40 VOL %	303	300	304	298	308	303	308
50 VOL %	319	316	318	314	340	317	320
60 VOL %	326	332	338	326	364	331	331
70 VOL %	351	349	353	349	386	352	351
80 VOL %	377	389	384	364	397	380	376
90 VOL %	408	414	406	403	421	413	413
END POINT	486	489	500	508	512	506	506

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

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PRODUCT INSPECTIONS

RUN NUMBER	P99-53-1	P99-53-2	P99-53-3	P99-53-5	P99-53-6	P99-53-7	P99-53-8
VACUUM TOWER BOTTOMS							
SPECIFIC GRAVITY, D70, G/CC	1.45	1.45	1.44	1.47	1.46	1.42	1.45
ELEMENTAL ANALYSIS (NORMALIZED TO 100%)							
CARBON, SEMI-MICRO, WTX	68.51	69.06	69.71	69.17	69.54	69.37	68.58*
HYDROGEN, SEMI-MICRO, WTX	4.06	4.19	4.03	4.11	4.02	4.23*	4.22
NITROGEN, GRILL, WTX	1.43	1.43	1.44	1.42	1.37	1.42	1.35
SULFUR, TOTAL, D1552, WTX	2.06	1.91	1.76	1.81	1.77	1.87	2.18
SULFUR, SULFIDE, WTX					1.49		
SULFUR, PYRITIC, WTX							
OXYGEN, GRILL, WTX	11.49*	11.45*	11.41*	11.69	11.41*	11.32*	11.17
CHLORINE, D2361, WTX	0.04	0.03	0.04	0.04	0.06	0.04	0.06
METALS, WTX	12.41	11.92	11.61	11.77	11.83	11.74	12.43
ASH, G599, WTX	22.69	21.80	21.23	21.51	21.63	21.46	22.73
SULFUR, WTX OF ASH	0.50*	0.50*	0.50*	0.50*	0.50*	0.50*	0.50*
OXYGEN, WTX OF ASH	44.80*	44.80*	44.80*	44.80*	44.80*	44.80*	44.80*
METALS, WTX OF ASH (BY DIFF)	54.70	54.70	54.70	54.70	54.70	54.70	54.70
PYRIDINE INSOLUABLES, WTX	36.0	34.6	34.4	34.4	34.4	36.5*	36.5
MELTING POINT, G898, C	150	145	150	150	150	155	153
HEAT OF COMB., D240, BTU/LB					12486		
CONCARBON RSD, D189, WTX					76.7		
DISTILLATION, CUSHMAN, C							
CONVERTED TO 760 MM HG USING K10 FACTOR							
INITIAL BOILING POINT	368	416	392	401	421	403	392
INTERMEDIATE BOILING POINT		477	481	464		468	451
END POINT	467	504	517	493	506	533	506
OVER AT INTERMED BP, WTX		5.3	5.6	5.8		6.6	6.2
RESIDUE, WTX	93.6	91.4	88.4	91.7	90.0	87.4	88.8

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

IN THE FOLLOWING DATA, DISTILLATE YIELDS HAVE BEEN ADJUSTED TO THE BOILING RANGES INDICATED

RUN NUMBER	P99-53-1	P99-53-2	P99-53-3	P99-53-5	P99-53-6	P99-53-7	P99-53-8
YIELDS, WT% MOISTURE FREE COAL							
HYDROGEN (BY H BALANCE)	-3.86	-3.94	-3.59	-3.81	-3.78	-3.98	-4.04
METHANE	6.50	5.64	5.51	5.60	5.41	5.54	5.37
ETHANE	4.20	4.26	4.10	4.23	4.08	4.12	4.05
PROPANE	3.99	4.01	3.83	3.88	3.81	3.85	3.84
I-BUTANE	0.24	0.23	0.23	0.21	0.23	0.23	0.21
N-BUTANE	1.87	1.87	1.81	1.82	1.74	1.79	1.80
TOTAL C1 TO C4	15.80	16.02	15.48	15.74	15.27	15.53	15.27
AMMONIA (BY N BALANCE)	0.36	0.37	0.33	0.36	0.41	0.36	0.40
HYDROGEN SULFIDE (BY S BAL)	2.02	2.14	2.15	2.16	2.21	2.12	2.01
CARBON DIOXIDE	0.82	0.88	0.80	0.87	0.77	0.82	0.80
CARBON MONOXIDE	0.16	0.13	0.12	0.08	0.11	0.12	0.08
HYDROGEN CHLORIDE (BY CL BAL)	0.03	0.04	0.03	0.03	0.02	0.03	0.02
TOTAL OTHER GASES	3.39	3.55	3.43	3.50	3.53	3.45	3.32
WATER (BY OXYGEN BALANCE)	6.83	7.05	6.77	6.81	7.19	6.82	7.21
C5 - 193 C (C5 - 380 F)	6.98	7.47	6.56	7.06	7.00	9.51	9.18
193 - 288 C (380 - 550 F)	14.61	14.71	13.39	14.10	15.64	18.47	18.79
288 - 482 C (550 - 900 F)	7.54	6.91	7.74	8.02	7.58	1.77	4.10
TOTAL C5+ DISTILLATE	29.13	29.10	27.69	29.19	30.22	29.75	32.07
482 C+ (900 F+) PYRIDINE SOL.	29.88	30.30	31.38	30.38	29.83	29.12	27.76
INSOLUBLE ORGANIC MATTER	7.25	6.36	7.27	6.62	6.18	7.74	6.84
ASH	11.57	11.57	11.57	11.57	11.57	11.57	11.57
TOTAL 482 C+ (900 F+) PROD	48.70	48.23	50.22	48.57	47.58	48.43	46.17

* THE QUANTITY OF DISTILLATE SHOWN MAY NOT BE RECOVERABLE COMMERCIALY, IF THE TOTAL 482 C+ (900 F+) PRODUCT IS NOT FLUID ENOUGH TO BE EASILY REMOVED FROM THE VACUUM COLUMN

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IN THE FOLLOWING DATA, DISTILLATE YIELDS HAVE BEEN ADJUSTED TO THE BOILING RANGES INDICATED

RUN NUMBER	P99-53-1	P99-53-2	P99-53-3	P99-53-5	P99-53-6	P99-53-7	P99-53-8
YIELDS, WT% MOISTURE AND ASH FREE COAL							
HYDROGEN (BY H BALANCE)	-4.36	-4.46	-4.07	-4.31	-4.28	-4.50	-4.57
METHANE	6.21	6.38	6.23	6.33	6.12	6.27	6.07
ETHANE	4.75	4.81	4.64	4.78	4.61	4.66	4.58
PROPANE	4.52	4.54	4.33	4.39	4.31	4.35	4.34
I-BUTANE	0.27	0.26	0.26	0.24	0.26	0.26	0.24
N-BUTANE	2.11	2.12	2.05	2.06	1.97	2.02	2.03
TOTAL C1 TO C4	17.87	18.11	17.51	17.80	17.27	17.56	17.27
AMMONIA (BY N BALANCE)	0.40	0.42	0.37	0.40	0.47	0.41	0.45
HYDROGEN SULFIDE (BY S BAL)	2.29	2.42	2.43	2.45	2.50	2.40	2.27
CARBON DIOXIDE	0.93	0.99	0.90	0.98	0.88	0.93	0.91
CARBON MONOXIDE	0.18	0.14	0.14	0.18	0.13	0.13	0.09
HYDROGEN CHLORIDE (BY CL BAL)	0.04	0.04	0.04	0.03	0.02	0.03	0.02
TOTAL OTHER GASES	3.64	4.01	3.88	3.96	3.99	3.90	3.75
WATER (BY OXYGEN BALANCE)	7.73	7.97	7.65	7.70	8.13	7.71	8.16
C5 - 193 C (C5 - 380 F)	7.89	8.45	7.42	7.99	7.91	10.75	10.39
193 - 288 C (380 - 550 F)	16.52	16.64	15.14	15.95	17.68	20.89	21.24
288 - 482 C (550 - 900 F)	8.53	7.82	8.76	9.07	8.57	2.00	4.63
TOTAL C5+ DISTILLATE*	32.94	32.90	31.32	33.01	34.17	33.64	36.26
482 C+ (900 F+) PYRIDINE SOL.	33.79	34.26	35.48	34.35	33.74	32.93	31.39
INSOLUBLE ORGANIC MATTER	8.20	7.19	8.23	7.48	6.98	8.76	7.74
TOTAL 482 C+ ORGANIC PROD	41.99	41.45	43.71	41.83	40.72	41.68	39.13

* THE QUANTITY OF DISTILLATE SHOWN MAY NOT BE RECOVERABLE COMMERCIALY, IF THE TOTAL 482 C+ (900 F+) PRODUCT IS NOT FLUID ENOUGH TO BE EASILY REMOVED FROM THE VACUUM COLUMN

SRC-11 RUN DATA, MATERIAL BALANCES, AND PRODUCT PROPERTIES

RUN NUMBER	P99-54-2	P99-54-5	P99-54-6	P99-54-7	P99-54-8	P99-54-9	P99-54-11
DATE (START OF PERIOD)	6- 3-79	6- 7-79	6- 8-79	6- 9-79	6-10-79	6-11-79	6-13-79
TIME & DATE CODE (START & END OF PERIOD)	0815 1549	0815 1589	0815 1599	0815 1609	0815 1619	0815 1629	0815 1649
RUN HOURS INCLUDED IN PERIOD	60-79	156-175	180-199	204-223	228-247	252-271	300-319
COAL CHARGE	POWHATAN LR-25844	POWHATAN LR-25844	POWHATAN LR-25844	POWHATAN LR-25844	POWHATAN LR-25844	POWHATAN LR-25844	POWHATAN LR-25844
OPERATING CONDITIONS							
RECYCLE SLURRY/WF COAL RATIO	1.55	1.55	1.57	1.55	1.56	1.56	1.56
OIL TO SOLIDS RATIO	1.12	1.05	1.05	1.02	1.03	1.05	1.07
SLURRY COMPOSITION, WTX							
COAL (MOISTURE FREE)	39.2	39.2	38.9	39.3	39.0	39.1	39.1
DISTILLATE	36.9	34.8	34.9	34.3	34.2	34.6	35.8
4H2 C+ (900 F+) PYRIDINE SOL.	15.9	16.4	16.2	16.3	16.6	16.6	15.8
PYRIDINE INSOLUABLES	8.0	9.6	9.9	10.1	10.2	9.6	9.3
TOTAL RX PRESSURE, MPA	13.81	13.78	13.79	13.79	13.81	13.81	13.81
PRESS X XH2 IN INLET GAS, MPA	12.42	12.38	12.41	12.45	12.49	12.41	12.36
OUTLET H2 PARTIAL PRESS, MPA	9.51	9.51	9.51	9.51	9.51	9.51	9.51
DISSOLVER TEMPERATURES, C							
ZONE 4 (TOP)	458	457	458	457	458	457	458
ZONE 3	456	456	456	456	456	456	456
ZONE 2	454	454	454	454	454	454	454
ZONE 1 (BTM)	452	452	452	452	452	452	451
AVERAGE	455	455	455	455	455	455	455
PREHEATER OUTLET	391	391	391	391	390	390	389
NOMINAL SLURRY RES. TIME, HR	1.32	1.32	1.31	1.32	1.32	1.32	1.32
WHSV, KG/HR/DN3							
SLURRY	0.91	0.91	0.91	0.91	0.91	0.91	0.91
COAL (MOISTURE FREE)	0.36	0.36	0.36	0.36	0.36	0.36	0.36
DISSOLVER GAS							
DN3/KG SLURRY	698	691	690	699	684	685	687
DN3/KG WF FEED COAL	1782	1765	1772	1781	1753	1752	1757
HYDROGEN CONTENT, VOL%	90.0	89.8	90.0	90.3	90.5	89.9	89.5
CLASH H2O & OF PRODUCT H2O	107.2	108.2	107.2	107.2	107.2	107.2	107.2

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THE FOLLOWING WEIGHT BALANCE AND HYDROGEN CONSUMPTION DATA WERE CALCULATED FROM MEASURED UNIT DATA

RUN NUMBER	P99-54-2	P99-54-5	P99-54-6	P99-54-7	P99-54-8	P99-54-9	P99-54-11
WATER IN THE FEED COAL ASSUMED							
LOST FROM FEED TANK, %	100.0	100.0	100.0	100.0	100.0	100.0	100.0
WEIGHT BALANCE, O/I, WTX	98.3	98.4	98.6	99.3	98.8	99.0	98.9

THE FOLLOWING DATA THROUGH AND INCLUDING ELEMENTAL BALANCES HAVE BEEN CORRECTED TO A 100% WT BALANCE

YIELDS, WTX FEED COAL

HYDROGEN	-3.85	-3.99	-3.89	-3.86	-3.91	-3.79	-3.86
METHANE	5.44	5.49	5.41	5.41	5.43	5.42	5.48
ETHANE	4.13	4.23	4.27	4.25	4.23	4.15	4.23
PROPANE	3.94	4.00	4.04	4.03	3.94	3.83	3.99
I-BUTANE	0.20	0.22	0.19	0.21	0.18	0.17	0.23
N-BUTANE	1.86	1.90	1.96	1.91	1.85	1.85	1.93
TOTAL C1 TO C4	15.57	15.85	15.86	15.81	15.63	15.42	15.86
AMMONIA	0.39	0.39	0.38	0.40	0.37	0.40	0.40
HYDROGEN SULFIDE	1.66	1.83	1.88	1.75	1.79	1.67	1.74
CARBON DIOXIDE	0.89	0.96	0.88	0.94	0.87	0.79	0.80
CARBON MONOXIDE	0.14	0.09	0.07	0.09	0.07	0.08	0.07
HYDROGEN CHLORIDE	0.02	0.02	0.02	0.03	0.01	0.02	0.02
TOTAL OTHER GASES	3.09	3.29	3.23	3.20	3.11	2.96	3.03
WATER	7.30	7.36	6.55	7.76	6.79	7.24	7.22
DEBUTANIZER LIQUID	16.90	17.20	17.20	17.31	17.51	17.32	16.65
PROCESS SOLVENT	12.31	12.82	14.14	9.86	10.58	13.00	14.70
TOTAL C5+ DISTILLATE	29.21	30.02	31.34	27.17	28.09	30.31	31.35
VACUUM TOWER BOTTOMS	48.68	47.46	46.90	49.93	50.28	47.86	46.40
CHEMICAL H2 CONSUMPTION BY UNIT GAS BALANCE							
DM3/KG FEED COAL	451	468	456	453	458	445	452
CONVERSIONS, WTX FEED COAL							
HYDROCRACKING	60.9	63.4	63.6	60.7	59.7	62.9	64.0
DESULFURIZATION	63.4	60.9	61.3	59.7	62.8	63.9	63.2
DENITROGENATION	24.9	26.6	24.8	26.3	22.1	23.7	26.7
OXYGEN REMOVAL	52.1	50.6	50.0	50.1	47.7	47.8	51.5

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RUN NUMBER

P99-54-2 P99-54-5 P99-54-6 P99-54-7 P99-54-8 P99-54-9 P99-54-11

GAS RATES, DM3/KG FEED COAL

DISSOLVER INLET GAS	1147.0	1113.4	1121.3	1117.8	1114.0	1125.1	1130.0
TOTAL QUENCH GAS	665.4	679.6	676.2	676.3	660.5	644.4	639.5
TOTAL DISSOLVER GAS	1812.4	1793.0	1797.5	1794.1	1774.5	1769.5	1777.5
MAKEUP GAS TO DISSOLVER	469.7	501.0	502.3	499.0	501.7	506.2	509.8
MAKEUP GAS TO SEP. SPARGE	80.2	73.4	74.7	80.0	62.3	75.9	77.7
MAKEUP GAS TO INSTRUMENT TAPS	262.8	261.9	261.4	259.7	260.9	260.5	260.7
TOTAL MAKEUP GAS	812.8	836.4	838.4	838.6	845.0	842.6	848.2
DISSOLVER OUTLET GAS	1522.8	1488.7	1505.8	1504.4	1478.9	1484.6	1488.2
GAS LEAVING SCRUBBERS	1941.6	1868.0	1888.6	1908.3	1889.3	1866.7	1868.7
SEPARATOR SPARGE GAS	309.4	262.6	267.2	287.5	291.2	265.3	270.9
PRODUCT GASES							
BLEED OFF GAS	365.5	376.2	389.1	393.4	395.3	401.5	395.3
DEBUTANIZER GAS	34.7	32.9	30.2	28.8	27.9	30.9	36.0
AMINE REACTIVATOR GAS	16.1	16.7	17.3	17.1	17.3	16.6	17.1
NAPHTHA REACTIVATOR GAS	102.6	95.6	98.2	97.4	96.4	96.2	98.0
CHROMATOGRAPH BLEED GAS	4.3	10.6	11.8	12.2	12.4	12.5	12.5

ELEMENTAL BALANCES

WATER IN THE FEED COAL ASSUMED LOST FROM FEED TANK, %	100.0	100.0	100.0	100.0	100.0	100.0	100.0
CARBON, O/I	1.00	0.99	1.00	0.98	0.99	0.99	1.00
HYDROGEN, O/I	0.99	0.99	0.98	0.98	0.97	0.98	1.03
NITROGEN, O/I	1.00	0.99	1.00	0.99	1.02	1.02	0.99
SULFUR, O/I	0.94	1.03	1.04	1.01	1.00	0.94	0.97
OXYGEN, O/I	1.03	1.05	1.00	1.08	1.03	1.06	1.02
CHLORINE, O/I	0.78	0.57	0.74	0.84	0.77	0.89	1.00
METALS, O/I	0.98	0.99	1.00	1.05	1.03	1.02	0.98
ASH, O/I	0.98	0.99	1.00	1.05	1.03	1.02	0.98

THE FOLLOWING DATA WERE BALANCED FOR CARBON, HYDROGEN, SULFUR, NITROGEN, OXYGEN, CHLORINE, AND METALS

RUN NUMBER P99-54-2 P99-54-5 P99-54-6 P99-54-7 P99-54-8 P99-54-9 P99-54-11

YIELDS, WTK MOISTURE FREE COAL

HYDROGEN (BY H BALANCE)	-3.70	-3.82	-3.74	-3.70	-3.60	-3.58	-4.10
METHANE	5.44	5.53	5.40	5.51	5.46	5.46	5.51
ETHANE	4.13	4.26	4.26	4.33	4.25	4.18	4.25
PROPANE	3.94	4.03	4.04	4.10	3.96	3.86	4.00
I-BUTANE	0.20	0.22	0.19	0.21	0.18	0.17	0.23
N-BUTANE	1.86	1.92	1.95	1.94	1.86	1.87	1.94
TOTAL C1 TO C4	15.57	15.96	15.84	16.09	15.72	15.54	15.93

AMMONIA (BY N BALANCE)	0.38	0.40	0.38	0.39	0.33	0.36	0.41
HYDROGEN SULFIDE (BY S BAL)	1.82	1.74	1.77	1.70	1.80	1.83	1.81
CARBON DIOXIDE	0.89	0.97	0.88	0.95	0.87	0.79	0.80
CARBON MONOXIDE	0.14	0.09	0.07	0.09	0.07	0.08	0.07
HYDROGEN CHLORIDE (BY CL BAL)	0.03	0.04	0.04	0.04	0.02	0.03	0.02
TOTAL OTHER GASES	3.27	3.25	3.13	3.17	3.10	3.08	3.12

WATER (BY OXYGEN BALANCE)	6.85	6.56	6.61	6.41	6.25	6.29	6.88
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DEBUTANIZER LIQUID	16.98	17.32	17.18	17.61	17.60	17.45	16.72
PROCESS SOLVENT	12.31	12.91	14.12	10.03	10.64	13.10	14.76
TOTAL C5+ DISTILLATE	29.21	30.23	31.30	27.65	28.24	30.55	31.48

VIB PYRIDINE SOLUABLES	30.91	30.01	28.10	30.66	30.84	29.38	28.90
INSOLUBLE ORGANIC MATTER	7.04	6.98	7.91	8.88	8.63	7.88	6.95
ASH	10.84	10.84	10.84	10.84	10.84	10.84	10.84
VACUUM TOWER BOTTOMS	48.79	47.82	46.85	50.38	50.30	48.10	46.69

CHEMICAL H2 CONSUMPTION, DM3/KG MOISTURE FREE COAL							
BY HYDROGEN BALANCE	434	448	438	433	423	419	481

CONVERSIONS, WTK MF COAL							
HYDROCRACKING	60.9	63.1	63.6	60.0	59.8	62.6	63.8
DESULFURIZATION	63.4	60.7	61.4	59.0	62.6	63.6	63.0
DENITROGENATION	24.9	26.1	24.9	25.0	21.7	23.1	26.4
OXYGEN REMOVAL	51.7	50.0	49.7	48.9	47.3	47.1	51.1

RUN NUMBER: P99-54-2 P99-54-5 P99-54-6 P99-54-7 P99-54-8 P99-54-9 P99-54-11

GAS COMPOSITIONS, VOL%

REACTOR INLET GAS

HYDROGEN	89.96	89.81	89.98	90.26	90.46	89.88	89.50
METHANE	8.57	8.53	8.37	8.14	8.05	8.51	8.74
ETHANE	1.37	1.58	1.58	1.55	1.49	1.56	1.62
PROPANE	0.00	0.00	0.01	0.00	0.00	0.00	0.00
I-BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
N-BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PENTANES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CARBON MONOXIDE	0.10	0.08	0.05	0.04	0.00	0.03	0.09
CARBON DIOXIDE	0.00	0.00	0.00	0.00	0.00	0.01	0.00

REACTOR OUTLET GAS (BUTANES AND LIGHTER ONLY)

HYDROGEN	72.61	71.76	72.72	72.36	72.09	72.27	71.68
METHANE	14.53	14.73	14.45	14.05	14.22	14.58	14.94
ETHANE	3.55	3.89	3.91	3.83	3.83	3.83	3.93
PROPANE	1.32	1.37	1.39	1.36	1.37	1.32	1.37
I-BUTANE	0.07	0.08	0.08	0.08	0.08	0.07	0.08
N-BUTANE	0.47	0.49	0.51	0.49	0.48	0.48	0.50
HYDROGEN SULFIDE	0.71	0.80	0.82	0.75	0.79	0.73	0.76
CARBON MONOXIDE	0.18	0.14	0.09	0.10	0.04	0.08	0.14
CARBON DIOXIDE	0.29	0.32	0.30	0.32	0.30	0.28	0.28
AMMONIA	0.33	0.34	0.33	0.34	0.33	0.35	0.35
WATER	5.91	6.08	6.39	6.33	5.68	6.00	5.97
HYDROGEN CHLORIDE	0.01	0.01	0.01	0.01	0.00	0.01	0.01

BLEED OFF GAS

HYDROGEN	84.56	84.09	84.77	84.79	84.86	85.10	85.03
METHANE	13.17	13.41	12.84	12.83	12.88	12.58	12.70
ETHANE	1.94	2.23	2.19	2.15	2.10	2.11	2.09
PROPANE	0.01	0.07	0.04	0.04	0.00	0.03	0.03
I-BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
N-BUTANE	0.00	0.01	0.01	0.00	0.01	0.02	0.00
PENTANES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CARBON MONOXIDE	0.33	0.19	0.14	0.19	0.15	0.16	0.15
CARBON DIOXIDE	0.00	0.00	0.00	0.00	0.00	0.00	0.01

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RUN NUMBER

P99-54-2 P99-54-5 P99-54-6 P99-54-7 P99-54-8 P99-54-9 P99-54-11

GAS COMPOSITIONS, VOL%

AMINE REACTIVATOR GAS

HYDROGEN	17.59	14.65	14.92	15.22	16.20	19.21	18.78
METHANE	1.95	1.99	1.84	2.27	2.20	2.07	2.07
ETHANE	0.36	0.51	0.49	0.86	0.64	0.58	0.73
PROPANE	0.01	0.08	0.03	0.36	0.17	0.09	0.29
I-BUTANE	0.00	0.00	0.00	0.02	0.00	0.00	0.01
N-BUTANE	0.00	0.05	0.06	0.21	0.15	0.12	0.15
PENTANES	0.00	0.00	0.00	0.07	0.00	0.02	0.04
HYDROGEN SULFIDE	60.32	61.65	63.81	61.51	60.91	59.10	60.33
CARBON MONOXIDE	0.03	0.08	0.05	0.10	0.08	0.02	0.04
CARBON DIOXIDE	19.75	20.99	18.81	19.39	20.64	18.78	17.56

NAPHTHA REACTIVATOR GAS

HYDROGEN	25.37	22.54	23.29	22.82	22.45	25.42	25.03
METHANE	24.73	24.39	23.70	23.81	24.06	23.52	23.47
ETHANE	22.00	22.76	22.63	22.90	23.23	22.01	22.08
PROPANE	18.71	20.15	20.15	20.33	20.27	19.37	19.58
I-BUTANE	1.00	1.10	1.10	1.11	1.11	1.03	1.04
N-BUTANE	6.23	6.85	6.93	6.88	6.71	6.62	6.73
PENTANES	1.45	2.08	2.06	2.06	2.06	1.91	1.95
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CARBON MONOXIDE	0.00	0.01	0.00	0.00	0.00	0.00	0.00
CARBON DIOXIDE	0.11	0.12	0.14	0.12	0.10	0.12	0.12

DEBUTANIZER GAS

HYDROGEN	57.44	55.61	54.89	56.86	55.68	56.05	58.26
METHANE	18.80	19.69	19.32	18.41	18.84	19.51	18.51
ETHANE	9.08	9.79	10.07	9.53	9.95	10.12	9.31
PROPANE	6.49	6.73	7.04	6.75	7.00	6.88	6.39
I-BUTANE	0.53	0.56	0.62	0.58	0.61	0.59	0.57
N-BUTANE	3.57	3.67	3.95	3.85	3.88	3.69	3.63
PENTANES	0.81	0.39	0.44	0.50	0.37	0.13	0.29
HYDROGEN SULFIDE	3.11	3.27	3.37	3.35	3.47	2.94	2.92
CARBON MONOXIDE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CARBON DIOXIDE	0.16	0.30	0.30	0.17	0.21	0.09	0.11

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COAL INSPECTIONS

RUN NUMBER	P99-54-2	P99-54-5	P99-54-6	P99-54-7	P99-54-8	P99-54-9	P99-54-11
FEED COAL							
ELEMENTAL ANALYSIS (MOISTURE FREE, NORMALIZED TO 100X)							
CARBON, SEMI-MICRO, WTX	71.62	71.62	71.62	71.62	71.62	71.62	71.62
HYDROGEN, SEMI-MICRO, WTX	5.26	5.26	5.26	5.26	5.26	5.26	5.26
NITROGEN, GRM, WTX	1.27	1.27	1.27	1.27	1.27	1.27	1.27
SULFUR, TOTAL, GRM, WTX	2.71	2.71	2.71	2.71	2.71	2.71	2.71
SULFUR, ORGANIC, WTX	1.63	1.63	1.63	1.63	1.63	1.63	1.63
SULFUR, PYRITIC, WTX	0.88	0.88	0.88	0.88	0.88	0.88	0.88
SULFUR, SULFATE, WTX	0.20	0.20	0.20	0.20	0.20	0.20	0.20
OXYGEN, GRM, WTX	13.16	13.16	13.16	13.16	13.16	13.16	13.16
OXYGEN, ORGANIC, WTX	7.98	7.98	7.98	7.98	7.98	7.98	7.98
OXYGEN, INORGANIC, WTX	5.18	5.18	5.18	5.18	5.18	5.18	5.18
CHLORINE, GRM, WTX	0.05	0.05	0.05	0.05	0.05	0.05	0.05
METALS, BY SPEC ASH, WTX	5.93	5.93	5.93	5.93	5.93	5.93	5.93
MINERAL MATTER, WTX							
MOISTURE, D271, WTX	1.30	1.30	1.30	1.30	1.30	1.30	1.30
VOLATILE MATTER, WTX	34.50	34.50	34.50	34.50	34.50	34.50	34.50
ASH, D271, WTX	10.84	10.84	10.84	10.84	10.84	10.84	10.84
SULFUR, WTX OF ASH	0.50	0.50	0.50	0.50	0.50	0.50	0.50
OXYGEN, WTX OF ASH	44.80	44.80	44.80	44.80	44.80	44.80	44.80
ALUMINUM, WTX OF ASH	12.0	12.0	12.0	12.0	12.0	12.0	12.0
CALCIUM, WTX OF ASH	1.5	1.5	1.5	1.5	1.5	1.5	1.5
IRON, WTX OF ASH	16.6	16.6	16.6	16.6	16.6	16.6	16.6
MAGNESIUM, WTX OF ASH	.4	.4	.4	.4	.4	.4	.4
POTASSIUM, WTX OF ASH	1.5	1.5	1.5	1.5	1.5	1.5	1.5
SILICON, WTX OF ASH	20.4	20.4	20.4	20.4	20.4	20.4	20.4
SODIUM, WTX OF ASH	.2	.2	.2	.2	.2	.2	.2
TITANIUM, WTX OF ASH	.6	.6	.6	.6	.6	.6	.6
TRACE METALS, WTX OF ASH	.1	.1	.1	.1	.1	.1	.1
PARTICLE SIZE DISTRIBUTION, WTX							
ON 80 MESH							
THRU 80 ON 200 MESH	5.6	5.6	5.6	5.6	5.6	5.6	5.6
THRU 200 ON 325 MESH	26.6	26.6	26.6	26.6	26.6	26.6	26.6
THRU 325 ON 625 MESH	35.1	35.1	35.1	35.1	35.1	35.1	35.1
THRU 625 MESH	32.7	32.7	32.7	32.7	32.7	32.7	32.7

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PRODUCT INSPECTIONS

RUN NUMBER	P99-54-2	P99-54-5	P99-54-6	P99-54-7	P99-54-8	P99-54-9	P99-54-11
DEBUTANIZER BOTTOMS							
GRAVITY, D287, API	25.2	24.8	24.8	24.9	25.4	24.9	24.9
ELEMENTAL ANALYSIS (NORMALIZED TO 100%)							
CARBON, SEMI-MICRO, WT%	84.35	84.21	84.35*	84.16	84.37*	84.32	84.26
HYDROGEN, SEMI-MICRO, WT%	10.43	10.53	10.34*	10.36	10.35*	10.41	10.51
NITROGEN, GB11, WT%	0.77	0.80	0.81	0.92	0.79	0.81	0.81
SULFUR, GRM1156, WT%	0.13	0.17	0.17	0.33	0.17	0.18	0.15
OXYGEN, GRM1117, WT%	4.32*	4.29*	4.32*	4.33*	4.32*	4.24*	4.27*
VISCOSITY, KIN. D445, CS							
-35C						15.83	
OC						7.76	
WATER, G525, PPM	8905	8407	8194	8322	8155	8260	7450
HEAT OF COMB., D240, BTU/LB						17354	
POUR POINT, D97, C						-54	
DISTILLATION, D86, C							
INITIAL BOILING POINT	67	67	68	70	70	97	70
5 VOL %	74	78	79	81	82	103	80
10 VOL %	106	106	109	102	108	111	114
30 VOL %	168	172	173	172	167	132	170
50 VOL %	193	196	197	194	194	150	193
70 VOL %	211	211	211	213	211	176	211
90 VOL %	231	233	234	234	239	209	236
95 VOL %	241	247	246	249	248	220	254
END POINT	259	259	261	259	258	235	268
WATER (INCLUDES FLUSH WATER)							
TOTAL CARBON, PPM	14400	13000	13000	12500	9100	8600	7600
ORGANIC CARBON, PPM	10600	9200	9600	8500	6500	6050	4600
NITROGEN, GB11, WT%	1.66	1.66	1.69	1.65	1.64	1.74	1.73
SULFUR, GRM1156, WT%	0.49	0.96	0.73	0.44	0.70*	0.63	0.50
CHLORINE, APHA, PPM	1143	1090	1356	1489	532	1196	1303

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

PRODUCT INSPECTIONS

RUN NUMBER	P99-54-2	P99-54-5	P99-54-6	P99-54-7	P99-54-8	P99-54-9	P99-54-11
PROCESS SOLVENT							
GRAVITY, D287, API	6.8	7.5	7.4	7.2	6.8	7.0	7.3
ELEMENTAL ANALYSIS (NORMALIZED TO 100%)							
CARBON, SEMI-MICRO, WT%	88.08	87.97	87.96*	87.94	87.66	88.08	87.87
HYDROGEN, SEMI-MICRO, WT%	8.40	8.57	8.50*	8.54	8.71	8.44	8.51
NITROGEN, GRM11, WT%	0.99	0.94	1.00	1.01	1.02	1.00	1.03
SULFUR, GRM1156, WT%	0.32	0.31	0.34	0.32	0.40	0.30	0.39
OXYGEN, GRM1117, WT%	2.21*	2.21*	2.20*	2.19*	2.21*	2.18*	2.20*
VISCOSITY, KIN, D445, CS							
25 C						21.86	
50 C						7.30	
100 C						2.19	
WATER, G525, PPM	590	754	538	2424	686	584	580
HEAT OF COMB., D240, BTU/LB						17332	
POUR POINT, D97, C						-7	
DISTILLATION, CUSHMAN, C							
CORRECTED TO 760 MM HG USING K10 FACTOR							
INITIAL BOILING POINT	193	189	173	202	196	201	165
10 VOL %	269	246	252	262	251	242	251
20 VOL %	278	268	274	265	268	271	271
30 VOL %	297	282	290	279	288	284	288
40 VOL %	308	293	306	294	299	298	302
50 VOL %	326	305	319	305	311	316	319
60 VOL %	339	316	337	322	326	329	334
70 VOL %	354	336	359	339	348	350	353
80 VOL %	383	351	377	359	377	370	376
90 VOL %	434	382	408	391	422	398	399
END POINT	517	433	512	458	469	481	481

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

PRODUCT INSPECTIONS

RUN NUMBER	P99-54-2	P99-54-5	P99-54-6	P99-54-7	P99-54-8	P99-54-9	P99-54-11
VACUUM TOWER BOTTOMS							
SPECIFIC GRAVITY, D70, G/CC	1.45	1.46	1.46	1.48	1.46	1.47	1.50
ELEMENTAL ANALYSIS (NORMALIZED TO 100%)							
CARBON, SEMI-MICRO, WTX	69.33	68.78	68.47	69.03	69.08	68.34	68.27
HYDROGEN, SEMI-MICRO, WTX	4.39	4.02	3.94	4.04	3.97	3.78	4.46
NITROGEN, G811, WTX	1.42	1.40	1.40	1.37	1.44	1.42	1.37
SULFUR, TOTAL, D1552, WTX	1.49	2.06	2.04	1.98	1.83	1.87	1.95
SULFUR, SULFIDE, WTX						0.33	
SULFUR, PYRITIC, WTX						0.13	
OXYGEN, GRM1117, WTX	10.79	11.46	11.62	11.11	11.53	12.05	11.44
CHLORINE, D2361, WTX	0.04	0.02	0.03	0.03	0.06	0.05*	0.06
METALS, WTX	11.85	12.26	12.50	12.43	12.08	12.48	12.46
ASH, G549, WTX	21.67	22.42	22.84	22.72	22.08	22.81	22.77
SULFUR, WTX OF ASH	0.50*	0.50*	0.50*	0.50*	0.50*	0.50*	0.50*
OXYGEN, WTX OF ASH	44.80*	44.80*	44.80*	44.30*	44.80*	44.80*	44.80*
METALS, WTX OF ASH (BY DIFF)	54.70	54.70	54.70	54.70	54.70	54.70	54.70
PYRIDINE INSOLUABLES, WTX	36.2	37.0	39.6	39.4	38.6	38.7	37.8
MELTING POINT, G898, C	150	155	150	175	185	175	170
HEAT OF COMB., D240, BTU/LB						12250	
CONCARBON RSD, D189, WTX						79.1	
DISTILLATION, CUSHMAN, C							
CONVERTED TO 760 MM HG USING K10 FACTOR							
INITIAL BOILING POINT	409	399	418	403	461	449	431
INTERMEDIATE BOILING POINT	454	469	474	476		503	504
END POINT	467	492	489	478	503	517	517
OVER AT INTERMED BP, WTX	5.1	5.5	5.0	5.0		5.6	5.3
RESIDUE, WTX	92.7	90.8	91.4	92.4	92.8	91.3	91.6

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

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IN THE FOLLOWING DATA, DISTILLATE YIELDS HAVE BEEN ADJUSTED TO THE BOILING RANGES INDICATED

RUN NUMBER	P99-54-2	P99-54-5	P99-54-6	P99-54-7	P99-54-8	P99-54-9	P99-54-11
YIELDS, WTX MOISTURE FREE COAL							
HYDROGEN (BY H BALANCE)	-3.70	-3.82	-3.74	-3.70	-3.60	-3.68	-4.10
METHANE	5.44	5.53	5.40	5.81	5.46	5.46	5.51
ETHANE	4.13	4.26	4.26	4.33	4.25	4.18	4.25
PROPANE	3.94	4.03	4.04	4.10	3.96	3.86	4.00
I-BUTANE	0.20	0.22	0.19	0.21	0.18	0.17	0.23
N-BUTANE	1.86	1.92	1.95	1.94	1.86	1.87	1.94
TOTAL C1 TO C4	15.57	15.96	15.84	16.09	15.72	15.54	15.93
AMMONIA (BY N BALANCE)	0.38	0.40	0.38	0.39	0.33	0.36	0.41
HYDROGEN SULFIDE (BY S BAL)	1.82	1.74	1.77	1.70	1.80	1.83	1.81
CARBON DIOXIDE	0.89	0.97	0.88	0.95	0.87	0.79	0.80
CARBON MONOXIDE	0.14	0.09	0.07	0.09	0.07	0.08	0.07
HYDROGEN CHLORIDE (BY CL BAL)	0.03	0.04	0.04	0.04	0.02	0.03	0.02
TOTAL OTHER GASES	3.27	3.25	3.13	3.17	3.10	3.08	3.12
WATER (BY OXYGEN BALANCE)	6.85	6.56	6.61	6.41	6.25	6.29	6.88
C5 - 193 C (C8 - 380 F)	6.76	6.58	6.65	6.89	7.02	12.59	6.82
193 - 288 C (380 - 550 F)	12.87	14.73	13.93	13.88	13.74	8.70	13.57
288 - 482 C (550 - 900 F)	12.94	11.93	12.97	9.65	9.24	10.91	12.77
TOTAL C5+ DISTILLATE*	32.58	33.25	33.55	30.42	30.00	32.19	33.16
482 C+ (900 F+) PYRIDINE SOL.	27.55	26.99	25.85	27.89	29.08	27.78	27.22
INSOLUBLE ORGANIC MATTER	7.04	6.98	7.91	8.88	8.63	7.88	6.95
ASH	10.84	10.84	10.84	10.84	10.84	10.84	10.84
TOTAL 482 C+ (900 F+) PROD	45.43	44.81	44.61	47.61	48.54	46.47	45.01

* THE QUANTITY OF DISTILLATE SHOWN MAY NOT BE RECOVERABLE COMMERCIALY, IF THE TOTAL 482 C+ (900 F+) PRODUCT IS NOT FLUID ENOUGH TO BE EASILY REMOVED FROM THE VACUUM COLUMN

IN THE FOLLOWING DATA, DISTILLATE YIELDS HAVE BEEN ADJUSTED TO THE BOILING RANGES INDICATED

RUN NUMBER P99-54-2 P99-54-5 P99-54-6 P99-54-7 P99-54-8 P99-54-9 P99-54-11

YIELDS, WTS MOISTURE AND ASH FREE COAL

HYDROGEN (BY H BALANCE)	-4.15	-4.29	-4.19	-4.14	-4.04	-4.01	-4.60
METHANE	6.10	6.20	6.06	6.18	6.12	6.13	6.18
ETHANE	4.64	4.78	4.78	4.85	4.77	4.69	4.76
PROPANE	4.42	4.52	4.53	4.60	4.44	4.33	4.49
I-BUTANE	0.22	0.25	0.21	0.24	0.20	0.20	0.26
N-BUTANE	2.04	2.15	2.19	2.18	2.09	2.09	2.18
TOTAL C1 TO C4	17.46	17.90	17.77	18.05	17.63	17.43	17.87
AMMONIA (BY N BALANCE)	0.43	0.45	0.43	0.43	0.38	0.40	0.46
HYDROGEN SULFIDE (BY S BAL)	2.04	1.96	1.98	1.90	2.02	2.05	2.03
CARBON DIOXIDE	1.00	1.08	0.98	1.07	0.98	0.89	0.90
CARBON MONOXIDE	0.15	0.10	0.08	0.10	0.08	0.09	0.08
HYDROGEN CHLORIDE (BY CL BAL)	0.04	0.05	0.04	0.04	0.02	0.03	0.03
TOTAL OTHER GASES	3.67	3.64	3.51	3.55	3.48	3.46	3.50
WATER (BY OXYGEN BALANCE)	7.69	7.35	7.41	7.19	7.01	7.06	7.72
C5 - 193 C (C5 - 380 F)	7.58	7.38	7.46	7.72	7.88	14.12	7.65
193 - 288 C (380 - 550 F)	14.44	16.52	15.63	15.56	15.41	9.75	15.23
288 - 482 C (550 - 900 F)	14.52	13.39	14.54	10.83	10.36	12.24	14.32
TOTAL C5+ DISTILLATE*	36.54	37.29	37.63	34.12	33.64	36.11	37.20
482 C+ (900 F+) PYRIDINE SOL.	30.90	30.28	29.00	31.28	32.61	31.12	30.53
INSOLUBLE ORGANIC MATTER	7.89	7.82	8.87	9.95	9.68	8.84	7.80
TOTAL 482 C+ ORGANIC PROD	38.79	38.10	37.87	41.24	42.29	39.96	38.33

* THE QUANTITY OF DISTILLATE SHOWN MAY NOT BE RECOVERABLE COMMERCIALY, IF THE TOTAL 482 C+ (900 F+) PRODUCT IS NOT FLUID ENOUGH TO BE EASILY REMOVED FROM THE VACUUM COLUMN

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SRC-II RUN DATA, MATERIAL BALANCES, AND PRODUCT PROPERTIES

RUN NUMBER	P99-55-1	P99-55-2	P99-55-3	P99-55-4	P99-55-5	P99-55-6	P99-55-7
DATE (START OF PERIOD)	6-17-79	6-18-79	6-19-79	6-20-79	6-22-79	6-23-79	6-24-79
TIME & DATE CODE (START & END OF PERIOD)	0815 1689	1615 1699	0815 1709	1215 1719	0815 1739	0815 1749	0815 1759
RUN HOURS INCLUDED IN PERIOD	80-99	112-123	128-147	156-171	200-219	224-243	248-267
COAL CHARGE	POWHATAN	POWHATAN	POWHATAN	POWHATAN	POWHATAN	POWHATAN	POWHATAN
OPERATING CONDITIONS	LR-25844	LR-25844	LR-25844	LR-25844	LR-25844	LR-25844	LR-25844
RECYCLE SLURRY/MF COAL RATIO	2.44	2.37	2.41	2.42	2.43	2.40	2.44
OIL TO SOLIDS RATIO	1.33	1.30	1.26	1.22	1.14	1.14	1.15
SLURRY COMPOSITION, WTX							
COAL (MOISTURE FREE)	29.1	29.6	29.3	29.3	29.1	29.4	29.1
DISTILLATE	31.4	31.7	29.7	28.4	25.8	27.0	27.8
482 C+ (900 F+) PYRIDINE SOL.	25.7	24.8	26.0	26.6	27.4	26.2	25.6
PYRIDINE INSOLUABLES	13.8	13.9	15.0	15.7	17.6	17.4	17.5
TOTAL RX PRESSURE, MPA	13.80	13.79	13.81	13.82	13.79	13.80	13.79
PRESS X XH2 IN INLET GAS, MPA	12.50	12.43	12.47	12.47	12.46	12.47	12.29
OUTLET H2 PARTIAL PRESS, MPA	9.30	9.30	9.30	9.30	9.30	9.30	9.30
DISSOLVER TEMPERATURES, C							
ZONE 4 (TOP)	457	458	458	458	458	458	458
ZONE 3	456	456	456	456	456	456	456
ZONE 2	454	454	454	454	454	454	454
ZONE 1 (BTM)	452	452	452	452	452	452	452
AVERAGE	455	455	455	455	455	455	455
PREHEATER OUTLET	401	402	400	399	400	402	400
NOMINAL SLURRY RES. TIME, HR	0.99	1.00	0.99	0.99	0.98	0.99	0.98
MHSV, KG/HR/DN3							
SLURRY	1.21	1.20	1.21	1.22	1.22	1.21	1.22
COAL (MOISTURE FREE)	0.35	0.36	0.36	0.36	0.36	0.36	0.36
DISSOLVER GAS							
DN3/KG SLURRY	489	496	486	482	484	472	473
DN3/KG MF FEED COAL	1681	1672	1687	1647	1661	1607	1626
HYDROGEN CONTENT, VOL%	90.6	90.1	90.3	90.2	90.4	90.4	89.1

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THE FOLLOWING WEIGHT BALANCE AND HYDROGEN CONSUMPTION DATA WERE CALCULATED FROM MEASURED UNIT DATA

RUN NUMBER	P99-55-1	P99-55-2	P99-55-3	P99-55-4	P99-55-5	P99-55-6	P99-55-7
WATER IN THE FEED COAL ASSUMED							
LOST FROM FEED TANK, %	100.0	100.0	100.0	100.0	100.0	100.0	100.0
WEIGHT BALANCE, O/I, WT%	99.7	99.5	98.8	97.9	99.4	98.9	101.8

THE FOLLOWING DATA THROUGH AND INCLUDING ELEMENTAL BALANCES HAVE BEEN CORRECTED TO A 100% WT BALANCE

YIELDS, WT% FEED COAL

HYDROGEN	-3.89	-3.81	-3.73	-3.91	-3.92	-3.65	-3.65
METHANE	5.49	5.42	5.48	5.55	5.33	5.74	5.46
ETHANE	4.27	4.25	4.27	4.25	4.20	4.37	4.48
PROPANE	4.03	4.03	4.02	4.03	4.02	4.08	4.43
I-BUTANE	0.16	0.15	0.13	0.09	0.13	0.16	0.04
N-BUTANE	1.94	1.95	1.93	1.99	2.00	2.02	2.22
TOTAL C1 TO C4	15.89	15.80	15.84	15.92	15.68	16.38	16.64
AMMONIA	0.42	0.41	0.39	0.39	0.39	0.39	0.36
HYDROGEN SULFIDE	1.93	1.75	1.86	1.96	1.81	1.83	1.86
CARBON DIOXIDE	0.83	0.81	0.89	0.92	0.82	0.82	0.83
CARBON MONOXIDE	0.08	0.09	0.10	0.08	0.06	0.07	0.07
HYDROGEN CHLORIDE	0.02	0.03	0.02	0.02	0.03	0.04	0.02
TOTAL OTHER GASES	3.30	3.09	3.26	3.37	3.11	3.15	3.15
WATER	7.44	7.61	7.13	6.72	6.92	7.17	6.64
DEBUTANIZER LIQUID	17.60	17.63	17.16	17.40	17.20	17.22	15.88
PROCESS SOLVENT	15.24	17.22	17.36	18.55	14.41	14.38	20.71
TOTAL C5+ DISTILLATE	32.84	34.85	34.52	35.95	31.61	31.59	36.59
VACUUM TOWER BOTTOMS	44.42	42.47	42.99	41.95	46.59	45.36	40.63
CHEMICAL H2 CONSUMPTION BY UNIT GAS BALANCE							
DM3/KG FEED COAL	456	447	438	459	460	428	428
CONVERSIONS, WT% FEED COAL							
HYDROCRACKING	65.0	65.9	66.1	65.8	63.2	64.2	67.7
DESULFURIZATION	63.7	65.3	65.2	63.9	64.3	64.0	65.2
DENITROGENATION	26.3	26.9	26.1	24.2	25.3	28.1	25.1
OXYGEN REMOVAL	62.9	61.0	61.7	61.2	46.0	43.3	61.7

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UN NUMBER	P99-55-1	P99-55-2	P99-55-3	P99-55-4	P99-55-5	P99-55-6	P99-55-7
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AS RATES, DM3/KG FEED COAL

DISSOLVER INLET GAS	1004.2	1049.5	1037.2	1050.9	1054.9	1011.4	1000.4
TOTAL QUENCH GAS	680.6	631.3	640.1	630.6	615.4	613.6	596.3
TOTAL DISSOLVER GAS	1684.9	1680.8	1677.3	1681.6	1670.3	1625.0	1596.7
MAKEUP GAS TO DISSOLVER	496.2	497.6	481.5	489.0	509.5	519.6	474.8
MAKEUP GAS TO SEP. SPARGE	88.9	88.5	85.8	76.3	103.2	100.6	84.5
MAKEUP GAS TO INSTRUMENT TAPS	260.6	259.2	260.9	263.2	259.4	260.6	253.4
TOTAL MAKEUP GAS	845.7	845.4	828.2	828.4	872.1	880.7	812.7
DISSOLVER OUTLET GAS	1394.2	1396.1	1404.8	1390.4	1372.6	1366.3	1340.7
GAS LEAVING SCRUBBERS	1800.9	1796.4	1807.9	1757.6	1819.3	1788.6	1729.0
SEPARATOR SPARGE GAS	301.9	299.1	298.8	262.3	338.2	314.8	284.2
PRODUCT GASES							
BLEED OFF GAS	386.6	390.2	386.2	365.6	411.6	457.3	395.2
DEBUTANIZER GAS	41.2	41.9	40.3	41.5	38.6	40.1	38.4
AMINE REACTIVATOR GAS	17.0	16.3	17.0	17.2	16.6	16.7	17.1
NAPHTHA REACTIVATOR GAS	97.6	99.7	99.3	99.6	95.8	96.4	93.7
CHROMATOGRAPH BLEED GAS	12.6	12.6	12.9	13.4	11.9	11.6	12.2

ELEMENTAL BALANCES

WATER IN THE FEED COAL ASSUMED LOST FROM FEED TANK, %	100.0	100.0	100.0	100.0	100.0	100.0	100.0
CARBON, O/I	1.00	1.00	1.00	1.01	0.99	0.98	1.00
HYDROGEN, O/I	1.00	1.02	1.03	1.00	0.98	1.02	1.05
NITROGEN, O/I	1.01	0.99	0.99	1.01	1.00	0.97	0.98
SULFUR, O/I	1.02	0.96	0.99	1.04	0.99	1.00	1.00
OXYGEN, O/I	1.03	1.04	1.02	1.00	1.06	1.10	0.98
CHLORINE, O/I	0.81	0.88	0.69	0.68	0.87	1.10	0.77
METALS, O/I	0.98	0.90	0.91	0.91	1.04	1.03	0.92
ASH, O/I	0.98	0.90	0.91	0.91	1.04	1.03	0.92

THE FOLLOWING DATA WERE BALANCED FOR CARBON, HYDROGEN, SULFUR, NITROGEN, OXYGEN, CHLORINE, AND METALS

RUN NUMBER	P99-55-1	P99-55-2	P99-55-3	P99-55-4	P99-55-5	P99-55-6	P99-55-7
YIELDS, WTX MOISTURE FREE COAL							
HYDROGEN (BY H BALANCE)	-3.91	-3.91	-3.94	-3.91	-3.73	-3.85	-4.08
METHANE	5.52	5.42	5.48	5.52	5.39	5.88	5.44
ETHANE	4.29	4.25	4.26	4.24	4.25	4.48	4.46
PROPANE	4.04	4.03	4.01	4.01	4.06	4.18	4.41
I-BUTANE	0.16	0.15	0.13	0.09	0.13	0.16	0.04
N-BUTANE	1.95	1.95	1.93	1.98	2.02	2.07	2.21
TOTAL C1 TO C4	15.97	15.80	15.82	15.83	15.85	16.77	16.57
AMMONIA (BY N BALANCE)	0.40	0.42	0.40	0.38	0.38	0.41	0.39
HYDROGEN SULFIDE (BY S BAL)	1.83	1.88	1.88	1.84	1.84	1.81	1.88
CARBON DIOXIDE	0.88	0.81	0.89	0.91	0.82	0.84	0.83
CARBON MONOXIDE	0.08	0.09	0.10	0.08	0.06	0.07	0.07
HYDROGEN CHLORIDE (BY CL BAL)	0.03	0.04	0.03	0.04	0.03	0.03	0.04
TOTAL OTHER GASES	3.22	3.23	3.31	3.26	3.14	3.16	3.21
WATER (BY OXYGEN BALANCE)	7.00	6.95	6.87	6.82	5.99	5.46	6.95
DEBUTANIZER LIQUID	17.69	17.64	17.14	17.31	17.39	17.63	15.81
PROCESS SOLVENT	15.31	17.22	17.34	18.44	14.56	14.72	20.61
TOTAL C5+ DISTILLATE	33.00	34.86	34.48	35.75	31.95	32.35	36.42
VTB PYRIDINE SOLUABLES	26.36	25.72	25.83	24.41	27.10	26.98	23.45
INSOLUABLE ORGANIC MATTER	7.52	6.51	6.80	7.08	8.86	8.29	6.64
ASH	10.84	10.84	10.84	10.84	10.84	10.84	10.84
VACUUM TOWER BOTTOMS	44.73	43.07	43.47	42.26	46.81	46.11	40.93
CHEMICAL H2 CONSUMPTION, DM3/KG MOISTURE FREE COAL							
BY HYDROGEN BALANCE	459	458	462	458	438	451	479
CONVERSIONS, WTX MF COAL							
HYDROCRACKING	64.8	65.9	66.2	66.6	62.9	63.3	67.8
DESULFURIZATION	63.5	65.3	65.2	64.1	63.9	63.1	65.3
DENITROGENATION	25.9	26.9	26.2	24.7	24.5	26.4	25.4
OXYGEN REMOVAL	52.4	51.7	51.7	51.4	45.2	41.8	51.8

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NUMBER	P99-55-1	P99-55-2	P99-55-3	P99-55-4	P99-55-5	P99-55-6	P99-55-7
COMPOSITIONS, VOL%							
NE REACTIVATOR GAS							
HYDROGEN	17.85	20.22	18.39	16.69	17.66	17.66	17.80
ETHANE	2.06	1.74	1.96	2.01	1.88	1.88	1.88
THANE	0.59	0.51	0.53	0.54	0.55	0.55	0.50
PROPANE	0.11	0.05	0.10	0.06	0.08	0.08	0.02
-BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-BUTANE	0.17	0.09	0.10	0.08	0.11	0.11	0.00
PENTANES	0.01	0.00	0.00	0.01	0.00	0.00	0.00
HYDROGEN SULFIDE	60.56	60.10	60.17	60.67	61.19	61.19	60.81
CARBON MONOXIDE	0.02	0.02	0.02	0.02	0.05	0.05	0.06
CARBON DIOXIDE	18.62	17.25	18.74	19.91	18.48	18.48	18.92
HTHA REACTIVATOR GAS							
HYDROGEN	24.57	26.18	25.02	23.80	25.00	25.00	25.49
ETHANE	23.44	23.20	23.63	24.33	22.40	22.40	22.04
THANE	22.54	21.86	22.50	22.61	22.05	22.05	21.34
PROPANE	19.71	19.21	19.28	19.42	19.99	19.99	19.70
-BUTANE	1.06	1.01	1.04	1.08	1.12	1.12	1.20
-BUTANE	6.58	6.59	6.48	6.59	7.18	7.18	7.66
PENTANES	1.97	1.84	1.94	2.04	2.15	2.15	2.51
HYDROGEN SULFIDE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CARBON MONOXIDE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CARBON DIOXIDE	0.12	0.13	0.12	0.12	0.12	0.12	0.06
TUTANIZER GAS							
HYDROGEN	55.29	55.40	54.21	54.08	58.77	58.77	51.49
ETHANE	19.87	20.31	20.26	20.47	18.29	18.29	20.08
THANE	9.83	10.27	10.07	9.73	9.47	9.47	11.31
PROPANE	6.81	6.91	7.22	6.89	6.43	6.43	8.66
-BUTANE	0.60	0.54	0.58	0.60	0.52	0.52	0.70
-BUTANE	3.71	3.46	3.77	3.88	3.43	3.43	4.09
PENTANES	0.40	0.30	0.34	0.43	0.26	0.26	0.42
HYDROGEN SULFIDE	3.15	2.68	3.19	3.56	2.78	2.78	2.95
CARBON MONOXIDE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CARBON DIOXIDE	0.34	0.14	0.37	0.35	0.85	0.05	0.30

COAL INSPECTIONS

NUMBER	P99-55-1	P99-55-2	P99-55-3	P99-55-4	P99-55-5	P99-55-6	P99-55-7
ED COAL							
ELEMENTAL ANALYSIS (MOISTURE FREE, NORMALIZED TO 100%)							
CARBON, SEMI-MICRO, WTX	71.62	71.62	71.62	71.62	71.62	71.62	71.62
HYDROGEN, SEMI-MICRO, WTX	5.26	5.26	5.26	5.26	5.26	5.26	5.26
NITROGEN, GRM, WTX	1.27	1.27	1.27	1.27	1.27	1.27	1.27
SULFUR, TOTAL, GRM159, WTX	2.71	2.71	2.71	2.71	2.71	2.71	2.71
SULFUR, ORGANIC, WTX	1.63	1.63	1.63	1.63	1.63	1.63	1.63
SULFUR, PYRITIC, WTX	0.88	0.88	0.88	0.88	0.88	0.88	0.88
SULFUR, SULFATE, WTX	0.20	0.20	0.20	0.20	0.20	0.20	0.20
OXYGEN, GRM117, WTX	13.16	13.16	13.16	13.16	13.16	13.16	13.16
OXYGEN, ORGANIC, WTX	7.98	7.98	7.98	7.98	7.98	7.98	7.98
OXYGEN, INORGANIC, WTX	5.18	5.18	5.18	5.18	5.18	5.18	5.18
CHLORINE, GRM117, WTX	0.05	0.05	0.05	0.05	0.05	0.05	0.05
METALS, BY SPEC ASH, WTX	5.93	5.93	5.93	5.93	5.93	5.93	5.93
273 MINERAL MATTER, WTX	12.19	12.19	12.19	12.19	12.19	12.19	12.19
MOISTURE, D271, WTX	1.30	1.30	1.30	1.30	1.30	1.30	1.30
VOLATILE MATTER, WTX	34.50	34.50	34.50	34.50	34.50	34.50	34.50
ASH, D271, WTX	10.84	10.84	10.84	10.84	10.84	10.84	10.84
SULFUR, WTX OF ASH	0.50	0.50	0.50	0.50	0.50	0.50	0.50
OXYGEN, WTX OF ASH	44.80	44.80	44.80	44.80	44.80	44.80	44.80
ALUMINUM, WTX OF ASH	12.0	12.0	12.0	12.0	12.0	12.0	12.0
CALCIUM, WTX OF ASH	1.5	1.5	1.5	1.5	1.5	1.5	1.5
IRON, WTX OF ASH	16.6	16.6	16.6	16.6	16.6	16.6	16.6
MAGNESIUM, WTX OF ASH	.4	.4	.4	.4	.4	.4	.4
POTASSIUM, WTX OF ASH	1.5	1.5	1.5	1.5	1.5	1.5	1.5
SILICON, WTX OF ASH	20.4	20.4	20.4	20.4	20.4	20.4	20.4
SODIUM, WTX OF ASH	.2	.2	.2	.2	.2	.2	.2
TITANIUM, WTX OF ASH	.6	.6	.6	.6	.6	.6	.6
TRACE METALS, WTX OF ASH	.1	.1	.1	.1	.1	.1	.1
PARTICLE SIZE DISTRIBUTION, WTX							
ON 80 MESH							
THRU 80 ON 200 MESH	5.6	5.6	5.6	5.6	5.6	5.6	5.6
THRU 200 ON 325 MESH	26.6	26.6	26.6	26.6	26.6	26.6	26.6
THRU 325 ON 625 MESH	35.1	35.1	35.1	35.1	35.1	35.1	35.1
THRU 625 MESH	32.7	32.7	32.7	32.7	32.7	32.7	32.7

BY DDDIC FORTYTHREE MINERAL MATTER - 1.00% ASH - 0.55% VOLATILE CARBON

PRODUCT INSPECTIONS

ITEM NUMBER	P99-55-1	P99-55-2	P99-55-3	P99-55-4	P99-55-5	P99-55-6	P99-55-7
REBUTANIZER BOTTOMS							
GRAVITY, D287, API		25.6	26.0	26.4	25.8	25.9	27.5
ELEMENTAL ANALYSIS (NORMALIZED TO 100%)							
CARBON, SEMI-MICRO, WT%	84.13*	84.24	84.15	84.05	84.13	84.18	84.12
HYDROGEN, SEMI-MICRO, WT%	10.58*	10.51	10.63	10.61	10.51	10.56	10.67
NITROGEN, GB11, WT%	0.80*	0.81	0.78	0.78	0.83	0.79	0.76
SULFUR, GRM156, WT%	0.20*	0.17	0.15	0.24	0.21	0.19	0.19
OXYGEN, GRM117, WT%	4.29*	4.28*	4.29*	4.32*	4.32*	4.28*	4.26*
VISCOSITY, KIN, D445, CS							
-35C							
OC					3.97		
WATER, G525, PPM	7300*	7606	7717	6238	6981	7155	7029
HEAT OF COMB., D240, BTU/LB					19215		
POUR POINT, D97, C					-54		
DISTILLATION, D86, C							
INITIAL BOILING POINT		70	70	67	72	50	61
5 VOL %		89	77	81	84		103
10 VOL %		106	108	107	109	113	118
30 VOL %		173	169	167	170	172	170
50 VOL %		197	197	194	192	196	197
70 VOL %		217	214	212	216	219	214
90 VOL %		241	238	238	242	248	241
95 VOL %		254	250	252	253	261	258
END POINT		263	263	256	263	269	267
WATER (INCLUDES FLUSH WATER)							
TOTAL CARBON, PPM	9700*	8980	7300	8100	8000	8300	8000
ORGANIC CARBON, PPM	6300*	5300	3600	4700	4700	5100	5000
NITROGEN, GB11, WT%	1.80*	1.75	1.71	1.72	1.78	1.72	1.67
SULFUR, GRM156, WT%	1.15*	0.88	1.03*	1.29	1.03*	1.03	1.07
CHLORINE, APHA, PPM	1300*	1542	1010	1037	1515	1914	1356

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

PRODUCT INSPECTIONS

RUN NUMBER	P99-55-1	P99-55-2	P99-55-3	P99-55-4	P99-55-5	P99-55-6	P99-55-7
PROCESS SOLVENT							
GRAVITY, D287, API		7.4	7.2	7.1	6.0	8.0	7.8
ELEMENTAL ANALYSIS (NORMALIZED TO 100%)							
CARBON, SEMI-MICRO, WT%	87.80*	87.92	87.87	87.73	87.87	87.65	87.59
HYDROGEN, SEMI-MICRO, WT%	8.70*	8.58	8.59	8.74	8.60	8.84	8.92
NITROGEN, G811, WT%	1.00*	1.02	1.03	1.03	1.00	1.00	1.00
SULFUR, GRM1156, WT%	0.30*	0.30	0.32	0.29	0.32	0.31	0.32
OXYGEN, GRM1117, WT%	2.20*	2.19*	2.19*	2.21*	2.21*	2.20*	2.16*
VISCOSITY, KIN, D445, CS							
25 C					22.69		
50 C					7.53		
100 C					2.21		
WATER, G525, PPM	480*	182	832	373	606	596	476
HEAT OF COMB., D240, BTU/LB					17020		
POUR POINT, D97, C					-9		
DISTILLATION, CUSHMAN, C							
CORRECTED TO 760 MM HG USING K10 FACTOR							
INITIAL BOILING POINT		171	166	151	169	166	179
10 VOL %		252	252	251	252	252	250
20 VOL %		274	270	269	267	274	273
30 VOL %		290	291	291	287	293	293
40 VOL %		299	309	308	308	306	306
50 VOL %		318	322	323	323	319	321
60 VOL %		327	342	339	337	338	338
70 VOL %		345	351	361	352	354	358
80 VOL %		377	383	381	376	374	384
90 VOL %		417	427	406	403	402	418
END POINT		504	512	506	500	500	493

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

PRODUCT INSPECTIONS

RUN NUMBER	P49-55-1	P49-55-2	P49-55-3	P49-55-4	P49-55-5	P49-55-6	P49-55-7
VACUUM TOWER BOTTOMS							
SPECIFIC GRAVITY, D70, G/CC		1.46	1.47	1.46	1.47	1.48	1.49
ELEMENTAL ANALYSIS (NORMALIZED TO 100%)							
CARBON, SEMI-MICRO, WTX	68.52*	68.38	68.41	68.02	67.19	65.83	67.44
HYDROGEN, SEMI-MICRO, WTX	3.88*	3.86	3.98	3.82	3.93	3.68	3.92
NITROGEN, GR18, WTX	1.39*	1.38	1.39	1.41	1.35	1.34	1.40
SULFUR, TOTAL, DISS2, WTX	1.99*	1.98	1.96	2.03	1.85	1.94	1.99
SULFUR, SULFIDE, WTX					0.28		
SULFUR, PYRITIC, WTX					0.14		
OXYGEN, GRM117, WTX	11.25*	11.96	11.85	12.04	12.66	13.84	12.17
CHLORINE, D2361, WTX	0.04*	0.04	0.04	0.04	0.04*	0.05	0.04
METALS, WTX	12.91	12.39	12.37	12.63	12.98	13.31	13.04
ASH, G599, WTX	23.80*	22.65	22.62	23.10	23.73	24.34	23.84
SULFUR, WTX OF ASH	0.50*	0.50*	0.50*	0.50*	0.50*	0.50*	0.50*
OXYGEN, WTX OF ASH	44.80*	44.80*	44.80*	44.80*	44.80*	44.80*	44.80*
METALS, WTX OF ASH (BY DIFF)	54.70	54.70	54.70	54.70	54.70	54.70	54.70
PYRIDINE INSOLUABLES, WTX	40.1*	38.9	39.2	40.6	41.8	41.4	40.8
MELTING POINT, G898, C		160	160	168	155	160	175
HEAT OF COMB., D240, BTU/LB					15849		
CONCARBON ASD, D189, WTX					78.5		
DISTILLATION, CUSHMAN, C							
CONVERTED TO 760 MM HG USING K10 FACTOR							
INITIAL BOILING POINT		438	450	440	399	447	450
INTERMEDIATE BOILING POINT			472				
END POINT		503	512	494	508	518	511
OVER AT INTERMED BP, WTX			5.8				
RESIDUE, WTX	93.0*	93.2	91.8	94.2	93.0	93.8	92.7

* FOLLOWING AN ENTRY INDICATES THAT IT IS AN ESTIMATED VALUE

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IN THE FOLLOWING DATA, DISTILLATE YIELDS HAVE BEEN ADJUSTED TO THE BOILING RANGES INDICATED

RUN NUMBER	P99-55-1	P99-55-2	P99-55-3	P99-55-4	P99-55-5	P99-55-6	P99-55-7
YIELDS, WT% MOISTURE FREE COAL							
HYDROGEN (BY H BALANCE)	-3.91	-3.91	-3.94	-3.91	-3.73	-3.85	-4.08
METHANE	5.52	5.42	5.48	5.52	5.39	5.88	5.44
ETHANE	4.29	4.25	4.26	4.24	4.25	4.48	4.46
PROPANE	4.04	4.03	4.01	4.01	4.06	4.18	4.41
I-BUTANE	0.16	0.15	0.13	0.09	0.13	0.16	0.04
N-BUTANE	1.95	1.95	1.93	1.98	2.02	2.07	2.21
TOTAL C1 TO C4	15.97	15.80	15.82	15.83	15.05	16.77	16.57
AMMONIA (BY N BALANCE)	0.40	0.42	0.40	0.38	0.38	0.41	0.39
HYDROGEN SULFIDE (BY S BAL)	1.83	1.88	1.88	1.84	1.84	1.81	1.88
CARBON DIOXIDE	0.88	0.81	0.89	0.91	0.82	0.84	0.83
CARBON MONOXIDE	0.08	0.09	0.10	0.08	0.06	0.07	0.07
HYDROGEN CHLORIDE (BY CL BAL)	0.03	0.04	0.03	0.04	0.03	0.03	0.04
TOTAL OTHER GASES	3.22	3.23	3.31	3.26	3.14	3.16	3.21
WATER (BY OXYGEN BALANCE)	7.00	6.95	6.87	6.82	5.99	5.46	6.95
C5 - 193 C (C5 - 380 F)	7.06	6.88	7.03	7.48	7.25	6.82	5.91
193 - 288 C (380 - 550 F)	14.49	15.06	14.24	14.22	13.78	14.01	14.90
288 - 482 C (550 - 900 F)	12.97	14.29	14.30	15.32	13.03	12.62	16.75
TOTAL C5+ DISTILLATE*	34.52	36.24	35.57	37.02	34.05	33.45	37.57
482 C+ (900 F+) PYRIDINE SOL.	24.84	24.34	24.74	23.14	25.00	25.07	22.31
INSOLUBLE ORGANIC MATTER	7.52	6.51	6.80	7.01	8.86	8.29	6.64
ASH	10.84	10.84	10.84	10.84	10.84	10.84	10.84
TOTAL 482 C+ (900 F+) PROD	43.20	41.69	42.38	40.99	44.71	45.00	39.79

* THE QUANTITY OF DISTILLATE SHOWN MAY NOT BE RECOVERABLE COMMERCIALY, IF THE TOTAL 482 C+ (900 F+) PRODUCT IS NOT FLUID ENOUGH TO BE EASILY REMOVED FROM THE VACUUM COLUMN

IN THE FOLLOWING DATA, DISTILLATE YIELDS HAVE BEEN ADJUSTED TO THE BOILING RANGES INDICATED

RUN NUMBER P99-55-1 P99-55-2 P99-55-3 P99-55-4 P99-55-5 P99-55-6 P99-55-7

YIELDS, WT% MOISTURE AND ASH FREE COAL

HYDROGEN (BY H BALANCE)	-4.39	-4.38	-4.42	-4.38	-4.19	-4.32	-4.50
METHANE	6.19	6.08	6.14	6.19	6.04	6.59	6.10
ETHANE	4.82	4.77	4.78	4.75	4.77	5.02	5.00
PROPANE	4.54	4.52	4.50	4.49	4.55	4.69	4.95
I-BUTANE	0.18	0.17	0.15	0.18	0.15	0.18	0.05
N-BUTANE	2.18	2.19	2.16	2.22	2.26	2.32	2.48
TOTAL C1 TO C4	17.91	17.73	17.74	17.75	17.77	18.81	18.50
AMMONIA (BY N BALANCE)	0.45	0.47	0.45	0.43	0.42	0.46	0.44
HYDROGEN SULFIDE (BY S BAL)	2.05	2.11	2.10	2.07	2.06	2.04	2.11
CARBON DIOXIDE	0.99	0.91	1.00	1.02	0.92	0.94	0.93
CARBON MONOXIDE	0.89	0.10	0.11	0.09	0.07	0.08	0.08
HYDROGEN CHLORIDE (BY CL BAL)	0.04	0.04	0.04	0.04	0.04	0.03	0.04
TOTAL OTHER GASES	3.62	3.62	3.71	3.65	3.52	3.55	3.60
WATER (BY OXYGEN BALANCE)	7.85	7.79	7.70	7.64	6.72	6.13	7.80
C5 - 193 C (C5 - 380 F)	7.82	7.71	7.88	8.34	8.13	7.65	6.63
193 - 288 C (380 - 550 F)	16.25	16.90	15.97	15.95	16.45	15.72	16.72
288 - 482 C (550 - 900 F)	14.55	16.03	16.04	17.19	14.61	14.15	18.78
TOTAL C5+ DISTILLATE*	38.71	40.64	39.89	41.52	38.19	37.52	42.13
482 C+ (900 F+) PYRIDINE SOL.	27.85	27.30	27.75	25.96	28.04	29.02	25.02
INSOLUBLE ORGANIC MATTER	8.44	7.30	7.63	7.88	9.94	9.30	7.45
TOTAL 482 C+ ORGANIC PROD	36.30	34.60	35.37	33.82	37.98	38.31	32.47

* THE QUANTITY OF DISTILLATE SHOWN MAY NOT BE RECOVERABLE COMMERCIALY. IF THE TOTAL 482 C+ (900 F+) PRODUCT IS NOT FLUID ENOUGH TO BE EASILY REMOVED FROM THE VACUUM COLUMN

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A P P E N D I X E

Second Order Models for the SRC Yields
from Kentucky and Powhatan Coals - Update Report

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GULF SCIENCE AND TECHNOLOGY COMPANY
Pittsburgh, PA 15230

SECOND ORDER MODELS FOR THE SRC
YIELDS FROM KENTUCKY AND POWHATAN COALS

UPDATE REPORT

by

Gary L. Jones

Chemicals and Minerals Division
Report No. 627RL032
Project No. 238-8575
Ft. Lewis Contract No.
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I. Summary and Conclusions

This report represents an update to a previous report¹ documenting the results of the second-order regression models for the SRC process yields in terms of 7 variables (avg. reactor temperature, inlet coal concentration, inlet hydrogen partial pressure, recycle ash concentration, slurry residence time, superficial gas velocity and coal type). The models discussed here are simplified and improved versions of those presented previously^{1,3}. Specifically, the following modifications were made:

- (1) All terms whose probable significance* did not exceed 50% were deleted from the model. This also included the intercept term for each model.
- (2) Linear terms for recycle IOM and SRC and recycle middle/heavy distillate were added when significant.
- (3) Error corrections were made to the data base and 3 more runs (P99-53, 54, 55) were added.
- (4) Model output includes, in addition to the yields reported in (1), IOM and total liquid product (sum of naphtha and total distillate yields) as independent models.
- (5) The single variable plots have been improved to show the effects of a second variable as a parameter in each plot.

The elimination of statistically insignificant terms in the models reduced the standard deviation and improved the significance (F-test) of all

*Defined as a Type IV sum of squares probability of significance less than 50%. Type IV means, with all other terms entered into the model, the reduction in the error sums of squares of the model by adding the particular term last. Refer to Part V, Section 2.

the models. The removal of the intercept term for middle distillate dramatically improved the R^2 value (ratio of model to total sum of squares) to .95. Because the maximum possible R^2 is 1.0, further improvements in the fit of this model are unlikely. The addition of the recycle IOM and recycle SRC terms improved some of the poorer models (with low R^2 value), namely IOM (R^2 improved from .48 to .80 and st. dev. reduced from 1.2 to 0.6%) and naphtha (reduced st. dev. from 3 to 2.4%). Although the models are still lacking in some respects, it is unlikely that further improvements can be made with models based as these are on historical data.

As in the previous report¹, the coal level term was introduced to approximate the effect of the coal type for two similar coals (assigned an arbitrary code value -1 for Kentucky and +1 for Powhatan coal). Models based on coal properties instead of the coal level term are being developed from a limited portion of the data base for which detailed coal properties are available. Many of the nonlinear (squared) and cross product terms were found to be quite significant and were included in the final models. Often these nonlinear terms were important in producing a curvature to the responses which were reasonable or expected on physical grounds. However, occasionally these terms produce a result near the extremes of the data (particularly where data are sparse) which were not physically reasonable. These regions are blanked out in the plots and figures in Part V, Sections 4 and 5. However, no such bounds are possible for the algebraic form of the models shown in Part V, Section 2, so caution must be exercised in performing calculations with these models with variable values near the extremes of the data or where data are sparse.

Models were also obtained with the above modifications but with the inlet hydrogen partial pressure terms and the velocity term replaced by the outlet hydrogen partial pressure estimated by the following expression found to fit some pilot plant data reasonably well⁵.

$$P_{H_2 \text{ outlet}} = \frac{P_{TOT} (\text{Hyd. Gas Rate} - 16.5)}{(\text{Hyd. Gas Rate} - 3.1)} \quad (\text{mPa})$$

where P_{TOT} = total reactor pressure (mPa)

Hyd. Gas Rate = hydrogen flow rate (MSCF/ton coal) =
total gas flow rate x hydrogen purity at the inlet

This variable was statistically significant in nearly all the responses except naphtha (somewhat more so than inlet hydrogen partial pressure). However, remarkably, this variable was not significant in the hydrogen consumption response against which a nearly perfect correlation would be expected. This variable did not lead to any real improvement in model fit over that using the inlet hydrogen partial pressure. In addition, it has two inherent defects: (1) it is not a truly independent variable but depends on such things as flow rate and extent of conversion in addition to the total pressure and feed hydrogen purity, and (2) it was sometimes negative when the hydrogen gas rate was less than 16.5. This occurred in a significant number of runs. For the above reasons, the updated versions of the models did not include the outlet hydrogen partial pressure as a variable.

Models were also developed involving only linear terms for temperature, outlet hydrogen partial pressure, inlet coal concentration, SRT, coal level and recycle SRC, IOM and middle to heavy distillate ratio. As seen in a previous work, these linear models did not provide a clearer picture of the process and often some of the linear terms were not statistically significant anyway. The linear models generally agree qualitatively with the higher order models as shown in Table I. The squared and crossed product terms not included were often found to be more significant than the linear terms. The linear model statistics are included in Table I but not in Part V as a means of comparing the various models.

The models were not improved by eliminating the SRC-I, HRI and Merriam short residence time (less than 0.4 hour) runs from the correlation data base. Therefore, the full data base (except 2 suspect runs) were used in the correlation. The qualitative trends of these models (full second order models of Reference 1, the revised second order models of this report and the linear models of this report) are summarized in Table I.

With the exception of the naphtha yield, which was somewhat different in this version from the full second order models and the IOM response, the plots of which were omitted in the previous report (Reference 1), the effects of the variables are similar to those reported previously^(1,3,4).

Summary of Effects:

- (1) On the average, Powhatan coals yield more middle distillate, naphthas and light gases, less SRC and heavy distillate but nearly the same total distillate and total liquid as Kentucky coal. The between-coal differences for hydrogen consumption, total distillate and total liquid yields fall within one standard deviation of the mean of the yields and are not judged to be statistically different*.
- (2) Total liquid product (naphtha and total distillate (380-850°F response), total distillate (middle and heavy) and heavy distillate responses are all very similar with respect to the variables (Refer to Table I).
- (3) Total liquid increases with temperature, SRT, recycle ash and inlet hydrogen partial pressure and decreases with inlet coal concentration. It is independent of gas velocity, decreases slightly with recycle IOM, SRC and recycle ratio (middle/heavy distillate). The effect of recycle ratio may not be the same as that reported for responses in the CSTR at Harmarville (A-1 unit) (Reference 2) because of the differences between the operations, i.e., once-through CSTR vs. tubular reactor with recycle, and different preheater SRTs. The effects on the responses of recycle IOM may be opposite to those of recycle SRC in some cases because of the way the models are fit to the data. In cases where the slopes with respect to these variables are opposite in sign, there is little or no overall effect of the sum of these terms. The effect of recycle ratio (a decrease) is caused by the net decrease of naphtha component.

*Less than 50% probability that a real difference exists.

- (4) Total distillate response is similar to that of total liquid except for a slight increase with recycle SRC and independence of recycle ratio. The effects of recycle IOM and SRC on these yields are highly correlated and should be considered together. Neither yield shows a maximum or minimum with respect to the principle variables. (Pressure, temperature, coal concentration, SRT or ash.) However, both yields increase less at high levels of ash, pressure and temperature (i.e., a "leveling" occurs). At low ash, these yields tend to be less coal concentration dependant. These yields are driven up more with increasing pressure at high temperatures than at low or moderate temperatures (caused by temperature/pressure interactions).
- (5) Heavy distillate generally increases with pressure and recycle ash, but is independent of SRT and decreases with coal concentration. Heavy distillate decreases with gas velocity while middle distillate increases by about the same amount. The total distillate is independent of velocity. Heavy distillate decreases with increasing recycle ratio and is independent of both recycle IOM and SRC. Middle distillate generally responds in the direction opposite to that of heavy distillate with respect to the linear terms. (Coal type, velocity, recycle terms, etc.).
- (6) Heavy distillate shows an optimum temperature (i.e., it increases with temperature at low temperatures and decreases at high temperatures). The optimum shifts upward from about 435° at lower coal concentrations (<30%) to 465-470°C at very high coal concentrations. The optimum temperature is independent of recycle ash concentration. The independence with respect to SRT regardless of the levels of other variables is striking. It is most probably due to a balance

between production and loss of heavy distillate by various reactions. The continuous increase of middle distillate with SRT indicates that it is probably produced from heavy distillate and/or SRC but does not undergo a significant degradation to simpler products, i.e., gases and naphtha.

- (7) Middle distillate increases with temperature, SRT, recycle ash and gas velocity, is independent of pressure and decreases with coal concentration. The independence of pressure is similar to that of naphtha. Middle distillate decreases with recycle ICM but increases with recycle SRC. Optimums are not observed with respect to any variables for this response within the ranges of the data (i.e., response is essentially linear).
- (8) Naphtha yield is practically independent of inlet coal concentration and pressure, increases with SRT and recycle ash and generally increases with temperature. At very low or high ranges of some variables such as SRT, naphtha yield is predicted to decrease with temperature. This is not physically reasonable. However, the total predicted range of decrease is only about 2%, which is nearly equal to the standard deviation for this yield. This indicates that the variation with temperature is probably not significant.
- (9) Often, the interactive (catalytic) effects of ash with SRT, temperature, pressure or coal are apparent. At low levels of ash, there may be little or no effect of these variables on yields, but at high levels of ash, the yields tend to be quite sensitive to these other variables. The situation is similar with SRT in that at high SRT, the effect of changes in temperature and pressure are much more pronounced than at low levels of SRT. This indicates a classical time-activity-temperature kinetic effect, as one would expect for a catalyzed reaction.

- (10) The light gas yield increases with increasing temperature, recycle ash and SRT and decreases with pressure and coal concentration. It is independent of gas velocity and recycle SRC but increases with recycle ratio and recycle IOM. The apparent minimum with coal concentration at about 40% results from the nonlinear terms in the model. It is believed that these terms are valid at low or average coal concentrations where most of the data are located, but not at very high coal concentrations. C1-C4 probably decreases with increasing coal concentration and then levels off at higher concentrations.
- (11) The SRC model is very similar to that in the previous report.¹ In general, those variable changes which increase total liquid or distillate products decrease SRC. SRC decreases with increasing temperature, pressure, SRT and ash and increases with increasing coal concentration. It is independent of gas velocity, recycle ratio and recycle SRC and decreases with recycle IOM. These results all seem consistent with the thermal hydrogenolysis of SRC to light gases and distillate. Note that none of the nonlinear or interaction terms were found to be significant for SRC. The truncated model is linear in all the variables.
- (12) The IOM yield responds somewhat differently from that of SRC. IOM decreases with pressure and recycle ash, which is similar to SRC. However, it goes through a minimum with temperature at around 435°C. This effect may only be correct at the lower and middle temperature range. It is practically independent of coal concentration and increases with SRT, which is not like SRC. IOM increases quite strongly (1%/1% WRIOM) with recycle IOM (RIOM), recycle SRC (0.9%/1% WRSRC) and middle/heavy distillate ratio (+.5% W ratio) and decreases slightly but probably not significantly with gas velocity.

- (13) The maximum total liquid and distillate yield occur at the extremes of the data base, (i.e., higher recycle ash, SRT, temperature, pressure and the lowest coal concentration). When one or two of these variables are at their extreme values with others at their basis levels, the maximum total liquid yield was about 52%, total distillate was 40%, heavy distillate 9%, middle distillate 38% and naphtha 11%. These yields only represent a local maximum. The true maximum liquid yield which occurs when all these variables are at their extremes may be considerably higher.

Because all of these models are independent of one another, there are no constraints in the models that all the individual predicted responses sum up to 100% or that individual responses sum to partial sums, such as total distillate or total liquid. However, the total distillate and total liquid models generally do not differ more than 1 standard deviation (2.5%) from the sum of the independent distillate and naphtha yields. The sums of the independent model predictions nearly always equal 100% plus predicted hydrogen consumption within a few percent. This indicates a reasonably consistent set of models. The water and byproduct gas yield models should be used with caution particularly near the extremes in the data. It is recommended that if water and byproduct gas yields exceed the maximum or minimum values in the data, that some average values be used instead. The choice of an average values for these yields has proved advantageous in assuring a good overall material balance in other work where certain variables such as SRT are near the lower end of the data range.

Optimization of Selected Yields

Middle distillate may be increased by increasing temperature and SRT and by decreasing coal concentration. Pressure and recycle ash are not effective in increasing this response. Heavy distillate is responsive to all of the above variables except SRT. Heavy distillate is maximized at an intermediate temperature level (~450°C). Total distillate and total liquid yields are increased by more reactive conditions (high temperature, ash,

pressure), longer residence times and by lower coal concentrations. Those conditions which increase total liquid yield generally drive down the production of SRC but may not drive down IOM. Recycle solids levels are to a certain extent fixed by external operating conditions but these results show that conditions which lead to high IOM yields may be detrimental to the other process yields due to the high level of nonreactive recycle IOM which may result. It is interesting to note the strong positive correlation between net IOM yield and recycle IOM. This may mean that high IOM production will lead to still higher production and have a destabilizing effect.

II. Introduction

This is the fourth in a series of reports on the regression models of the effects of process variables on SRC pilot plant yields. During the course of the project, the data base was expanded to include several more P-99 runs and coal properties for all the P-99 runs. This report, however, is based on only that data for two coals (Powhatan and Kentucky) and a data base of 110 runs. A report of work in preparation will include the effects of coal properties as well as process variables on data of a larger set of runs. Information from the systematic variable study in the A-1 CSTR unit at Harmarville and insights from previous work were used to develop these revised models. Although these are more accurate than those developed previously, these models still show biases and unrealistic trends at process conditions where little or no data were available. These represent the best second order models which are possible considering the nature of the data base (i.e., historic rather than systematic data) where the variable space is not uniformly covered.

The results presented here are similar to those in previous reports and were obtained by similar methods. These regression models are only correlations and as such do not necessarily explain the actual physical or chemical processes occurring.

III. Discussion

In addition to the variables used in previous reports: average reactor temperature (TAVG), inlet hydrogen partial pressure (PH_2), nominal

slurry residence time (SRT), inlet coal concentration (CIN), recycle ash concentration (RASH), as linear (5), mixed product (10) and squared (5) terms, plus linear terms for superficial gas velocity (V), coal type Powhatan (+1) or Kentucky (-1) (NCOAL), the models here include several new linear terms: recycle IOM (RIOM), recycle SRC (SRC) and middle/heavy distillate ratio in the recycle stream (RATIO). Model coefficients and statistics were obtained as before by means of the Statistical Analysis System (SAS). Independent models were developed for the following responses (yields):

Yield (Moisture-ash Free) (MAF) Basis

Symbol Used

Hydrogen consumption	SHY
Light hydrocarbon gases (C ₁ -C ₄)	SC ₁ C ₄
By-product gases (CO ₂ , CO, H ₂ S)	SBY
Water	SHW
Naphthas	SNAP
Middle distillate (350-550°F)	SMD
Heavy distillate (550-850°F)	SHD
Total distillate (350°F-850°F)	SDIST
SRC (>850°F, pyridine soluble organics)	SSRC
IOM (>850°F, pyridine insoluble organics)	SIOM
Total Liquid (naphtha + total distillate)	SLIQ

The variable ranges are as follows:

<u>Variable</u>	<u>Symbol</u>	<u>Range</u>
1. Temperature	TAVG	413-465°C (775-869°F)
2. Inlet hydrogen partial pressure	PH ₂	6.89 - 17.65 mPa (1006-2577 psi)
3. Nominal slurry residence time	SRT	.13 - 1.59 hours
4. Inlet coal concentration	CIN	23.4 - 50 g/100g slurry
5. Recycle ash concentration	RASH	0-12.7 g/100g slurry
6. Superficial gas velocity	V	.4 - 6 cm/sec
7. Coal type	NCOAL	-1(Kentucky) +1 (Powhatan)
8. Recycle IOM	RIOM	0 - 8.8 g/100g slurry
9. Recycle SRC	RSRC	0 - 33.8 g/100g slurry
10. Recycle ratio of middle to heavy distillate	RATIO	0 - 2.05

Variables 1-5 above appear as linear, squared and crossed product terms in each model. Variables 6 and 8-10 appear only as linear terms. Term 7 appears only as + or - 1 depending on the coal type. Only those terms which are significant appear in each model.

The general form of the response model:

Response = intercept (only if significant) + sum of 5 linear, 10 squared and 5 crossed terms in 5 variables + sum of 5 linear terms in velocity, coal type and recycle composition variables.

The new variables were quite significant in one or more of the responses. All previous models included all terms regardless of the statistical significance of these terms. The relatively insignificant terms had smaller coefficients assigned to them. The significance of the models was improved by deleting statistically insignificant terms from each model. It was hoped that by doing this, biases in the model predictions would be reduced, particularly in areas of the variable space where the data are rather sparse. These areas generally occur near the upper and lower limits of the range of each variable. Terms were not included if the Type IV sum of squares probability (refer to Part V, Section 2 Model Output) exceeded 50% ($Pr > .5$). The Pr value represents the probability that the null hypothesis is true. The null hypothesis is that the term is really zero. The variables in this report were not coded about their mean values as in previous reports. Thus, the coefficients and intercept terms are quite different from those reported previously. Each model contains a different set of terms in the present report.

The model coefficients are summarized in Table III. Table II compares the model statistics of this report (revised on truncated models) with those of the previous report involving 22 terms in each model. A large improvement in model significance (F statistic increased), standard deviation (or coefficient of variation decreased) and R^2 (ratio of model sum of squares and data sum of squares increased) were achieved in most of the models. No single statistic shows whether a particular model is adequate. Model adequacy

is best shown by the consistency and reasonableness of plots of model predictions over ranges of the variables. These are shown in Part V, Sections 3, 4 and 5. The usual parity plots in Section 3 are similar to those in earlier reports. The plots in Section 4 show individual model prediction responses vs. a single variable for 5 levels of a second variable (parameter plots) with the remaining variables fixed at the Demo plant basis conditions shown in Table IV. The values of basis recycle IOM, SRC and ratio, which are not specified for the Demo plant, were chosen based on typical P-99 conditions.

TABLE IV
BASIS VALUES FOR VARIABLES

TAVG	average reaction temp	455°C
PH ₂	inlet hydrogen partial pressure	12.55 mPa (13.7 x .91)
SRT	slurry residence time	1.00 hr.
CIN	inlet coal conc.	30%
RASH	recycle ash conc.	10.17%
RIOM	recycle iom conc.	4.5%
RSRC	recycle SRC conc.	22%
RATIO	recycle middle/heavy distillate	.2
V	nominal gas velocity	12 cm/sec
NCOAL	coal level	Powhatan

The variables RIOM and RSRC are very highly correlated with each other and should be lumped together as a single response or as recycle organic vacuum bottoms. In cases where the model coefficients of these variables are of opposite sign, the overall effect of the sum of these variables is usually small.

Because even these truncated models are still too complex to study directly as linear models would be, it is still necessary to study the effects of the variables via contour and parametric plots. The contour plots (Part 5, Section 5) for each principle response (all except water and byproduct gases) represents a response surface vs. two principle variables (temperature, inlet pressure, recycle ash, inlet coal concentration and SRT). Each plot shows the response at 10 discrete levels separated by contour lines. The value of the response at each level is defined at the bottom of each plot. Each of the 10

combinations of the principle variables is presented. The areas of the contours in which the response is not physically consistent are blanked out. These are areas where the data are rather sparse. Often in these areas the variations in the responses are not very great and the level of the response is probably close to that of the adjacent areas.

The parameter plots of Part V, Section 4 illustrate the model predictions somewhat differently. In these, each response is plotted on the y axis against a variable on the x axis. This is done 5 times for a series of values of a second variable. The remaining variables are held fixed at the basis values in each case (Table IV). These plots illustrate the effects of single variables and interactive effects between variables. As with the contour plots, it was necessary to blank out certain areas of the plots where the responses were not consistent. The contour and parameter plots can be used to bound the ranges of the variables. These plots also show that the models should not be used to calculate or predict responses in these areas. In many cases, the correct response is flat in the case of the contour plots or asymptotic in the case of the parameter plots and the correct level can be obtained directly from the plots by averaging over adjacent levels. The levels of the 5 principle variables used in each of the parameter plots are shown in Table V.

Tables I, II and III summarize the general trends of the variables and compare model statistics and regression coefficients.

In Table I, the general effect of each variable to increase the response is indicated by inc (increase), dec (decrease) and null (no effect) or max (a maximum occurs). Three types of models are compared: the full second order models with 22 terms (Reference 1), the truncated models of this report and the linear models each containing all 9 linear terms: the five principle variables plus coal level, recycle IOM, SRC and ratio. There is fairly good agreement between the model trends particularly for the better models such as total distillate, total liquid and SRC. The differences are primarily in the yields with a higher level of uncertainty. The yield showing the greatest differences is the heavy distillate and it is not clear which model is best. However, the maximum temperature dependence in the truncated

heavy distillate model is probably more realistic than the conflicting predictions of the other models. The prediction of nil dependence on SRT appears to be a compromise between the predictions of the linear and second order models. The dependence on pressure agrees with the linear model and is more physically reasonable. In general, the elimination of low probability terms reduced model bias from that shown in the full second order models. The models still provide the necessary curvature and interactions not provided by the linear models.

Table II shows the improvements in model statistics achieved by modifying the models. The IOM yield was dramatically improved by introducing recycle IOM and recycle SRC. Apparently the yield of IOM is affected by the presence of IOM in the feed. The mean square error for the naphtha yield was improved by reducing the number of terms. The R^2 of the middle distillate yield was increased to 0.95 (maximum value = 1.0) by eliminating the intercept term. The statistical terms are defined at the bottom of Table II.

Table III summarizes the coefficients for each model. Those terms with coefficients of zero do not enter the model.

The results of the model development are contained in Part V. These include the Glossary and Definition of Terms, the Data Summary, Regression Models and Statistical Data Summary, the Parity Plots, Parametric Single Variable Plots and Contour Plots. The terms are the same as those used in previous reports. The model statistics of Section 2 are summarized in Table II. The model coefficients of Section 2 (called "estimates") are summarized in Table III. The observed values of Part 2 are taken from the data of Section 1. The Parity Plots of Section 3 are simply plots of the observed vs. predicted values for each run (observation) for each model from Section 2.

The model behavior, shown in Sections 4 and 5, is summarized in qualitative terms in Table I. The parameter plots show various combinations of variables in which a yield (response) is plotted on the y axis against a single variable on the x axis for 5 levels of a second variable to produce a family of curves. The levels of each variable are shown in Table V. These plots illustrate not only the effect of a single variable on each response but

also the interactions between variables and nonlinear effects. These plots enable the individual to compute yields for combinations of conditions. The values of the other variables not specified in the plot are at the basis level. Each variable takes on the entire range of values in the data base.

The contour plots show the response surface of each yield to combinations of pairs of variables over their entire range in the data base. Certain combinations of variables not present in the data base may lead to inaccuracy in the model predictions in certain areas. These areas are blocked out of the contour and parametric plots. The response level in these areas is close to those in the adjacent areas.

The trends and variable effects have been summarized earlier in this report and elsewhere and will not be discussed here. These show that the effects of the variables in these revised models are consistent with previous reports.

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2. M. E. Prudich to W. L. Carr, "Second Order Models Without Squared Terms for Prepilot SRC-II Variable Study Task," Chemicals and Minerals Division, Ref. No. 6270FT07-30-30, March 31, 1980.
3. W. L. Carr, G. L. Jones, M. McMahon, "Second-Order Models for the SRC Yields from Kentucky Coal," C&M Div. Report No. 627RK001, June 18, 1979.
4. W. L. Carr, G. L. Jones, M. McMahon, "A Sequel Report: Second-Order Models for the SRC Yields from Kentucky Coal," C&M Div. Report No. 627RK002, June 18, 1979.
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TABLE I

COMPARISON OF EFFECTS OF VARIABLES PREDICTED FROM
SEVERAL MODELS WITH TWO COALS - FULL 2ND ORDER MODEL, TRUNCATED SECOND ORDER MODEL, LINEAR MODEL
 (Effects are for increases in variables)

<u>Response</u> <u>SHY (Con-</u> <u>sumption)</u>	<u>Avg. Tem-</u>		<u>Recycle</u>	<u>Hydrogen</u>		<u>Inlet</u>	<u>Linear</u>	<u>Coal</u>	<u>Ratio</u>	<u>Recycle</u>	
	<u>perature</u>		<u>Ash Conc</u>	<u>Pressure</u>		<u>Coal</u>	<u>Gas</u>	<u>Type</u>	<u>MD/HD</u>	<u>SRC&IOM</u>	
	<u>TAVG</u>	<u>SRT</u>	<u>RASH</u>	<u>Inlet</u>	<u>Outlet</u>	<u>Conc.</u>	<u>Velocity</u>	<u>NCOAL</u>	<u>RATIO</u>	<u>RSRC + RIOM</u>	
</											

TABLE I (Continued)

COMPARISON OF EFFECTS OF VARIABLES PREDICTED FROM
SEVERAL MODELS WITH TWO GOALS - FULL 2ND ORDER MODEL, TRUNCATED SECOND ORDER MODEL, LINEAR MODEL
(Effects are for increases in variables)

	Avg. Tem- perature	Recycle Ash Conc	Hydrogen Partial Pressure	Inlet Coal Conc.	Linear Gas Velocity	Coal Type	Ratio MD/HD	Recycle SRC&IOM
	TAVG	SRT	Inlet Outlet PH2	CIN	V	NCOAL	RATIO	RSRC + RIOM
<u>SDIST</u>								
full 2nd order	inc	inc	inc	inc	nil	inc	---	---
truncated model	inc	inc	inc	inc	nil	nil	nil	inc
linear model	inc	inc	inc	---	inc	dec	inc	inc dec
<u>SSRC</u>								
full 2nd order	dec	dec	dec	dec	inc	dec	---	---
truncated model	dec	dec	dec	dec	nil	dec	nil	dec
linear model	dec	dec	dec	---	inc	dec	inc	inc dec
<u>SIOM</u>								
full 2nd order	--	---	---	---	---	---	---	---
truncated model	min	inc	dec	dec	nil	inc	inc	inc
linear model	dec	inc	dec	---	inc	inc	inc	inc
<u>SLIQ</u>								
full 2nd order	---	---	---	---	---	---	---	---
truncated model	inc	inc	inc	inc	nil	nil	---	---
linear model	inc	inc	inc	---	inc	nil	dec	dec dec

* --- Indicates this term is not present in the model.

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TABLE II

COMPARISON OF MODEL STATISTICS

MODEL STATISTICS

Full Second Order Models (107 Runs)

MODEL STATISTICS

(Model not coded about the mean of variables)
Revised Second Order Models (110 runs)

Yield Response	Terms include intercept	Sum of Square Error	Mean Square Error	R ²	F for Model	Stand. Dev.	CV Coef. of Var.	Mean %	Number of Terms	Sum of Square Error	Mean Square Error	R ²	F Stat.	Stand. Dev.	CV Coef. of Var.	Mean %
Hyd. Cons	22	35	0.41	.82	17.8	.64	15.9	4.0	13	35	.36	.82	37.3	.60	14.8	4.0
C ₁ C ₄		299	3.52	.91	38.9	1.88	14.3	13.1	12	309	3.15	.91	86.9	1.77	13.5	13.2
Naphtha		649	7.63	.45	3.2	2.76	29.6	9.3	9	604	5.98	.48	11.7	2.44	26.4	9.3
Middle Distillate		114	13.40	.78	13.4	3.66	29.7	12.3	13	1040	10.72	.95	140.6	3.27	27.0	12.1
Heavy Distillate		1168	13.75	.75	12.2	3.71	33.0	11.2	13	1013	10.44	.79	30.2	3.23	28.5	11.3
Total Distillate		1218	14.30	.89	30.7	3.79	16.1	23.6	16	1188	12.64	.89	49.7	3.55	15.2	23.4
Total Liquid									17	261	8.18	.94	99.9	2.86	8.8	32.7
SRC		938	11.00	.97	120.1	3.32	8.2	40.6	9	1143	11.31	.96	315.2	3.36	8.3	40.7
ICM		98	1.16	.40	2.6	1.08	17.7	6.1	17	35	.37	.80	23.7	.61	10.0	6.1
Byproduct		76	0.30	.76	12.1	.55	13.2	4.0	15	25	.27	.76	20.0	.52	12.5	4.1
Gases																
Water		88	1.04	.78	13.7	1.02	13.9	7.4	17	102	1.09	.75	17.6	1.04	14.1	7.4

RUNS

Sum of Square Error = $\sum (\text{Model prediction} - \text{data value})^2$

Mean Square Error = Sum of Square Error/ number of degrees of freedom

Number of degrees of freedom = number of runs - number of terms in model (i.e., 107 - 22 = 85)

R² = sum of squares attributed to model/sum of squares of each yield in data

CV = coefficient of variation

F = ratio of the mean square error of the model to that predicted by a random function normally distributed about the mean of each response. Indicates significance of the model compared to random prediction.

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TABLE III

SLOPE VALUES OF VARIABLES (REGRESSION COEFFICIENTS)

Model Terms	Model Coefficient/ (Pr ²)	Hpd. Cone.	C ₁ C ₄ Light Gases	Naphtha	Middle	Heavy Distillate	Total	Total Liquid	SBC >850°F Pyridine Soluble	ICM >850°F -Pyridine Insoluble	Byproduct Gases	Water Vapor
Intercept		-44.377 (.051)	824.38 (.0075)	6.8729 (.0001)	-----	-1489.5 (.0279)	-959.8118 (.298)	-599.98 (.255)	332.421 (.0001)	363.61 (.0009)	110.0 (.216)	156.79 (.459)
TAVG	Temperature	.1233 (.0145)	-3.527 (.011)	-----	-----	9.0204 (.0072)	6.06889 (.1723)	3.101 (.186)	-.5839 (.0001)	-1.719 (.0005)	-.51011 (.2005)	-.674 (.477)
PH2	Pressure	-1.035 (.0036)	-----	-----	-----	-27.575 (.0003)	-32.5146 (.0006)	-13.775 (.1162)	-.9089 (.0005)	4.7963 (.0086)	.02511 (.4844)	-----
SRT	Slurry	-4.846 (.0938)	-215.915 (.0001)	-99.7959 (.0002)	-112.354 (.1485)	-----	99.43475 (.3389)	-----	-25.214 (.0001)	-27.3069 (.1324)	2.109 (.0168)	-83.74 (.013)
CIN	Inlet Coal	1.5294 (.05011)	-1.213 (.002)	-----	-3.3854 (.0782)	-22.232 (.0004)	-9.31002 (.1874)	-.9990 (.1456)	.4223 (.0001)	-----	-.23718 (.0712)	-----
RASH	Recycle	.1896 (.0001)	-----	(12.4223) (.079)	-35.8813 (.0004)	4.5398 (.0003)	-22.47676 (.1056)	-----	-.5270 (.1295)	-1.52064 (.0001)	.94727 (.0001)	9.224 (.036)
TAVG ²	Ash Conc	-----	.003895 (.0124)	-----	-----	-.01272 (.0021)	-.008768 (.1036)	-.00382 (.1456)	-----	.002066 (.0003)	.0006158 (.1709)	.00078 (.465)
PH2 ²	Squared	.03024 (.022)	-----	-----	-----	-----	-----	-.05673 (.4376)	-----	-----	-----	-.0205 (.0031)
SRT ²	Terms	-----	-----	-----	-----	-----	-----	-----	-----	-----	-1.09662 (.0422)	2.719 (.102)
CIN ²		-----	.01598 (.0047)	-----	-----	-----	-----	-----	-----	-----	.003802 (.0357)	-.00072 (.587)
RASH ²		-----	.02602 (.143)	-.0846 (.236)	-----	-.154216 (.0001)	-.1118774 (.0145)	-.1612 (.0001)	-----	.01764 (.020)	-.0286 (.0001)	.0376 (.0004)
V	Linear	-.0842 (.173)	-----	-----	.9311 (.0098)	-1.0655 (.0005)	-----	-----	-----	-.0734 (.3688)	.13034 (.0284)	-.409 (.0011)
NGOAL	Coal level	-----	1.193 (.0001)	-----	2.68851 (.0001)	-3.249 (.0001)	-----	-----	-.1269 (.8426)	.4145 (.0012)	-.3253 (.0001)	-.5914 (.0028)
-1 Kentucky +1 Powhatan												

TABLE III (Continued)

SLOPE VALUES OF VARIABLES (REGRESSION COEFFICIENTS)

Model Terms	Model Coefficient/ (Pr*)	Hyd. Cons.	C ₁ C ₄ Light Gases	Naphtha	Middle	Heavy Distillate	Total	Total Liquid	>850°F Pyridine Soluble	>850°F Pyridine Insoluble	Byproduct Gases	Water Vapor
TAVG*PH2		-----	-----	-----	-----	.063326 (.0003)	.075289 (.0005)	.03058 (.1195)	-----	-.01098 (.0008)	-----	-----
TAVG* SRT		-----	.496 (.0001)	.22484 (.0001)	.287037 (.0952)	-----	.23999 (.2936)	.05014 (.0009)	-----	.064111 (.1048)	-----	.1477 (.0481)
TAVG* CIN		-.00352 (.043)	-----	-----	-.007373 (.0826)	.04936 (.0004)	.020386 (.1923)	-----	-----	-----	-----	-----
TAVG* RASH	CROSSED PRODUCT TERMS	-----	-----	-.02487 (.1072)	.083845 (.0002)	-----	.062824 (.0418)	.01605 (.0001)	-----	-----	-----	-.0199 (.0851)
PH2* SRT		.4209 (.0083)	-----	-----	-----	-----	-----	-----	-----	-.2103 (.2804)	-----	.8326 (.0027)
PH2* CIN		-----	-----	-----	-----	-----	-----	.08815 (.0337)	-----	-----	-----	-----
PH2* RASH		-----	-.019 (.298)	-----	-----	-----	-.05594 (.4835)	-----	-----	.02184 (.2292)	-----	-----
SRT* CIN		.0546 (.223)	-----	-----	-.2234 (.0568)	-----	-----	-.2834 (.222)	-----	-----	-----	.127 (.209)
SRT* RASH		-----	-----	-----	-----	-----	-----	-.928 (.089)	2.58532 (.0001)	.36229 (.0047)	-----	-.648 (.027)
CIN* RASH		-----	-----	-----	-.07491 (.0021)	-.05006 (.07)	-.105258 (.00101)	-.10228 (.0001)	.105024 (.0001)	-----	-.01627 (.0005)	-----
RIOM	Recycle		.4308 (.0497)	.25670 (.4376)	-1.48706 (.0033)	-----	-.967488 (.0552)	-.5053 (.183)	-1.489 (.0174)	.9837 (.0001)	-.06430 (.3617)	.405 (.0056)
RSRC	Recycle	-.014 (.320)	-----	-.3082 (.0001)	.3208 (.0004)	-----	.29187 (.0025)	-.0939 (.232)	-.0201 (.843)	.0796 (.0001)	-----	-----
RATIO	SRC ratio of mid- dle Dist. to heavy Dist in recycle	.8739 (.0001)	1.554 (.0162)	-.92164 (.284)	3.15772 (.0047)	-2.7707 (.0112)	-----	-2.165 (.0595)	(.3458) (.8009)	.5149 (.2292)	-.3576 (.0708)	-----

* PR defined as fractional probability that the coefficient is insignificant, i.e., low PR means high probability the coefficient is significant.

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TABLE V

LEVELS OF VARIABLES IN PARAMETER PLOTS

	<u>TAVG</u>	<u>SRT</u>	<u>RASH</u>	<u>CIN</u>	<u>PH2 (mPa)</u>
1.	413	.130	0.	22.4	6.89
2.	426	.495	3.18	30.1	9.58
3.	439	.860	6.35	36.7	12.27
4.	452	1.275	9.52	43.4	14.96
5.	465	1.590	12.70	50.0	17.65

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SUMMARY OF THE CONTENTS OF THE REPORT

THE REPORT IS COMPOSED OF FIVE SECTIONS

SECTION ONE - A COMPLETE LISTING OF THE DATA BASE CONTAINING YIELDS AND VARIABLES DESCRIBED BELOW

SECTION TWO - THE RESULTS OF THE GENERAL LINEAR REGRESSION OF THE DATA BASE SHOWING THE MODEL COEFFICIENTS, MODEL STATISTICS, PREDICTIONS, RESIDUALS
EACH MODEL HAS A DIFFERENT FORM I.E. A DIFFERENT NUMBER AND COMBINATION OF VARIABLES CHOSEN ON THE BASIS OF A TYPE 4 SUM OF SQUARES SIGNIFICANCE LEVEL OF GREATER THAN 50% OR $P > .5$

SECTION THREE - PARITY OR SCATTER PLOTS IN WHICH THE INDIVIDUAL YIELD PREDICTIONS ARE COMPARED TO THE YIELD DATA
THE PREDICTED YIELDS CORRESPOND TO THE RESULTS IN SECTION TWO.

SECTION FOUR - TWO VARIABLE PARAMETER PLOTS SHOWING INDIVIDUAL YIELDS PREDICTED FROM THE REGRESSION MODELS VS. ONE VARIABLE (E.G. SRT) FOR A SERIES OF DISCRETE VALUES OF A SECOND VARIABLE WITH ALL OTHER VARIABLES HELD AT SOME BASIS VALUES
THESE PLOTS INDICATE INTERACTIVE EFFECTS BETWEEN VARIABLES AS WELL AS THE EFFECT OF EACH VARIABLE

SECTION FIVE - CONTOUR PLOTS SHOWING RESPONSE SURFACES FOR EACH RESPONSE (YIELD) AT 10 DISCRETE LEVELS AS PREDICTED BY THE REGRESSION MODELS AS TWO VARIABLES ARE VARIED CONTINUOUSLY OVER THE ENTIRE RANGES
THE DISCRETE LEVELS OF THE YIELD ARE TABULATED AT THE BOTTOM OF EACH CONTOUR PLOT

SRC2 PILOT PLANT DATA BASE

REACTOR CONDITIONS AND NET PRODUCT YIELDS BASED ON
MOISTURE AND ASH FREE COAL (MAFC)

CODE REFERS TO THE PILOT PLANT

FTL=FT LEWIS, WASH, MER=MERRIAM, KS, P99=P99 HARMARVILLE

HRI=HYDROCARBON RESEARCH INSTITUTE

COAL REFERS TO COAL TYPE +1=POWHATAN COAL -1=KENTUCKY COAL

MODE REFERS TO SRC1 OR SRC2 MODE

TAVG=AVERAGE REACTOR TEMPERATURE DEG C

SRT=NOMINAL SLURRY RESIDENCE TIME IN HOURS

CIN=INLET COAL CONC. G COAL/100 G SLURRY FEED

PH2=INLET HYDROGEN PARTIAL PRESSURE (TOTAL PRESSURE*PURITY)
WITH UNITS OF MEGA PASCALS

V= SUPERFICIAL GAS VELOCITY DETERMINED FROM THE OVERALL
GAS FLOW RATE, COAL CONC., REACTOR LENGTH AND TEMP AND PRESS
USING A FORMULA GIVEN IN THE TEXT

PREFIX R REFERS TO A RECYCLE COMPONENT IN G/100G SLURRY

RASH=RECYCLE ASH CONC.

RMD=RECYCLE MIDDLE DISTILLATE

RHD=RECYCLE HEAVY DISTILLATE

RATIO=RATIO OF MIDDLE TO HEAVY DISTILLATE IN RECYCLE

RSRC=RECYCLE SRC MATERIAL

RIDM=RECYCLE IDM MATERIAL

PREFIX S REFERS TO THE NET YIELD OF EACH PRODUCT
OR CONSUMPTION IN THE CASE OF HYDROGEN

SHY=CONSUMPTION OF HYDROGEN

SCIC4=LIGHT GASES C1-C4

SNAP=NAPHTHAS BOILING BELOW 350 DEG F

SMD=MIDDLE DISTILLATE BOILING BETWEEN 350 AND 550 DEG F

SHD=HEAVY DISTILLATE BOILING BETWEEN 550 AND 850 DEG F

SDIST=TOTAL DISTILLATE (MIDDLE + HEAVY)

SLIQ=TOTAL LIQUID PRODUCT (NAPHTHAS+ TOTAL DISTILLATE)

SSRC=SRC OR PYRIDINE SOLUBLE ORGANIC VACUUM BOTTOMS

SIOM=PYRIDINE INSOLUBLE ORGANIC VACUUM BOTTOMS

S8Y=8YPRODUCT GASES (E.G. H2S CO2 CO

SHW=WATER VAPOR

SUMIN=SUM OF HYDROGEN CONSUMPTION + 100 (I.E. THEORETICAL
TOTAL NET MATERIAL PRODUCED BASED ON COAL FEED)

SUMOUT= SUM OF THE ACTUAL MEASURED NET YIELDS

SHC2 PILOT PLANT DATA BASE
TABLE OF REACTOR CONDITIONS AND NET YIELDS BASED ON
MOISTURE AND ASH FREE (MAF) COAL

8:13 THURSDAY, APRIL 3

OBS	CODE	COAL	MODE	TAVG	SRT	CIN	PH2	V	RASH	RATIO	RSRC	RIDM	SHY	SC1C4
1	FTLS1	KENT	1	450.0	0.525	37.3	10.1531	2.26598	0.0	0.368996	0.0	0.0	2.75634	5.9537
2	FTLS2	KENT	1	447.0	0.926	38.4	10.0693	1.98348	0.0	0.371938	0.0	0.0	2.97357	6.0573
3	FTLS3	KENT	1	461.0	0.350	37.5	9.7406	2.55862	0.0	0.367615	0.0	0.0	2.30263	8.6623
4	FTLS4	KENT	1	445.0	0.348	38.6	9.7959	2.50270	0.0	0.367483	0.0	0.0	2.20507	4.0794
5	FTLS5	KENT	1	451.0	0.275	38.1	9.5271	2.59216	0.0	0.369469	0.0	0.0	2.20507	3.1974
6	FTLS6	KENT	1	462.0	0.274	38.4	9.3703	2.39070	0.0	0.368849	0.0	0.0	2.22469	6.5628
7	FTLS7	KENT	1	452.0	0.274	38.4	9.3654	2.38124	0.0	0.371918	0.0	0.0	2.10643	4.1020
8	FTLS8	KENT	1	447.0	0.346	39.1	9.7299	2.46463	0.0	0.368539	0.0	0.0	2.65487	4.0929
9	FTLS9	KENT	1	457.0	0.303	39.3	9.5182	2.57290	0.0	0.370203	0.0	0.0	2.32558	6.5338
10	FTLS10	KENT	1	448.0	0.367	38.0	6.8950	4.04121	0.0	0.368653	0.0	0.0	4.05862	5.1860
11	FTLS11	KENT	1	451.0	0.366	38.4	8.2905	3.31955	0.0	0.371938	0.0	0.0	3.26948	6.0879
12	MERS1	KENT	1	450.0	0.367	39.1	9.9300	1.03212	0.0	0.000000	0.0	0.0	1.80383	3.2694
13	MERS2	KENT	1	453.0	0.283	38.9	9.3400	0.88584	0.0	0.000000	0.0	0.0	2.02931	3.8331
14	MERS3	KENT	1	453.0	0.288	39.1	9.3400	0.91909	0.0	0.000000	0.0	0.0	1.98320	4.8405
15	MERS4	KENT	1	446.0	0.353	39.3	9.8300	0.94667	0.0	0.000000	0.0	0.0	1.93584	3.6504
16	MERS5	KENT	1	447.0	0.358	39.5	9.8300	0.99517	0.0	0.000000	0.0	0.0	1.59292	5.1991
17	MERS6	KENT	1	460.0	1.000	35.0	13.8900	1.43335	0.0	0.000000	0.0	0.0	2.18739	15.6275
18	MERS7	KENT	1	461.0	1.000	45.0	13.8900	1.40495	0.0	0.000000	0.0	0.0	2.31168	14.5467
19	MERS8	KENT	1	459.0	1.000	50.0	13.8900	1.48504	0.0	0.000000	0.0	0.0	2.98827	15.6292
20	MERS9	KENT	1	456.0	0.977	30.0	13.8900	1.21656	0.0	0.000000	0.0	0.0	2.65193	11.6022
21	MERS10	KENT	1	456.0	0.993	45.0	13.8900	1.21687	0.0	0.000000	0.0	0.0	4.20819	11.6279
22	MERS11	KENT	1	455.0	1.032	30.0	13.8900	1.06152	0.0	0.000000	0.0	0.0	4.55050	10.9878
23	MERS12	KENT	1	455.0	1.084	45.0	13.8900	1.05566	0.0	0.000000	0.0	0.0	4.67186	11.5684
24	MERS13	KENT	1	455.0	1.044	45.0	13.8900	1.05430	0.0	0.000000	0.0	0.0	4.68750	10.8259

OBS	SNAP	SMD	SHD	SDIST	SLIQ	SSRC	SIDM	SDY	SNW	SUMIN	SUMOUT
1	7.2767	8.8203	0.1103	8.9305	16.2073	64.2778	7.2767	3.63837	5.4024	102.756	102.756
2	11.2335	11.4537	-3.0837	8.3700	19.6035	63.3260	5.2863	2.86344	5.8370	102.974	102.974
3	16.6667	-4.6053	-3.1798	-7.7851	8.8816	64.2544	7.7851	4.27632	7.8947	102.303	101.754
4	4.7409	6.3947	2.3153	8.7100	13.4509	70.5623	6.3947	2.31533	5.2922	102.205	102.095
5	2.8666	7.6075	0.9923	8.5998	11.4664	74.2007	6.9460	2.20507	6.1742	102.205	104.190
6	4.0044	5.5617	2.1135	7.6752	11.6796	73.3037	7.2303	2.78087	5.0067	102.225	107.564
7	4.1020	6.6519	0.9978	7.6497	11.7517	72.7273	6.3193	3.10421	6.0976	102.106	104.102
8	8.4416	5.7522	3.5398	9.2920	14.9336	69.6903	5.9735	2.43363	5.5310	102.655	102.655
9	5.5371	5.6478	-0.1107	5.5371	11.0742	71.0963	6.5338	2.65781	5.5371	102.326	103.433
10	1.6011	7.1026	-1.0147	6.0879	7.7790	73.7317	7.1026	3.15671	7.1026	104.059	104.059
11	6.3134	3.1567	1.0147	4.1714	10.4848	68.8839	6.8771	3.15671	7.8918	103.269	103.382
12	13.4160	5.1860	0.0030	5.1860	18.6320	63.3596	5.9752	3.38219	7.2153	101.804	101.804
13	10.8230	0.2255	0.0000	0.2255	11.0485	57.4183	6.5389	3.49493	9.5829	102.029	101.917
14	10.5611	0.0000	-3.1903	-3.1903	7.3707	71.6172	7.3707	3.41034	7.2607	101.980	101.870
15	5.9735	3.8717	4.6460	8.5177	14.4912	67.9204	6.0841	3.09735	6.1947	101.936	101.438
16	4.2038	7.6327	0.7743	8.4071	12.6106	67.4779	5.9735	3.76106	5.1991	101.593	100.221
17	12.0419	5.2543	11.6022	16.8565	28.8984	38.6853	4.9611	4.54392	9.4451	102.187	101.161
18	10.2616	6.9350	11.8290	18.7641	29.0257	37.9003	5.0068	4.76996	10.4195	102.312	101.669
19	13.9265	5.9089	14.4903	20.3992	34.3257	37.3252	5.0519	5.08570	9.6414	102.988	107.059
20	11.7127	13.3702	3.5359	16.9061	28.6188	47.1823	4.5304	3.97790	6.7403	102.652	102.652
21	11.4064	11.6279	7.3090	18.9369	30.3433	45.8472	4.8726	3.98671	7.5305	104.208	104.208
22	11.8757	15.6493	4.5505	20.1998	32.0755	43.7292	4.7725	2.55272	13.4329	104.550	104.550
23	7.6752	12.5695	13.2364	25.8065	33.4816	41.2681	5.1168	3.89321	9.3437	104.672	104.672
24	10.1362	9.5982	11.1607	20.7549	30.9152	43.7500	5.2455	3.90625	10.3446	104.687	104.687

SRC2 PILOT PLANT DATA BASE
TABLE OF REACTOR CONDITIONS AND NET YIELDS BASED ON
MOISTURE AND ASH FREE (MAF) COAL

8:13 THURSDAY, APR 1

OBS	CODE	CCAL	MODE	TAVG	SRT	CIN	PH2	V	HASH	RATIO	RSRC	RIOM	SHY	SCICA
25	HRIS1	KENT	1	441.1	0.700	24.4	10.4500	0.71427	0.00	0.00000	0.00	0.00	2.15914	6.3459
26	HRIS2	KENT	1	426.7	0.716	24.9	10.4500	0.69337	0.30	0.00000	0.00	0.00	1.98690	4.9454
27	HRIS3	KENT	1	426.7	0.710	24.8	17.1700	0.46863	0.00	0.00000	0.00	0.00	2.24658	5.0141
28	HRIS4	KENT	1	440.6	0.671	23.4	17.2400	0.42680	0.00	0.00000	0.00	0.00	2.70740	6.5565
29	HRIS5	KENT	1	412.8	0.731	24.2	10.4500	0.68651	0.30	0.00000	0.00	0.00	1.96228	3.1724
30	HRIS6	KENT	1	440.6	0.367	25.5	10.4800	1.36415	0.00	0.00000	0.00	0.00	2.15183	5.4178
31	HRIS7	KENT	1	426.7	0.357	24.8	10.5500	1.33326	0.00	0.00000	0.00	0.00	1.60782	3.6719
32	HRIS8	KENT	1	426.7	0.359	24.9	17.6500	0.77551	0.00	0.00000	0.00	0.00	1.77560	3.5730
33	HRIS9	KENT	1	441.1	0.360	25.1	17.3700	0.81444	0.00	0.00000	0.00	0.00	2.17273	5.3499
34	HRIS10	KENT	1	440.6	0.721	25.1	6.8900	1.42142	0.00	0.00000	0.00	0.00	2.03301	8.0009
35	PNN1	KENT	2	460.0	1.060	33.2	11.7590	1.61447	3.90	0.87500	12.30	2.80	5.42892	18.9406
36	PNN2	KENT	2	460.0	1.000	29.6	13.0219	1.08479	5.90	0.87983	16.90	3.70	5.15362	16.9144
37	PNN3	KENT	2	465.0	1.040	32.8	11.6300	1.15724	4.40	0.87933	12.30	3.90	5.24171	18.8746
38	PNN4	KENT	2	460.0	1.330	32.7	12.7550	0.95262	4.10	0.87938	12.10	2.80	5.52803	21.8698
39	PNN5	KENT	2	460.0	0.660	29.8	11.5879	1.47658	5.30	0.88462	20.50	5.30	4.41581	15.7141
40	PNN6	KENT	2	460.0	0.660	29.6	14.6006	1.48511	7.40	0.87923	20.70	3.40	5.09856	16.2317
41	PNN7	KENT	2	460.0	1.220	29.6	14.7023	1.07764	7.50	0.87917	13.50	4.30	6.48607	23.7969
42	PNN8	KENT	2	460.0	1.210	29.7	11.7728	1.17542	6.80	0.87826	14.20	6.10	5.80652	23.2481
43	FTLL1	KENT	2	461.0	0.997	26.1	12.4860	3.35921	8.60	0.07082	22.40	5.10	4.53450	18.4556
44	FTLL2	KENT	2	459.0	0.984	24.2	12.0328	3.40981	10.30	0.07563	22.30	4.80	4.10112	18.2921
45	FTLL3	KENT	2	459.0	0.823	24.6	12.1520	4.66421	10.60	0.24400	27.80	5.90	4.50111	16.3969
46	FTLL4	KENT	2	461.0	0.799	29.9	11.9328	5.73797	9.20	0.27928	26.30	6.20	4.29679	15.4817
47	FTLL5	KENT	2	458.0	0.780	30.6	12.1910	6.05484	5.10	0.35505	20.20	2.50	3.59823	12.7042
48	FTLL6	KENT	2	459.0	0.956	33.5	12.0458	4.97037	6.00	0.56087	19.80	4.80	3.59513	14.3031

OBS	SNAP	SND	SND	SDIST	SLIQ	SSRC	SIOM	SBY	SHW	SUMIN	SUMOUT
25	5.2828	8.1324	12.0780	20.2104	25.4932	59.5024	5.5897	2.63043	2.6085	102.159	102.170
26	3.7862	6.2882	7.7293	14.0175	17.8057	68.4607	6.1354	2.63100	1.9978	101.987	101.976
27	4.0156	7.9227	5.6544	13.5772	17.5928	63.0237	4.8839	2.71326	4.2544	102.247	97.482
28	5.7627	9.4379	11.7321	21.1699	26.9327	56.8338	4.8603	3.33805	4.1861	102.707	102.707
29	3.4885	6.6390	10.3892	17.0282	20.5167	67.1972	6.2030	2.46375	2.6164	101.962	102.169
30	4.5877	7.8209	10.0601	17.8809	22.4686	61.6712	5.6253	2.69798	4.2709	102.152	102.152
31	4.1391	3.7914	5.8338	9.6252	13.7643	71.3960	6.1814	2.34655	4.2694	101.608	101.630
32	3.8126	4.3900	7.1895	11.5795	15.3922	70.3268	6.2200	2.34205	3.8780	101.776	101.732
33	4.8149	6.5073	10.3505	16.8577	21.6727	62.4413	5.6666	2.69680	4.3564	102.173	102.184
34	6.7658	4.8639	5.7930	10.6569	17.4227	63.1326	5.8695	2.64696	4.9186	102.033	102.011
35	6.2989	17.7624	13.3686	31.1109	37.4298	27.6291	7.4772	4.44885	8.7435	105.429	104.669
36	11.2212	17.8394	12.4986	30.3381	41.5593	27.3538	6.3870	4.23962	9.6995	105.154	105.154
37	11.5736	15.2526	11.3974	26.6601	38.2337	25.9112	8.8537	4.65808	8.6995	105.242	105.231
38	7.2129	15.6591	12.3775	28.0366	35.2494	27.5410	6.9596	4.68010	9.2391	105.528	105.539
39	5.4730	14.4918	13.1814	27.6732	33.1461	32.2431	10.1971	4.50391	9.6224	104.416	104.427
40	8.5343	16.2547	18.2579	34.5226	43.0569	27.4639	4.6471	4.42683	9.2831	105.099	105.110
41	11.0671	21.8588	11.3314	33.1902	44.2572	18.6874	5.9355	5.09856	8.7105	106.486	106.486
42	8.4839	19.2706	13.3098	32.5804	41.0643	19.1935	9.1670	4.82591	9.3186	105.807	105.818
43	9.1238	22.2563	11.0734	33.3297	42.4535	25.7284	5.7503	6.26506	5.8488	104.535	104.502
44	10.4944	22.3483	16.8989	39.2472	49.7416	22.8989	5.8652	6.20225	5.3034	104.101	108.303
45	15.3991	17.8049	12.3947	30.1996	45.5987	23.3038	5.9978	7.61641	5.6984	104.501	104.612
46	6.8882	20.0775	10.3876	30.4651	37.3533	28.7708	7.1872	6.29014	9.1916	104.297	104.275
47	9.0949	17.3951	12.7042	30.0993	39.1943	34.5033	5.1987	4.80132	7.1965	103.598	103.598
48	12.9978	18.6947	0.0000	18.6947	31.6925	37.8982	8.3960	5.99558	5.2987	103.595	103.584

SRC2 PILOT PLANT DATA BASE
TABLE OF REACTOR CONDITIONS AND NET YIELDS BASED ON
MOISTURE AND ASH FREE (MAF) COAL

8:13 THURSDAY, APRIL 3

QBS	CODE	COAL	MODE	TAVG	SRT	CIN	PH2	V	HASH	RATIO	RSRC	RICH	SHY	SC1C4
49	FTLL7	KENT	2	461.0	0.982	29.5	11.9793	4.34161	8.20	0.26038	23.90	5.00	4.80044	18.4035
50	MERL1	KENT	2	461.0	0.955	35.0	13.8900	0.66843	8.40	0.00000	19.20	4.70	5.20512	18.6590
51	MERL2	KENT	2	455.0	1.010	40.0	13.2000	1.28500	5.50	0.00000	17.30	2.50	3.26599	11.8294
52	MERL3	KENT	2	455.0	1.040	45.0	13.2000	1.25564	5.40	0.00000	22.70	2.60	3.68071	12.7827
53	MERL4	KENT	2	455.0	1.490	45.1	13.2000	0.87837	5.00	0.00000	14.30	3.00	5.71111	23.4000
54	MERL5	KENT	2	455.0	1.590	40.1	13.2000	0.82749	6.50	0.00000	18.55	3.99	4.98896	15.3863
55	MERL6	KENT	2	455.0	1.020	35.0	13.2000	1.28598	6.76	0.00000	24.50	4.76	2.93695	9.3077
56	MERL7	KENT	2	454.0	0.980	35.0	13.2000	1.30803	6.89	0.00000	23.30	4.96	3.33187	11.3042
57	MERL8	KENT	2	463.0	1.080	40.0	13.2000	1.30501	5.25	0.00000	18.56	3.75	3.61126	13.0315
58	MERL9	KENT	2	455.0	0.990	45.0	13.2000	1.27266	2.01	0.00000	8.55	1.33	3.58720	12.5828
59	MERL10	KENT	2	455.0	1.040	35.0	13.2000	1.18518	7.10	0.00000	26.67	4.73	3.13906	11.5355
60	MERL11	KENT	2	455.0	0.970	30.0	13.2000	1.77922	9.60	0.00000	25.30	5.10	4.11563	12.0049
61	MERL12	KENT	2	455.0	0.990	45.0	13.2000	1.65711	2.00	0.00000	9.20	1.00	2.95414	9.0057
62	MERL13	KENT	2	455.0	1.000	40.0	13.2000	1.70908	5.20	0.00000	19.50	2.80	3.55212	10.5350
63	MERL14	KENT	2	455.0	1.000	30.0	13.2000	1.81334	9.50	0.00000	31.90	4.40	3.96869	11.0241
64	MERL15	KENT	2	455.0	1.480	45.0	13.2000	0.92668	2.39	0.00000	7.09	1.04	4.52939	15.6954
65	MERL16	KENT	2	465.0	0.680	30.0	13.8900	2.21883	10.77	0.00000	26.20	7.89	5.03282	18.4464
66	MERL17	KENT	2	455.0	1.020	30.0	13.8900	1.01898	10.78	0.00000	25.30	7.94	5.72057	16.0616
67	MERL18	KENT	2	455.0	0.990	30.0	13.8900	0.80629	10.25	0.00000	26.30	8.83	4.85651	15.5629
68	MERL19	KENT	2	455.0	1.030	30.0	14.4800	1.16350	10.76	0.00000	23.40	5.85	6.20915	17.2113
69	MERL20	KENT	2	455.0	1.060	30.0	11.7200	1.43865	11.02	0.00000	33.80	7.34	5.93407	15.8242
70	MERL21	KENT	2	455.0	1.040	30.0	13.8900	1.21525	11.21	0.00000	30.90	8.10	5.71429	15.8242
71	MERL22	KENT	2	455.0	0.996	30.0	13.8900	1.21468	12.70	0.25131	27.10	6.50	6.20155	17.8295
72	MERL23	KENT	2	455.0	0.998	30.0	13.8900	1.21224	3.70	0.99693	0.00	1.20	4.78842	13.3630

QBS	SNAP	SND	SND	SOIST	SLIQ	SSRC	SICM	SBY	SHW	SUMIN	SUMOUT
49	14.2018	19.6009	8.6031	28.2040	42.4058	26.0976	6.59645	5.29933	5.9978	104.800	104.800
50	11.0278	11.5130	21.4491	32.9621	43.9899	23.4892	5.73445	4.65373	8.7009	105.205	105.227
51	11.2682	8.1481	15.9484	24.0965	35.3648	37.8227	5.72391	4.94949	7.5533	103.266	103.244
52	9.1131	5.3769	13.1264	18.5033	27.6164	46.0089	5.32151	4.24612	7.6386	103.681	103.614
53	9.1444	6.2667	12.3667	18.6333	27.7778	32.2222	6.88889	4.58889	10.8111	105.711	105.689
54	11.7991	8.4989	18.7387	27.2296	39.0287	29.6137	6.36865	2.94702	10.1656	104.989	103.510
55	8.0601	7.8834	19.5208	27.4042	35.4643	37.7608	7.33135	3.85337	9.1099	102.937	102.827
56	8.6980	8.0713	17.5060	25.5773	34.2753	33.7585	7.16956	4.79437	7.9956	103.332	101.298
57	7.1563	7.3219	16.9409	24.2628	31.4191	36.8857	7.45445	4.82606	8.4484	103.611	102.065
58	8.5872	5.3422	13.7859	19.1280	27.7152	44.1501	5.84989	4.13907	7.8035	103.587	102.241
59	7.9574	7.1452	19.9100	27.0552	35.0126	36.6590	6.49764	3.52321	8.5172	103.139	101.745
60	9.7650	11.4311	23.1049	34.5360	44.3010	27.2537	5.43970	6.16794	8.2864	104.116	103.454
61	6.8122	6.5917	14.3519	20.9436	27.7557	45.8554	5.13668	4.99339	7.6058	102.954	100.353
62	8.3949	6.9498	17.7827	24.7325	33.1274	38.6100	5.60397	5.00827	7.7441	103.552	100.629
63	9.2823	8.8524	20.3395	29.1919	38.4743	34.2961	4.75141	5.91996	7.2759	103.969	101.742
64	11.1369	9.6026	16.3024	25.9051	37.0419	30.7947	4.52539	4.22737	10.9272	104.525	103.212
65	10.1094	10.2954	20.8972	31.1926	41.3020	22.8665	6.99278	4.81400	10.3282	105.033	104.650
66	12.6513	9.2409	20.9021	30.1430	42.7943	23.5424	7.37074	4.51045	11.4411	105.721	105.721
67	11.3687	7.1744	20.6402	27.8146	39.1832	26.6004	8.94040	4.30464	13.2649	104.857	104.857
68	11.7647	9.6950	24.0741	33.7691	45.5338	21.7865	5.44662	4.79303	10.3486	106.209	105.120
69	8.9011	8.6813	21.4246	30.1099	39.0110	30.3247	6.59341	4.94505	9.2308	105.934	105.934
70	11.3187	9.3407	21.4286	30.7692	42.0879	27.2527	7.14286	4.39560	9.3110	105.714	105.714
71	11.0742	12.4031	19.6013	32.0044	43.0786	23.2558	5.64784	4.87265	11.5172	106.202	106.202
72	12.6949	10.9131	12.8062	23.7194	36.4143	40.5345	3.22940	4.74294	6.9042	104.788	104.788

SRC2 PILOT PLANT DATA BASE
TABLE OF REACTOR CONDITIONS AND NET YIELDS BASED ON
MOISTURE AND ASH FREE (MAF) COAL

8:13 THURSDAY, APRIL 3,

OBS	CODE	COAL	MODE	TAVG	SRT	CIN	PH2	V	RASH	RATIO	RSRC	RIUM	SHY	SCICA
73	NERL24	KENT	2	455.0	1.026	30.0	13.8900	1.21360	3.2	1.00000	0.3	1.5	5.34521	14.6993
74	NERL25	KENT	2	455.0	1.110	30.0	13.8900	1.21430	6.5	1.00000	0.5	3.0	5.56793	13.3630
75	NERL26	KENT	2	455.0	0.990	30.0	13.8900	1.21574	11.0	1.00000	0.0	3.8	5.34521	14.1425
76	NERL27	KENT	2	454.0	1.070	30.0	13.8900	0.44008	12.2	0.00000	26.9	5.5	4.56570	16.2584
77	NERL28	KENT	2	455.0	1.052	30.0	13.8900	0.44084	10.6	0.00000	29.8	5.3	5.99334	13.9845
78	NERL29	KENT	2	463.0	0.133	30.0	13.8900	0.89722	1.8	1.66667	11.1	1.1	2.43902	4.3237
79	NERL30	KENT	2	463.0	0.130	40.0	13.8900	0.90359	1.9	2.05479	12.2	1.3	1.77384	3.8803
80	FTLLA	POWH	2	456.1	0.910	29.2	11.8128	1.86438	10.2	0.06738	25.5	5.0	4.49977	14.9054
81	FTLL9	POWH	2	455.6	0.860	27.1	11.8128	2.12789	11.0	0.11896	26.6	5.2	4.59995	17.4977
82	FTLL10	POWH	2	455.1	0.880	27.9	11.8680	2.19743	11.3	0.38073	25.1	5.6	5.49983	21.4955
83	FTLL11	POWH	2	460.0	0.970	30.0	11.6886	2.06378	10.7	0.31754	24.7	5.9	5.20054	21.6990
84	FTLL13	POWH	2	456.1	0.950	30.2	11.8542	2.28070	9.1	0.05435	27.0	4.6	3.89963	15.6030
85	FTLL14	POWH	2	456.1	0.970	30.6	11.7990	2.90688	9.2	0.05424	25.1	4.0	4.49950	17.5980
86	FTLL15	POWH	2	455.0	0.970	31.3	11.8680	2.77178	9.4	0.09020	27.0	4.5	4.50046	16.9024
87	FTLL16	POWH	2	455.0	0.930	29.6	11.4816	2.25725	9.6	0.08425	26.9	4.3	4.40035	17.3005
88	NERL31	POWH	2	457.0	1.010	30.0	12.5100	0.47504	8.2	0.25442	22.4	3.9	5.63536	15.6906
89	NERL32	POWH	2	455.0	1.000	30.0	12.5100	0.47465	7.4	0.28421	22.1	3.9	5.40839	15.0110
90	NERL33	POWH	2	455.0	1.010	30.0	12.5100	0.67312	8.0	0.08876	21.3	3.9	5.29801	16.5563
91	NERL34	POWH	2	455.0	1.020	30.0	12.5100	0.67028	9.3	0.26148	20.7	4.3	6.03645	17.6538
92	NERL35	POWH	2	455.0	1.010	30.0	12.5100	0.47469	9.7	0.13399	21.3	4.3	5.22134	15.5505
93	NERL36	POWH	2	455.0	1.020	30.0	12.5100	0.67216	10.2	0.50661	19.8	5.8	4.65380	15.4370
94	NERL37	POWH	2	455.0	1.010	30.0	12.5100	0.47279	9.6	0.14570	21.6	4.2	5.98194	15.2370
95	NERL38	POWH	2	455.0	1.010	30.0	12.7640	0.46094	9.4	0.13115	21.9	4.2	5.29876	14.9944
96	NERL39	POWH	2	455.0	1.050	30.0	12.9060	0.45490	9.8	0.15278	22.5	4.5	5.17435	14.8481

OBS	SNAP	SMD	SMD	SDIST	SLIQ	SSRC	SIOM	SHY	SHW	SUMIN	SUMOUT
73	13.6971	7.4610	15.2561	22.7171	36.4143	38.4187	3.45212	5.12249	7.23831	105.345	105.345
74	19.2650	3.0067	19.8218	22.8285	42.0935	35.1893	2.44989	4.34298	8.12918	105.568	105.568
75	16.4811	9.2428	15.4788	24.7216	41.2027	35.7461	1.44766	4.34298	8.46325	105.345	105.345
76	8.2405	13.5857	22.1604	35.7461	43.9866	25.0557	5.12249	4.23163	9.91091	104.566	104.566
77	7.6582	13.5405	22.3085	35.8491	43.5072	31.0766	5.54939	3.99556	7.88013	105.993	105.993
78	5.3215	8.9800	2.2173	11.1973	16.5188	64.9667	6.31929	3.43681	6.87361	102.439	102.439
79	4.6563	8.7583	7.8714	16.6297	21.2860	59.6452	7.76053	3.21508	5.98670	101.774	101.774
80	11.9536	29.1460	2.1969	31.3429	43.2965	30.7008	6.19648	3.04191	6.29788	104.500	104.439
81	8.0576	20.7389	12.3980	33.1369	41.1945	27.6972	6.40299	4.60109	7.40027	104.600	104.794
82	12.6172	21.5859	6.4950	28.0809	40.6981	25.5958	6.09963	4.80363	6.73995	105.500	105.490
83	11.1537	20.1730	5.8022	25.9802	37.1338	27.7039	7.09779	4.69806	6.80487	105.201	105.137
84	10.3498	26.8582	6.0020	32.8602	43.2100	30.4013	5.70023	3.99016	4.99609	103.900	103.901
85	5.9438	21.9531	17.5080	39.5512	45.4949	26.1071	4.79947	4.59949	5.79936	104.500	104.488
86	8.8390	18.1683	17.0963	35.2646	44.1036	28.2048	4.99544	3.90055	6.39827	104.500	104.505
87	8.1621	22.2273	9.6038	31.8311	39.9932	31.6040	6.30522	3.80293	5.69872	104.400	104.405
88	13.4807	17.4586	13.1492	30.6077	44.0884	28.7293	5.08287	4.97238	7.07182	105.635	105.635
89	12.9139	15.2318	15.3422	30.5740	43.4879	30.9051	5.40839	4.52539	5.84989	105.408	105.188
90	13.1347	22.5166	8.8300	31.3466	44.4812	27.7042	5.07726	4.96689	6.51214	105.298	105.298
91	9.9089	14.2369	15.3759	29.6128	39.5216	30.7517	6.37813	4.32802	7.40319	106.036	106.036
92	10.3292	21.5664	9.4211	30.9875	41.3167	29.8524	6.01589	4.08627	8.51305	105.221	105.335
93	15.8910	7.3780	20.8908	27.4688	43.3598	25.9932	7.71850	4.42679	7.71850	104.654	104.654
94	11.2867	22.7991	10.8352	33.6343	44.9210	28.2167	5.64334	4.06321	7.90068	105.982	105.982
95	10.9357	19.2785	12.5141	31.7926	42.7283	29.6505	5.74972	4.39684	7.77903	105.299	105.299
96	10.3487	24.1845	11.1361	35.3206	45.5693	28.7964	5.73678	5.28684	4.83690	105.174	105.174

SRC2 PILOT PLANT DATA BASE
TABLE OF REACTOR CONDITIONS AND NET YIELDS BASED ON
MOISTURE AND ASH FREE (MAF) COAL

8:13 THURSDAY, APRIL

OBS	CODE	COAL	MODE	TAVG	SRT	CIN	PH2	V	RASH	RATIO	KSQC	RICH	SHY	SCIC4
97	PNN10	POWH	2	454	0.99	29.5	11.7229	1.02835	8.1	0.110266	28.5	4.7	4.70562	18.4690
98	PNN11	POWH	2	454	0.99	29.5	12.9612	0.75904	8.0	0.107280	29.4	4.5	4.79399	18.2481
99	PNN12	POWH	2	455	0.99	29.5	11.7631	0.70266	7.6	0.114391	27.7	5.0	4.72771	18.2481
100	PNN13	POWH	2	455	0.99	29.4	12.4435	0.86499	9.5	0.107914	25.4	4.9	4.32753	16.1941
101	PNN14	POWH	2	455	1.00	29.7	12.4289	0.84982	9.2	0.109589	24.6	4.1	4.32753	16.5129
102	PNN15	POWH	2	450	0.99	29.5	12.3820	0.83561	9.2	0.108844	24.8	3.9	3.92894	14.7478
103	PNN16	POWH	2	460	1.00	30.0	11.7932	1.02226	11.1	0.107527	22.8	5.2	4.72827	17.2154
104	PNN17	POWH	2	457	1.00	29.4	12.3876	0.84687	9.7	0.105567	24.2	4.9	4.85359	19.4827
105	PNN18	POWH	2	455	1.00	29.4	12.9554	0.91753	11.2	0.256303	25.0	4.5	5.07007	18.9814
106	PNN19	POWH	2	455	1.00	29.4	14.3073	0.73418	11.0	0.186508	25.5	4.3	5.13843	18.4345
107	PNN20	POWH	2	457	1.00	29.5	12.4248	0.85275	9.8	0.300030	23.3	4.9	4.77384	18.7308
108	PNN21	POWH	2	455	1.33	39.3	12.4159	0.98642	3.8	0.132686	19.4	2.8	4.27206	17.8190
109	PNN22	POWH	2	455	1.32	39.0	12.4159	0.95963	5.8	0.132813	22.5	3.7	4.44070	17.6728
110	PNN23	POWH	2	455	0.99	29.2	12.4034	0.88432	9.8	0.220264	27.1	6.2	4.55312	17.9989

OBS	SNAP	SND	SND	SDIST	SLIQ	SSRC	S10M	SBY	SHW	SUMIN	SUMOUT
97	9.8310	14.9674	15.5529	30.5203	40.3513	29.0180	6.05324	4.37424	6.46195	104.706	104.728
98	10.4275	15.3761	14.2494	29.6255	40.0530	29.6697	5.87651	4.38529	6.56136	104.794	104.794
99	10.4496	14.3930	13.2000	27.5931	38.0426	30.0784	6.82647	4.57307	6.94797	104.728	104.717
100	10.5341	14.6339	10.7505	25.3844	35.9185	33.6180	7.24291	4.35030	7.00376	104.328	104.328
101	8.8942	16.0905	11.1946	27.1951	36.0893	34.7910	6.26352	4.08837	6.58239	104.328	104.328
102	8.5526	15.4083	13.0623	28.4706	37.0231	35.9868	5.78522	3.92894	6.44574	103.929	103.918
103	10.3680	17.8649	13.1252	30.9901	41.3581	32.6080	6.28916	4.28392	8.56785	104.728	110.322
104	10.5617	15.1305	9.3540	24.4844	35.0461	35.7525	6.83605	4.31810	8.95522	104.854	110.391
105	9.0692	16.4078	15.2330	32.1408	41.2100	32.3801	5.44605	3.99770	8.88686	105.070	110.892
106	9.1717	18.2978	15.1077	33.4055	42.5772	31.8332	5.20679	4.01048	8.81850	105.138	110.881
107	8.5109	16.8205	12.3391	28.8595	37.3704	34.8297	6.97277	3.98770	8.65900	104.774	110.550
108	8.0045	16.5486	7.3075	23.8561	31.8606	35.7841	8.07195	3.67622	7.06015	104.272	104.272
109	8.3530	14.8623	11.8943	26.7566	35.1096	31.6133	8.37549	3.76616	7.91456	104.441	104.452
110	7.6447	16.2114	13.7043	29.9157	37.5604	29.4885	7.85835	3.76616	7.86959	104.553	104.542

STATISTICAL ANALYSIS SYSTEM

12:34 FRIDAY, M

VARIABLE	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE	SUM	VARIANCE	UNCORRECTED SS	CORRECTED SS	STD ERROR OF MEAN
SHY	4.0416638	1.33724588	1.5929204	6.4860698	4.8931495	444.5830	1.788227	1991.8	194.9167	0.12750139
SCIC4	13.1544901	5.52068505	3.1723536	23.7969387	20.6245850	1446.9939	30.477963	22356.6	3322.0980	0.52637667
SBY	4.1347070	0.98465498	2.2050717	7.6164880	5.4113363	454.8178	0.969545	1986.2	105.6805	0.09388317
SHW	7.3968366	1.93956878	1.9978166	11.5171650	9.5193484	813.6520	3.761927	6428.5	410.0500	0.18493063
SNAP	9.2519482	3.26905442	1.6910936	19.2650334	17.5739398	1017.7143	10.686717	10580.7	1164.8521	0.31169211
SND	12.1245189	6.40078020	-4.6052632	29.1460117	33.7512749	1333.6971	40.969987	20636.2	4465.7286	0.61029045
SND	11.3295811	6.63143057	-3.1903190	24.0740741	27.2643931	1246.2539	43.975871	18912.9	4793.3700	0.63228210
SSRC	40.6940746	16.50063783	18.6873692	74.2006615	55.5132923	4476.3482	272.271049	211838.4	29677.5443	1.57327409
S10M	6.1222847	1.27478564	1.4476615	10.1971149	8.7494534	673.4513	1.625078	4300.2	177.1335	0.12154604
SDIST	23.4540999	9.86793344	-7.7850877	39.5511610	47.3362487	2579.9510	97.376110	71124.4	10613.9960	0.94087054
TAVG	453.7327273	8.22250335	412.8000000	465.0000000	52.2000000	49910.6000	67.609561	22653442.1	7369.4422	0.78398493
PH2	12.4080399	1.87758387	6.8900000	17.6500000	10.7600000	1364.8844	3.525321	17319.8	384.2600	0.17902060
SRT	0.8666000	0.30488013	0.1300000	1.5900000	1.4600000	95.3260	0.092952	92.7	10.1318	0.02906918
CIN	32.9018182	5.98330984	23.4000000	50.0000000	26.6000000	3619.2000	35.799997	122980.5	3902.1996	0.57048621
RASH	5.5008182	4.35862556	0.0000000	12.7000000	12.7000000	605.0900	18.997617	5399.2	2070.7402	0.41557864
V	1.5124063	1.08891344	0.4267959	6.0548440	5.6280480	166.3647	1.185732	380.9	129.2448	0.10382382
NCOAL	-0.4363636	0.90388837	-1.0000000	1.0000000	2.0000000	-48.0000	0.817014	110.0	89.0545	0.08618237
DUM	1.0000000	0.00000000	1.0000000	1.0000000	0.0000000	110.0000	0.000000	110.0	0.0000	0.00000000
RDIST	44.1070000	16.62078353	17.8000000	76.6000000	58.8000000	4851.7700	276.250445	244108.3	30111.2985	1.56472953
RSRC	14.5210909	11.53190893	0.0000000	33.8000000	33.8000000	1597.3200	132.984924	37690.2	14495.3567	1.09952437
R10M	3.0346364	2.44824583	0.0000000	8.8300000	8.8300000	333.8100	5.993908	1666.3	653.3359	0.23343108
RATIO	0.2383961	0.36330532	0.0000000	2.0547945	2.0547945	26.2236	0.131991	20.6	14.3870	0.03463980

VARIABLE	C.V.	SKEWNESS	T	PR>|T|
SHY	33.087	-0.30587606	31.70	0.0001
SCIC4	41.968	-0.41355440	24.99	0.0001
SBY	23.814	0.28998287	44.04	0.0001
SHW	26.222	-0.25879412	40.00	0.0001
SNAP	35.334	0.12948461	29.68	0.0001
SND	52.792	0.25589237	19.87	0.0001
SND	58.532	-0.32135375	17.92	0.0001
SSRC	40.548	0.85578369	25.87	0.0001
S10M	20.822	-0.10979799	50.37	0.0001
SDIST	42.073	-0.89533373	24.93	0.0001
TAVG	1.812	-2.50989628	578.75	0.0001
PH2	15.132	-0.18896757	69.31	0.0001
SRT	35.181	-0.73523580	29.81	0.0001
CIN	18.185	0.75936294	57.67	0.0001
RASH	79.236	-0.13782230	13.24	0.0001
V	71.999	2.09694549	14.57	0.0001
NCOAL	-207.141	0.98340561	-5.06	0.0001
DUM	0.000	.	.	.
RDIST	37.683	0.54752784	27.83	0.0001
RSRC	79.415	-0.74769308	13.21	0.0001
R10M	80.677	0.05067798	13.00	0.0001
RATIO	152.396	2.37232048	6.88	0.0001

DEFINITION OF TYPE I AND TYPE IV SUM OF SQUARES
USED IN THE REGRESSION ANALYSIS

THE TYPE I SUM OF SQUARES IS THE INDIVIDUAL SUM OF SQUARES CONTRIBUTED BY EACH TERM IN THE MODEL TO THE OVERALL MODEL SUM OF SQUARES BASED ON THE ADDITION OF EACH TERM IN THE ORDER (WHICH IS ARBITRARY) OF APPEARANCE IN THE VARIABLE LIST. FOR EXAMPLE IN THE HYDROGEN CONSUMPTION REGRESSION MODEL OF PAGE 2, THE TEMPERATURE (TAVG) IS ENTERED FIRST AND THE TYPE I SUM OF SQUARES ATTRIBUTED TO TAVG IS 47.589... COMPARED TO 160.205... FOR THE TOTAL MODEL. THE TOTAL VARIATION IN THE DATA IS MADE UP OF THE MODEL CONTRIBUTION (OR PORTION EXPLAINED) AND THE REMAINDER WHICH IS ASSIGNED TO ERROR. IN THIS CASE TOTAL S.S. IS 194.9... THUS TAVG "EXPLAINS" ABOUT ONE-FIFTH OF THE VARIATION IN THE DATA.

THE TYPE IV SUM OF SQUARES IS CALCULATED IN A SIMILAR WAY TO THE TYPE I SUM OF SQUARES EXCEPT THAT THE CONTRIBUTION OF EACH TERM IS BASED ON THE DEGRADATION IN THE MODEL (IE THE REDUCTION IN THE MODEL SUM OF SQUARES WHICH WOULD RESULT IF A PARTICULAR TERM WERE TO BE REMOVED ONCE ALL THE TERMS HAVE BEEN ENTERED INTO THE MODEL. EQUIVALENTLY THE TYPE IV SUM OF SQUARES IS THE INCREMENTAL IMPROVEMENT IN THE MODEL BY ENTERING THE PARTICULAR VARIABLE LAST INTO THE MODEL.

GENERAL LINEAR REGRESSION MODEL FOR THE CONSUMPTION OF HYDROGEN
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND PUNHATAN COAL

8:54 WEDNESDAY, MAR

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SHV NET CONSUMPTION OF H₂

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	12	160.20508209	13.35042351	37.31	0.0001	0.821916	14.8010
ERROR	97	34.71161031	0.35785165		STD DEV		SHV MEAN
CORRECTED TOTAL	109	194.91669240			0.59820703		4.04166379

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE IV SS	F VALUE	PR > F
TAVG	1	47.58949086	132.99	0.0001	1	2.21588932	6.19	0.0145
PH2	1	14.62522732	40.87	0.0001	1	3.18691261	8.91	0.0036
SRT	1	51.44774054	143.77	0.0001	1	1.02486489	2.86	0.0938
CIN	1	19.80740893	55.35	0.0001	1	1.40799998	3.93	0.0501
RASH	1	10.33226270	28.87	0.0001	1	7.41430991	20.72	0.0001
PH22	1	2.00516140	5.60	0.0149	1	1.91698048	5.36	0.0227
V	1	1.35245889	3.78	0.0548	1	0.67426537	1.88	0.1730
TC	1	1.92447029	5.38	0.0225	1	1.50533167	4.21	0.0430
PS	1	2.21178087	6.18	0.0146	1	2.59804227	7.26	0.0083
RSRC	1	2.24836247	6.28	0.0139	1	0.35480202	0.99	0.3219
RATIO	1	6.12364786	17.11	0.0001	1	6.53612251	18.26	0.0001
SC	1	0.53707017	1.50	0.2235	1	0.53707017	1.50	0.2235

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	-44.37711320	-1.98	0.0506	22.41707801
TAVG	0.12332190	2.49	0.0145	0.04955845
PH2	-1.03536571	-2.98	0.0036	0.34694467
SRT	-4.84644425	-1.69	0.0938	2.86379171
CIN	1.52943606	1.98	0.0501	0.77104818
RASH	0.18560116	4.85	0.0001	0.04077527
PH22	0.03024619	2.31	0.0227	0.01306813
V	-0.08416263	-1.37	0.1730	0.06131340
TC	-0.00352403	-2.05	0.0430	0.00171820
PS	0.42091119	2.69	0.0083	0.15621361
RSRC	-0.01395265	-1.00	0.3219	0.01401249
RATIO	0.87392237	4.27	0.0001	0.20448633
SC	0.05462563	1.23	0.2235	0.04458948

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
1	2.75633498	2.52141993	0.23491965	1.29851079	3.74432907
2	2.97356828	3.16756334	-0.19399505	1.85056920	4.48455747
3	2.39263159	2.25260608	0.04982549	0.94333893	3.51227324
4	2.25071166	2.35787349	-0.15280682	1.0493254	3.62877443
5	2.23507166	2.28725700	-0.08218534	1.05746564	3.51704836

GENERAL LINEAR REGRESSION MODEL FOR THE CONSUMPTION OF HYDROGEN
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

8:54 WEDNESDAY, MAR

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: CHY

NET CONSUMPTION OF H2

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
6	2.22469410	2.21156273	0.01311137	0.91739337	3.50577210
7	2.10643016	2.33678713	-0.23035697	1.10720888	3.56636537
8	2.65486726	2.34009088	0.31477638	1.08731567	3.59286609
9	2.32558140	2.18424597	0.14133543	0.94303846	3.42545348
10	4.05862458	3.32609400	0.73253058	1.92151706	4.73067094
11	3.26944758	2.75290717	0.51654041	1.49401259	4.01180174
12	1.80383315	2.06699158	-0.26315844	0.82748582	3.30649735
13	2.02931229	2.11950424	-0.09019195	0.87273470	3.36627378
14	1.98019802	2.11251176	-0.13231374	0.86656788	3.35845563
15	1.93584071	2.13579830	-0.19995759	0.86869815	3.40289846
16	1.59292035	2.11848452	-0.52556417	0.85913479	3.37783425
17	2.18739429	3.38992400	-1.20252971	2.12929043	4.65055757
18	2.31168245	2.98715596	-0.67547350	1.70878640	4.26552552
19	2.98827244	2.88360421	0.10466823	1.59514458	4.17206385
20	2.65193370	3.46202263	-0.81008892	2.17887596	4.74516929
21	4.20819491	3.15507409	1.05312082	1.92197245	4.38817573
22	4.55049945	3.60260327	0.94789617	2.31613236	4.88907418
23	4.67185762	3.51859443	1.15326319	2.28514131	4.75204756
24	4.68750000	3.38038283	1.30711717	2.14818079	4.61258487
25	2.15914073	2.45263153	-0.29349080	1.18787193	3.71739112
26	1.98609956	1.96333879	0.02256077	0.67085027	3.25582732
27	2.24658129	2.63480922	-0.38822793	1.29222483	3.97739361
28	2.70740459	2.99340759	-0.28600300	1.68174071	4.30507447
29	1.96228061	1.37665074	0.58562987	-0.06180055	2.81510203
30	2.15182960	2.07362501	0.07820459	0.74083684	3.40641318
31	1.60782184	1.65746706	0.05535478	0.19280451	2.91212968
32	1.77559913	1.36349816	0.39210097	-0.00443691	2.77143324
33	2.17277678	1.84624871	0.32647757	0.46852528	3.22397215
34	2.03300907	3.14274092	-1.10973185	1.69916725	4.58631460
35	5.47891752	4.62437201	0.89954551	3.29688624	5.76149577
36	5.15361744	5.07394854	0.07966890	3.04696047	6.30093661
37	5.24171347	4.66426844	0.57744503	3.41512241	5.91341446
38	5.52802555	5.42063344	0.10739211	4.16194458	6.67932230
39	4.41581324	4.12587514	0.28993809	2.87169881	5.38005148
40	5.09655743	4.62257801	0.47397942	3.37880049	5.86635553
41	6.48606982	6.44687440	0.04019542	5.14846380	7.74328500
42	5.80652270	5.46027576	0.34624694	4.20907590	6.71147562
43	4.53450164	4.67102653	-0.13652488	3.43421924	5.90783381
44	4.16112360	4.91202316	-0.81089456	3.66889199	6.15515433
45	4.50110865	4.67237327	-0.17126462	3.41194733	5.93279921
46	4.29676848	4.12412717	0.16766131	2.84416260	5.41409175
47	3.58823400	3.38104405	0.21718995	2.07147236	4.69061574
48	3.59513274	4.06606640	-0.47093366	2.78802631	5.33410649
49	4.80044346	4.43046216	0.36998089	3.19016932	5.67076581
50	5.20511489	4.61440539	0.59071150	3.38974663	5.83906416
51	3.26594327	3.97213617	-0.70644290	2.76495789	5.18031445
52	3.66070453	3.88211643	-0.22140730	2.63818291	5.12605076
53	5.71111111	5.38305222	0.32805889	4.06546838	6.70014606

GENERAL LINEAR REGRESSION MODEL FOR THE CONSUMPTION OF HYDROGEN
BASED IN THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

8:54 WEDNESDAY.

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: GHY

NET CONSUMPTION OF H2

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
54	4.48896747	5.85946041	-0.87049794	4.59326103	7.12565980
55	2.93695484	4.22628415	-1.28932930	3.01649828	5.43607001
56	3.33186717	4.16045976	-0.82859260	2.95430370	5.36661583
57	3.61126449	3.96848143	-0.35721693	2.71499284	5.22197002
58	3.58719647	3.29053990	0.29665657	2.06487097	4.51620883
59	3.13406267	4.32002433	-1.18096165	3.10361217	5.53643649
60	4.11563500	4.67468556	-0.55905056	3.47175058	5.87762054
61	2.95414462	3.24725839	-0.29311377	2.02023044	4.47428634
62	3.55212355	3.82162236	-0.26949880	2.60928379	5.03396092
63	3.96869143	4.63161698	-0.66292555	3.40981846	5.85341550
64	4.52538631	4.96274863	-0.43736232	3.65882165	6.26667562
65	5.03282276	4.38572674	0.64709602	3.12573394	5.64571954
66	5.72057206	5.22229674	0.49827582	4.00956883	6.43502365
67	4.45651214	5.04871204	-0.19219990	3.83656702	6.26085706
68	6.20915033	5.41051061	0.79863972	4.18405730	6.63696391
69	5.93400593	4.81614433	1.11792160	3.59535104	6.03693762
70	5.71428571	5.26022676	0.45405895	4.03788405	6.48256947
71	6.20155039	5.69335931	0.50819107	4.46564422	6.92107441
72	4.78841871	5.05816534	-0.26974668	3.80592784	6.31040295
73	5.34521158	5.03763116	0.30758043	3.78245468	6.29280763
74	5.56792873	5.60504486	-0.03711613	4.33221959	6.87787013
75	5.34521158	6.39433005	-1.04911847	5.00227821	7.78638189
76	4.56570156	5.62658548	-1.06088392	4.40083491	6.85233604
77	5.99334073	5.25920031	0.73414043	4.03410923	6.48429138
78	2.43902439	3.02072076	-0.58169637	1.60379029	4.43765122
79	1.77383542	2.40381196	-0.62997604	0.94284593	3.86477798
80	4.45977467	4.59140585	-0.09163118	3.38273149	5.80080822
81	4.59995467	4.71237001	-0.11241534	3.49850941	5.92614061
82	5.49983057	5.03691911	0.46291145	3.82007151	6.25376672
83	5.20054078	5.00402214	0.19651865	3.78533521	6.22270906
84	3.81463116	4.36607100	-0.46643984	3.16007042	5.57207157
85	4.49950006	4.37936936	0.12013069	3.16576716	5.59297657
86	4.50045620	4.40715815	0.09329805	3.19489915	5.61941716
87	4.40004541	4.42478175	-0.02473634	3.21571652	5.63384698
88	5.63535912	4.60105163	0.83430749	3.59560619	6.00649707
89	5.40838857	4.62704561	0.78134271	3.41986856	5.83422307
90	5.79801325	4.58263331	0.71537994	3.37886931	5.78639730
91	6.03644647	5.00405430	1.03234217	3.79943399	6.20867461
92	5.22135939	4.95438208	0.26695731	3.74462191	6.16414225
93	4.65380250	5.39771369	-0.74391119	4.16119265	6.61423472
94	5.96194131	4.94702824	0.03991307	3.73381489	6.15024159
95	5.29875986	4.92817998	0.37057989	3.72311167	6.13324828
96	5.17435321	5.12603326	0.04831995	3.92064681	6.33141970
97	4.70562245	4.34911146	0.35651099	3.14012114	5.56810177
98	4.79391074	4.49563697	0.29835398	3.26746380	5.72381014
99	4.72771457	4.32154177	0.40617290	3.09696659	5.54611695
100	4.32752534	4.76615774	-0.43863240	3.56355059	5.96876490
101	4.32752534	4.73653742	-0.40901209	3.53431835	5.93876650

GENERAL LINEAR REGRESSION MODEL FOR THE CONSUMPTION OF HYDROGEN
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

8:54 WEDNESDAY, MAR

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SHY NET CONSUMPTION OF H2

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
102	3.92893748	4.61520640	-0.68626892	3.40784509	5.82256770
103	4.72626706	5.10504914	-0.37678208	3.86869903	6.34139926
104	4.85359462	4.94205021	-0.08845558	3.73845283	6.14564758
105	5.07006950	5.31121542	-0.24114592	4.10365298	6.51877785
106	5.13842999	5.50563621	-0.36720622	4.28305099	6.72822142
107	4.77384072	5.07422733	-0.30038661	3.87100648	6.27744817
108	4.27206296	4.46147820	-0.18941524	3.22221200	5.70074439
109	4.44069702	4.76709609	-0.32639907	3.53703658	5.99715561
110	4.55311973	4.89334319	-0.34022346	3.68967264	6.09701374
SUM OF RESIDUALS			0.00000000		
SUM OF SQUARED RESIDUALS			34.71161031		
SUM OF SQUARED RESIDUALS - ERROR SS			0.00000000		
PRESS STATISTIC			49.48790973		
FIRST ORDER AUTOCORRELATION			0.30342026		
DURBIN-WATSON D			1.38623493		

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF C1-C4 GASES
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

8:54 WEDNESDAY, MAR

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SC1C4		NET YIELD OF C1-C4					
SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	11	3013.05465488	273.91405953	86.86	0.0001	0.986973	13.4997
ERROR	98	309.04335760	3.15350365		STD DEV		SC1C4 MEAN
CORRECTED TOTAL	109	3322.09801248			1.77581070		13.15449007

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE IV SS	F VALUE	PR > F
TAVG	1	1154.95812261	366.25	0.0001	1	21.20441920	6.72	0.0110
SRT	1	1287.69559354	408.34	0.0001	1	68.45673247	21.71	0.0001
CIN	1	320.37717270	101.59	0.0001	1	31.68112396	10.06	0.0020
TAVG2	1	19.62140848	6.22	0.0143	1	20.45857337	6.49	0.0124
RASH2	1	59.43008821	18.85	0.0001	1	6.89005972	2.18	0.1426
CIN2	1	13.41830154	4.26	0.0418	1	26.38305205	8.37	0.0047
NCOL	1	58.00236717	18.39	0.0001	1	82.81529931	26.26	0.0001
TS	1	72.09018349	22.86	0.0001	1	74.72449930	23.70	0.0001
NIOM	1	8.26607750	2.62	0.1086	1	12.44807323	3.95	0.0497
RATIO	1	15.73969751	4.99	0.0277	1	18.87919968	5.99	0.0162
PR	1	3.45484212	1.10	0.2978	1	3.45484212	1.10	0.2978

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	824.38179153	2.73	0.0075	301.47291772
TAVG	-3.52695035	-2.59	0.0110	1.36013753
SRT	-215.91525866	-4.66	0.0001	46.34169567
CIN	-1.23246027	-3.17	0.0020	0.38899314
TAVG2	0.00389593	2.55	0.0124	0.00152957
RASH2	0.02601724	1.48	0.1426	0.01760137
CIN2	0.01598971	2.89	0.0047	0.00552809
NCOL	1.19284059	5.12	0.0001	0.23276028
TS	0.44599158	4.67	0.0001	0.10189185
NIOM	0.43078404	1.99	0.0497	0.21682293
RATIO	1.55424303	2.45	0.0162	0.63521948
PR	-0.01899511	-1.05	0.2978	0.01814782

OBSERVATION	UNOBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
1	5.95369350	5.64065102	0.31304248	2.01645222	9.26484981
2	6.05726872	7.25913936	-1.20187064	3.48895459	11.02932413
3	8.64228070	6.51119457	2.15108613	2.77769072	10.24869843
4	4.07936258	3.66187569	0.41750689	-0.03993073	7.36358252
5	3.14735391	3.91896930	-0.72161539	0.28405833	7.55388027
6	6.56784761	5.73267128	0.83017633	1.43608023	9.52926233
7	4.10194557	4.03918524	0.06291033	0.40981260	7.66835788

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF C1-C4 GASES
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

8:54 WEDNESDAY, MAR

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SC1C4 NET YIELD OF C1-C4

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
8	4.09292035	3.89830720	0.19461316	0.22679058	7.56982381
9	6.53377630	5.10849278	1.42528352	1.46531426	8.75167131
10	5.18602029	4.16223171	1.02378858	0.51330521	7.81115821
11	6.08793687	4.62758689	1.46034997	1.00618238	8.24899141
12	3.26944758	3.89634657	-0.62689900	0.26464543	7.52804771
13	3.83314543	3.67622048	0.15692495	0.02560180	7.32683916
14	4.84048405	3.72291460	1.11756945	0.07409444	7.37173476
15	3.65044248	3.24298579	0.40745669	-0.42291585	6.90888743
16	5.19911504	3.40455975	1.79455530	-0.24928201	7.05840150
17	15.62746646	13.84583688	1.78162958	10.00989218	17.68178157
18	14.54668471	14.86529907	-0.31861436	11.11965784	18.61094030
19	15.62922869	15.16906592	0.44016277	11.09457565	19.26355619
20	11.60220994	12.42716568	-0.82495574	8.63986044	16.21447092
21	11.62790678	12.08545008	-0.45754311	8.41828126	15.75261891
22	10.98779134	12.46718902	-1.46939767	8.66020987	16.25416816
23	11.56840934	12.45893033	-0.89052099	8.77680797	16.14105269
24	10.82589286	12.06849391	-1.24260105	8.39413097	15.74285686
25	6.34590092	6.92169283	-0.57579191	3.15178692	10.69159875
26	4.94541485	3.73464075	1.21077410	-0.06246749	7.53174899
27	5.01410896	3.80412081	1.20998816	0.01296955	7.59527206
28	6.55648581	7.18675132	-0.63026551	3.37201578	11.00148686
29	3.17235365	2.84217587	0.33017778	-1.73448751	7.41883924
30	5.41780448	5.44347542	-0.02567094	1.70691134	9.18003950
31	3.67191744	5.31342570	-1.64150826	1.32995869	9.29689270
32	3.57298475	5.26104824	-1.68806349	1.28260171	9.23949478
33	5.34992903	5.63801787	-0.28808884	1.86259102	9.39344473
34	0.06087441	6.54001935	-1.46085507	2.79248283	10.28755586
35	18.94064530	16.92746622	2.01317909	13.25996478	20.59496765
36	16.911443674	17.33356227	-0.41912554	13.69502199	20.97210255
37	18.87457328	20.20399026	-1.32941697	16.40888882	23.99999170
38	21.86983812	20.24829990	1.62153816	16.47046099	24.02613893
39	15.71412840	13.92967888	1.78444952	10.17033855	17.68901920
40	16.23169754	12.96761384	3.26407670	9.20817973	16.72704795
41	23.79693866	20.20665289	3.59028578	16.49097479	23.92233099
42	23.74812693	21.14322189	2.60490504	17.33240002	24.95404376
43	18.45564074	18.83465875	-0.37901800	15.13112937	22.53818812
44	18.29213483	18.79247040	-0.50033557	15.02769387	22.56724693
45	16.39689579	17.52659378	-1.12969800	13.78364050	21.26954707
46	15.48172757	16.06024448	-0.57851691	12.42365178	19.69663719
47	12.70419426	12.21427319	0.48992107	8.50876708	15.83977930
48	14.30309735	15.48939197	-1.18629462	11.86406519	19.11471875
49	18.46354767	17.72475424	0.67879343	14.11222954	21.33727894
50	16.65902073	15.47406009	1.18496064	11.76876226	19.17935792
51	11.82940516	11.59068258	0.23872258	7.94013728	15.24122789
52	12.78270510	12.55418006	0.22852504	8.60216950	16.30619062
53	23.40000000	17.13173815	6.26826185	13.39404432	20.86943198
54	15.38631347	17.96013290	-2.57381943	14.24977619	21.67048962
55	9.30771779	12.91644956	-3.60873177	0.27041100	16.56248812

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF C1-C4 GASES
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

8:54 WEDNESDAY.

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SCIC4

NET YIELD OF C1-C4

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
56	11.30415659	12.12521908	-0.82106249	8.46155301	15.78888514
57	13.03147432	17.48667203	-4.45519770	13.74377912	21.22956493
58	12.58278146	11.71548150	0.86729995	8.05727399	15.37368902
59	11.53550653	13.13609784	-1.60059131	9.49900094	16.77319474
60	12.00485490	14.03969977	-2.03484486	10.43050307	17.64889646
61	9.00573192	11.57478683	-2.56905491	7.91879736	15.23077631
62	10.53502482	11.61401398	-1.07898916	7.97741168	15.25061628
63	11.02414287	14.00635887	-2.98221600	10.37405624	17.63066150
64	15.69536424	16.32162162	-0.62625738	12.60446349	20.03877975
65	18.44638950	16.54227689	1.90411261	12.70857370	20.37598008
66	16.06160616	15.43968772	0.12191844	12.24351363	19.63586181
67	15.56291391	15.88010893	-0.31719502	12.06810599	19.69211187
68	17.71132893	15.01043824	2.20089073	11.35645378	18.66442271
69	15.82417582	16.59869150	-0.77451568	12.79727684	20.40010617
70	15.82417582	16.33639052	-0.51221469	12.62781134	20.04496969
71	17.82945736	16.14201405	1.68744331	12.33274444	19.95175366
72	13.36302895	13.57169464	-0.20866569	9.86519165	17.27819764
73	14.69923185	14.02116452	0.67816733	10.32640654	17.71392250
74	13.36302895	14.47329904	-1.11027009	10.77526167	18.17133642
75	14.14253898	15.48427648	-1.34173750	11.58034270	19.38821026
76	16.25835189	15.30578657	0.95256532	11.52505804	19.08651510
77	13.98446171	15.06213332	-1.07767211	11.41399696	18.71027068
78	4.32372506	7.27962932	-2.95590396	3.32415530	11.23510273
79	3.86026608	6.77438343	-2.89411736	2.65406741	10.89469945
80	14.90536278	17.07925091	-2.17386813	13.48177255	20.67672927
81	17.49773345	17.46496935	0.03276360	13.81559126	21.11034844
82	21.49553824	18.22811516	3.26742307	14.60084834	21.97538199
83	21.69866350	20.23731373	1.46164977	16.54004825	23.93457921
84	15.60299542	16.70310902	-1.10011361	13.11432336	20.29189469
85	17.59864466	16.58102740	1.01701726	12.98750932	20.17454548
86	16.90237226	16.16759754	0.73477462	12.58054196	19.75465333
87	17.30048814	16.24660168	1.05388646	12.65679891	19.83440445
88	15.69060773	17.55863741	-1.86802967	13.95067271	21.16660210
89	15.01103753	16.31856184	-1.30752432	12.69834018	19.93878351
90	16.55629139	16.21021130	0.34608009	12.59436880	19.82605380
91	17.65375854	17.02480358	0.62895496	13.43874560	20.61086156
92	15.55051078	16.83171239	-1.28120161	13.24249406	20.42093073
93	15.43760341	18.29469329	-2.85769488	14.64797954	21.94141703
94	15.23702032	16.78038135	-1.54336103	13.18976975	20.37094295
95	14.99436302	16.66106909	-1.66670607	13.06600063	20.25613755
96	14.84814398	17.29076568	-2.44262170	13.69999171	20.88153965
97	18.46901580	16.16758017	2.30143563	12.54688277	19.78827757
98	18.74809455	15.86598710	2.37911245	12.23262184	19.50534237
99	18.74809455	16.71000342	1.53809114	13.05484837	20.36515846
100	16.19405535	16.98396412	-0.78990876	13.39962841	20.56829963
101	16.51292563	16.58065493	-0.06772930	12.98875424	20.17255563
102	14.74775093	14.01170081	0.73605031	10.38138757	17.64201345
103	17.21544947	20.32584919	-3.11039972	16.62199358	24.02970480

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF C1-C4 GASES
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

8:54 WEDNESDAY, MA

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SC1C4 NET YIELD OF C1-C4

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
104	19.48273898	18.31101433	1.17172465	14.72518113	21.89684754
105	18.98142973	17.54469706	1.43673168	13.89301602	21.19637810
106	18.43454483	17.00129667	1.43324816	13.30263099	20.69996235
107	18.73077361	18.47847323	0.25230038	14.88998751	22.06695896
108	17.81899944	17.35307574	0.46592370	13.64448340	21.06166808
109	17.67284992	17.79474044	-0.12189053	14.10097121	21.48850968
110	17.99887577	17.86497436	0.13390142	14.22967075	21.50027797
SUM OF RESIDUALS			0.00000000		
SUM OF SQUARED RESIDUALS			309.04335772		
SUM OF SQUARED RESIDUALS - ERROR SS			0.00000012		
PRESS STATISTIC			404.74272137		
FIRST ORDER AUTOCORRELATION			0.26742341		
DURBIN-WATSON D			1.46477807		

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF BYPRODUCTS
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

8:54 WEDNESDAY

40

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SBY

NET YIELD OF BYPRODUCT GASES

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	14	80.46667857	5.74761990	21.66	0.0001	0.761415	12.4598
ERROR	95	25.21377261	0.26540813		STD DEV		SBY MEAN
CORRECTED TOTAL	109	105.68045118			0.51517777		4.13470696

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE IV SS	F VALUE	PR > F
TAVG	1	37.42588896	141.01	0.0001	1	0.44095388	1.66	0.2005
PH2	1	4.62431227	17.42	0.0001	1	0.13076342	0.49	0.4844
SRT	1	6.94241196	26.16	0.0001	1	1.57283626	5.93	0.0168
CIN	1	5.13151807	19.33	0.0001	1	0.88347982	3.33	0.0712
RASH	1	1.83656898	6.92	0.0099	1	5.91078193	22.27	0.0001
TAVG2	1	1.97747310	7.45	0.0076	1	0.50517268	1.90	0.1709
SRT2	1	5.03762402	18.98	0.0001	1	1.12500971	4.24	0.0422
CIN2	1	3.88269820	14.63	0.0002	1	1.20523135	4.54	0.0357
RASH2	1	1.93767307	7.30	0.0082	1	5.05234376	19.04	0.0001
V	1	5.24194184	19.75	0.0001	1	1.31557757	4.96	0.0284
NCOAL	1	2.67754438	10.09	0.0020	1	4.20916846	15.86	0.0001
RION	1	0.11426695	0.45	0.5043	1	0.22292670	0.84	0.3617
RATIO	1	0.23188238	0.87	0.3523	1	0.88613452	3.34	0.0708
CR	1	3.39882439	12.81	0.0005	1	3.39882439	12.81	0.0005

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	109.99998831	1.26	0.2106	87.27965249
TAVG	-0.51010757	-1.29	0.2005	0.39575125
PH2	0.02511444	0.70	0.4844	0.03577977
SRT	2.10899025	2.43	0.0168	0.86634311
CIN	-0.23718255	-1.82	0.0712	0.12999945
RASH	0.94727148	4.72	0.0001	0.20072853
TAVG2	0.00061584	1.38	0.1709	0.00044638
SRT2	-1.09661997	-2.06	0.0422	0.53264166
CIN2	0.00380241	2.13	0.0357	0.00178435
RASH2	-0.02868295	-4.36	0.0001	0.00657407
V	0.13034305	2.23	0.0284	0.05854459
NCOAL	-0.32532687	-3.98	0.0001	0.08169188
RION	-0.06429887	-0.92	0.3617	0.07015536
RATIO	-0.35757283	-1.83	0.0708	0.19569142
CR	-0.01628739	-3.58	0.0005	0.00454580

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF BYPRODUCTS
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

8:54 WEDNESDAY, MARC

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SHY

NET YIELD OF BYPRODUCT GASES

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
1	3.63836825	3.15096832	0.48739993	2.09089211	4.21104454
2	2.66343612	3.24745108	-0.38401496	2.14339339	4.35150877
3	4.27631579	3.54767758	0.72863821	2.46719991	4.62815524
4	2.31532525	2.83105835	-0.51573310	1.75723789	3.90487881
5	2.20507166	2.95404732	-0.74897565	1.89387104	4.01422359
6	2.78086763	3.61234805	-0.73148042	2.41584529	4.60885080
7	3.10421286	2.98221188	0.12200098	1.92419261	4.04023115
8	2.43362832	2.92893981	-0.49531149	1.86246494	3.99541467
9	2.65780731	3.35534983	-0.69754252	2.29682211	4.41387755
10	3.15670800	3.07055218	0.08615583	1.97724761	4.16385674
11	3.16670800	3.16097991	-0.00427190	2.09556620	4.22639362
12	3.38218715	3.03379481	0.34839233	1.96890770	4.09868193
13	3.45492672	3.00873505	0.44619167	1.92741967	4.09005043
14	3.41034103	3.03236428	0.37797675	1.95255368	4.11217488
15	3.09734513	2.84712419	0.25022045	1.77311879	3.92112958
16	3.76106195	2.91241770	0.84864424	1.84137623	3.98345918
17	4.54391701	3.89191398	0.65200303	2.76552973	5.01829823
18	4.76995940	4.61539689	0.15456252	3.51973861	5.71105517
19	5.08570140	5.13314162	-0.04744022	3.93815849	6.32812474
20	3.97790055	3.59914020	0.37876035	2.48766053	4.71061988
21	3.98671096	4.31833549	-0.33162452	3.23601424	5.40065673
22	2.55271920	3.52283334	-0.97011414	2.41205809	4.63360858
23	3.89321468	4.23105033	-0.33783565	3.14670938	5.31539128
24	3.90625000	4.23985689	-0.33360689	3.15650865	5.32320512
25	2.63042525	2.91116827	-0.28074301	1.77964524	4.04269129
26	2.63100437	2.54231241	0.08869195	1.44239400	3.64223083
27	2.71326243	2.68333710	0.02992533	1.55725683	3.80941736
28	3.33804501	3.06565374	0.27239128	1.92412469	4.20718278
29	2.46375232	2.47267277	-0.00892045	1.14338922	3.80195632
30	2.69797925	2.61535110	0.08262815	1.51588753	3.91481466
31	2.34655079	2.29834819	0.04820260	1.20076920	3.59592718
32	2.34204793	2.40178897	-0.05974104	1.24151148	3.56206646
33	2.69660096	2.74190819	-0.04510723	1.59656375	3.88725263
34	2.66695814	2.87478407	-0.20782673	1.69458679	4.05498294
35	4.44884925	4.47201959	-0.02317034	3.40838975	5.53564943
36	4.23962119	4.97603497	-0.73641378	3.91251297	6.03955697
37	4.65807730	4.74628980	-0.08821249	3.65125525	5.84132434
38	4.68010131	4.33317739	0.34692392	3.24018541	5.42616937
39	4.50390926	4.68216002	-0.17825076	3.57954461	5.78477543
40	4.42682524	5.11565056	-0.68882532	4.03236586	6.19893526
41	5.09855743	5.03759841	0.06095902	3.96773715	6.10745967
42	4.82591450	4.81576904	0.01014546	3.71241605	5.91912202
43	6.26506024	6.72872435	-0.03633589	5.12735266	7.33009604
44	6.20224719	6.50200286	-0.29975567	5.35081547	7.65319024
45	7.61640798	6.41366897	1.20273902	5.23554201	7.54174592
46	6.29014346	5.69843956	0.59170440	4.56459538	6.01228374
47	4.80132450	5.51134239	-0.71001789	4.37408807	6.64859672
48	5.09557522	5.08654529	0.00602993	3.97783932	6.20125127

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF HYPRODUCTS
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND PUNHATAN COAL

R154 WEDNESDAY.

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SUB

NET YIELD OF HYPRODUCT GASES

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% C. INDIVIDUAL	UPPER 95% C. INDIVIDUAL
49	5.29933481	5.72614338	-0.42680857	4.65541282	6.79687395
50	4.65372739	4.69925667	-0.04552928	3.60737959	5.79113376
51	4.44949495	4.43012435	0.01937060	3.34714157	5.51310712
52	4.24611973	4.40819576	-0.16207602	3.25038941	5.56600210
53	4.58888889	4.06947832	0.51941056	2.92110547	5.21785118
54	2.94701987	3.79274340	-0.84572353	2.60163169	4.90385511
55	3.85337309	4.52421424	-0.67084114	3.46265330	5.58577518
56	4.79436991	4.46613897	0.32823094	3.39912631	5.53315162
57	4.82606295	4.78435299	0.04170996	3.69590885	5.87279714
58	4.13907285	4.48876380	-0.34971095	3.41808093	5.55948667
59	3.52321370	4.50332876	-0.98011506	3.44383143	5.56282609
60	6.16793556	5.04186441	1.12607115	3.98956809	6.09416073
61	4.99338624	4.55911053	0.43427572	3.48911743	5.62910363
62	5.00827358	4.47016201	0.53811157	3.39727471	5.54304930
63	5.91496472	5.09863968	0.82132505	4.03517129	6.16210808
64	4.22737307	4.70233366	0.02503941	3.07306545	5.33160186
65	4.81400438	5.26858927	-0.45458489	4.14449664	6.39268190
66	4.51045105	4.62596401	-0.11551297	3.54076951	5.71115852
67	4.30463576	4.62016682	-0.31553106	3.49203465	5.74829899
68	4.79302832	4.79576433	-0.00275601	3.73635125	5.85321741
69	4.94505495	4.61801781	0.32703714	3.54501845	5.69101716
70	4.39560440	4.56451794	-0.16891354	3.47324731	5.65578857
71	4.87264673	4.24532988	0.62731686	3.12163620	5.36902355
72	4.34298441	4.41938194	-0.07639753	3.33610805	5.50265584
73	5.12249443	4.26540810	0.85708633	3.18812737	5.34268883
74	4.34298441	4.76841395	-0.42542954	3.68667985	5.85014806
75	4.34298441	4.52668852	-0.18370411	3.38833793	5.66503910
76	4.23162584	4.36472441	-0.13309858	3.26042304	5.46902578
77	3.99556049	4.74285172	-0.74729123	3.67590681	5.80979664
78	3.43680710	3.26285718	0.17394992	2.09863707	4.182107729
79	3.21507761	3.12267635	0.09240125	1.91858705	4.32676566
80	3.04191077	4.48025313	-1.43834236	3.43645864	5.52404762
81	4.60108794	4.76486813	-0.16378019	3.70637377	5.82336249
82	4.80063255	4.47623073	0.32440182	3.40654199	5.54391948
83	4.69806219	4.19526169	0.50280050	3.11206776	5.27845563
84	3.99016430	4.49880210	-0.50863780	3.45196503	5.54563912
85	4.59946895	4.54657643	0.05091851	3.48819774	5.60894312
86	3.90054745	4.30649334	-0.40594590	3.24603517	5.36695151
87	3.80292882	4.49734863	-0.69441980	3.45019249	5.54450476
88	4.97237569	4.36248866	0.60986703	3.31243965	5.41253767
89	4.52538631	4.24022411	0.28516220	3.18586782	5.29458041
90	4.96688742	4.34554918	0.62133824	3.29351418	5.39758418
91	4.32801822	4.20647092	0.11954731	3.16659997	5.25034186
92	4.08626561	4.19544854	-0.10918293	3.15078719	5.24010989
93	4.42678774	3.93455709	0.49223065	2.87161537	4.99749881
94	4.06320542	4.20687743	-0.14367201	3.16161208	5.25214278
95	4.39684729	4.23406624	0.16278105	3.10907316	5.27904753
96	5.28683915	4.16722699	1.11961225	3.18422289	5.21023090

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF BYPRODUCTS
BASED IN THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

6:54 WEDNESDAY, MARC

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SRY

NET YIELD OF BYPRODUCT GASES

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
97	4.37424058	4.33604593	0.03819465	3.28227883	5.38986304
98	4.38528665	4.34671632	0.03857033	3.29070868	5.40272395
99	4.57306970	4.31500018	0.25806952	3.24819215	5.38180821
100	4.35030179	4.33488684	0.01541494	3.29324176	5.37653192
101	4.08837262	4.35422439	-0.26585176	3.30968936	5.39875941
102	3.92893748	4.16126921	-0.23233173	3.10655176	5.21598666
103	4.28392389	4.27598989	0.00793400	3.20359046	5.34838933
104	4.31810414	4.38899781	-0.07089367	3.34744829	5.43054732
105	3.98769511	4.11448452	-0.12678941	3.05290076	5.17606829
106	4.01048194	4.19590362	-0.18542168	3.13328810	5.25851915
107	3.98769511	4.32364371	-0.33614860	3.28212617	5.36556126
108	3.67622260	3.47466827	0.20155432	2.38044956	4.56888699
109	3.76616076	3.47729796	0.28886280	2.38636055	4.56823537
110	3.76616076	4.22202494	-0.45586418	3.16301936	5.28103052
SUM OF RESIDUALS			-0.00000000		
SUM OF SQUARED RESIDUALS			25.21377261		
SUM OF SQUARED RESIDUALS - ERROR SS			0.00000000		
PRESS STATISTIC			33.30677105		
FIRST ORDER AUTOCORRELATION			0.04657050		
DURBIN-WATSON D			1.88919521		

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF WATER VAPOR
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

8:54 WEDNESDAY, MAR

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SHW NET YIELD OF WATER

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	16	388.38154595	19.27384662	17.63	0.0001	0.752058	14.1353
ERROR	93	191.66830143	1.09320969		STD DEV		SHW MEAN
CORRECTED TOTAL	109	410.05004739			1.04556669		7.39683656

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE IV SS	F VALUE	PR > F
TAVG	1	148.30809359	135.66	0.0001	1	0.55822321	0.51	0.4767
SRT	1	35.40793854	32.39	0.0001	1	7.01006219	6.41	0.0130
RASH	1	0.60046482	0.73	0.3944	1	4.97270678	4.55	0.0356
TAVG2	1	0.17351702	0.16	0.6912	1	0.58790417	0.54	0.4652
PH22	1	6.86792189	6.28	0.0139	1	10.05280149	9.20	0.0031
SRT2	1	9.20240346	8.42	0.0046	1	2.97552622	2.72	0.1024
CIN2	1	24.46342414	22.38	0.0001	1	0.32475922	0.30	0.5870
RASH2	1	18.40167390	16.33	0.0001	1	14.62651460	13.38	0.0004
V	1	4.57112055	4.18	0.0437	1	12.40744520	11.35	0.0011
NCOAL	1	30.12203323	27.55	0.0001	1	10.33647335	9.46	0.0028
TS	1	1.70341162	1.56	0.2151	1	4.39322367	4.02	0.0479
TR	1	2.35604448	2.16	0.1455	1	4.98791654	4.56	0.0353
PS	1	4.60804142	4.21	0.0431	1	10.36634991	9.48	0.0027
RIUM	1	5.76207402	5.01	0.0057	1	8.81267000	8.06	0.0056
SC	1	7.10908028	6.50	0.0124	1	1.75310009	1.60	0.2086
SH	1	5.53810301	5.06	0.0269	1	5.53810301	5.06	0.0269

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCLPT	156.79045656	0.74	0.4587	210.72455141
TAVG	-0.67372853	-0.71	0.4767	0.94282857
SRT	-83.73915438	-2.53	0.0130	33.06887134
RASH	9.22440178	2.13	0.0356	4.32507379
TAVG2	0.00677562	0.73	0.4652	0.00105766
PH22	-0.02048754	-3.03	0.0031	0.00675613
SRT2	2.71425901	1.65	0.1024	1.64825190
CIN2	-0.00071508	-0.55	0.5870	0.00131380
RASH2	0.03758644	3.66	0.0004	0.01027573
V	-0.40890600	-3.37	0.0011	0.12137634
NCOAL	-0.54142625	-3.07	0.0028	0.17607790
TS	0.14772337	2.00	0.0479	0.07369012
TR	-0.01991055	-2.14	0.0353	0.00932128
PS	0.63259916	3.08	0.0027	0.27038019
RIUM	0.40458729	2.84	0.0056	0.14249447
SC	0.12699781	1.27	0.2086	0.10028699
SH	-0.64807935	-2.25	0.0269	0.28814648

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF WATER VAPOR
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

8:54 WEDNESDAY

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SMV

NET YIELD OF WATER

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
1	5.40242558	5.79312925	-0.39070367	3.64803119	7.93822731
2	5.83700441	5.42046835	0.41603606	3.11575831	7.72617839
3	7.89473684	6.94617399	0.94856285	4.66138559	9.23096240
4	5.79217200	5.66710553	-0.37493353	3.47852198	7.85568908
5	6.17420066	6.29374087	-0.11954021	4.12877347	8.45470827
6	6.00667408	7.22166535	-1.21499127	4.91637550	9.52695520
7	6.09756098	6.46966394	-0.37210297	4.30831669	8.63101120
8	5.53097345	5.82679205	-0.29781860	3.65258467	8.00499943
9	5.53709856	6.65660730	-1.11950874	4.44056294	8.83265165
10	7.10259301	5.31085320	1.79173981	3.11114628	7.51056012
11	7.89177001	5.83160776	2.06016225	3.67202061	7.99119491
12	7.21533758	6.56702582	0.64830676	4.41459309	8.71945855
13	9.58286359	7.12010840	2.46267518	4.95086529	9.28951152
14	7.26072607	7.08998089	0.17074518	4.92173899	9.25822280
15	6.19469027	6.34631948	-0.15162921	4.14754625	8.54509270
16	5.19911504	6.38235256	-1.18323751	4.19402626	8.57067846
17	8.44514601	9.06427544	-0.61912943	6.74470017	11.32885071
18	10.41948579	9.96134612	0.45813967	7.09864055	12.22405169
19	9.64140731	9.84832077	-0.20691347	7.56994695	12.17669460
20	6.74033149	7.91222253	-1.17189103	5.67475650	10.14968855
21	7.53046404	9.06781265	-1.53735861	6.88530157	11.25032372
22	10.43285239	8.03563362	2.39721877	5.77218674	10.29908050
23	9.34371524	9.53681907	-0.19310384	7.34211247	11.73152568
24	10.04464286	9.27572718	0.76891568	7.06958963	11.46186472
25	2.60850504	4.69324293	-2.08473789	2.44412412	6.94236174
26	1.99781659	3.16896937	-1.17115278	0.69018972	5.44774902
27	4.25439549	3.45507873	0.79931676	1.04320648	5.86695048
28	4.18614766	4.73508169	-0.54893404	2.39323877	7.07692462
29	2.61637414	2.08360184	0.53277231	-0.64356677	4.81077044
30	4.27089022	5.69480912	-1.42391889	3.36066614	8.024995210
31	4.26941874	5.02008359	-0.75066480	2.54760351	7.49256367
32	3.87799564	3.25569899	0.62229665	0.69577588	5.81562209
33	4.35637078	4.11432529	0.24204549	1.67646226	6.55218831
34	4.91857034	3.45145488	1.46711545	1.04563223	5.85727753
35	8.74353045	7.70539436	1.03813609	5.53268201	9.87810670
36	8.69948244	7.89509469	0.80438775	5.74131679	10.04887258
37	8.69948244	8.62599003	0.07349240	6.33695024	10.91502982
38	9.23907059	9.01059972	0.22847137	6.70012062	11.32107761
39	8.62239841	8.45849433	0.16390409	6.18669038	10.73029827
40	9.28311860	7.95897452	1.32413908	5.64408505	10.23387399
41	8.71049444	8.76498757	-0.05449313	6.46113010	11.06884504
42	8.31864257	8.20925228	0.10939029	5.92160705	10.49689751
43	5.84884995	6.98244360	-1.13354366	4.79634415	9.16854305
44	5.30337074	6.79611375	-1.49274297	4.56764830	9.02457921
45	5.64644789	7.62118326	-1.92273537	5.38516169	9.85720483
46	9.19158361	7.2322547	1.95835314	4.96596347	9.50048747
47	7.1946749	5.27720777	1.91746022	2.95847710	7.59593844
48	5.29867257	6.68779183	-1.38910927	4.44771890	8.92784476

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF WATER VAPOR
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

8:54 WEDNESDAY, M

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SHW

NET YIELD OF WATER

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
49	5.99779271	6.68417247	-0.68638977	4.43762581	8.88071914
50	8.70092633	9.04758899	-0.34666265	6.82533559	11.26984239
51	7.55331089	7.86796889	-0.33465801	5.71076653	10.06517126
52	7.63858093	8.35306619	-0.71448526	6.11979277	10.58633961
53	10.81111111	10.44762634	0.36348478	8.11999717	12.77525550
54	10.16556291	10.04751604	0.11804687	7.62413533	12.47089675
55	9.10897648	8.39351709	0.71545939	6.25024155	10.53679264
56	9.95660150	8.43341181	1.56218968	6.26671501	10.59810862
57	8.44837107	9.28109881	-0.83272774	7.05991687	11.50228075
58	7.80353201	8.39341073	-0.58987822	6.22760177	10.55921869
59	8.51717704	8.42930944	0.08786760	6.29114381	10.56747508
60	8.28643937	8.37905887	-0.09261950	6.24628510	10.51183264
61	7.60582011	8.10595054	-0.50013043	5.93964641	10.27225466
62	7.74407060	7.84571340	-0.10164280	5.68536865	10.00605815
63	7.27593430	7.98072230	-0.70478800	5.83574729	10.12569731
64	10.92715232	10.91977446	0.00737786	8.51947667	13.32007225
65	10.32822757	10.17098367	0.15724390	7.65430923	12.68765811
66	11.44114411	10.23391531	1.20722881	8.01447084	12.45335978
67	10.26490006	10.59470329	-0.32980263	9.28086072	12.90854587
68	10.34858388	9.46051150	0.88807238	7.30569123	11.61533177
69	9.28676923	9.01516443	0.21560480	6.77426650	11.25606235
70	9.01098401	10.30427272	-1.29328371	8.06983777	12.53870768
71	11.51716501	10.40711309	1.11005191	8.16248715	12.65173904
72	6.90423163	7.04326508	-0.13903345	4.86019912	9.22633103
73	7.23830735	7.33908330	-0.10077595	5.16494261	9.51322399
74	8.12917595	7.49660545	0.63257050	5.33161876	9.66159213
75	8.46325167	8.63366477	-0.17061310	6.39634887	10.87138067
76	9.91091314	9.89056485	0.02034829	7.63607753	12.14506218
77	7.80013319	9.27049374	-1.39036056	7.11129002	11.42969746
78	6.87361419	7.17458272	-0.30096852	4.66658595	9.88257948
79	5.98669623	6.92406613	-0.93736990	4.34753016	9.50060211
80	6.29786193	7.14471142	-0.84682949	5.01543376	9.27348909
81	7.40027149	7.53942621	-0.13915423	5.34788126	9.73097117
82	6.79955482	7.72876435	-0.92860954	5.55086438	9.90666433
83	6.80486706	7.28564464	-0.48077758	5.06368491	9.50760436
84	4.99608807	6.45033459	-1.45424652	4.32783979	8.57282940
85	5.74935563	5.91912171	-0.11976608	3.77208817	8.06615524
86	6.39826642	6.30889009	0.08937634	4.16526181	8.45251836
87	5.69871722	6.39643632	-0.69771910	4.25685770	8.53601494
88	7.07182320	6.81243743	0.25938578	4.67482843	8.95004643
89	5.84968962	6.71224330	-0.86235367	4.57545217	8.84903442
90	6.51214128	6.66841741	-0.15627613	4.54310494	8.79372989
91	7.40318907	7.01237140	0.39081766	4.89664327	9.12809953
92	8.51305335	7.21026261	1.30277074	5.06490300	9.33063522
93	7.71650170	7.63177907	-0.11327736	5.70304264	9.96051550
94	7.70067720	7.14700445	0.75367275	5.02563215	9.26837674
95	7.77903044	7.18400266	0.59002776	5.06907395	9.30893140
96	4.83689539	7.34168193	-2.50478654	5.21746032	9.46590354

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GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF WATER VAPOR
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

8:54 WEDNESDAY

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SHW

NET YIELD OF WATER

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
97	6.46194632	6.58474365	-0.12279733	4.44290188	8.72658541
98	6.56136087	6.96948493	-0.40812406	4.84240680	9.13656307
99	6.94797305	6.81257707	0.13539596	4.65550894	8.96964520
100	7.00375811	7.23660522	-0.23284711	5.12353203	9.34967842
101	6.58239380	6.84211700	-0.25972320	4.72555979	8.95867422
102	6.44573511	6.80871045	-0.36297534	4.58254867	9.03487223
103	6.56784778	7.37354615	-1.19430164	5.10364250	9.64344979
104	8.95522388	7.21833668	1.73688700	5.09511554	9.34155823
105	8.88686339	7.68298549	1.20387791	5.53498372	9.83098725
106	8.81850291	7.97723721	0.84126569	5.80100672	10.15346770
107	8.65899510	7.25750205	1.40149305	5.13343318	9.38157092
108	7.06014615	7.73234079	-0.67219464	5.51098715	9.95369443
109	7.91455874	7.50079245	0.41376629	5.28249435	9.71909054
110	7.86958966	7.79997032	0.06961933	5.65196994	9.94797071

SUM OF RESIDUALS	0.00000000
SUM OF SQUARED RESIDUALS	101.66850143
SUM OF SQUARED RESIDUALS - ERROR SS	0.00000000
F-TEST STATISTIC	147.37059316
FIRST ORDER AUTOCORRELATION	0.14428100
DURBIN-WATSON D	1.70988889

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF NAPHTHAS
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POMHATAN COAL

8:54 WEDNESDAY

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SNAP NET YIELD OF NAPHTHAS

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	(R-SQUARE	C.V.
MODEL	8	561.05040532	70.13130066	11.73	0.0001	0.481649	26.4273
ERROR	101	603.80172913	5.97823494		STD DEV		SNAP MEAN
CORRECTED TOTAL	109	1154.85213445			2.44504293		9.25194823

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE IV SS	F VALUE	PR > F
SRT	1	271.00172213	45.33	0.0001	1	89.80142641	15.02	0.0002
RASH	1	41.64392249	6.97	0.0096	1	18.85225328	3.15	0.0788
RASH2	1	1.22746313	0.21	0.6514	1	8.51234749	1.42	0.2356
TS	1	90.33600092	15.11	0.0002	1	96.01135021	16.06	0.0001
TR	1	6.95595339	1.16	0.2833	1	15.78904002	2.64	0.1072
R10M	1	7.92769467	1.33	0.2522	1	3.63029183	0.61	0.4376
RSRC	1	135.02524355	22.59	0.0001	1	132.47189529	22.16	0.0001
RATIO	1	6.93250503	1.16	0.2841	1	6.93250503	1.16	0.2841

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	6.87288529	7.33	0.0001	0.93744676
SRT	-99.79589000	-3.08	0.0002	25.74883163
RASH	12.42234287	1.78	0.0788	6.99533260
RASH2	-0.03459825	-1.19	0.2356	0.02899452
TS	0.22483569	4.01	0.0001	0.05610356
TR	-0.02487109	-1.63	0.1072	0.01530395
R10M	0.25669879	0.78	0.4376	0.32941210
RSRC	-0.30820500	-4.71	0.0001	0.06547331
RATIO	-0.92164033	-1.08	0.2841	0.85586027

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
1	7.27673649	7.25739314	0.01934335	2.33109473	12.18369206
2	11.23348018	7.18353620	4.04994398	2.13702597	12.23004542
3	16.66666667	7.86275340	8.78391327	2.84290085	12.87260594
4	4.74096408	6.62328283	-1.88237875	1.68039039	11.56617529
5	2.96659316	6.97374423	-4.10715106	2.00135435	11.94613410
6	4.00444539	7.05032800	-3.64587927	2.64195563	12.65870169
7	4.10199557	7.33146903	-2.92947346	2.05651030	12.00642715
8	5.64159242	6.77738387	-1.13579095	1.83233136	11.72243668
9	5.53709856	7.42675905	-1.88966049	2.44524736	12.40827025
10	1.69104357	6.37461233	-5.18356875	1.93294381	11.81628084
11	6.31341601	7.11752455	-0.80410954	2.17006098	12.06498811
12	13.41600902	7.37940758	6.03660144	2.39903978	12.35977539
13	10.62249867	7.45435882	3.16814055	2.41931469	12.47940296

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF NAPHTHAS
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND PENNSYLVANIA COAL

8:54 WEDNESDAY.

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SNAP

NET YIELD OF NAPHTHAS

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
14	10.56105611	7.46463221	3.09642390	2.44182142	12.48744299
15	5.97345133	7.04261722	-1.06916589	2.06684829	12.01638614
16	4.20353982	7.12551253	-2.92197270	2.14963030	12.10134476
17	12.04194385	10.50141191	1.54053194	5.43018706	15.57263676
18	10.26161479	10.72674760	-0.46463280	5.63423802	15.81825717
19	13.92647722	10.27657622	3.64990100	5.22376961	15.32938783
20	11.71270718	9.53929793	2.17340925	4.53509915	14.54349671
21	11.40642303	9.58296487	1.82345816	4.57340159	14.59252815
22	11.87569367	9.45737261	2.41832106	4.44234698	14.47239824
23	7.67519466	9.58759872	-1.91240406	4.55116318	14.62403425
24	10.15625000	9.48742479	0.66882521	4.46771120	14.50713838
25	5.28277071	6.43827777	-1.15550705	1.47206365	11.40448669
26	3.78820961	4.11019800	-0.32198839	-1.13629885	9.35669485
27	4.01562839	4.13334901	-0.11772062	-1.10746102	9.37415904
28	5.76274872	6.33085056	-0.61810184	1.41824024	11.34346089
29	3.48849886	1.97729906	1.51119979	-3.70865717	7.66325529
30	4.58765702	6.60376943	-2.01611241	1.63777643	11.56976242
31	4.13905486	5.49540015	-1.35634529	0.49733025	10.49347005
32	3.81263617	5.48768314	-1.67504698	0.46945602	10.48591027
33	4.81493613	6.64937285	-1.83443672	1.68119760	11.61754810
34	6.76576675	6.34418628	0.42158047	1.36562933	11.32274322
35	6.29886576	10.14268033	-3.84381456	5.14434542	15.14101524
36	11.22123114	10.01895921	1.20227194	5.03836743	14.99955099
37	11.57361524	11.31798103	0.25563421	6.24023693	16.39572513
38	7.21286202	11.32095992	-4.10809790	6.22634762	16.41557222
39	5.47296553	7.72554444	-2.25257890	2.58860224	12.86248663
40	8.53430239	6.31985079	0.21445160	3.25443035	13.38527123
41	11.06706310	12.84859890	-1.78153580	7.80470948	17.89248831
42	8.48391362	12.71864316	-4.23472954	7.52277694	17.91500938
43	9.17376760	10.72411440	-1.60034660	5.69978244	15.74944636
44	10.49438202	11.20813317	-0.71375114	6.19097946	16.722528688
45	15.39911308	9.17722609	6.22188699	4.17964226	14.17480993
46	6.881815061	9.05364689	-2.16579628	4.01968295	14.08821083
47	9.09492274	7.80132019	1.29360255	2.80898714	12.79365324
48	12.99778761	9.53311920	3.46466841	4.55779783	14.50844057
49	14.20177384	9.85342691	4.34834693	4.86246337	14.84439044
50	11.02779603	11.43740184	-0.40961186	6.35426700	16.52053678
51	11.26823793	9.74845599	1.51978194	4.75326206	14.74364992
52	9.11308204	8.11206184	1.00102020	3.10760650	13.11651719
53	9.14444444	11.63215052	-2.48770609	6.60497507	16.65932600
54	11.79411700	11.88901948	-0.0990248	6.84843677	16.92960219
55	8.06006404	3.94365726	4.11640678	4.00642395	13.98089056
56	8.69804267	4.34607679	4.35196588	4.31580357	14.38035001
57	7.15626726	10.57077389	-3.41450664	5.51012016	15.63142762
58	8.51719647	9.14171730	-0.62452083	4.21605184	14.06738277
59	7.95741411	9.58023613	-1.62282201	3.60578464	13.55468761
60	9.76497648	10.24266326	-0.47768678	5.32577775	15.15954877
61	6.01216931	5.04700086	0.96516845	3.41518734	13.7781437

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF NAPHTHAS
 BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

8:54 WEDNESDAY.

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SNAP

NET YIELD OF NAPHTHAS

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
62	6.39492554	6.90163285	-0.50670731	3.42858939	13.87467631
63	9.28232810	8.05943464	1.22289366	3.04655985	13.07230943
64	11.13686534	11.10681460	0.03005074	6.03460384	16.17882536
65	10.10940919	9.27491164	0.83449755	3.68778233	14.86204096
66	12.65126513	11.56994753	1.08131759	6.37032297	16.76957209
67	11.36865342	11.21452496	0.15412846	5.78425021	16.64479970
68	11.76470588	11.63686505	0.12784083	6.68046396	16.59326614
69	8.90169890	8.98078058	-0.07908168	3.86709046	14.09447071
70	11.31863132	10.08358575	1.23509557	4.89782903	15.27434247
71	11.07419712	10.91757867	0.15661845	5.68878718	16.14637015
72	12.69487751	12.37998365	0.31489385	7.24998779	17.50997951
73	13.69710468	11.99819259	1.69891208	6.90833511	17.08805008
74	19.26503341	14.82382567	4.44120774	9.44839539	20.19925595
75	16.48166904	17.38556834	-0.90449930	11.73505304	23.03608365
76	8.24053452	11.08006259	-2.83952807	5.95708010	16.20304509
77	7.65815760	9.51954605	-1.86139045	4.55687273	14.48222337
78	5.32150776	4.29096464	1.03054312	-1.10554284	9.68747213
79	4.65631929	3.71055684	0.94576245	-1.95578052	9.37689421
80	11.95350269	10.14157214	1.81201051	5.22366604	15.05947834
81	8.05757026	9.98499719	-1.92742692	5.02957828	14.94041609
82	12.61719191	10.41577258	2.20141933	5.43077848	15.40081668
83	11.15367283	10.54415762	0.60951521	5.49231535	15.59599689
84	10.34983793	9.24667873	1.10315920	4.32609768	14.16725978
85	5.94378402	9.77793313	-3.83414910	4.83008220	14.72578405
86	8.83895985	9.39104137	-0.55208151	4.46560376	14.31807897
87	8.16210694	9.36635495	-1.20424801	4.42252873	14.31018117
88	13.48066298	10.05418889	3.42647409	5.13127799	14.97709980
89	12.91390728	9.59485547	3.31905182	4.67033775	14.51937318
90	13.13465784	10.39050997	2.74414736	5.44988368	15.33113627
91	9.90668383	11.20364374	-1.29475991	6.28040516	16.12648232
92	10.32917140	11.29063534	-0.96146395	6.35518363	16.22608706
93	15.89103292	12.02835720	3.86267572	7.03997515	17.01673925
94	11.28660172	11.11788806	0.16871366	6.18344326	16.05233286
95	10.93573844	10.94910864	-0.01337020	6.01973247	15.87848481
96	10.34870641	11.09811760	-0.74941119	6.17813163	16.01810357
97	9.83099525	8.34064759	1.49034766	3.37387500	13.30742019
98	10.42748260	7.95729229	2.47019031	2.97468676	12.93989783
99	10.44957473	8.40014941	2.04942531	3.43415015	13.36614866
100	10.53410773	10.06661547	0.46749226	5.16039293	14.97283801
101	8.89420339	9.99361733	-1.09941393	5.06357535	14.92365930
102	8.55255666	9.88741379	-1.33485714	4.75688682	15.01794077
103	10.36800729	11.34342555	-0.97541825	6.20596133	16.48889976
104	10.56169534	10.44452874	0.11716660	5.54014842	15.34890906
105	9.06915003	10.63818045	-1.56902242	5.60815368	15.66820721
106	9.17169876	10.42948079	-1.25778204	5.40639476	15.45256683
107	8.51088071	10.65552772	-2.14464701	5.74850850	15.56254694
108	8.06449691	8.44713390	-0.44263699	3.34827368	13.49599411
109	8.35300731	9.37228173	-0.96927442	4.33409048	14.31047298

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF NAPHTHAS
 BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL 8:54 WEDNESDAY, MAR

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SNAP NET YIELD OF NAPHTHAS

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
110	7.64474424	9.90430333	-2.25955909	4.95040103	14.85820564
SUM OF RESIDUALS			0.00000000		
SUM OF SQUARED RESIDUALS			603.80172913		
SUM OF SQUARED RESIDUALS - ERROR SS			0.00000000		
PRESS STATISTIC			707.52427291		
FIRST ORDER AUTOCORRELATION			0.26523358		
DURBIN-WATSON D			1.46107646		

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF MIDDLE DIST.
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

8:54 WEDNESDAY, 1

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SMD

NET YIELD OF MIDDLE DIST.

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	13	19596.14114403	1507.39547262	140.59	0.0001	0.949602	27.0067
ERROR	97	1040.02285067	10.72108506		STD DEV		SMD MEAN
UNCORRECTED TOTAL	110	20636.16399470			3.27442897		12.12451888

SOURCE	DF	TYPE III SS	F VALUE	PR > F	DF	TYPE IV SS	F VALUE	PR > F
SRT	1	16882.72156244	1574.60	0.0001	1	22.74375699	2.12	0.1485
CIN	1	2.35354146	0.22	0.6405	1	33.97597983	3.17	0.0782
RASH	1	932.91618901	87.01	0.0001	1	142.53176259	13.29	0.0004
V	1	343.92504264	32.08	0.0001	1	74.48341103	6.95	0.0098
NCOAL	1	561.11513095	52.33	0.0001	1	306.55992158	28.59	0.0001
TS	1	0.59962976	0.06	0.8136	1	30.43514464	2.84	0.0952
TC	1	17.57443252	1.64	0.2035	1	32.99048359	3.08	0.0826
TR	1	216.55775970	20.20	0.0001	1	159.35280854	14.86	0.0002
R10M	1	45.88741601	4.28	0.0412	1	97.09651564	9.06	0.0033
RSRC	1	15.44926083	1.44	0.2329	1	146.69953589	13.68	0.0004
RATIO	1	232.20893266	21.66	0.0001	1	89.82218210	8.38	0.0047
SC	1	237.49475269	22.15	0.0001	1	39.84498825	3.72	0.0568
CR	1	107.33747335	10.01	0.0021	1	107.33747335	10.01	0.0021

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
SRT	-112.35417775	-1.46	0.1485	77.14249769
CIN	3.38539847	1.78	0.0782	1.90177604
RASH	-35.88127662	-3.65	0.0004	9.84119035
V	0.93111026	2.64	0.0098	0.35327012
NCOAL	2.64850953	6.35	0.0001	0.50279328
TS	0.28703714	1.68	0.0952	0.17036770
TC	-0.00737310	-1.75	0.0826	0.00428331
TR	0.08384486	3.86	0.0002	0.02174864
R10M	-1.48705910	-3.01	0.0033	0.49415362
RSRC	0.32081364	3.70	0.0004	0.08673077
RATIO	3.15771783	2.89	0.0047	1.09095076
SC	-0.22433020	-1.93	0.0568	0.11636883
CR	-0.07491342	-3.16	0.0021	0.02367661

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
1	8.82028666	7.53801675	1.28226991	0.91778649	14.15824702
2	11.45374449	10.56545493	0.88828956	3.80289923	17.33401063
3	-4.08576316	4.36974252	-8.9950567	-2.54864586	11.37813089
4	6.3470783	7.16671743	-0.77400960	0.29172262	14.04571194

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF MIDDLE DIST.
BASED IN THE PILOT PLANT DATA FOR KENTUCKY AND PUGHATAN COAL

8:54 WEDNESDAY.

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SMD

NET YIELD OF MIDDLE DIST.

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
5	7.00749724	5.53463698	2.07286026	-1.17207631	12.24135027
6	6.56173526	3.08697446	2.47474080	-4.00388933	10.17787825
7	6.65188470	5.13260970	1.51927500	-1.56120626	11.82642567
8	5.75221239	6.75858744	-1.00637505	-0.03179042	13.54896530
9	5.64784053	4.53233483	1.11550570	-2.25572288	11.32039254
10	7.10259301	9.19484771	-1.09225470	1.32547685	15.06421858
11	3.15670800	6.99137966	-3.83469166	0.26329810	13.71950122
12	5.18602029	3.86296641	1.32305389	-2.86661926	10.59255207
13	0.22547914	2.43375641	-2.20827727	-4.35928977	9.22680259
14	0.00000000	2.50560762	-2.50560762	-4.28457391	9.29578915
15	3.87168142	4.42225118	-0.55056977	-2.42868516	11.27318753
16	7.63274336	4.31650585	3.31623751	-2.49348912	11.12650082
17	5.25425640	10.25943527	-5.00517887	3.36600497	17.15086557
18	6.93504736	7.88264084	-0.94759948	0.98712242	14.77817127
19	5.90888588	5.93079638	-1.02191049	-0.15443605	14.01602880
20	13.37016575	10.67548787	2.69467788	3.72596530	17.62501043
21	11.62790698	7.87220884	3.75569814	1.03844035	14.70597732
22	15.64927858	11.10536324	4.54391534	4.14721694	18.06350954
23	12.56952169	8.51077442	4.05874727	1.60161423	15.41993462
24	9.59421429	8.18338760	1.41082668	1.30544777	15.06132743
25	8.13239807	7.37371951	0.75867856	0.57316423	14.17427479
26	6.28820961	7.16529232	-0.87708271	0.09610273	14.23448191
27	7.92272629	6.92079954	1.00192675	-0.13886545	13.98046453
28	9.43786017	6.65867620	2.57918398	0.04515581	13.67219658
29	6.63904939	6.71669676	-0.07764738	-0.95018019	14.38357371
30	7.82086292	5.15088206	2.66998086	-1.51934364	11.82110775
31	3.79141771	6.11577409	-2.32435638	-0.89724536	13.12879354
32	4.38997821	5.62144383	-1.23146561	-1.41249030	12.65537795
33	6.50726062	4.51700346	1.99025716	-2.15945380	11.19346072
34	4.86391955	8.18564720	-3.32172765	1.37895365	14.99434076
35	17.76236097	14.90334118	2.85901980	6.16209809	21.64458426
36	17.83944500	16.65032162	1.18912338	9.86504166	23.43560157
37	15.26263627	15.06564857	0.19698770	6.16812590	21.96317124
38	15.65906838	17.88615158	-2.22708320	10.91083084	24.85347233
39	14.49179606	10.97912147	3.51267458	4.07847813	17.87976481
40	16.26472855	14.95672610	1.30800245	8.05001545	21.86343675
41	21.85882612	18.27985415	3.57897197	11.43276125	25.12692704
42	19.27060379	15.37781584	3.89278795	8.34631967	22.40931201
43	22.25629792	20.99998909	1.25630883	14.12404721	27.87593097
44	22.34831401	22.05604933	-0.30773472	15.54858980	29.76350885
45	17.80487805	22.08186467	-4.27698662	14.93879470	29.22493464
46	20.07751938	17.83158432	2.24593506	10.75092826	24.91224038
47	17.39514349	17.80367174	-0.40852825	10.59489192	25.01245156
48	18.69469027	14.88461288	3.81007739	7.84578936	21.92343639
49	19.60088692	19.72126949	-0.12038257	12.90387717	26.53866180
50	11.51301779	9.45487138	2.05814141	2.41430446	16.49543630
51	8.14814815	6.92689679	1.22125136	0.13419690	13.71960668
52	5.37694013	5.79832678	-0.42138664	-1.26122615	12.65794171

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF MIDDLE DIST.
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

8:54 WEDNESDA

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SMD

NET YIELD OF MIDDLE DIST.

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
101	16.00045553	16.51342276	-2.51296723	11.88594379	25.14090173
102	15.40826785	14.72952573	0.67874212	7.45287119	21.60618027
103	17.86487410	21.21137856	-3.34650445	14.24412803	28.17862908
104	15.13045460	19.50068997	-4.37015537	12.86350624	26.13771370
105	16.90782728	14.96947937	-2.06165210	12.27926206	25.65969668
106	18.24782366	19.02304697	-0.72522312	12.11834544	25.72774850
107	16.52045118	19.50461799	-2.98416681	12.86526838	26.14396761
108	16.54862282	17.71140815	-1.16277733	10.811891275	24.60388755
109	14.86228218	15.66065964	-0.79837746	8.77810340	22.54321588
110	16.21135469	16.94711191	-0.73575722	10.21489436	23.67932947
SUM OF RESIDUALS			0.41264966		
SUM OF SQUARED RESIDUALS			1040.02285087		
SUM OF SQUARED RESIDUALS - ERROR SS			0.00000000		
PRESS STATISTIC			1308.47426879		
FIRST ORDER AUTOCORRELATION			0.05496299		
DURBIN-WATSON D			1.88797257		

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GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF HEAVY DIST.
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

8:54 WEDNESDAY, M

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SHD

NET YIELD OF HEAVY DISTILLATE

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	12	3780.14290794	315.01190866	30.16	0.0001	0.788619	28.5268
ERROR	97	1013.22708407	10.44564004		STD DEV		SHD MEAN
CORRECTED TOTAL	109	4793.36998802			3.23197154		11.32958105

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE IV SS	F VALUE	PR > F
TAVG	1	248.28746483	23.77	0.0001	1	78.87823089	7.55	0.0072
PH2	1	1357.15198506	129.93	0.0001	1	145.07528929	13.89	0.0003
CIN	1	141.73847492	13.57	0.0004	1	139.23382062	13.33	0.0004
RASH	1	1013.44881595	97.02	0.0001	1	150.31011817	14.39	0.0003
TAVG2	1	4.76247335	0.46	0.5011	1	103.93808206	9.95	0.0021
RASH2	1	76.42379986	7.32	0.0081	1	172.89720017	16.55	0.0001
V	1	35.52419243	3.40	0.0692	1	86.15103522	8.25	0.0050
NCOAL	1	502.93121133	48.15	0.0001	1	450.15093393	43.09	0.0001
TP	1	151.63609062	14.52	0.0002	1	150.44185852	14.40	0.0003
TC	1	151.46345613	14.50	0.0002	1	140.30306943	13.43	0.0004
RATIO	1	61.72532228	5.91	0.0169	1	69.79313120	6.68	0.0112
CR	1	35.04961639	3.36	0.0701	1	35.04961639	3.36	0.0701

PARAMETER	ESTIMATE	T FOR HO: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	-1489.49231021	-2.23	0.0279	667.30565249
TAVG	9.02039464	2.75	0.0072	3.28257370
PH2	-27.57525902	-3.73	0.0003	7.39929608
CIN	-22.23266742	-3.65	0.0004	6.08957143
RASH	4.53981684	3.79	0.0003	1.19677291
TAVG2	-0.01272496	-3.15	0.0021	0.00403401
RASH2	-0.15421613	-4.07	0.0001	0.03790560
V	-1.06546957	-2.87	0.0050	0.37100378
NCOAL	-3.24872479	-6.56	0.0001	0.49488168
TP	0.06332643	3.80	0.0003	0.01668661
TC	0.04936086	3.66	0.0004	0.01346842
RATIO	-2.77069125	-2.58	0.0112	1.07188778
CR	-0.05006187	-1.83	0.0701	0.02732958

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
1	0.11025359	1.29437973	-1.18412614	-5.29130406	7.89006351
2	-3.08370044	1.07003571	-4.15373615	-5.64251736	7.78258878
3	-3.17982456	-0.54367059	-2.63615397	-7.44131743	6.35397625
4	2.31532525	-0.09536155	2.41068680	-6.47018333	6.77946072
5	0.99228225	0.39151456	0.60076769	-6.20611499	6.98914410

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF HEAVY DIST.
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWATAN COAL

8:54 WEDNESDAY, 1

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SHD

NET YIELD OF HEAVY DISTILLATE

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
102	13.06229359	14.32067909	-1.31858630	7.76743325	20.99382153
103	13.12521363	9.90985853	3.21535510	3.16052152	16.65919554
104	9.35399339	12.28505310	-2.93105971	5.75145945	18.81864674
105	15.73299533	13.16525593	2.04773940	6.56286430	19.80834556
106	15.10766777	15.31908478	-0.21141701	8.66169617	21.97647340
107	12.33906602	12.00486558	0.33420244	5.47218254	18.53761851
108	7.30747611	7.56029867	-0.25282256	0.87156174	14.24903559
109	11.89432265	9.79146709	2.10286057	3.04653971	16.53638446
110	13.70432827	12.42853663	0.77579164	6.39863501	19.45843426

SUM OF RESIDUALS -0.00000000
 SUM OF SQUARED RESIDUALS 1013.22708345
 SUM OF SQUARED RESIDUALS - ERROR SS -0.00000062
 PRESS STATISTIC 1318.67284906
 FIRST ORDER AUTOCORRELATION -0.04259583
 DURBIN-WATSON D 2.08321382

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF IOM
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND PINHATAN COAL

8:54 WEDNESDAY, MAR

GENERAL LINEAR MODEL'S PROCEDURE

DEPENDENT VARIABLE: SIGN

NET YIELD OF IOM >900C INSOLUBLE ORG.

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	16	142.27498354	8.89218647	23.72	0.0001	0.803207	10.0000
ERROR	93	34.85856373	0.37482327				
CORRECTED TOTAL	109	177.13354727			0.61222812		6.12228475

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE IV SS	F VALUE	PR > F
TAVG	1	3.89619737	10.39	0.0017	1	4.82351272	12.87	0.0005
PH2	1	18.77636316	50.09	0.0001	1	2.70265354	7.21	0.0086
SRT	1	0.34378314	0.92	0.3407	1	0.86387563	2.30	0.1324
RASH	1	1.12460651	3.00	0.0866	1	10.76459648	28.72	0.0001
TAVG2	1	10.79985484	28.81	0.0001	1	5.31501261	14.18	0.0003
RASH2	1	4.62231747	12.33	0.0007	1	2.10135561	5.61	0.0200
V	1	2.07282041	5.53	0.0208	1	0.30571197	0.82	0.3688
NCOAL	1	0.02757069	0.07	0.7868	1	4.19933121	11.20	0.0012
TP	1	14.85208276	39.62	0.0001	1	2.74957818	7.34	0.0080
TS	1	1.83562066	4.90	0.0293	1	1.00568509	2.68	0.1048
PS	1	3.94911080	10.54	0.0016	1	0.44180022	1.18	0.2804
RICH	1	67.15017565	179.15	0.0001	1	41.53467308	110.81	0.0001
RSRC	1	5.69285185	15.19	0.0002	1	6.59117226	17.58	0.0001
RATIO	1	3.06145004	8.17	0.0053	1	1.42077194	3.79	0.0546
PR	1	0.92556714	2.47	0.1195	1	0.54915155	1.47	0.2292
SR	1	3.14459105	8.39	0.0047	1	3.14459105	8.39	0.0047

PARAMETER	ESTIMATE	T FOR HO: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	363.60995695	3.43	0.0009	106.01224383
TAVG	-1.71901896	-3.59	0.0005	0.47914494
PH2	4.79633685	2.69	0.0086	1.78619043
SRT	-27.30692770	-1.52	0.1324	17.98707309
RASH	-1.52064142	-5.36	0.0001	0.28375349
TAVG2	0.00206627	3.77	0.0003	0.00054872
RASH2	0.01764774	2.37	0.0200	0.00745339
V	-0.07340838	-0.90	0.3688	0.08126355
NCOAL	0.41440701	3.35	0.0012	0.12383236
TP	-0.01098050	-2.71	0.0080	0.00405417
TS	0.06411149	1.64	0.1048	0.03913976
PS	-0.21030372	-1.09	0.2804	0.19370787
RICH	0.98365387	10.53	0.0001	0.09344373
RSRC	0.07960469	4.19	0.0001	0.01898325
RATIO	0.51468505	1.95	0.0546	0.26446034
PH	0.02183616	1.21	0.2292	0.01804029
SR	0.36229331	2.90	0.0047	0.12508104

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF 10M.
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

8:54 WEDNESDAY.

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: STUM

NET YIELD OF 10M >900C INSOLUBLE ORG.

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
1	7.27673649	6.29772152	0.97901497	5.04427342	7.55116962
2	5.28634361	5.86136134	-0.57503773	4.46742428	7.25483840
3	7.76508772	7.33639496	0.44868776	6.00379675	8.66900316
4	6.39470783	6.23706345	0.15764438	4.95962636	7.51450054
5	6.94597574	6.60463171	0.34134403	5.34040358	7.86885984
6	7.23025584	7.55671277	-0.32645693	6.18186712	8.93155842
7	6.31924047	6.71783837	-0.39854791	5.45396908	7.98170767
8	5.97345133	6.33167217	-0.35822084	5.06646165	7.59688269
9	6.53377630	7.02963389	-0.49585759	5.74732564	8.31194214
10	7.10259301	6.81567731	0.28691570	5.48409364	8.14726099
11	6.87711367	6.80437437	0.07273950	5.57466142	8.08408732
12	5.97519729	6.34138020	-0.36618290	5.08135067	7.60140973
13	6.53889515	6.70571847	-0.16682332	5.41751134	7.99392560
14	7.37073707	6.70213430	0.66860277	5.41562549	7.98864311
15	6.08407080	6.18900007	-0.10492928	4.92005845	7.45794170
16	5.97345133	6.27270834	-0.24925701	4.95829643	7.48712024
17	4.96110046	5.28909783	-0.32799737	3.99587898	6.58231669
18	5.00676590	5.38678757	-0.38002168	4.08323061	6.69034454
19	5.05187190	5.19383079	-0.14195889	3.90856958	6.47909200
20	4.53038674	4.98676141	-0.45637467	3.71701639	6.25650643
21	4.87264673	4.97084721	-0.09820048	3.70004225	6.24165217
22	4.77247503	4.86652277	-0.09404774	3.54253057	6.14051497
23	5.11679644	4.61197227	0.50482417	3.52978134	6.09416320
24	5.24553571	4.85436524	0.39117047	3.57871718	6.13001331
25	5.58966366	5.56528126	0.02437240	4.24057322	6.84998931
26	6.13537118	5.47168998	0.66368120	4.14209637	6.80128358
27	4.84387237	5.24331308	-0.35944071	3.73119250	6.75543366
28	4.86028253	4.36526014	0.49502038	3.02111025	5.70941004
29	6.20298703	6.25768903	-0.05470201	4.65585562	7.85952245
30	5.62534134	5.91614583	-0.29080448	4.63279940	7.19949225
31	6.18142314	6.19951773	-0.01809459	4.77004961	7.62098586
32	6.22604357	6.48788076	-0.26783718	4.94618386	8.02957766
33	5.64655748	5.12417011	0.54238737	3.66942665	6.57891357
34	5.86949393	6.15864981	-0.28915587	4.75141230	7.56588732
35	7.47715809	7.27034512	0.20680496	5.97880798	8.56188226
36	6.38696179	6.61390915	-0.22694736	5.34642636	7.88139194
37	6.05365048	6.70015396	0.65349652	7.34826009	10.05204782
38	6.95958505	7.03755206	-0.07796611	5.71587574	8.35922838
39	10.19711486	8.78774715	1.40936771	7.43438450	10.14110980
40	4.64706530	4.54349468	0.10357062	3.18961676	5.89737260
41	5.93546956	5.80555333	0.12991633	4.46093897	7.15016769
42	9.16703394	9.01890929	0.14812464	7.67153385	10.36628474
43	5.75027382	6.42783872	-0.67755489	5.15625622	7.69942121
44	5.86516654	5.02586124	0.83930730	3.71964358	6.33207689
45	5.99778271	5.80622325	0.19155946	4.50246317	7.10998333
46	7.18715303	6.95297966	0.23417427	5.62834870	8.27761062
47	5.19867550	5.38797706	-0.18930157	4.02649011	6.74906401
48	8.39601170	7.54774852	0.84826918	6.23092686	8.86457017

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF IOM
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

8:54 WEDNESDAY, MI

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SIOM

NET YIELD OF IOM >900C INSOLUBLE ORG.

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
49	6.59645233	6.82009664	-0.22364431	5.53940281	8.10079047
50	5.73445082	5.54861992	0.18583090	4.25306521	6.84417463
51	5.72390572	4.76225291	0.96165282	3.49092026	6.03358555
52	5.32150776	5.39137654	-0.06986878	4.11320025	6.66955283
53	6.88866869	5.81735337	1.07153552	4.53112285	7.10358388
54	6.36865342	6.54303931	-0.17438589	5.17656176	7.90951687
55	7.33134592	6.75460254	0.57674338	5.49753077	8.01167431
56	7.16956235	6.63286907	0.53669328	5.36762691	7.89811123
57	7.45444506	7.14602798	0.30841707	5.85096251	8.44109346
58	5.84988962	5.48091814	0.36897149	4.23767641	6.72415987
59	6.49764022	6.72822543	-0.23058522	5.46886355	7.98758732
60	5.43969988	5.35765263	0.08204725	4.10839297	6.60691229
61	5.13668430	5.18786326	-0.05117896	3.94338435	6.43234218
62	5.60397132	5.39492824	0.20904308	4.13586644	6.65399004
63	4.75140558	5.32225933	-0.57085376	4.02261299	6.62190568
64	4.52538631	4.77962195	-0.25423564	3.49275336	6.06649054
65	6.89277899	7.32023302	-0.42745402	5.88669790	8.75176813
66	7.37073707	7.61810344	-0.24736636	6.31142825	8.92477863
67	8.94039735	8.76171993	0.17867742	7.39850135	10.12493851
68	5.44662309	5.33111863	0.11550446	4.04721310	6.61502417
69	6.59340659	8.07512009	-1.48171350	6.69488840	9.45535178
70	7.14285714	8.06926528	-0.92640814	6.75446165	9.38406890
71	5.64784053	5.54272721	0.10511332	4.20231604	6.88313838
72	3.22939866	3.66035273	-0.43095407	2.36178142	4.95892405
73	3.452711581	4.35066579	-0.89854997	3.05879524	5.64253633
74	2.44988864	3.59560060	-1.14571196	2.24380150	4.94739970
75	1.44766147	1.64242758	-0.19476611	0.41599394	3.26886123
76	5.12249443	4.85268996	0.26980447	3.52203922	6.18334070
77	5.54938957	5.59566265	-0.04627308	4.30468927	6.88663603
78	6.31929047	6.87616077	-0.55687031	5.44823888	8.30498267
79	7.76053215	7.24901355	0.51151860	5.78641605	8.71161105
80	6.19648490	5.98176159	0.21472331	4.73035836	7.23316482
81	6.40299184	5.60929906	0.79369278	4.33180424	6.88679387
82	6.04962725	5.95345930	0.14616795	4.66710978	7.23980882
83	7.09779180	7.27781863	-0.18002683	6.00412776	8.55150948
84	5.70023472	6.42314533	-0.72291061	5.17851742	7.66777323
85	4.79946673	5.64356945	-0.84410272	4.38326188	6.90387702
86	4.99543796	6.07891053	-1.08347258	4.82481936	7.33300170
87	6.00522193	5.75191161	0.25331032	4.49326680	7.01055642
88	5.08287293	6.22452625	-1.14165332	4.97799440	7.47105809
89	5.40830852	6.49626457	-1.08788105	5.24640733	7.74613182
90	5.07726269	5.97065209	-0.89338940	4.72053359	7.22077059
91	6.37813212	5.68273936	0.69573856	4.44023627	6.92455086
92	6.01589103	5.43434642	0.58154461	4.18828486	6.84040798
93	7.71850170	6.73188282	0.98661888	5.46245461	8.00131103
94	5.64334066	5.42012557	0.22321529	4.17499186	6.66525927
95	5.74971815	5.49406339	0.25565476	4.25016684	6.73795994
96	5.73678290	5.71350404	0.02327886	4.46855495	6.95844813

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GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF IOM
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

8:54 WEDNESDAY.

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SIOM NET YIELD OF IOM >900C INSOLUBLE ORG.

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
97	6.05324202	7.30058760	-1.24734558	6.04661434	8.55456026
98	5.87650503	6.47987491	-1.10336989	5.70918534	8.25056438
99	6.82644634	7.95671595	-1.13024958	6.69416938	9.21926262
100	7.24291003	6.37723629	0.86567454	5.14034925	7.61412332
101	6.26352352	5.72551772	0.53800580	4.48542755	6.96560788
102	5.78521808	5.13693832	0.64827977	3.87924453	6.39463211
103	6.28916486	6.26377597	0.00538889	4.98840461	7.57914734
104	6.83604876	6.43896353	0.39708523	5.20030738	7.67761968
105	5.44605218	5.08037210	0.36568009	3.81439759	6.34634660
106	5.20679049	4.76802437	0.43876611	3.42137185	6.11467768
107	6.97276974	6.36260171	0.60996803	5.12335045	7.60225296
108	8.07192053	7.50227187	0.56973267	6.18543269	8.81900305
109	8.37549185	7.72135313	0.65413872	6.41937287	9.02333338
110	7.85834739	7.69061100	0.16773639	6.43221824	8.94900376

SUM OF RESIDUALS	-0.00000000
SUM OF SQUARED RESIDUALS	34.85856374
SUM OF SQUARED RESIDUALS - ERROR SS	0.00000001
FRESS STATISTIC	49.54279732
FIRST ORDER AUTOCORRELATION	0.26769988
DURBIN-WATSON D	1.43629712

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GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF TOTAL DIST.
TOTAL DISTILLATE DEFINED AS MIDDLE + HEAVY DISTILLATE
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND PUNHATAN COAL

8:54 WEDNESDAY, M

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SDIST

NET YIELD OF TOTAL DISTILLATE(MD+HD)

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	15	9425.90003898	628.38666927	49.71	0.0001	0.888054	15.1587
ERROR	94	1188.19598906	12.64038286		STD DEV		SDIST MEAN
CORRECTED TOTAL	109	10613.49602804			3.55533161		23.45409993

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE IV SS	F VALUE	PR > F
TAVG	1	1519.84151977	120.24	0.0001	1	23.91805364	1.89	0.1722
PH2	1	1959.69153618	155.03	0.0001	1	157.45092034	12.46	0.0006
SRT	1	2456.03234815	194.30	0.0001	1	11.67875964	0.92	0.3389
CIN	1	2106.68572022	166.66	0.0001	1	22.29443638	1.76	0.1874
RASH	1	792.48719380	62.69	0.0001	1	33.75097362	2.67	0.1056
TAVG2	1	12.02264279	0.95	0.3319	1	34.14113914	2.70	0.1036
RASH2	1	43.17699863	3.42	0.0677	1	78.38724662	6.20	0.0145
TP	1	117.34639439	9.28	0.0030	1	164.75804537	13.03	0.0005
TS	1	30.72834306	2.43	0.1223	1	14.10240342	1.12	0.2936
TC	1	1.03806196	0.08	0.7751	1	21.79977935	1.72	0.1923
TR	1	13.99660680	1.11	0.2954	1	53.85502492	4.26	0.0418
RIDM	1	25.52813663	2.02	0.1586	1	47.62459951	3.77	0.0552
RSRC	1	157.84271314	12.49	0.0006	1	122.38098975	9.68	0.0025
PR	1	43.11578355	3.41	0.0679	1	6.25475112	0.49	0.4835
CR	1	146.76403791	11.57	0.0010	1	146.26403791	11.57	0.0010

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	-959.81181592	-1.05	0.2968	914.79407464
TAVG	6.06888922	1.38	0.1722	4.41190758
PH2	-32.51464865	-3.53	0.0006	9.21269255
SRT	-44.43475383	-0.96	0.3389	103.44748985
CIN	-9.31002452	-1.33	0.1874	7.01023683
RASH	-22.47676024	-1.63	0.1056	13.75531925
TAVG2	-0.00876612	-1.64	0.1036	0.00533516
RASH2	-0.11167742	-2.49	0.0145	0.04492622
TP	0.07528895	3.61	0.0005	0.02085344
TS	0.23998900	1.06	0.2936	0.22720866
TC	0.02036541	1.31	0.1923	0.01552323
TR	0.06282391	2.06	0.0418	0.03043631
RIDM	-0.96749783	-1.94	0.0552	0.49843664
RSRC	0.29187175	3.88	0.0025	0.09380267
PR	-0.05543614	-0.70	0.4835	0.07951140
CR	-0.10525771	-3.40	0.0010	0.03094370

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GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF TOTAL DIST.
TOTAL DISTILLATE DEFINED AS MIDDLE + HEAVY DISTILLATE
BASED ON THE PILE PLANT DATA FOR KENTUCKY AND POKHATAN COAL

8:54 WEDNESDAY, 1

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SDIST

NET YIELD OF TOTAL DISTILLATE(MD+HD)

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
1	8.93054024	8.91343176	0.01710848	1.66078147	16.14608205
2	8.37004405	12.16051693	-3.81047288	4.47917355	19.88186031
3	-7.78508772	3.11747528	-10.90256300	-4.66663435	10.90158490
4	8.71003308	7.58641645	1.12361663	-0.00149542	15.17432832
5	8.59777949	5.53826293	3.06151657	-1.74118735	12.81771320
6	7.67519466	1.06307000	6.61212466	-6.57388187	9.10002187
7	7.64966741	4.96676308	2.68290432	-2.31814848	12.25167465
8	9.29203540	7.10615761	2.18387779	-0.33220778	14.54852300
9	5.53709856	3.82037642	1.71672214	-3.64090196	11.28165480
10	6.08793687	3.86269422	2.22504204	-3.61669918	11.34248883
11	4.17136415	4.52278428	-0.35142013	-2.82327182	11.86884037
12	5.18609029	7.01078031	-1.82476002	-0.26638596	14.28794657
13	0.22547914	1.65963042	-1.43415128	-2.63939228	11.95865312
14	-3.19031903	1.69098154	-7.88130058	-2.60871059	11.99067366
15	6.51769912	7.37261746	-1.14508165	-0.16311688	14.90835180
16	8.40707965	7.23723501	1.16984463	-0.21990929	14.69437932
17	16.85646634	19.28721357	-2.43074723	11.48616627	27.08026088
18	18.76409562	28.15827746	-1.39418184	12.31562107	28.00093385
19	20.39918009	19.98292671	0.41626138	11.90572480	28.06012863
20	16.90607735	18.98147841	-2.07540106	11.15614512	26.80681169
21	16.93687708	18.93007870	0.00679837	11.44488740	26.41527001
22	20.19977802	19.54535058	0.65442745	11.76400011	27.32670104
23	25.80645161	19.53569259	6.27075903	12.01814616	27.05323901
24	20.75892857	19.14528288	1.61364570	11.64012878	26.65043697
25	20.21043402	15.17718432	5.03324470	7.38668580	22.96768284
26	14.01748725	16.18485729	-2.16738505	8.33517045	24.03453414
27	13.57718516	13.61509406	-0.03793288	4.99384858	22.23634755
28	21.16994672	19.89282856	1.27711816	11.94846011	27.83717701
29	17.02823504	14.39444098	2.63379406	4.97010795	23.68187740
30	17.88093938	12.84160233	5.03933705	5.15378351	20.52942114
31	9.62520369	15.14139604	-5.51619234	6.77733242	23.50545966
32	11.57952070	12.32534705	-0.74582635	3.559171764	21.05897646
33	16.85773556	17.58194103	-0.72420547	9.62939426	25.53448780
34	10.65698239	12.84355745	-2.18665505	4.63115936	21.05595553
35	31.13093272	23.34147073	7.78946199	16.03658524	30.64635622
36	30.33806949	29.75411351	0.58395498	22.46605678	37.04217025
37	26.66005946	22.78869672	3.87136274	15.06264440	30.49474905
38	28.03655485	28.58087858	-0.54431373	21.09497260	36.06678457
39	27.67316375	22.02461376	5.64854999	14.51325037	29.53597716
40	34.52262467	31.75289958	2.76973009	24.05620335	39.44959582
41	33.14017729	35.17347294	-1.98329565	27.58021632	42.76672956
42	32.58043191	27.75163188	4.82880002	20.08524605	35.41801772
43	33.3468237	34.85303176	-1.52334940	27.36237814	42.32368539
44	39.24719101	37.13143749	2.11575352	29.52168114	44.74119344
45	30.11455654	35.93217065	-5.73262031	28.34041584	43.48393786
46	30.46811628	29.06350898	1.40160729	21.64814693	36.44287104
47	30.09933775	26.25859083	3.84074692	18.94824321	33.56893846

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF TOTAL DIST.
TOTAL DISTILLATE DEFINED AS MIDDLE + HEAVY DISTILLATE
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

8:54 WEDNESDAY, MA

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SDIST

NET YIELD OF TOTAL DISTILLATE(MD+HD)

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
48	19.69469027	25.03138488	-6.33669461	17.76683405	32.29593571
49	28.20399113	31.24073663	-3.03674570	23.94650243	38.53497124
50	32.96206440	28.94094540	4.02111901	21.40675881	36.47513198
51	24.09652076	23.40733861	0.68918215	16.05470051	30.75997672
52	18.50332594	22.17115058	-3.66782463	14.52664642	29.81565473
53	18.63333333	23.88060905	-5.24727572	16.31214713	31.44907097
54	27.22958057	27.73662181	-0.50704124	20.21450337	35.25874026
55	27.46421773	26.88267703	0.57154070	19.62499245	34.14036162
56	25.57730372	25.49510986	0.08219384	18.17903907	32.81118068
57	24.26283621	26.60390143	-2.34106322	18.94635287	34.26144999
58	19.12603532	19.44578126	-0.31774594	12.15191010	26.73965243
59	27.05520799	27.78620955	-0.73100156	20.52357801	35.04884110
60	34.53602560	31.11339881	3.42262679	23.95349198	38.27330564
61	20.94356261	19.95292352	0.99063909	12.65750198	27.24834505
62	24.73248759	23.67289800	1.05958959	16.36531469	30.98048111
63	29.19193033	34.00228391	-4.81035359	26.60565819	41.39890964
64	25.90507726	24.13628278	1.76879448	16.67512099	31.59744458
65	31.19256018	31.54786571	-0.35530554	23.20602117	39.88971026
66	30.14301430	29.55926491	0.58374940	21.95975381	37.15877600
67	27.81456954	23.79231908	-0.97774955	20.86025475	36.72438342
68	33.76906318	31.80166086	1.96740230	24.36459112	39.23873065
69	30.10989011	30.50522035	-0.39533024	22.89372049	38.11672021
70	30.76923077	31.11085135	-0.34162058	23.49008742	38.73162028
71	32.00442968	30.37295321	1.63147646	22.68646233	38.05944410
72	23.71937639	24.56262515	-0.84324875	17.04807662	32.07717367
73	22.71714922	23.93248663	-1.21533741	16.47646051	31.38851276
74	22.82850780	25.97460522	-3.14609743	18.10527045	33.84394000
75	24.72160356	25.82958577	-1.10798221	17.51314091	34.14603063
76	35.74610245	31.53123282	4.21486963	23.92322970	29.73923594
77	35.84905660	33.77851417	2.07054243	26.37940449	41.17762386
78	11.19733925	15.07240604	-3.87556679	6.76493197	23.38088011
79	16.62971175	14.67708982	1.95190193	6.49807033	22.85754931
80	31.34294727	30.40921218	0.93373509	23.16041148	37.65801288
81	33.13689937	32.34210070	0.79479867	24.99451547	39.68968592
82	28.08087654	31.08031174	-2.99943520	23.71199863	38.44862484
83	25.98017125	29.63169028	-3.65151903	22.00756008	37.25582048
84	32.86017660	30.40747649	2.45270010	23.21748364	37.60246935
85	39.55116098	30.19821419	9.35294679	22.95112218	37.44530621
86	35.26459854	29.22198235	6.04261619	21.97214549	36.47181921
87	31.83108165	30.31156044	1.51952140	23.00307171	37.62004918
88	30.60773481	31.39083447	-0.78309967	24.20907256	38.57259639
89	30.57395143	30.03467903	0.53927241	22.82645188	37.24294618
90	31.34657837	30.21543293	1.13114543	23.07973129	37.40113458
91	29.61275626	30.16060919	-0.54785293	22.98425454	37.33696385
92	30.98751419	30.22611226	0.66940193	23.09964957	37.47637495
93	27.46878547	28.50860852	-1.04002305	21.18775479	35.82986224
94	33.63431151	30.46328328	3.17102823	23.27105940	37.64850676

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF TOTAL DIST.
 TOTAL DISTILLATE DEFINED AS MIDDLE + HEAVY DISTILLATE
 BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

6:54 WEDNESDAY.

GENERAL LINEAR MODEL'S PROCEDURE

DEPENDENT VARIABLE: SDIST NET YIELD OF TOTAL DISTILLATE(MD+HD)

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
95	31.79255919	30.63478501	0.95777418	23.66796664	38.00160338
96	35.32058493	31.31485829	4.00572664	24.15422811	38.47548847
97	30.52026452	30.49267340	0.02759613	23.10527730	37.80006949
98	29.62553150	32.41013013	-2.78459164	25.03458623	39.78567404
99	27.59306307	30.05562872	-2.46256565	22.74555762	37.36569983
100	25.38435258	31.22068716	-5.84433456	24.07270911	38.38466520
101	27.19508029	31.48047349	-4.28539320	24.29702203	38.66392495
102	26.47056144	29.36315307	-0.89259163	21.83779576	36.88851037
103	30.99008773	31.26145187	-0.27136414	23.57262785	38.95027588
104	24.48444799	31.85036532	-7.36591733	24.70096759	38.99976306
105	32.14082250	32.17635818	-0.02953568	24.86389096	39.47682541
106	33.40549163	34.07166950	-0.66617788	26.45531862	41.68802039
107	28.85951920	31.56167400	-2.70215480	24.40931969	38.7102830
108	23.85609893	26.04621762	-2.19011869	18.67226697	33.42016833
109	26.75660483	26.29187039	0.46473444	18.95173923	33.53200255
110	29.91568297	30.68004685	-0.76436388	23.43518547	37.92490722

SUM OF RESIDUALS -0.00000000
 SUM OF SQUARED RESIDUALS 1188.19598870
 SUM OF SQUARED RESIDUALS - ERROR SS -0.00000037
 PRESS STATISTIC 1785.24459370
 FIRST ORDER AUTOCORRELATION 0.18516209
 DURBIN-WATSON D 1.62918386

GENERAL LINEAR REGRESSION MODFL FOR THE YIELD OF TOTAL LIQUIDS
TOTAL LIQUIDS DEFINES AS TOTAL DISTILLATE + NAPHTHAS
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

8:54 WEDNESDAY.

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SLIQ		NET YIELD OF TOTAL LIQUIDS(TOT DIST+NAP)						
SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.	
MODEL	16	13080.32720596	817.52045037	99.92	0.0001	0.945025	8.7458	
ERROR	93	760.71569196	8.1818916			STD DEV	SLIQ MEAN	
CORRECTED TOTAL	109	13841.24289792			2.86040017		32.70604817	

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE IV SS	F VALUE	PR > F
TAVG	1	3045.54366303	372.23	0.0001	1	14.51904724	1.77	0.1861
PH2	1	2579.12390471	315.22	0.0001	1	20.57220312	2.51	0.1162
CIN	1	2536.36250330	310.00	0.0001	1	35.63027879	4.35	0.0396
TAVG2	1	10.36215979	1.27	0.2633	1	17.63165141	2.15	0.1455
PH22	1	2121.04655362	259.24	0.0001	1	4.97226196	0.61	0.4376
RASH2	1	574.72192610	119.13	0.0001	1	136.17393183	16.64	0.0001
TP	1	139.04724546	16.99	0.0001	1	20.20648838	2.47	0.1195
TS	1	1162.03403406	142.03	0.0001	1	57.69904058	7.05	0.0093
TR	1	99.96155977	12.22	0.0007	1	393.54187159	48.10	0.0001
RIOM	1	41.02016078	5.01	0.0275	1	14.72804594	1.80	0.1830
RSRC	1	1.13303482	0.14	0.7106	1	11.84239843	1.45	0.2320
RATIO	1	33.20389379	4.06	0.0468	1	29.78692411	3.64	0.0595
PC	1	54.87418073	6.71	0.0111	1	38.01052833	4.65	0.0337
SC	1	46.46760556	5.68	0.0192	1	12.35398303	1.51	0.2223
SH	1	97.83689722	11.96	0.0008	1	24.09936550	2.95	0.0894
CR	1	137.58088122	16.82	0.0001	1	137.58088122	16.82	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	-599.88836734	-1.15	0.2546	523.33077542
TAVG	3.10690646	1.33	0.1861	2.32780396
PH2	-13.77626427	-1.59	0.1162	8.68734605
CIN	-0.99403352	-2.09	0.0396	0.47873728
TAVG2	-0.00382606	-1.47	0.1455	0.00260635
PH22	-0.05672755	-0.74	0.4376	0.07276857
RASH2	-0.16170241	-4.08	0.0001	0.03951403
TP	0.63054630	1.57	0.1195	0.01946293
TS	0.05014901	2.66	0.0093	0.01884447
TR	0.01605160	6.94	0.0001	0.00231446
RIOM	-0.00536012	-1.34	0.1830	0.03766444
RSRC	-0.00390740	-1.20	0.2320	0.07805609
RATIO	-2.16478797	-1.91	0.0595	1.13456487
PC	0.04815538	2.16	0.0337	0.04090603
SC	-0.78343989	-1.23	0.2223	0.23066711
SH	-0.42816123	-1.72	0.0894	0.54077140
CR	-0.10228230	-4.10	0.0001	0.02494447

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF TOTAL LIQUIDS
TOTAL LIQUIDS DEFINES AS TOTAL DISTILLATE + NAPHTHAS
BASED ON THE PILUT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

8:54 WEDNESDAY, 1

GENERAL LINEAR MODEL: PROCEDURE

DEPENDENT VARIABLE: SLIO

NET YIELD OF TOTAL LIQUIDS(TOT DIST+NAP)

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
1	16.20727674	16.39783046	-0.19055372	10.54320958	22.25245134
2	19.60352423	20.54160534	-0.93809112	14.19999820	26.88321249
3	8.88157895	12.60707147	-3.72549252	6.45436208	16.75978085
4	13.45093716	13.23914114	0.21179602	7.26871696	19.20956531
5	11.46637266	11.81481671	-0.34844405	5.94288373	17.68674969
6	11.67964405	10.35633287	1.32331118	4.08529838	16.62736736
7	11.75166247	11.29575531	0.45590716	5.42170915	17.16980148
8	14.93362832	12.96001073	1.97361758	7.01846194	18.90155953
9	11.07419712	11.42790186	-0.35370474	5.48157472	17.37422894
10	7.77903044	6.84282068	0.93620976	0.05296421	13.63267714
11	10.48478016	9.84624032	0.63853984	3.82488945	15.86759119
12	18.60202931	14.41481822	4.18721109	8.50599054	20.32364590
13	11.04847802	11.95686876	-0.90839075	6.01577723	17.89796029
14	7.37073707	11.96306161	-4.59313154	6.02163545	17.90610178
15	14.49115044	14.01159688	0.47955356	8.02921629	19.99397747
16	12.61061947	14.02379591	-1.41317644	8.05585711	19.99173471
17	28.89841019	31.11746666	-2.21905646	24.95487506	37.28005825
18	29.02571047	30.58961132	-1.56390090	24.47586441	36.70335822
19	34.32560531	30.18779023	4.13787509	23.85524717	36.57033329
20	28.61678453	30.79214602	-2.17336149	24.50263206	37.08165998
21	30.34338011	30.18181543	0.16148468	24.11681870	36.24681215
22	32.07547170	31.49024540	0.58522630	25.16546159	37.81502920
23	33.48164627	31.00754262	2.47410365	24.91890183	37.09618341
24	30.91517857	30.60502750	0.31015607	24.52747448	36.68257051
25	25.49320473	23.07333353	2.41987120	16.79484587	29.35182119
26	17.80567686	21.21518705	-3.40951020	15.02810809	27.40226602
27	17.59279357	20.45361594	-2.86082236	13.65623760	27.25099928
28	26.93261544	24.17105970	2.76163574	17.73611632	30.60600308
29	20.51673389	17.80606732	2.71066658	10.30638771	25.30674692
30	27.46859640	17.60022267	4.66837372	11.32629385	24.27415149
31	13.76425856	16.11177961	-2.34752106	9.71643032	22.50712891
32	15.39215686	15.20922141	0.18293545	8.34223213	22.07621070
33	21.67267169	20.20580691	1.46686478	13.68169878	26.72991503
34	17.42266914	19.84241075	-2.41974160	12.27495826	27.40986323
35	37.42979848	33.07777646	4.35202202	27.14163842	39.01391450
36	41.55929964	39.48787565	2.07142399	33.62264406	45.35310724
37	38.23367471	33.39426773	4.83440697	27.30124748	39.49728799
38	35.24942167	38.24914639	-2.99972452	32.16191502	44.31637777
39	33.14612929	31.73541884	1.41071044	25.54911465	37.92172304
40	43.05093206	40.66479783	2.39213423	34.38407585	46.94551981
41	44.25724039	45.46875744	-1.21151205	39.16103740	51.77646747
42	41.06434553	39.56161365	1.50273188	33.30330771	45.81991958
43	42.45345016	40.01800977	2.43544039	39.92229267	52.11372687
44	40.74157303	40.90475700	-0.16318397	42.64213793	55.11737607
45	45.58860762	46.25728984	-0.66868222	40.11836237	52.39621730
46	37.35326689	38.66221215	-1.30894526	32.84795342	44.82647089
47	39.14421047	35.35230171	3.84195978	29.44747603	41.25712738

GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF TOTAL LIQUIDS
TOTAL LIQUIDS DEFINES AS TOTAL DISTILLATE + NAPHTHAS
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

8:54 WEDNESDAY, 1

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SL10

NET YIELD OF TOTAL LIQUIDS(TOT DIST+NAP)

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
48	31.69247788	34.35132573	-2.65884786	28.49368604	40.20896542
49	42.40576497	40.72563391	1.68013105	34.69573617	46.55553165
50	43.98985443	39.66498851	4.32486592	33.54110431	45.78887271
51	35.36475470	33.84373640	1.52102230	27.85661001	39.83086279
52	27.61640798	30.01596217	-2.39955419	23.82610266	36.20582168
53	27.77777778	32.94223365	-5.16445588	26.56204911	39.32241820
54	39.02869757	36.37622920	2.65046837	29.99373851	42.76271990
55	35.46428177	36.53321373	-1.06893195	30.66733400	42.39909345
56	34.27534638	36.17316991	-1.89782353	30.26070959	42.08563023
57	31.41910547	34.46660398	-3.04769852	28.41393356	40.51967441
58	27.71523179	29.74255427	-2.02732248	23.84954210	35.63556643
59	35.01262211	36.65526110	-1.64263900	30.79494932	42.51957288
60	44.30100408	41.94467725	2.35632683	36.16430319	47.70505131
61	27.75573192	29.83692795	-2.08119603	23.94724701	35.72660890
62	33.12741313	33.25400943	-0.12659631	27.31779758	39.19022129
63	38.47425863	41.81799105	-3.34373242	35.90724754	47.72873456
64	37.04194260	34.27779850	2.76414411	27.93111796	40.62447903
65	41.30196937	42.24703427	-0.94506491	35.50920571	48.98486283
66	42.79427943	41.64536403	1.14891540	35.57154033	47.71918774
67	39.18322246	41.01156102	-1.82833806	34.69616978	47.32695227
68	45.53376906	43.62125077	1.91251829	37.72931591	49.51318562
69	39.01098901	38.36627708	0.64471193	32.32449858	44.40805558
70	42.08791209	41.00654446	1.08136763	34.89960551	47.11348340
71	43.07862680	40.64571809	2.43290871	34.41142494	46.88001124
72	36.41425390	38.27454090	-1.86028700	32.21804364	44.33043817
73	36.41425390	37.30753668	-0.89328279	31.27899013	43.33608324
74	42.06354120	42.07128467	0.02225653	35.74757223	48.35499712
75	41.20267261	43.77647654	-2.57380593	37.06644532	50.48651175
76	43.98663697	41.98959072	1.99704625	35.89922734	48.07995411
77	43.50721421	42.72865559	0.77855862	36.83038859	48.62692259
78	16.51884701	20.68561350	-4.16676649	13.78920814	27.58201886
79	21.278603104	19.40913684	1.86946626	12.77415958	27.04411410
80	43.29682997	40.94017819	2.35665177	35.13045991	46.74989647
81	41.19446463	43.15159323	-1.95712360	37.21492480	49.08826166
82	40.69806345	41.74241364	-1.04434518	35.77112993	47.71369734
83	37.13364407	39.58650414	-1.45266007	32.66176014	44.51124814
84	43.21001453	39.76328794	3.44672659	33.98319492	45.54338095
85	45.4494501	39.84822199	5.60122811	34.03388129	45.66256270
86	44.16355339	38.47568934	5.67986405	32.67364391	44.27769477
87	39.99318878	39.91136832	0.08182046	34.07758421	45.74515244
88	44.09839779	41.32615868	2.77223911	35.54408689	47.10823046
89	43.48765672	40.23617775	3.25147897	34.44265066	46.02970483
90	44.48123620	41.29795154	3.18328466	35.49245443	47.10344465
91	39.52164009	41.49654257	-1.97490247	35.72941046	47.26367467
92	41.31660558	41.75328241	-0.43667683	35.97258655	47.53397927
93	43.35981039	40.42278828	2.93703011	34.56516316	46.28041341
94	44.92046323	41.73165823	3.18880500	35.95160171	47.51171476

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GENERAL LINEAR REGRESSION MODEL FOR THE YIELD OF TOTAL LIQUIDS
TOTAL LIQUIDS DEFINES AS TOTAL DISTILLATE + NAPHTHAS
BASED ON THE PILOT PLANT DATA FOR KENTUCKY AND POWHATAN COAL

8:54 WEDNESDAY.

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SLIO

NET YIELD OF TOTAL LIQUIDS(TOT DIST+NAP)

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL INDIVIDUAL	UPPER 95% CL INDIVIDUAL
95	42.77829763	42.03160043	0.69669720	36.25756938	47.80563148
96	45.66729134	42.25539314	3.41389820	36.47559112	48.03519516
97	40.35126477	39.37836481	0.98089996	33.51939932	45.22141030
98	40.05302110	40.94151391	-0.88849281	35.04572569	46.83730213
99	38.04253730	39.08469769	-1.04205989	33.21731420	44.95208118
100	35.91646031	41.57244706	-5.65398677	35.82199431	47.32289984
101	36.08928368	41.64121885	-5.55193446	35.85811516	47.42432013
102	37.02311810	40.75711019	-3.73399210	34.90924112	46.60497927
103	41.35809502	41.03381190	0.32428312	35.08518462	46.98243918
104	35.04614333	41.94468681	-6.89854348	36.19649875	47.69287487
105	41.20998063	42.26265884	-1.05267821	36.36063842	48.16468727
106	42.57719038	44.11420448	-1.53701410	38.15519622	50.07321275
107	37.37039991	41.74202362	-4.37162371	35.99461612	47.48943112
108	31.86059584	33.31810740	-1.45781156	27.31284168	39.32397312
109	35.10961214	33.62293335	1.48667879	27.65894487	39.58692184
110	37.56042721	40.77726600	-3.21683879	34.97300159	46.58153040

SUM OF RESIDUALS	0.00000000
SUM OF SQUARED RESIDUALS	760.91569191
SUM OF SQUARED RESIDUALS - ERROR SS	-0.00000005
PRESS STATISTIC	1273.71860272
FIRST ORDER AUTOCORRELATION	0.11968041
DURBIN-WATSON D	1.74699198

354

PARITY PLOT FOR H₂ CONSUMPTION
COMPARISON OF PREDICTED AND EXPERIMENTAL CONSUMPTION

8:54 WEDNESDAY, MARCH :

PANITY PLOT FOR BYPRODUCT GAS YIELD
COMPARISON OF PREDICTED AND EXPERIMENTAL YIELDS

8:54 WEDNESDAY, MARCH

PARITY PLOT FOR LIGHT GAS (C1-C4) YIELD
COMPARISON OF PREDICTED AND EXPERIMENTAL YIELDS

8:54 WEDNESDAY, MAR

357

PARITY PLOT FOR YIELD OF NARITHAS
COMPARISON OF PREDICTED AND EXPERIMENTAL YIELDS

8154 WEDNESDAY, MARCH

PARITY PLOT FOR YIELD OF MIDDLE DISTILLATE
COMPARISON OF PREDICTED AND EXPERIMENTAL YIELDS

8:54 WEDNESDAY, MARCH 21

PARITY PLOT FOR YIELD OF HEAVY DISTILLATE
COMPARISON OF PREDICTED AND EXPERIMENTAL YIELDS

0150 WEDNESDAY, MARCH

360

PARITY PLOT FOR YIELD OF SRC (PYRIDINE SOLUBLE BOTTOMS)
COMPARISON OF PREDICTED AND EXPERIMENTAL YIELDS

8:54 WEDNESDAY, MARCH 26.

83

84

PARITY PLOT FOR YIELD OF ION(PYRIDINE INSOLUBLE BOTTOMS)
COMPARISON OF PREDICTED AND EXPERIMENTAL YIELDS

8:54 WEDNESDAY

362

STD. DEVIATION = ±0.61%

PARITY PLOT FOR YIELD OF TOTAL DISTILLATE
COMPARISON OF PREDICTED AND EXPERIMENTAL YIELDS

8:54 WEDNESDAY, MARC

PARITY PLOT FOR YIELD OF TOTAL LIQUID PRODUCTS
COMPARISON OF PREDICTED AND EXPERIMENTAL YIELDS

8:54 WEDNESDAY, MARCH

86

364

PARAMETER PLOT OF PREDICTED HYDROGEN CONSUMPTION
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

9:12 TUESDAY, APRIL 11

87

SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
INLET HYDROGEN PARTIAL PRESSURE MPa

365

PARAMETER PLOT OF PREDICTED LIGHT GAS YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
INLET HYDROGEN PARTIAL PRESSURE MPa

0112 TUESDAY, APRIL

366

PARAMETER PLOT OF PREDICTED NAPHTHA YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
INLET HYDROGEN PARTIAL PRESSURE MPA

9:12 TUESDAY, AP

Total Variation with Temperature not significant

367

12.4
12.3
12.3
12.3
12.2
12.2
12.2
12.1
12.1
12.0
12.0
12.0
11.9
11.9
11.9
11.8
11.8
11.8
11.7
11.7
11.6
11.6
11.6
11.5
11.5
11.5
11.4
11.4
11.4
11.3
11.3
11.3
11.2
11.2
11.1
11.1
11.1
11.0
11.0
10.9
10.9
10.8

PARAMETER PLOT OF PREDICTED MIDDLE DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

9:12 TUESDAY.

90

SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
INLET HYDROGEN PARTIAL PRESSURE MPa

368

PARAMETER PLOT OF HEAVY DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

9:12 TUESDAY, APRIL 1.

91

SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
INLET HYDROGEN PARTIAL PRESSURE MPA

PARAMETER PLOT OF THE PREDICTED SAC YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
INLET HYDROGEN PARTIAL PRESSURE MPa

9:12 TUESDAY, APR 11

PARAMETER PLOT OF THE PREDICTED TOTAL DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
INLET HYDROGEN PARTIAL PRESSURE MPa

9:12 TUESDAY, APR

93

371

9:12 TUESDAY, APR 1

PARAMETER PLOT OF PREDICTED ION YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
INLET HYDROGEN PARTIAL PRESSURE MPa

372

PARAMETER PLOT OF PREDICTED TOTAL LIQUID YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
INLET HYDROGEN PARTIAL PRESSURE MPa

9:12 TUESDAY, APRIL

95

PARAMETER PLOT OF PREDICTED HYDROGEN CONSUMPTION
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
NOMINAL SLURRY RESIDENCE TIME HOURS

13:29 THURSDAY, APRIL

374

PARAMETER PLOT OF PREDICTED LIGHT GAS YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF SRT

10154 FRIDAY, MARCH 28.

375

PARAMETER PLOT OF PREDICTED NAPHTHA YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF 5RT

10:54 FRIDAY, MARCH

PARAMETER PLOT OF PREDICTED MIDDLE DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF SRT

10:54 FRIDAY, MA

99

377

PARAMETER PLOT OF HEAVY DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF SRT

10:54 FRIDAY, MARCH 28

100

PARAMETER PLOT OF THE PREDICTED SRC YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF SRT

10:54 FRIDAY, MARCH 26.

PARAMETER PLOT OF THE PREDICTED TOTAL DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF SRT.

10:54 FRIDAY, MARCH

102

PARAMETER PLOT OF PREDICTED ION YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF SHT

10:54 FRIDAY, MAY

103

PARAMETER PLOT OF PREDICTED TOTAL LIQUID YIELD
YIELD VS. INFLUENT VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF SRT

10:54, FRIDAY, MAR

104

382

PARAMETER PLOT OF PREDICTED HYDROGEN CONSUMPTION
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

14364 MONDAY, MARCH

105

RECYCLE ASH CONC. g/100g SLURRY

NOTE: 10 DMS HAD MISSING VALUES 9.24 G/LS H2O IN

PARAMETER PLOT OF PREDICTED LIGHT GAS YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIC VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

14:04 MONDAY, MARCH

384

RECYCLE ASH CONC. (X) 100G SLURRY

NOTE: 10 OBS HAD MISSING VALUES 1026 OBS HIDDEN

PARAMETER PLOT OF PREDICTED NAPHTHA YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

14:04 MONDAY, MARC

385

PARAMETER PLOT OF PREDICTED MIDDLE DISTILLATE YIELD
 YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
 ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES GIVEN IN
 THE GLOSSARY SECTION
 LEVELS 3 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

PARAMETER PLOT OF HEAVY DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE.
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

10:00 MONDAY, MARI

109

387

HEAVY DISTILLATE YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE

NOTE: 10 DMS HAD MISSING VALUES 446 DMS HIDDEN

PARAMETER PLOT OF THE PREDICTED SMC YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE.
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLASSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

14:04 MONDAY, MARCH

388

NOTE: 10 OPS HAD MISSING VALUES

99% OPS HIDDEN

PARAMETER PLOT OF THE PREDICTED TOTAL DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

14:04 MONDAY, MARCH 31.

389

PANAMINT PLOT OF PREDICTED 300 YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS IN A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT HIGHEST VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

10104 HUNNEY, NAHI

112

RECYCLE ASH CONC. G/100G SLURRY

NOTE:

10 OBS HAD MISSING VALUES

900 OBS HIDDEN

PARAMETER PLOT OF PREDICTED TOTAL LIQUID YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

14:04 MONDAY, MARCH

391

PARAMETER PLOT OF PREDICTED HYDROGEN CONSUMPTION
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
RECYCLE ASH CONCENTRATION G/100G SLURRY

9109 FRIDAY, APRIL

114

392

PARAMETER PLOT OF PREDICTED LIGHT GAS YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF RECYCLE ASM

11104 FRIDAY, MARCH

115

393

PARAMETER PLOT OF PREDICTED NAPHTHA YIELD
 YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
 ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
 THE GLOSSARY SECTION
 SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF RECYCLE ASH

11:04 FRIDAY, MARCH 2

394

117

PARAMETER PLOT OF PREDICTED MIDDLE DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF RECYCLE ASH

11:04 FRIDAY, MAR

395

INLET HYDROGEN PART. PRESSURE MPa

PARAMETER PLOT OF HEAVY DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE.
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF RECYCLE ASH

11:34 FRIDAY, MARC

PARAMETER PLOT OF THE PREDICTED SAC YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF RECYCLE ASH

11:34 FRIDAY, MARCH 28.

120

PARAMETER PLOT OF THE PREDICTED TOTAL DISTILLATE YIELD
FIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF RECYCLE ASH

11:00 FRIDAY, MAR

398

INLET HYDROGEN PART. PRESSURE NPA

PARAMETER PLOT OF PREDICTED ION YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF RECYCLE ASH

11:00 FRIDAY, MARCH

399

INLET HYDROGEN PART. PRESSURE MPa

PARAMETER PLOT OF PREDICTED TOTAL LIQUID YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF RECYCLE ASH

11:04 FRIDAY, MARCH 28

PARAMETER PLOT OF PREDICTED HYDROGEN CONSUMPTION
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
RECYCLE ASH CONCENTRATION G/100G SLURRY

9:06 FRIDAY, APR 11

123

PARAMETER PLOT OF PREDICTED LIGHT GAS YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF RECYCLE ASH

12122 FRIDAY, MARCH 20

125

PARAMETER PLOT OF PREDICTED NAPHTHA YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF RECYCLE ASH

12:22 FRIDAY, MARCH

PARAMETER PLOT OF PREDICTED MIDDLE DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF RECYCLE ASM

12122 FRIDAY, MAR

404

127

PARAMETER PLOT OF HEAVY DISTILLATE YIELD
 YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
 ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
 THE GLOSSARY SECTION
 SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF RECYCLE ASH

PARAMETER PLOT OF THE PREDICTED SRC YIELD
 YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
 ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
 THE GLOSSARY SECTION
 SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF RECYCLE ASH

12122 FRIDAY, MARCH

PARAMETER PLOT OF THE PREDICTED TOTAL DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF RECYCLE ASH

407

PARAMETER PLOT OF PREDICTED ION YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF RECYCLE ASH

12122 FRIDAY, NJ

130

408

PARAMETER PLOT OF PREDICTED TOTAL LIQUID YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF RECYCLE ASH

12:22 FRIDAY.

409

132

12:15 THURSDAY, APRIL

PARAMETER PLOT OF PREDICTED HYDROGEN CONSUMPTION
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
INLET HYDROGEN PARTIAL PRESSURE MPa

PARAMETER PLOT OF PREDICTED LIGHT GAS YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF PRESSURE

12:27 FRIDAY, MARCH

PARAMETER PLOT OF PREDICTED NAPHTHA YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF PHESSURE

12127 FRIDAY, MAR

134

412

PARAMETER PLOT OF PREDICTED MIDDLE DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASE VALUES SHOWN IN
THE GLOSSARY SECTION:
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF PRESSURE

12127 FRIDAY, MARCH

135

413

PARAMETER PLOT OF HEAVY-DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF PRESSURE

12:27 FRIDAY, MARCH

414

PARAMETER PLOT OF THE PREDICTED SRC YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF PRESSURE

12:27 FRIDAY, MARCH

PARAMETER PLOT OF THE PREDICTED TOTAL DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF PRESSURE

12:27 FRIDAY, MARCH 2

138

416

PARAMETER PLOT OF PREDICTED 10M YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF PRESSURE

12:27 FRIDAY, MARCH

417

140

PARAMETER PLOT OF PREDICTED TOTAL LIQUID YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF PRESSURE

12:27 FRIDAY, MARC

418

141

PARAMETER PLOT OF PREDICTED HYDROGEN CONSUMPTION
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
AVERAGE REACTOR TEMPERATURE DEG C

12:59 THURSDAY, APRIL 10

PARAMETER PLOT OF PREDICTED LIGHT GAS YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

11:14 FRIDAY, MAY

142

143

PARAMETER PLOT OF PREDICTED NAPHTHA YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE.
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

11:19 FRIDAY, MA

TOTAL VARIATION (LS%) INSIGNIFICANT

421

PARAMETER PLOT OF PREDICTED MIDDLE DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

11:19 PM DAY, MAR

422

PARAMETER PLOT OF HEAVY DISTILLATE YIELD
YIELD VS. INLET VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

11110 FRIDAY, MARCH 28,

PARAMETER PLOT OF THE PREDICTED SRC YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

11:19 FRIDAY, MARCH

146

PARAMETER PLOT OF THE PREDICTED TOTAL DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE.
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

11:19 FRIDAY, MARCH

425

PARAMETER PLOT OF PREDICTED TON-YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

11:19, FRIDAY, M

148

426

11:19 FRIDAY, MARCH

PARAMETER PLOT OF PREDICTED TOTAL LIQUID YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

PARAMETER PLOT OF PREDICTED HYDROGEN CONSUMPTION
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
NOMINAL SLURRY RESIDENCE TIME HOURS

10:46 TUESDAY, APR

150

428

PARAMETER PLOT OF PREDICTED LIGHT GAS YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
NOMINAL SLURRY RESIDENCE TIME HOURS

10:46 TUESDAY, APR

151

429

PARAMETER PLOT OF PREDICTED NAPHTHA YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
NOMINAL SLURRY RESIDENCE TIME HOURS

10146 TUESDAY, APRIL 1

PARAMETER PLOT OF PREDICTED MIDDLE DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
NOMINAL SLURRY RESIDENCE TIME HOURS

PARAMETER PLOT OF HEAVY DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
NOMINAL SLURRY RESIDENCE TIME HOURS

10:46 TUESDAY, APR 1

154

432

HEAVY DISTILLATE YIELD
15.0
14.8
14.6
14.4
14.2
14.0
13.9
13.7
13.6
13.3
13.1
12.9
12.7
12.5
12.3
12.1
12.0
11.8
11.6
11.4
11.2
11.0
10.8
10.6
10.4
10.2
10.0
9.9
9.7
9.5
9.3
9.1
8.9
8.7
8.5
8.3
8.1
7.9
7.8
7.6
7.4
7.2

PARAMETER PLOT OF THE PREDICTED SRC YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
NOMINAL SLURRY RESIDENCE TIME HOURS

10146 TUESDAY, API

433

156

PARAMETER PLOT OF THE PREDICTED TOTAL DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
NOMINAL SLURRY RESIDENCE TIME HOURS

10:46 TUESDAY, APR 1

PARAMETER PLOT OF PREDICTED ICM YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
NOMINAL SLURRY RESIDENCE TIME HOURS

10:46 TUESDAY, APR 1

PARAMETER PLOT OF PREDICTED TOTAL LIQUID YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
NOMINAL SLURRY RESIDENCE TIME HOURS

10146 TUESDAY.

PARAMETER PLOT OF PREDICTED HYDROGEN CONSUMPTION
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
INLET HYDROGEN PARTIAL PRESSURE MPa

12:13 THURSDAY, APR 11

437

PARAMETER PLOT OF PREDICTED LIGHT GAS YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE.
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF PRESSURE

11111 FRIDAY, MARCH

PARAMETER PLOT OF PREDICTED NAPHTHA YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF PRESSURE

11:11 FRIDAY, MAR

439
NAPHTHA YIELD
G/100G SLURRY

11.2635

23.400 26.775 30.050 33.375 36.700 40.025 43.350 46.675 50.000

INLET COAL CONCENTRATION G/100G SLURRY

162

PARAMETER PLLOT OF PREDICTED MIDDLE DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE.
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF PRESSURE

11:11 FRIDAY, MARCH

440

26.0
25.4
24.8
24.2
23.7
23.1
22.5
21.9
21.3
20.8
20.2
19.6
19.0
18.4
17.9
17.3
16.7
16.1
15.5
15.0
14.4
13.8
13.2
12.7
12.1
11.5
10.9
10.3
9.7
9.1
8.5
7.9
7.4
6.9
6.3
5.7
5.1
4.5
4.0
3.4
2.8
2.2

PARAMETER PLOT OF HEAVY DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF PRESSURE

11:11 FRIDAY, MARCH

PARAMETER PLOT OF THE PREDICTED SNC YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF PRESSURE

11:11 FRIDAY, MAR

165

PARAMETER PLOT OF THE PREDICTED TOTAL DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF PRESSURE

11:11 FRIDAY, MARCH

PARAMETER PLOT OF PREDICTED TON YIELD.
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF PRESSURE

11:11 FRIDAY, MARCH

444

PARAMETER PLOT OF PREDICTED TOTAL LIQUID YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF PRESSURE

11:11 FRIDAY, MAR

PARAMETER PLOT OF PREDICTED HYDROGEN CONSUMPTION
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF RECYCLE ASH

INLET COAL CONCENTRATION G/100G SLURRY

PARAMETER PLOT OF PREDICTED LIGHT GAS YIELD
 YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
 ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
 THE GLOSSARY SECTION
 SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF RECYCLE ASH

PARAMETER PLOT OF PREDICTED NAPHTHA YIELD
 YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
 ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
 THE GLOSSARY SECTION
 SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF RECYCLE ASH

14:00 MONDAY, MARCH 3

170

448

PARAMETER PLOT OF PREDICTED MIDDLE DISTILLATE YIELD
 YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
 ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
 THE GLOSSARY SECTION
 SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF RECYCLE ASH

PARAMETER PLOT OF HEAVY DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION.
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF RECYCLE ASH

10100 MONDAY, MARCH

172

PARAMETER PLOT OF THE PREDICTED SRC YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF RECYCLE ASH

10190 MONDAY, MARCH

451

PARAMETER PLOT OF THE PREDICTED TOTAL DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF RECYCLE ASH

10100 MONDAY, MARCH 31

175

PARAMETER PLOT OF PREDICTED ION YIELD
 YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
 ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
 THE GLOSSARY SECTION
 SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF RECYCLE ASH

14100 MONDAY, 1

PARAMETER PLOT OF PREDICTED TOTAL LIQUID YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF RECYCLE ASH

14100 MONDAY, MARCH 3

177

PARAMETER PLOT OF PREDICTED HYDROGEN CONSUMPTION
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

12152 MONDAY, MARCH

455

PARAMETER PLOT OF PREDICTED LIGHT GAS YIELD
 YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
 ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
 THE GLOSSARY SECTION
 SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

12:52 MONDAY, MA

178

PARAMETER PLOT OF PREDICTED NAPHTHA YIELD
 YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
 ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
 THE GLOSSARY SECTION
 SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

12:52 MONDAY, MARC

TOTAL VARIATION NOT SIGNIFICANT (1.4%)

457

180

PARAMETER PLOT OF PREDICTED MIDDLE DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

12:52 MONDAY.

PARAMETER PLOT OF HEAVY DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

12:52 MONDAY, MARCH 31

PARAMETER PLOT OF THE PREDICTED SHC YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

12:52 MONDAY, MARCH

PARAMETER PLOT OF THE PREDICTED TOTAL DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION.
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

12:52 MONDAY, MARCH 3

183

461

PARAMETER PLOT OF PREDICTED ION YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

462

PARAMETER PLOT OF PREDICTED TOTAL LIQUID YIELD
 YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
 ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
 THE GLOSSARY SECTION
 SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

12:52 MONDAY, MAR 61

PARAMETER PLOT OF PREDICTED HYDROGEN CONSUMPTION
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
INLET COAL CONCENTRATION G/100G SLURRY

13:09 THURSDAY, APRIL

PARAMETER PLOT OF PREDICTED LIGHT GAS YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF COAL CONC

14:19 FRIDAY, MARCH

PARAMETER PLOT OF PREDICTED NAPHTHA YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF COAL CONC

10119 FRIDAY, MARCH

466

PARAMETER PLOT OF PREDICTED MIDDLE DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF COAL CONC

14:19 FRIDAY, MARCH

467

190

PARAMETER PLOT OF HEAVY DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF COAL CONC

14:19 FRIDAY, MARCH

468

191

PARAMETER PLOT OF THE PREDICTED SRC YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF COAL CONC

14:19 FRIDAY, MAR

PARAMETER PLOT OF THE PREDICTED TOTAL DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF COAL CONC

10:10 FRIDAY, MA

193

PARAMETER PLOT OF PREDICTED 10M YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF COAL CONC

14119 FRIDAY, MARCH

471

194

PARAMETER PLOT OF PREDICTED TOTAL LIQUID YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF COAL CONC

14:19 FRIDAY, MM

472

195

PARAMETER PLOT OF PREDICTED HYDROGEN CONSUMPTION
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF
AVERAGE REACTOR TEMPERATURE DEG C

13:01 THURSDAY, APRIL

196

14:50 FRIDAY, MARC

PARAMETER PLOT OF PREDICTED LIGHT GAS YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

197

14:58 FRIDAY, MARC

PARAMETER PLOT OF PREDICTED NAPHTHA YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

TOTAL VARIATION NOT SIGNIFICANT WITH RESPECT
TO TEMPERATURE

475

PARAMETER PLOT OF PREDICTED MIDDLE DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

14:58 FRIDAY, MARCH

476

199

14:58 FRIDAY, MARCH 28,

PARAMETER PLOT OF HEAVY DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE.
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION.
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

PARAMETER PLOT OF THE PREDICTED SHC YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

14158 FRIDAY, MAR

478

201

PARAMETER PLOT OF THE PREDICTED TOTAL DISTILLATE YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

14:58 FRIDAY, MARCH

202

PARAMETER PLOT OF PREDICTED ION YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 2 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

14:58 FRIDAY, MARC

203

14:58 FRIDAY, MJ

PARAMETER PLOT OF PREDICTED TOTAL LIQUID YIELD
YIELD VS. ONE VARIABLE AT FIVE LEVELS OF A SECOND VARIABLE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION
SYMBOLS 1 THROUGH 5 INDICATE INCREASING LEVELS OF TEMPERATURE

481

CONTINUE ON RESPONSE SURFACE PLOT OF PREDICTED HYDROGEN CONS.
 AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
 VARIED WITHIN THEIR RESPECTIVE RANGES IN THE DATA BASE
 ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
 THE GLOSSARY SECTION

13:51 WEDNESDAY, 1

204

SYMBOL	YHYP	SYMBOL	YHYP	SYMBOL	YHYP	SYMBOL	YHYP
.....	4.071290 - 4.223177	+++++	4.830725 - 5.134499	XXXXXX	5.742047 - 6.045821	BBBBBB	6.653369 - 6.805286
.....	4.223177 - 4.526951	+++++	5.134499 - 5.438273	XXXXXX	6.045821 - 6.349595		
-----	4.526951 - 4.830725	000000	5.438273 - 5.742047	XXXXXX	6.349595 - 6.653369		

NOTE: 1243 OBS HIDDEN

CONTOUR ON RESPONSE SURFACE PLOT OF PREDICTED LIGHT GAS YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

13:51 WEDNESDAY.

SYMBOL	YC1C4P	SYMBOL	YC1C4P	SYMBOL	YC1C4P
.....	1.252179 - 2.532327	+++++	10.213213 - 12.773509	#####	20.454396 - 23.014691
.....	2.532327 - 5.092622	00000	12.773509 - 15.333805	#####	23.014691 - 24.294839
.....	5.092622 - 7.652918	XXXXX	15.333805 - 17.894100		
.....	7.652918 - 10.213213	#####	17.894100 - 20.454396		

NOTE: 1248 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED NAPHTHA YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

13:51 WEDNESDAY, 206

TOTAL VARIATION (1.4%) NOT SIGNIFICANT

SYMBOL		SYMBOL		SYMBOL		SYMBOL	
YNAPP		YNAPP		YNAPP		YNAPP	
.....	10.93338 - 11.01646	=====	11.34880 - 11.51496	XXXXXX	11.84730 - 12.01347	#####	12.34580 - 12.42889
.....	11.01646 - 11.18263	+++++	11.51496 - 11.68113	#####	12.01347 - 12.17964		
-----	11.18263 - 11.34880	000000	11.68113 - 11.84730	#####	12.17964 - 12.34580		

NOTE: 1246 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED MIDDLE DISTILLATE
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

13:51 WEDNESDAY.

207

485

SYMBOL	YMDP	SYMBOL	YMDP	SYMBOL	YMDP
.....	-18.4932780 -	+++++	0.5271045 -	#####	22.2646845 -
.....	-15.7760805 -	UUUUU	5.9614995 -	#####	27.6990795 -
-----	-10.3416855 -	XXXXX	11.3958945 -		30.4162770
=====	-4.9072905 -	UUUUU	16.8302895 -		
	0.5271045		22.2646845		

NOTE: 1248 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED HEAVY DISTILLATE
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

13:51 WEDNESDAY.

SYMBOL		YMDP	SYMBOL		YMDP	SYMBOL		YMDP			
.....	-5.329760	-	-3.933467	+++++	-4.444329	-	7.236928	000000	-15.614724	-	18.407323
.....	-3.933467	-	-1.140668	000000	7.236928	-	10.029526	000000	18.407323	-	19.803622
-----	-1.140668	-	1.651730	XXXXXX	10.029526	-	12.822125				
-----	1.651730	-	4.341319	000000	12.822125	-	15.614724				

NOTE: 1248 DMS HIDDEN

CONTOUR ON RESPONSE SURFACE PLOT OF PREDICTED SNC YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED WITHIN THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION.

13:51 WEDNESDAY, MAR

487

SYMBOL	YSRCP	SYMBOL	YSRCP	SYMBOL	YSRCP	SYMBOL	YSRCP
.....	20.21367 - 22.38798	+++++	31.08520 - 35.43381	XXXXXX	44.13104 - 48.47965	#####	57.17687 - 59.35118
.....	22.38798 - 26.73659	+++++	35.43381 - 39.78242	#####	48.47965 - 52.82826		
-----	26.73659 - 31.08520	ODDUUO	39.78242 - 44.13104	#####	52.82826 - 57.17687		

NOTE: 1248 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED TOTAL DISTILLATE
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

13:51 WEDNESDAY, M.

SYMBOL	NDISTP	SYMBOL	YDISTP	SYMBOL	YDISTP
.....	-15.147055 -	+++++	6.674033 -	#####	35.040991 -
.....	-14.601185 -	000000	13.765773 -	#####	42.132731 -
-----	-7.509440 -	XXXXXX	20.957512 -		45.676601
=====	-0.417706 -	#####	27.949252 -		
			35.040991		

NOTE: 1248 NUS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED IOM YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

13:51 WEDNESDAY,

211

INLET HYDROGEN PART. PRESSURE MPA

SYMBOL	YIOMP	SYMBOL	YIOMP	SYMBOL	YIOMP	SYMBOL	YIOMP
.....	3.716732 - 3.973393	=====	5.000036 - 5.513357	XXXXXX	6.540000 - 7.053322	#####	8.079965 - 8.336626
.....	3.973393 - 4.486714	+++++	5.513357 - 6.026679	000000	7.053322 - 7.566643		
-----	4.486714 - 5.000036	000000	6.026679 - 6.540000	#####	7.566643 - 8.079965		

NOTE: 1248 OBS HIDDEN

CONTOUR ON RESPONSE SURFACE PLOT OF PREDICTED TOTAL LIQUID YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

13:51 WEDNESDAY

SYMBOL	YL IQP	SYMBOL	YL IQP	SYMBOL	YL IQP	SYMBOL	YL IQP
.....	23.33430 - 24.86374	#####	30.98148 - 34.04035	XXXXXX	40.15808 - 43.21695	#####	49.33469 - 50.86413
.....	24.86374 - 27.92261	++++++	34.04035 - 37.09922	#####	43.21695 - 46.27582		
-----	27.92261 - 30.98148	000000	37.09922 - 40.15808	#####	46.27582 - 49.33469		

NOTE: 1248 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED HYDROGEN CONS.
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

13146 WEDNESDAY, MAI

SYMBOL	YMVP	SYMBOL	YMVP	SYMBOL	YMVP	SYMBOL	YMVP
.....	2.439566 - 2.663244	.....	3.557954 - 4.005309	XXXXXX	4.900020 - 5.347375	.....	6.242085 - 6.465763
.....	2.663244 - 3.110599	+++++	4.005309 - 4.452665	888888	5.347375 - 5.794730		
-----	3.110599 - 3.557954	000000	4.452665 - 4.900020	888888	5.794730 - 6.242085		

NOTE: 1248 ORS HIDDEN

214

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED LIGHT GAS YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

13:46 WEDNESDAY

492

SYMBOL	YC1C4P	SYMBOL	YC1C4P	SYMBOL	YC1C4P
.....	-4.637650 -	+++++	9.858035 -	#####	26.424532 -
.....	-2.566038 -	000000	13.999659 -	#####	30.566156 -
-----	1.574786 -	XXXXXX	18.141283 -		32.636968
=====	5.716411 -	#####	22.282908 -		
	9.858035		26.424532		

NOTE: 1248 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED NAPHTHA YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

13:46 WEDNESDAY

493

SYMBOL	YNAPP	SYMBOL	YNAPP	SYMBOL	YNAPP
.....	6.592569 - 7.254270	++++++	11.224474 - 12.547876	000000	16.518080 - 17.841482
.....	7.254270 - 8.577671	000000	12.547876 - 13.871277	000000	17.841482 - 18.503183
-----	8.577671 - 9.901073	XXXXXX	13.871277 - 15.194679		
=====	9.901073 - 11.224474	000000	15.194679 - 16.518080		

NOTE: 1248 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED MIDDLE DISTILLATE
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

13746 WEDNESDAY

216

494

SYMBOL	YMDP	SYMBOL	YMDP	SYMBOL	YMDP
.....	-18.860394 -	+++++	3.840173 -	#####	29.783678 -
.....	-15.617456 -	000000	10.326049 -	#####	36.269554 -
-----	-9.131580 -	XXXXXX	16.811925 -		39.512492
#####	-2.645704 -	888888	23.297801 -		
	3.840173		29.783678		

NOTE: 1248 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED HEAVY DISTILLATE
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

13:46 WEDNESDAY, MI

SYMBOL	YMDP	SYMBOL	YMDP	SYMBOL	YMDP
.....	2.295281 - 2.984042	+++++	7.116603 - 8.494124	#####	12.626686 - 14.004206
.....	2.984042 - 4.361562	000000	8.494124 - 9.871645	#####	14.004206 - 14.692966
-----	4.361562 - 5.739083	XXXXXX	9.871645 - 11.249165		
#####	5.739083 - 7.116603	#####	11.249165 - 12.626686		

NOTE: 1248 OBS HIGHEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED SRC YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

13:46 WEDNESDAY

SYMBOL	YSRCP	SYMBOL	YSRCP	SYMBOL	YSRCP	SYMBOL	YSRCP
.....	18.38916 - 21.07838	=====	31.83523 - 37.21366	XXXXXX	47.97051 - 53.34893	#####	64.10579 - 66.79500
.....	21.07838 - 26.45680	+++++	37.21366 - 42.59208	000000	53.34893 - 58.72736		
-----	26.45680 - 31.83523	000000	42.59208 - 47.97051	000000	58.72736 - 64.10579		

NOTE: 1248 QRS HIDDEN

CONTOUR ON RESPONSE SURFACE PLOT OF PREDICTED TOTAL DISTILLATE
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

13:46 WEDNESDA

497

SYMBOL	YDISTP	SYMBOL	YDISTP	SYMBOL	YDISTP
.....	-7.720634 - -4.919166	+++++	11.889642 - 17.492578	000000	34.301387 - 39.904323
.....	-4.919166 - 0.683770	000000	17.492578 - 23.095514	000000	39.904323 - 42.705791
-----	0.683770 - 6.286706	xxxxxx	23.095514 - 28.698450		
=====	6.286706 - 11.319642	wwwwww	28.698450 - 34.301387		

NOTE: 1248 ORS HIDDEN

CONTOUR ON RESPONSE SURFACE PLOT OF PREDICTED IOM YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

13:46 WEDNESDAY

498

SLURRY RESIDENCE TIME HRS.

SYMBOL	YIOMP	SYMBOL	YIOMP	SYMBOL	YIOMP	SYMBOL	YIOMP
.....	2.714129 - 3.053756	=====	4.412266 - 5.091521	XXXXXX	6.450032 - 7.129287	#####	8.487797 - 8.827424
.....	3.053756 - 3.733011	+++++	5.091521 - 5.770777	#####	7.129287 - 7.808542		
-----	3.733011 - 4.412266	(H)(H)	5.770777 - 6.450032	#####	7.808542 - 8.487797		

NOTE: 1248 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED TOTAL LIQUID YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

13:46 WEDNESDAY

SYMBOL	YL10P	SYMBOL	YL10P	SYMBOL	YL10P	SYMBOL	YL10P
.....	23.15527 - 24.46836	=====	29.72074 - 32.34693	XXXXXX	37.59930 - 40.22549	#####	45.47787 - 46.79096
.....	24.46836 - 27.09455	+++++	32.34693 - 34.97312	UUUUUU	40.22549 - 42.85168		
-----	27.09455 - 29.72074	UUUUUU	34.97312 - 37.59930	#####	42.85168 - 45.47787		

NOTE: 1248.DMS HIDDEN

222

CONTOUR ON RESPONSE SURFACE PLOT OF PREDICTED HYDROGEN CONS.
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:00 WEDNESDAY, MA

SYMBOL	YHYP	SYMBOL	YHYP	SYMBOL	YHYP	SYMBOL	YHYP
.....	3.390590 - 3.581720	=====	4.346240 - 4.728500	XXXXXX	5.493019 - 5.875279	■■■■■■	6.639799 - 6.830929
.....	3.581720 - 3.963980	+++++	4.728500 - 5.110760	000000	5.875279 - 6.257539		
-----	3.963980 - 4.346240	000000	5.110760 - 5.493019	■■■■■■	6.257539 - 6.639799		

NOTE: 1224 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED LIGHT GAS YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:00 WEDNESDA

INLET COAL CONCENTRATION G/100G SLURRY

SYMBOL		YCIC4P		SYMBOL		YCIC4P		SYMBOL		YCIC4P		
.....		1.110132	-	2.476442	++++++	10.674303	-	13.406923	000000	21.604784	-	24.337404
.....		2.476442	-	5.209062	000100	13.406923	-	16.139543	000000	24.337404	-	25.703714
-----		5.209062	-	7.941682	XXXXXX	16.139543	-	18.872163				
000000		7.941682	-	10.674303	000000	18.872163	-	21.604784				

NOTE: 1224 UBS HIDDEN

CONTINUE ON RESPONSE SURFACE PLOT OF PREDICTED NAPP-TNA YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:00 WEDNESDAY, M

TOTAL VARIATION (1.4%) NOT SIGNIFICANT

502

INLET COAL CONCENTRATION G/100G SLURRY

SYMBOL	YNAPP	SYMBOL	YNAPP	SYMBOL	YNAPP	SYMBOL	YNAPP
.....	10.93338 - 11.01646	=====	11.34080 - 11.51496	XXXXXX	11.84730 - 12.01347	#####	12.34580 - 12.42889
+++++	11.01646 - 11.18263	+++++	11.51496 - 11.68113	#####	12.01347 - 12.17964		
-----	11.18263 - 11.34680	UUUUUU	11.68113 - 11.84730	#####	12.17964 - 12.34580		

NOTE: 1224 DMS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED MIDDLE DISTILLATE
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:00 WEDNESDAY, MARI

503

SYMBOL	YMDP	SYMBOL	YMDP	SYMBOL	YMDP
.....	-25.043761 -	.....	-3.863231 -	.....	25.635232 -
.....	-25.043761 -	.....	3.507635 -	.....	33.011098 -
.....	-25.043761 -	.....	10.843501 -	.....	36.696031
.....	-11.244097 -	.....	10.843501 -	.....	
.....	-11.244097 -	.....	10.259367 -	.....	

NOTE: 1224 RES MINEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED HEAVY DISTILLATE
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:00 WEDNESDAY.

504

SYMBOL		YMDP	SYMBOL		YMDP	SYMBOL		YMDP
.....	-45.104163 -	-41.362356	+++++	-18.911520 -	-11.427908	nnnnnn	11.022929 -	18.506541
.....	-41.362356 -	-33.878744	nnnnnn	-11.427908 -	-3.944295	nnnnnn	18.506541 -	22.248347
-----	-33.878744 -	-26.395132	xxxxxx	-3.944295 -	3.539317			
=====	-26.395132 -	-18.911520	nnnnnn	3.539317 -	11.022929			

NOTE: 1224 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED SRC YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:00 WEDNESDAY.

SYMBOL	YSRCP	SYMBOL	YSRCP	SYMBOL	YSRCP	SYMBOL	YSRCP
.....	17.64156 - 20.44073	=====	33.83743 - 40.31578	XXXXXX	53.27247 - 59.75082	#####	72.70752 - 75.94669
.....	20.44073 - 27.35908	+++++	40.31578 - 46.79412	(HIDHH)	59.75082 - 66.22917		
-----	27.35908 - 33.83743	(HUUU)	46.79412 - 53.27247	#####	66.22917 - 72.70752		

NOTE: 1224 OUS. HIDEEN

CONTINUUM RESPONSE SURFACE PLOT OF PREDICTED TOTAL DISTILLATE
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:00 WEDNESDAY, MAR

SYMBOL	YDISTP	SYMBOL	YDISTP	SYMBOL	YDISTP
.....	-40.79554 - -41.92754	+ + + + +	-12.71953 - -2.98352	#####	26.22449 - 35.96049
.....	-41.92754 - -32.19153	000000	-2.98352 - 6.75248	#####	35.96049 - 40.82849
-----	-32.19153 - -22.45553	XXXXXX	6.75248 - 16.48848		
=====	-22.45553 - -12.71953	000000	16.48848 - 26.22449		

NOTE: 1224.045 HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED IOM YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:00 WEDNESDAY

507

SYMBOL	YIOMP	SYMBOL	YIOMP	SYMBOL	YIOMP	SYMBOL	YIOMP
.....	4.438622 - 4.558016	=====	5.035592 - 5.274380	XXXXXX	5.751956 - 5.990744	#####	6.468320 - 6.587714
.....	4.558016 - 4.796804	++++++	5.274380 - 5.513168	#####	5.990744 - 6.229532		
-----	4.796804 - 5.035592	000000	5.513168 - 5.751956	#####	6.229532 - 6.468320		

NOTE: 1224 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED TOTAL LIQUID YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:00 WEDNESDAY

SYMBOL	YL10P	SYMBOL	YL10P	SYMBOL	YL10P
.....	1.227857 - 4.018368	+++++	20.761433 - 26.342454	#####	43.085520 - 48.666541
.....	4.018368 - 9.599389	00000	26.342454 - 31.923476	#####	48.666541 - 51.457052
-----	9.599389 - 15.180411	xxxxx	31.923476 - 37.504498		
=====	15.180411 - 20.761433	#####	37.504498 - 43.085520		

NOTE: 1224 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED HYDROGEN CONS.
AT 13 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

8:49 THURSDAY.

509

SYMBOL	YHYP	SYMBOL	YHYP	SYMBOL	YHYP	SYMBOL	YHYP
.....	2.356644 - 2.542279	000000	3.284818 - 3.656087	XXXXXX	4.398626 - 4.769896	000000	5.512435 - 5.698069
+++++	2.542279 - 2.913548	+++++	3.656087 - 4.327357	000000	4.769896 - 5.141165		
-----	2.913548 - 3.284818	000000	4.027357 - 4.398626	000000	5.141165 - 5.512435		

NOTE: 1248 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED LIGHT GAS YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION.

8149 THURSDA

510

SYMBOL	YC1C4P	SYMBOL	YC1C4P	SYMBOL	YC1C4P
.....	1.466233 - 2.729950	+++++	10.312253 - 12.839637	#####	20.421989 - 22.949424
.....	2.729950 - 5.257384	000000	12.839687 - 15.367121	#####	22.949424 - 24.213141
-----	5.257384 - 7.784818	XXXXXX	15.367121 - 17.894555		
#####	7.784818 - 10.312253	000000	17.894555 - 20.421989		

NOTE: 1248 OBS HIDDEN

CONTOUR ON RESPONSE SURFACE PLOT OF PREDICTED NAPHTHA YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

8:49 THURSDAY,

233

511

SYMBOL		YNAPP		SYMBOL		YNAPP		SYMBOL		YNAPP	
.....	-5.9186260 -	-4.6896112	+++++	2.6844775 -	5.1425070	000000	12.5165957 -	14.9746253	000000	12.5165957 -	14.9746253
.....	-4.6896112 -	-2.2315817	000000	5.1425070 -	7.6005366	000000	14.9746253 -	16.2036400			
-----	-2.2315817 -	0.2264479	XXXXXX	7.6005366 -	10.0585661						
000000	0.2264479 -	2.6844775	000000	10.0585661 -	12.5165957						

NOTE: 1248 OHS MDCEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED MIDDLE DISTILLATE
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

8:49 THURSDA

512

SYMBOL	YMDP	SYMBOL	YMDP	SYMBOL	YMDP
.....	-27.605304 - -24.197679	+++++	-3.751923 - 3.063329	#####	23.509085 - 30.324337
.....	-24.197679 - -17.382427	00000	3.063329 - 9.878581	#####	30.324337 - 33.731962
-----	-17.382427 - -10.567175	XXXXX	9.878581 - 16.693833		
#####	-10.567175 - -3.751923	00000	16.693833 - 23.509085		

NOTE: 1248 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED HEAVY DISTILLATE
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

8:49 THURSDAY.

513

SYMBOL		YHDP	SYMBOL		YHDP	SYMBOL		YHDP
.....	-12.650889 -	-11.130935	+++++	-2.011210 -	1.028699	#####	10.148424 -	13.188332
.....	-11.130935 -	-8.091026	000000	1.028699 -	4.068607	#####	13.188332 -	14.708286
-----	-8.091026 -	-5.051118	XXXXXX	4.068607 -	7.108516			
=====	-5.051118 -	-2.011210	#####	7.108516 -	10.148424			

NOTE: 1248 DUS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED SNC YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVEN THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

8:49 THURSDAY, MARI

236

514

SYMBOL	YSRCP	SYMBOL	YSRCP	SYMBOL	YSRCP	SYMBOL	YSRCP
.....	24.41287 - 26.34050	=====	35.05105 - 39.30632	XXXXXX	47.81686 - 52.07214	#####	60.58268 - 62.71032
.....	26.34050 - 30.76578	+++++	39.30632 - 43.56159	000000	52.07214 - 56.32741		
-----	30.76578 - 35.15105	000000	43.56159 - 47.81686	000000	56.32741 - 60.58268		

NOTE: 1248 OHS MIDCEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED TOTAL DISTILLATE
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

8:49 THURSDAY, MA

515

SYMBOL	YDISTP	SYMBOL	YDISTP	SYMBOL	YDISTP
.....	-15.815816 - -12.936552	+++++	4.339032 - 10.097561	#####	27.373145 - 33.131673
.....	-12.936552 - -7.178024	00000	10.097561 - 15.856089	#####	33.131673 - 36.010937
-----	-7.178024 - -1.419496	XXXXX	15.856089 - 21.614617		
#####	-1.419496 - 4.339032	00000	21.614617 - 27.373145		

NOTE: 1248 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED IOM YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

8:49 THURSDAY, MARC

516

SYMBOL	YIOMP		SYMBOL	YIOMP		SYMBOL	YIOMP	
.....	3.112908	- 3.704181	+++++	7.251819	- 8.434365	#####	11.982003	- 13.164549
.....	3.704181	- 4.886727	00000	8.434365	- 9.616911	#####	13.164549	- 13.755822
-----	4.886727	- 6.069273	XXXXX	9.616911	- 10.799457			
#####	6.069273	- 7.251819	00000	10.799457	- 11.982003			

NOTE: 1248 ONS MDCEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED TOTAL LIQUID YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

8:49 THURSDAY.

517

SYMBOL	YLIQP	SYMBOL	YLIQP	SYMBOL	YLIQP	SYMBOL	YLIQP
.....	15.48505 - 17.04100	=====	23.26478 - 26.37666	XXXXXX	32.60044 - 35.71233	#####	41.93611 - 43.49206
.....	17.04100 - 20.15289	++++++	26.37666 - 29.48855	000000	35.71233 - 38.82422		
-----	20.15289 - 23.26478	000000	29.48855 - 32.60044	#####	38.82422 - 41.93611		

NOTE: 1248 OBS WIDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED HYDROGEN CONS.
 AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
 VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
 ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
 THE GLOSSARY SECTION

14139 WEDNESDAY

240

518

SYMBOL	YHYP	SYMBOL	YHYP	SYMBOL	YHYP	SYMBOL	YHYP
.....	2.776818 - 3.138154	=====	4.583495 - 5.306166	XXXXXX	6.751508 - 7.474179	#####	8.919520 - 9.280856
.....	3.138154 - 3.860824	+++++	5.306166 - 6.028837	000000	7.474179 - 8.196849		
-----	3.860824 - 4.583495	000000	6.028837 - 6.751508	#####	8.196849 - 8.919520		

NOTE: 936 OBS HIDDEN

CONTINUUM RESPONSE SURFACE PLOT OF PREDICTED LIGHT GAS YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:39 WEDNESDAY

241

519

SYMBOL	YCIC4P	SYMBOL	YCIC4P	SYMBOL	YCIC4P
.....	7.527776 - 0.453057	+++++	14.004743 - 15.455305	.....	21.406990 - 23.257552
.....	0.453057 - 10.303619	ooooo	15.455305 - 17.705867	.....	23.257552 - 24.182833
-----	10.303619 - 12.154101	xxxxx	17.705867 - 19.556428		
.....	12.154101 - 14.004743	ooooo	19.556428 - 21.406990		

NOTE: 936 005 MIDUEN

CONTINU ON RESPONSE SURFACE PLOT OF PREDICTED NAPHTHA YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVLR THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:39 WEDNESDA

242

520

SYMBOL	YNAPP	SYMBOL	YNAPP	SYMBOL	YNAPP
.....	9.063098 - 9.270452	+++++	10.514579 - 10.929289	000000	12.173416 - 12.588125
.....	9.270452 - 9.685161	000000	10.929289 - 11.343998	000000	12.588125 - 12.795480
-----	9.685161 - 10.099870	XXXXXX	11.343998 - 11.758707		
=====	10.099870 - 10.514579	000000	11.758707 - 12.173416		

NOTE: 936 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED MIDDLE DISTILLATE
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:39 WEDNESDA

243

521

SLURRY RESIDENCE TIME MRS.

SYMBOL	YMDP	SYMBOL	YMDP	SYMBOL	YMDP	SYMBOL	YMDP
.....	10.24876 - 11.20187	.....	15.01429 - 16.92050	XXXXXX	20.73291 - 22.63912	.....	26.45154 - 27.40465
.....	11.20187 - 13.10608	+++++	16.92050 - 18.82671	000000	22.63912 - 24.54533		
-----	13.10608 - 15.01429	(X)(X)(X)	18.82671 - 20.73291	000000	24.54533 - 26.45154		

NOTE: 936 OBS HIDDEN

CONTOUR ON RESPONSE SURFACE PLOT OF PREDICTED HEAVY DISTILLATE
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:39 WEDNESD

522

SYMBOL	YHDP	SYMBOL	YHDP	SYMBOL	YHDP
.....	6.153317 - 6.900215	++++++	11.437607 - 12.947404	#####	17.476796 - 18.986594
.....	6.908215 - 8.418013	(UUUUU)	12.947404 - 14.457202	#####	18.986594 - 19.741492
-----	8.418013 - 9.927810	xxxxxx	14.457202 - 15.966999		
=====	9.927810 - 11.437607	#####	15.966999 - 17.476796		

NOTE: 936 OBS HIDDEN

CONTINUOR RESPONSE SURFACE PLOT OF PREDICTED SRC YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:39 WEDNESDAY

523

SLURRY RESIDENCE TIME HRS.

SYMBOL	YSRCP	SYMBOL	YSRCP	SYMBOL	YSRCP	SYMBOL	YSRCP
.....	23.95258 - 24.79501	=====	28.16472 - 29.84958	XXXXXX	33.21930 - 34.90416	#####	38.27388 - 39.11630
.....	24.79501 - 26.47987	+++++	29.84958 - 31.53444	000000	34.90416 - 36.58902		
-----	26.47987 - 28.16472	000000	31.53444 - 33.21930	#####	36.58902 - 38.27388		

NOTE: 936 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED TOTAL DISTILLATE
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:39 WEDNESDAY.

524

SYMBOL	YDISTP	SYMBOL	YDISTP	SYMBOL	YDISTP	SYMBOL	YDISTP
.....	15.16252 - 16.68507	=====	22.77530 - 25.82042	XXXXXX	31.91065 - 34.95576	#####	41.04599 - 42.56855
.....	16.68507 - 19.73019	+++++	25.82042 - 28.86553	#####	34.95576 - 38.00087		
-----	19.73019 - 22.77530	UUUUUU	28.86553 - 31.91065	#####	38.00087 - 41.04599		

NOTE: 436 UMS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED IOM YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:39 WEDNESDAY

247

525

SYMBOL	YIOMP	SYMBOL	YIOMP	SYMBOL	YIOMP	SYMBOL	YIOMP
.....	2.811258 - 3.153338	=====	4.521654 - 5.205819	XXXXXX	6.574139 - 7.258299	#####	8.626619 - 8.968699
.....	3.153338 - 3.837498	+++++	5.205819 - 5.889979	HHHHHH	7.258299 - 7.942459		
-----	3.837498 - 4.521654	DDDDDD	5.889979 - 6.574139	NNNNNN	7.942459 - 8.626619		

NOTE: 936 GGS H2O/N

YI
SF
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CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED TOTAL LIQUID YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:39 WEDNESDAY

SYMBOL	YL1QP	SYMBOL	YL1QP	SYMBOL	YL1QP	SYMBOL	YL1QP
.....	27.73601 - 28.98200	=====	33.95593 - 36.45790	XXXXXX	41.44184 - 43.93361	#####	48.91775 - 50.16373
.....	29.98200 - 31.47395	+ + + + +	36.45790 - 38.94937	#####	43.93361 - 46.42578		
-----	31.47395 - 33.96593	000000	38.94937 - 41.44184	#####	46.42578 - 48.91775		

NOTE: 936 GHS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED HYDROGEN CONS.
 AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
 VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
 ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
 THE GLOSSARY SECTION

14:29 WEDNESDAY, M.

527

SYMBOL	YHYP	SYMBOL	YHYP	SYMBOL	YHYP	SYMBOL	YHYP
.....	2.926488 - 3.159882	*****	4.093459 - 4.560248	XXXXXX	5.493824 - 5.960613	#####	6.894190 - 7.127584
.....	3.159882 - 3.626671	+++++	4.560248 - 5.027036	888888	5.960613 - 6.427401		
-----	3.626671 - 4.093459	000000	5.027036 - 5.493824	888888	6.427401 - 6.894190		

NOTE: 936 OBS MIDCEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED LIGHT GAS YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:29 WEDNESDAY.

SYMBOL	YC1C4P	SYMBOL	YC1C4P	SYMBOL	YC1C4P	SYMBOL	YC1C4P
.....	15.67285 - 15.88269	=====	16.72207 - 17.14176	XXXXXX	17.98114 - 18.40083	#####	19.24022 - 19.45006
.....	15.88269 - 16.30238	+++++	17.14176 - 17.56145	#####	18.40083 - 18.82052		
-----	16.30238 - 16.72207	000000	17.56145 - 17.98114	#####	18.82052 - 19.24022		

NOTE: 936 QRS HIDDEN

251

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED NAPHTHA YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:29 WEDNESDAY

RECYCLE ASH CONC. G/100G SLURRY

SYMBOL		YNAPP		SYMBOL		YNAPP		SYMBOL		YNAPP	
.....	3.569622 -	4.043337		+++++	6.885624 -	7.833053		#####	10.675340 -	11.622769	
.....	4.043337 -	4.990766		000000	7.833053 -	8.780482		#####	11.622769 -	12.096484	
-----	4.990766 -	5.938195		XXXXXX	8.780482 -	9.727911					
#####	5.938195 -	6.885624		060000	9.727911 -	10.675340					

NOTE: 936 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED MIDDLE DISTILLATE
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:29 WEDNESDAY, MA

530

SYMBOL	YMDP	SYMBOL	YMDP	SYMBOL	YMDP	SYMBOL	YMDP
.....	17.57578 - 17.76653	=====	18.52952 - 18.91101	XXXXXX	19.67400 - 20.05550	888888	20.81849 - 21.00924
.....	17.76653 - 18.14802	+++++	18.91101 - 19.29251	000000	20.05550 - 20.43699		
-----	18.14802 - 18.52952	000000	19.29251 - 19.67400	000000	20.43699 - 20.81849		

NOTE: 936 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED HEAVY DISTILLATE
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

10:29 WEDNESDAY, 1

SYMBOL	YHDP	SYMBOL	YHDP	SYMBOL	YHDP
.....	-8.762854 - -7.206761	+++++	2.309794 - 5.481979	888888	14.998535 - 18.170720
.....	-7.206761 - -4.034576	000000	5.481979 - 8.654164	888888	18.170720 - 19.756812
-----	-4.034576 - -0.862391	XXXXXX	8.654164 - 11.826349		
888888	-0.862391 - 2.309794	888888	11.826349 - 14.998535		

NOTE: 936 OBS HIDDEN

CONTOUR ON RESPONSE SURFACE PLOT OF PREDICTED SRC YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION.

14129 MEDNESO

SYMBOL	YSRCP	SYMBOL	YSRCP	SYMBOL	YSRCP	SYMBOL	YSRCP
.....	26.13670 - 27.11698	+++++	31.03813 - 32.99870	XXXXXX	36.91984 - 38.88041	#####	42.80155 - 43.78184
.....	27.11698 - 29.07756	+++++	32.99870 - 34.95927	#####	38.88041 - 40.84098		
-----	29.07756 - 31.03813	000000	34.95927 - 36.91984	#####	40.84098 - 42.80155		

NOTE: 936 QBS MIDCEN

255

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED TOTAL DISTILLATE
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:29 WEDNESD

533

SYMBOL	YDISTP	SYMBOL	YDISTP	SYMBOL	YDISTP
.....	9.138351 - 10.672931	+++++	19.880412 - 22.949572	#####	32.157053 - 35.226214
.....	10.672931 - 13.742091	00000	22.949572 - 26.018733	#####	35.226214 - 36.760794
-----	13.742091 - 16.811252	XXXXX	26.018733 - 29.087893		
#####	16.811252 - 19.880412	#####	29.087893 - 32.157053		

NOTE: 936 DBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED ION YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:29 WEDNESDAY

SYMBOL	YIOMP	SYMBOL	YIOMP	SYMBOL	YIOMP
.....	3.366937 - 4.005180	+++++	7.834638 - 9.111124	#####	12.940582 - 14.217068
.....	4.005180 - 5.281666	000000	9.111124 - 10.387610	#####	14.217068 - 14.855311
-----	5.281666 - 6.558152	XXXXXX	10.387610 - 11.664096		
=====	6.558152 - 7.834638	000000	11.664096 - 12.940582		

NOTE: 936 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED TOTAL LIQUID YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14129 WEDNESDAY

535

SYMBOL	VL10P	SYMBOL	VL10P	SYMBOL	VL10P	SYMBOL	VL10P
.....	15.01700 - 16.00260	.....	23.94103 - 27.51140	XXXXXX	34.65054 - 38.22011	.....	45.35926 - 47.14404
.....	16.00260 - 20.37226	.....	27.51140 - 31.08097	.....	38.22011 - 41.78969	.....	47.14404 - 50.71361
.....	20.37226 - 23.94103	.....	31.08097 - 34.65054	.....	41.78969 - 45.35926	.....	50.71361 - 54.28318

NOTE: 936 GMS HIDDEN

CONTINUUM RESPONSE SURFACE PLOT OF PREDICTED HYDROGEN CONS.
 AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
 VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
 ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
 THE GLOSSARY SECTION

14:47 WEDNESDAY, 1

SYMBOL	YHYP	SYMBOL	YHYP	SYMBOL	YHYP	SYMBOL	YHYP
.....	4.426491 - 4.554951	=====	5.068790 - 5.325709	XXXXXX	5.839548 - 6.096467	#####	6.610306 - 6.738765
.....	4.554951 - 4.811870	+++++	5.325709 - 5.562628	#####	6.096467 - 6.353386		
-----	4.811870 - 5.068790	|||||	5.562628 - 5.839548	#####	6.353386 - 6.610306		

NOTE: 918 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED LIGHT GAS YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:47 WEDNESDAY, 1

259

537

SYMBOL	YCIC4P	SYMBOL	YCIC4P	SYMBOL	YCIC4P	SYMBOL	YCIC4P
.....	14.45010 - 15.17164	+++++	16.45879 - 17.10226	XXXXXX	18.38921 - 19.03269	#####	20.31964 - 20.64138
.....	15.17164 - 15.61531	+++++	17.10226 - 17.74574	#####	19.03269 - 19.67617		
-----	15.61531 - 16.45879	#####	17.74574 - 18.38921	#####	19.67617 - 20.31964		

NOTE: 418 DWS HIDDEN

260

CONTINUUM OF RESPONSE SURFACE PLOT OF PREDICTED NAPHTHA YIELD
 AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
 VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
 ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
 THE GLOSSARY SECTION

14:47 WEDNESDAY, MAR

538

INLET COAL CONCENTRATION G/100G SLURRY

SYMBOL

YNAPP

..... 11.24358 - 11.24358

NOTE: 916 DMS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED MIDDLE DISTILLATE
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARC
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:47 WEDNESDAY, MAR

261

539

SYMBOL	YMDP	SYMBOL	YMDP	SYMBOL	YMDP
.....	2.800575 - 4.147037	+++++	11.865809 - 14.438733	.....	22.157504 - 24.730428
.....	4.147037 - 6.719961	(|||||)	14.438733 - 17.011656	.....	24.730428 - 26.016890
-----	6.719961 - 9.292885	xxxxxx	17.011656 - 19.584580		
=====	9.292885 - 11.865809	uuuuuu	19.584580 - 22.157504		

NOTE: 918 DMS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED HEAVY DISTILLATE
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:47 WEDNESDAY, MA

540

SYMBOL	YHDP	SYMBOL	YHDP	SYMBOL	YHDP
.....	0.4137126 - 1.5927042	+++++	8.6666536 - 11.0246370	#####	18.0985867 - 20.4565699
.....	1.5927042 - 3.9506074	#####	11.0246370 - 13.3826203	#####	20.4565699 - 21.6355616
-----	3.9506074 - 6.3086706	xxxxxx	13.3826203 - 15.7406035		
=====	6.3086706 - 8.6666536	#####	15.7406035 - 18.0985867		

NOTE: 918 DLS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED SRC YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION.

14:47 WEDNESDAY.

SYMBOL	YSRCP	SYMBOL	YSRCP	SYMBOL	YSRCP	SYMBOL	YSRCP
.....	19.36539 - 21.45722	=====	29.82451 - 34.00816	XXXXXX	42.37545 - 46.55910	#####	54.92639 - 57.01821
.....	21.45722 - 25.64086	+++++	34.00816 - 38.19180	#####	46.55910 - 50.74274		
-----	25.64086 - 29.82451	000000	38.19180 - 42.37545	#####	50.74274 - 54.92639		

NOTE: 918 DBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED TOTAL DISTILLATE
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:47 WEDNESDAY, M

542

SYMBOL	YDISTP	SYMBOL	YDISTP	SYMBOL	YDISTP
.....	1.554643 - 3.902664	+++++	17.990553 - 22.066516	#####	36.774405 - 41.470368
.....	3.902664 - 6.598627	000000	22.066516 - 27.382479	#####	41.470368 - 43.818350
-----	6.598627 - 13.294590	XXXXXX	27.382479 - 32.078442		
#####	13.294590 - 17.990553	#####	32.078442 - 36.774405		

NOTE: YIELD HIDDEN

CONTOUR ON RESPONSE SURFACE PLOT OF PREDICTED ION YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:47 WEDNESDAY.

INLET COAL CONCENTRATION G/100G SLURRY

SYMBOL	YIOMP	SYMBOL	YIOMP	SYMBOL	YIOMP	SYMBOL	YIOMP
.....	4.369466 - 4.403969	=====	4.641001 - 5.170987	xxxxxx	5.628499 - 5.858005	#####	6.316016 - 6.430519
+++++	4.483964 - 4.712975	+++++	5.170987 - 5.399993	#####	5.858005 - 6.087010		
-----	4.712975 - 4.941981	#####	5.399993 - 5.628499	#####	6.087010 - 6.316016		

NOTE: 916 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED TOTAL LIQUID YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:47 WEDNESDAY,

SYMBOL	YLIQ	SYMBOL	YLIQ	SYMBOL	YLIQ
.....	-2.3274458 - 0.0051083	+++++	10.8308530 - 24.8760812	#####	43.0117659 - 49.0569942
.....	0.6951683 - 6.7403965	000000	24.8760812 - 30.9213095	#####	49.0569942 - 52.0796083
-----	6.7403965 - 12.7956243	xxxxxx	30.9213095 - 36.9665377		
=====	12.7956243 - 18.8708530	HHHHHH	36.9665377 - 43.0117659		

NOTE: 918 DUS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED HYDROGEN CONS.
AT 10 LEVELS AS SRT AND CIN VARY CONTINUOUSLY OVER THEIR
RANGES AND THE OTHER VARIABLES ARE FIXED AT BASIS VALUES
SHOWN IN THE GLOSSARY SECTION

8:12 WEDNESDAY, MAI

SYMBOL	YHYP	SYMBOL	YHYP	SYMBOL	YHYP	SYMBOL	YHYP
.....	1.844262 - 2.106283	=====	3.154287 - 3.678289	XXXXXX	4.726294 - 5.250296	#####	6.298300 - 6.560301
.....	2.106283 - 2.630285	++++++	3.678289 - 4.202291	#####	5.250296 - 5.774298		
-----	2.630285 - 3.154287	DDDDDD	4.202291 - 4.726294	#####	5.774298 - 6.298300		

NOTE: 728 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED LIGHT GAS YIELD
AT 10 LEVELS AS SMT AND CIN VARY CONTINUOUSLY OVER THEIR
RANGES AND THE OTHER VARIABLES ARE FIXED AT BASIS VALUES
SHOWN IN THE GLOSSARY SECTION

8:12 WEDNESDAY, MAR

268

SYMBOL	YCIC4P	SYMBOL	YCIC4P	SYMBOL	YCIC4P
.....	7.385729 - 8.397172	+++++	14.465832 - 16.488719	#####	22.557378 - 24.580265
.....	8.397172 - 10.420059	000000	16.466719 - 18.511605	#####	24.580265 - 25.591708
-----	10.420059 - 12.442946	XXXXXX	18.511605 - 20.534492		
=====	12.442946 - 14.465832	#####	20.534492 - 22.557378		

NOTE: 728 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED NAMTHA YIELD
AT 10 LEVELS AS SKT AND CIN VARY CONTINUOUSLY OVER THEIR
RANGES AND THE OTHER VARIABLES ARE FIXED AT BASIS VALUES
SHOWN IN THE GLOSSARY SECTION

8:12 WEDNESDAY, M

269

547

SYMBOL		YNAPP	SYMBOL		YNAPP	SYMBOL		YNAPP			
.....	9.180773	-	9.387716	+++++	10.581384	-	10.979272	000000	12.172938	-	12.570827
.....	9.387716	-	9.785606	(X)(X)(X)	10.979272	-	11.377161	000000	12.570827	-	12.764771
-----	9.785606	-	10.183495	XXXXXX	11.377161	-	11.775050				
=====	10.183495	-	10.581384	000000	11.775050	-	12.172938				

NOTE: 728 ONS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED MIDDLE DISTILLATE
AT 10 LEVELS AS SRT AND CIN VARY CONTINUOUSLY OVER THEIR
RANGES AND THE OTHER VARIABLES ARE FIXED AT BASIS VALUES
SHOWN IN THE GLOSSARY SECTION

8:12 WEDNESDAY, MAR

270

548

SYMBOL	YMDP	SYMBOL	YMDP	SYMBOL	YMDP
.....	-6.987288 - -4.841419	+++++	8.033792 - 12.325530	#####	25.200741 - 29.492478
.....	-4.841419 - -0.549682	00000	12.325530 - 16.617267	#####	29.492478 - 31.638347
-----	-0.549682 - 3.742055	xxxxxx	16.617267 - 20.909004		
=====	3.742055 - 8.033792	#####	20.909004 - 25.200741		

NOTE 1 728 OHS HIDDEN

CONTINUUM (OR RESPONSE SURFACE) PLOT OF PREDICTED HEAVY DISTILLATE
AT 10 LEVELS AS SNT AND CIN VARY CONTINUOUSLY OVER THEIR
RANGES AND THE OTHER VARIABLES ARE FIXED AT BASIS VALUES
SHOWN IN THE GLOSSARY SECTION

8:12 WEDNESDAY, 1

SYMBOL	YHDP	SYMBOL	YHDP	SYMBOL	YHDP
.....	7.419883 - 7.843976	+++++	10.388534 - 11.236720	000000	13.781278 - 14.629464
000000	7.843976 - 8.692162	000000	11.236720 - 12.084906	000000	14.629464 - 15.053557
XXXXXX	8.692162 - 9.540348	XXXXXX	12.084906 - 12.933092		
000000	9.540348 - 10.388534	000000	12.933092 - 13.781278		

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED SRC YIELD
AT 10 LEVELS AS SMT AND CIN VARY CONTINUOUSLY OVER THEIR
RANGES AND THE OTHER VARIABLES ARE FIXED AT BASIC VALUES
SHOWN IN THE GLOSSARY SECTION

0312 WEDNESDAY, MARC

272

550

SYMBOL	YSRCP	SYMBOL	YSRCP	SYMBOL	YSRCP	SYMBOL	YSRCP
.....	21.65497 - 23.49859	=====	30.87307 - 34.56030	XXXXXX	41.93478 - 45.62202	#####	52.99649 - 54.84011
.....	23.49859 - 27.18583	+++++	34.56030 - 38.24754	#####	45.62202 - 49.30925		
-----	27.18583 - 30.87307	DDIXX	38.24754 - 41.93478	#####	49.30925 - 52.99649		

NOTE: 728 OHS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED TOTAL DISTILLATE.
AT 10 LEVELS AS SRT AND CIN VARY CONTINUOUSLY OVER THEIR
RANGES AND THE OTHER VARIABLES ARE FIXED AT BASIS VALUES
SHOWN IN THE GLOSSARY SECTION

8:12 WEDNESDAY.

551

SYMBOL	YDISTP	SYMBOL	YDISTP	SYMBOL	YDISTP
.....	-0.602118 -	1.866647	+++++	16.672233 -	21.616761
.....	1.866647 -	6.804175	000000	21.616761 -	26.554290
-----	6.804175 -	11.741704	XXXXXX	26.554290 -	31.491819
000000	11.741704 -	16.672233	000000	31.491819 -	36.429347
				36.429347 -	41.366876
				41.366876 -	43.835640

NOTE: 728 GDS MORDIN

CONTOUR ON RESPONSE SURFACE PLOT OF PREDICTED IOM YIELD 8:12 WEDNESDAY, MAR
AT 10 LEVELS AS SRT AND CIN VARY CONTINUOUSLY OVER THEIR
RANGES AND THE OTHER VARIABLES ARE FIXED AT BASIS VALUES
SHOWN IN THE GLOSSARY SECTION

SYMBOL	YIOMP	SYMBOL	YIOMP	SYMBOL	YIOMP	SYMBOL	YIOMP
.....	2.836941 - 3.077817	=====	4.040322 - 4.521675	XXXXXX	5.484380 - 5.965733	#####	6.928438 - 7.169115
.....	3.077817 - 3.558970	+++++	4.521675 - 5.003028	#####	5.965733 - 6.447086		
-----	3.558970 - 4.040322	000000	5.003028 - 5.484380	#####	6.447086 - 6.928438		

NOTE: 728 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED TOTAL LIQUID YIELD
AT 10 LEVELS AS SRT AND CIN VARY CONTINUOUSLY OVER THEIR
RANGES AND THE OTHER VARIABLES ARE FIXED AT BASIS VALUES
SHOWN IN THE GLOSSARY SECTION

8:12 WEDNESDAY.

553

SYMBOL	YLIOP	SYMBOL	YLIOP	SYMBOL	YLIOP	SYMBOL	YLIOP
.....	10.68537 - 18.74234	=====	26.97021 - 31.08415	XXXXXX	39.31203 - 43.42597	000000	51.65385 - 53.71082
.....	18.74234 - 22.85628	+++++	31.08415 - 35.19809	000000	43.42597 - 47.53991		
-----	22.85628 - 26.97021	000000	35.19809 - 39.31203	000000	47.53991 - 51.65385		

NOTE: 726 DES HIDDEN

CONTINUOUS RESPONSE SURFACE PLOT OF PREDICTED HYDROGEN CONS.
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:21 WEDNESDAY, MARC

SYMBOL	YHYP	SYMBOL	YHYP	SYMBOL	YHYP	SYMBOL	YHYP
.....	2.711846 - 2.874053	=====	3.522683 - 3.847298	XXXXXX	4.496127 - 4.820542	#####	5.469371 - 5.631579
.....	2.874053 - 3.198468	++++++	3.847298 - 4.171712	#####	4.820542 - 5.144957		
-----	3.198468 - 3.522683	(00000)	4.171712 - 4.496127	#####	5.144957 - 5.469371		

NOTE: 728 DES HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED LIGHT GAS YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:21 WEDNESDAY, MAY

555

RECYCLE ASH CONC. G/100G SLURRY

SYMBOL	YCICAP	SYMBOL	YCICAP	SYMBOL	YCICAP	SYMBOL	YCICAP
.....	15.06415 - 15.36946	=====	16.59069 - 17.20130	XXXXXX	18.42253 - 19.03314	#####	20.25437 - 20.55968
.....	15.36946 - 15.48007	+++++	17.20130 - 17.81192	#####	19.03314 - 19.64376		
-----	15.98007 - 16.59069	(DUMM)	17.81192 - 18.42253	#####	19.64376 - 20.25437		

NOTE: 728 OHS MINIMEN.

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED NAPHTHA YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:21 WEDNESDAY, M

556

RECYCLE ASH CONC. G/100G SLURRY								
SYMBOL		YNAPP	SYMBOL		YNAPP	SYMBOL		YNAPP
.....	3.569622 -	4.043337	+++++	6.285624 -	7.833053	000000	10.675340 -	11.622769
.....	4.043337 -	4.990766	000000	7.833053 -	8.780482	000000	11.622769 -	12.096484
-----	4.990766 -	5.738195	xxxxxx	8.780482 -	9.727911			
=====	5.738195 -	6.285624	000000	9.727911 -	10.675340			

NOTE: 936 OBS HIDDEN

CONTOUR ON RESPONSE SURFACE PLOT OF PREDICTED MIDDLE DISTILLATE
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:21 WEDNESDAY.

279

557

SYMBOL	YMDP	SYMBOL	YMDP	SYMBOL	YMDP
.....	-0.115103 - 1.445751	+++++	10.810875 - 13.932583	#####	23.297708 - 26.419416
.....	1.445751 - 4.567459	000000	13.932583 - 17.054291	#####	26.419416 - 27.980270
-----	4.567459 - 7.689167	xxxxxx	17.054291 - 20.175999		
=====	7.689167 - 10.810875	#####	20.175999 - 23.297708		

NOTE: 936 OAS HIDDEN

CONTOUR ON RESPONSE SURFACE PLOT OF PREDICTED HEAVY DISTILLATE
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:21 WEDNESDAY, MA

558

SYMBOL		YHDP	SYMBOL		YHDP	SYMBOL		YHDP
.....	-3.252741	-2.230891	+++++	3.900205	5.943904	#####	12.075001	14.118700
.....	-2.230891	-0.187193	OUUUU	5.943904	7.987603	#####	14.118700	15.140550
-----	-0.187193	1.856506	XXXXX	7.987603	10.031302			
=====	1.856506	3.900205	#####	10.031302	12.075001			

NOTES: 936 OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED SRC YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:21 WEDNESDAY,

JUN 1980

559

SYMBOL	YSRCP	SYMBOL	YSRCP	SYMBOL	YSRCP	SYMBOL	YSRCP
.....	23.59093 - 25.61191	=====	33.69584 - 37.73780	XXXXXX	45.82173 - 49.86369	#####	57.94762 - 59.96860
.....	25.61191 - 29.65387	++++++	37.73780 - 41.77976	ROOOOO	49.86369 - 53.90565		
-----	29.65387 - 33.69584	UUUUUU	41.77976 - 45.82173	#####	53.90565 - 57.94762		

NOTE: 72A OBS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED TOTAL DISTILLATE
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:21 WEDNESDAY, M

SYMBOL	YDISTP	SYMBOL	YDISTP	SYMBOL	YDISTP
.....	1.388731 - 3.454558	+++++	15.849520 - 19.981174	#####	32.376136 - 36.507790
.....	3.454558 - 7.586212	#####	19.981174 - 24.112828	#####	36.507790 - 38.573617
-----	7.586212 - 11.717866	xxxxxx	24.112828 - 28.244482		
=====	11.717866 - 15.849520	#####	28.244482 - 32.376136		

NOTE: 936 DKS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED IOM YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:21 WEDNESDAY.

283

561

SYMBOL	YIOMP		SYMBOL	YIOMP		SYMBOL	YIOMP	
.....	4.042109	- 4.513988	++++++	7.345263	- 8.289021	#####	11.120295	- 12.064053
.....	4.513988	- 5.457746	#####	8.289021	- 9.232779	#####	12.064053	- 12.535932
-----	5.457746	- 6.401504	xxxxxx	9.232779	- 10.176537			
=====	6.401504	- 7.345263	#####	10.176537	- 11.120295			

NOTE: 936 OHS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED TOTAL LIQUID YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:21 WEDNESDAY, M

SYMBOL	YL10P	SYMBOL	YL10P	SYMBOL	YL10P	SYMBOL	YL10P
.....	10.31040 - 12.53198	=====	21.41831 - 25.86147	XXXXXX	34.74780 - 39.19097	#####	48.07729 - 50.29888
.....	12.53198 - 16.97514	++++++	25.86147 - 30.30464	000000	39.19097 - 43.63413		
———	16.97514 - 21.41831	000000	30.30464 - 34.74780	000000	43.63413 - 48.07729		

NOTE: 728 GMS HIDDEN

CONTOUR OR RESPONSE SURFACE PLOT OF PREDICTED HYDROGEN CONS.
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:12 WEDNESDAY, MARC

563

SYMBOL	YHYP	SYMBOL	YHYP	SYMBOL	YHYP	SYMBOL	YHYP
.....	1.294764 - 1.599949	+++++	2.020610 - 3.431058	XXXXXX	4.651797 - 5.262167	+++++	6.462906 - 6.788091
.....	1.599949 - 2.210314	+++++	3.431058 - 4.041428	XXXXXX	5.262167 - 5.872537	+++++	
.....	2.210314 - 2.820689	+++++	4.041428 - 4.651797	XXXXXX	5.872537 - 6.482906	+++++	

NOTE: 1144 BUS MIDWYN

CONTOUR ON RESPONSE SURFACE PLOT OF PREDICTED LIGHT GAS YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:12 WEDNESDAY.

286

564

SYMBOL	YC1C4P	SYMBOL	YC1C4P	SYMBOL	YC1C4P
.....	7.741830 - 9.650681	+++++	14.103782 - 15.921483	#####	21.374584 - 23.192285
.....	9.650681 - 10.468381	00000	15.921483 - 17.739183	#####	23.192285 - 24.101135
-----	10.468381 - 12.286082	xxxxx	17.739183 - 19.556884		
=====	12.286082 - 14.103782	#####	19.556884 - 21.374584		

NOTE: 1144 OBS HIDDEN

CONTOUR ON RESPONSE SURFACE PLOT OF PREDICTED NAPHTHA YIELD
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVER THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:12 WEDNESDAY

SYMBOL	YNAPP	SYMBOL	YNAPP	SYMBOL	YNAPP
.....	1.387141 - 2.070210	+++++	6.156625 - 7.518763	#####	11.605177 - 12.967316
.....	2.070210 - 3.432348	000000	7.518763 - 8.80901	#####	12.967316 - 13.648385
-----	3.432348 - 4.794460	XXXXXX	8.80901 - 10.243039		
=====	4.794460 - 6.156625	#####	10.243039 - 11.605177		

NOTE: 1144 OBS MIDUEN

CONTOUR ON RESPONSE SURFACE PLOT OF PREDICTED MIDDLE DISTILLATE
AT 10 LEVELS AS TWO VARIABLES IN THE REGRESSION MODEL ARE
VARIED OVLH THEIR RESPECTIVE RANGES IN THE DATA BASE
ALL OTHER VARIABLES ARE HELD FIXED AT BASIS VALUES SHOWN IN
THE GLOSSARY SECTION

14:12 WEDNESDAY.

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*U.S. GOVERNMENT PRINTING OFFICE: 1981-740-145/1298

SYMBOL	YNDP	SYMBOL	YNDP	SYMBOL	YNDP
.....	7.553206 - 8.697058	+++++	15.560171 - 17.847875	#####	24.710989 - 26.998693
.....	8.697058 - 10.984762	(UUUUU)	17.847875 - 20.135580	#####	26.998693 - 28.142545
-----	10.984762 - 13.272467	xxxxxx	20.135580 - 22.423284		
#####	13.272467 - 15.560171	uuuuuu	22.423284 - 24.710984		

NOTE: 1144 OHS HIDDEN