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SOLVENT REFINED COAL (SRC) PROCESS

Annual Technical Progress Report for Period January–December 1979

Volume 2–Part 1

November 1980

Work Performed Under Contract No. AC05-76ET10104

Pittsburg & Midway Coal Mining Company
Englewood, Colorado

U. S. DEPARTMENT OF ENERGY

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ANNUAL TECHNICAL PROGRESS REPORT
FOR THE PERIOD
JANUARY, 1979 THROUGH DECEMBER, 1979
VOLUME II - Part 1

NOVEMBER 1980

Work Performed Under Contract DEAC-0179-ET10104
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THE PITTSBURG & MIDWAY COAL MINING CO.
ENGLEWOOD, COLORADO 80111

U. S. DEPARTMENT OF ENERGY

Division of Coal Conversion and Utilization

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ABSTRACT

This report summarizes the progress of research and development tasks of the Solvent Refined Coal (SRC) project by the Pittsburgh & Midway Coal Mining Co. for the Department Of Energy for the period January 1, 1979 through December 31, 1979. A set of statistically designed, simulated recycle SRC-II experiments utilizing a bench-scale unit was completed; the objective was to study the effects of principle operating variables over wide ranges of conditions. Using data from four pilot plants, models have been developed which predict yields as a function of operating variables and which describe unsteady state, three-phase convection, backmixing and generation of heat by reaction of hydrogen in the liquid phase of SRC-II reactors. A substantial amount of preparatory work was completed on a bench-scale reactor and analytical equipment and procedures which permits determining the effects of heavy media separation on response to coal liquefaction. Laboratory tests were completed to measure the effects of corrosion-erosion of coal slurries on various steels; the metal losses were found to be dependent on type of steel and conditions. A measure of coal reactivity was determined by correlating the effects of coal properties on product yields from a process development unit.

VI. DEMONSTRATION PLANT TECHNICAL SUPPORT ACTIVITIES

SUMMARY OF R&D ACTIVITIES

A set of statistically designed experiments was used to study the effects of several important operating variables on coal liquefaction product yield structures. These studies used a Continuous Stirred-Tank Reactor (CSTR) to provide a hydrodynamically well-defined system from which kinetic data could be extracted. An analysis of the data shows that product yield structures can be adequately represented by a correlative model. It was shown that second-order effects (interaction and squared terms) are necessary to provide a good model fit of the data throughout the range studied.

Three reports were issued covering the SRC-II database and yield correlation models for Kentucky and Powhatan coals. The database includes 104 runs from four pilot plants and two coal types in both the SRC-I and II modes. The models predict yields as functions of operating variables. The results agree well with the generally-held concepts of the SRC reaction process, i.e., liquid phase hydrogenolysis of liquid coal which is time-dependent, thermally activated, catalyzed by recycle ash, and reaction rate-controlled.

Four reports were issued summarizing the comprehensive SRC reactor thermal response models and reporting the results of several studies made with the models. The models describe unsteady state, three-phase convection, backmixing and generation of heat by reaction of hydrogen in the liquid phase of SRC-II reactors. The models take into account thermal properties, holdups and velocities of the three phases and the point hydrogen reaction rate dependence on temperature, pressure and ash level.

The thermal response models were used to compare responses of a countercurrent flow SRC-II reactor with those of a conventional cocurrent reactor. Many of the responses were similar. Studies were made to identify minimum acceptable slurry flow rates at which a certain reactor outlet temperature would not be exceeded. Studies were also made to predict time-temperature profiles when inlet variables of slurry velocity, coal concentration and inlet temperature were each subjected to step changes.

A bench-scale heavy media coal-cleaning unit was constructed to provide coal fractions for subsequent liquefaction. Operating difficulties and small sample throughput prevented the actual use of the unit for this project.

Analytical equipment for measuring SRC off-gas composition and simulated distillation of coal liquids and appropriate procedures have been established. Off-gas analysis has been successfully automated and is currently measuring gas composition along with molecular weight and gas density. Simulated distillation of light, middle, and heavy distillates is currently being accomplished as a routine procedure with excellent comparison with true boiling point

data. This work was accomplished as a preparatory step for the experimental liquefaction operations to be performed on coal fractions separated by heavy media.

Laboratory tests using the Gulf flow-through corrosion detector have demonstrated the corrosion/erosion effects of coal-oil-gas slurries. Test conditions covered velocities from 0.6 m/s (2 fps) to 9.8 m/s (32 fps) for carbon steel and from 0.6 m/s (2 fps) to 15.8 m/s (52 fps) for Types 304 and 316 stainless steels. Test temperatures varied from 213°C (415°F) to 430°C (805°F) at a test pressure of 1000 psig. The principal conclusions from sixteen tests are:

- Type 316 stainless steel was not affected significantly by superficial velocities up to 15.8 m/s (52 fps) at temperatures to 430°C (805°F).
- Carbon steel was affected by superficial velocities above 3 m/s (10 fps) and temperatures above 232°C (450°F).
- Small variations in solids and ash content had negligible effects on Type 316 stainless steel.
- Corrosion appeared to have only a minor effect on Type 316 stainless steel.
- Tube bend radii greater than 3 diameters had virtually no effect on metal loss for Type 316 stainless steel.

A correlation of SRC-II yields with coal properties was made to determine relative reactivity of coal feedstocks. Regression equations describing the product yield responses were formulated for each product component. As a result of this analysis, product yield structures can be predicted for each coal (in the set studied) at a set of base conditions.

A. SRC-II REACTOR MODELING AND SIMULATION

1. Yield Correlation Models

Three reports^{1,2,3} issued in 1979 document the SRC-II database and the yield correlation models for Kentucky and Powhatan coals. These reports discuss the effects of key reactor variables (average temperature, nominal slurry residence time, hydrogen partial pressure, recycle ash and coal feed concentrations, superficial gas velocity and coal type). A database incorporating data from 4 pilot plants, 108 runs, 2 coal types in both SRC-I and II modes was used to develop the yield models.

The model results coincide with the generally held concepts of the SRC reaction process, i.e., that of liquid phase hydrogenolysis of liquid coal which is time-dependent, thermally activated, catalyzed by recycle ash and reaction rate rather than mass transfer controlled.

In the closed loop system with fixed total solids, the models show that increased coal concentration reduces the yields of distillates, light hydrocarbon gases, and total liquids and increases SRC yields. Recycle models show that the reduction is caused by the substitution of coal for catalytic ash in the feed.

The models show indirectly the point rate kinetic effects of residence time and temperature which produce distillates from liquid coal. They also show the interactive effects of ash which catalyzes the reactions.

The weak dependence of the hydrogen consumption rate on the inlet hydrogen partial pressure provides indirect evidence that the overall hydrogenolysis rate is reaction rate rather than mass transfer influenced at the pilot plant scale.

The difference between Kentucky and Powhatan coal types appears as variations in yields of lighter products (light hydrocarbon gases, naphthas, middle distillate) and yields of heavy distillate and SRC. Overall, there is only a slight predicted increase (2.28%) in total distillate with Powhatan compared to Kentucky coal. This increase is well within one standard deviation (3.78%), and may not be significant. The results show that for these similar coals, the coal property differences can be accounted for by a linear correction to the yield model.

The models show significant nonlinear behavior of the yields, particularly upon temperature, recycle ash and residence time. The SRC and heavy distillate yields decrease linearly with Slurry Residence Time. This and other data indicate that hydrogenolysis of SRC and heavy distillate is essentially zero-order. The implications of this are that the detailed flow patterns may not be necessary in order to design the reactor to achieve acceptable conversion because of the independence of the point rate on local concentrations in the reactor.

Increasing superficial gas velocity tends to shift the yields from heavy distillate to middle distillate; however, the effect of velocity on total distillate liquids or SRC is small and probably not significant.

Higher gas velocity causes gas holdup to increase, increases the level of backmixing and flattens the temperature profile. At higher velocity, a larger fraction of distillate enters the vapor phase. This increases the internal slurry residence time which increases the degree of reaction. At long residence times, more middle distillate is produced by hydrogenolysis of heavy distillate and SRC which remain in the liquid phase.

2. SRC-II Reactor Modelling and Computer Simulations

Several reports were issued in 1979 documenting the results of the comprehensive SRC reactor thermal response models.⁴⁻⁶ The dispersion models developed by Shah, Parulekar and Jones describe unsteady, three-phase (solid, liquid, vapor) convection, backmixing and generation of heat by reaction of hydrogen in the liquid phase in the bubble column reactor. The thermal properties, holdups, and velocities of the three phases are taken into account in the models as well as the point reaction rate dependence on temperature, pressure and ash level. The models are uniaxial and adiabatic except for the cooling effect of quench gas injection.

The results of Parulekar and Shah⁵ include the thermal response of both pilot-scale and large-scale reactors operated adiabatically with and without quench gas. Their results show that without quench control, the steady state average reactor temperature increases as gas velocity and slurry velocity decrease. An especially large increase occurs if both flows are decreased together. An incremental increase in feed temperature causes a doubled increase in the outlet reactor temperature. Increased recycle ash composition in the feed slurry reduces the reactor temperature rise. When holding the inlet and outlet temperatures at constant values, the models show that the location of the quench point along the reactor does not affect the flatness of the internal temperature profile very much. When the feed gas rate is decreased by one-third (12 to 4 cm/sec), the actual quench rate must double. When the liquid (slurry) rate is decreased by about one-half, the quench rate must be tripled to maintain a constant outlet temperature. These models and their predictions were found to be in agreement with three different pilot plant runs.

The models developed by Jones⁴ were used to study and compare the thermal response of a countercurrent flow SRC-II reactor model with that of the cocurrent flow reactor under similar flow conditions. The yield correlations were incorporated into the model to predict the yield structure at each condition. The results show that for identical gas and slurry inlet conditions, the temperature rise, hydrogen consumption and yield profile are nearly identical for the two reactor types. The thermal responses of the reactors with respect to inlet coal, inlet temperature, recycle ash concentrations, total pressure and gas/slurry velocities are also similar, i.e., the average dissolver temperature increases only modestly (12°F) as gas velocity decreases from 4.5 to 1.5 cm/sec, increases slightly (5°F) as total pressure increases from 11 to 17 mPa (1600-2466 psia), increases (50°F) as feed coal concentration increases from 20 to

40%, decreases 6°F as recycle ash concentration increases from 4 to 14%, increases from 60°F to 100°F as slurry feed temperature increases from 765 to 823°F and increases substantially from 60 to 180°F as slurry velocity decreases from 0.45 to 0.15 cm/sec. These results are similar to those of Parulekar and Shah⁵.

The thermal behavior of the countercurrent flow reactor with cool inlet hydrogen was compared to that of the cocurrent flow reactor without quench at various slurry and gas velocities. For the countercurrent flow reactor, inlet gas cooled to less than 580°F should permit the slurry velocity to be reduced to 1/2 of normal while maintaining an 860°F slurry outlet temperature. The yields of light gases, naphthas and middle distillates are reduced and heavy distillate and SRC increased in such a case. The counter-current flow reactor would provide for more quenching capacity to stabilize the heat generation when slurry turndown is required.

Another report⁶ by Jones documents the studies of the transient thermal responses to predict the thermal stability of the reactor. The objective of this study was to determine the minimum slurry flow for which the reactor temperature could be controlled below a specified level (860°F) by the addition of quench gas. The total feed gas rate was fixed. As the quench rate was increased, the gas fed with the slurry was decreased. The simulations show that regardless of quench location, the slurry flow should not be reduced below 1/3 of its design level (0.4 cm/sec for a 133' high commercial dissolver, 0.1 cm/sec for the Ft. Lewis pilot plant) without excessive quench requirements and/or an unacceptable cutback in feed gas rate. This is true regardless of the inlet slurry temperature (between 784°F and 804°F).

The minimum acceptable slurry velocity was not greatly affected by quench location or by small (10°F) changes in slurry inlet temperature. As quench rate increased, the relative temperature rise within the reactor was reduced when the quench was located in the upper level and was increased when the quench was near the bottom (slurry inlet). This difference is due to the efficiency of the quench in reducing the local slurry temperature. However, the bottom quench was more efficient in controlling the overall temperature rise as the slurry flow decreased. This difference is probably caused by the more efficient reduction of the overall reaction rate by quenching near the slurry inlet.

The upper quench is preferable to maintain a flatter temperature profile within the reactor, while a bottom quench is preferable to maintain a desired slurry outlet temperature, particularly when slurry flow is changing.

Hydrogen consumption was slightly higher for the upper quench location for both reactor scales, although the difference is probably not significant. Although the bottom quench tended to accentuate the relative temperature rise within the reactor, it also reduced the slurry exit temperature more than the upper quench. This led to a somewhat lower level of quench required to maintain slurry outlet temperature below 860°F for the same reduction in slurry velocity.

Although hydrogen quench gas tends to reduce the slurry temperature by diluting it with cool gas, it also tends to promote reaction by providing more hydrogen reactant. Therefore, under some conditions of slurry flow and quench rate, the predicted temperature response may be opposite to what was originally intended or expected. Under these conditions of intermediate levels of quench, the temperature rises even further. When a sufficient amount of quench gas is provided, the dilution effect dominates and the temperature drops to the desired level. However, the temperature rise for intermediate amounts of quench gas tends to increase as slurry flow decreases. At the lower levels of slurry flow, it may not be possible to achieve stable operating temperatures by the addition of quench. The temperature increase is more pronounced as the hydrogenolysis reaction becomes more dependent on hydrogen partial pressure.

Theoretical analyses of adiabatic reactors with exothermic reactions show that for certain combinations of reactor variables, multiple steady state temperatures exist. If the steady states are far apart, the transition to a new higher steady state temperature would appear as a temperature excursion. It was of interest to determine the stability of the normal steady state to perturbations or step changes in specific variables. This report also summarizes the time-temperature and hydrogen concentration profiles of the reactor predicted by the transient thermal model when one of three input variables (slurry velocity, inlet coal concentration or inlet slurry temperature) undergoes a step change to a new level after achieving the "normal" or basic steady-state conditions. The somewhat restrictive adiabatic reactor case (no quench) was chosen in order to predict the stability behavior under the most severe conditions. Normally, quench injection would provide a measure of control for these cases.

This study was based on the premise that the reactor sees no recycle composition feedback; therefore, the results of this work were to guide decisions about making further studies.

B. PREPILOT PLANT DEVELOPMENT

An experimental program to generate coal liquefaction data suitable for subsequent modeling has been conducted under the Prepilot SRC-II Development Project. This work consisted of a variable study task, i.e., a statistically designed set of experiments to study the effects of several important operating variables on coal liquefaction product yield structures.

These yield structures were determined by experimental runs on the A-1 prepilot SRC-II unit. The operating variables under study included temperature, pressure, nominal slurry residence time, feed coal concentration, feed recycle ash concentration and middle-to-heavy distillate ratio in the feed slurry. The identification of all the important variables for study was the result of numerous analyses on a comprehensive SRC data base. The experimental results and an initial analysis of the data will be presented when completed.

A 1-liter, continuous stirred-tank reactor (CSIR) was used in order to fit the experimental needs of:

- Isothermicity
- Constant three-phase internal compositions, including hydrogen's activity
- Elimination of mass transfer effects
- Elimination of hydrodynamic uncertainties
- Basis for point-rate kinetic data

A simulation of SRC-II recycle operation was achieved on the once-through unit through the use of a SRC-II recycle slurry containing mineral matter from the P-99 Process Development Unit. Powhatan No. 5 coal was used as the feed coal for all runs. The other feedstock components were produced via normal SRC-II operations on Powhatan coal by P-99 and Ft. Lewis at conditions near the center of the variable space covered in this study.

An initial analysis of the data showed that the experimentally derived product yield structures could be adequately represented by a correlative model. More importantly, it was shown that second-order effects (interactions and squared terms) were necessary in order to provide a good model fit of the data throughout the range studied.

Several yield structures were observed, e.g., 70% total liquid product and 4% organic vacuum bottoms, which differ significantly from any yield structures yet observed through other studies. These yields were determined to be reproducible and explicable. Further analysis of these data should result in a better understanding of the behavior of the SRC-II reactor system as well as pointing out possible avenues of process improvement.

C. HEAVY MEDIA SEPARATION

During 1979, the major research efforts have been focused in two main areas:

- Preparation of feedstock coals by heavy media separation.
- Development of analytical facilities for gaseous and liquid products from SRC-II liquefaction units.

Bench-scale heavy media equipment was constructed for heavy media separation of coals for SRC-II liquefaction tests. Numerous operating problems were encountered with the heavy media machine limiting use of the equipment for coal preparation. Due to the operating problems and limited samples size, external preparation of coal became necessary to prepare suitable quantities of heavy media separated coals. Samples of Powhatan #5, Blacksville #2, and Illinois #6 coals were collected and shipped for preparation.

Analytical equipment and facilities were interfaced with a bench-scale SRC-II liquefaction unit which permit rapid accumulation and reduction of data. Description, calibration and application of this equipment is given below.

1. Coal Preparation

A bench-scale heavy media washing unit was constructed, as detailed in Figure 1. The machine consists of two heavy media funnels, one for the coal sink fraction, the second for the coal float fraction and return of the heavy media fluid to a pump. The pump recirculates the heavy media fluid to the sink funnel.

An attempt was made to fractionate coals by using a heavy media suspension of magnetite in water at various specific gravities. Unfortunately, the HMS machine could not be operated successfully due to pumping problems and the difficulty of holding constant specific gravities. Moreover, throughput of the machine was small compared to the needs of the coal washing program. In addition, it was determined that coals could be fractionated at a lower cost by outside contractors. Hence, it was decided to sub-contract the coal washing to outside parties.

Three candidate coals were selected for heavy media separation. Powhatan #5, Blacksville #2, and Illinois #6 coals were obtained and shipped for heavy media separation.

2. Analytical Facilities Development

SRC Off-Gas Analysis

Off-gas analysis of SRC coal liquefaction units is being accomplished on a multi-detector, multi-column gas chroma-

tograph operating isothermally. The system consists of a Carle 311H gas chromatograph and a Hewlett-Packard 3354 laboratory automation system interfaced by analog to digital converters. Operating in tandem, this equipment is capable of both gas analysis and automated data reduction to calculate weight and mole percentages of each component as well as molecular weight and gas density.

Chromatograph

The gas chromatograph is designed to analyze hydrocarbon gases with carbon numbers ranging from 1 to 6 along with fixed gases. Since the GC system uses both thermal conductivity (TCD) and flame ionization (FID) detectors, two sets of data are produced for any one sample with components partitioned as follows:

<u>TCD</u>	<u>FID</u>
Hydrogen	Methane
CO ₂	Ethane and Ethylene (combined peak)
Ethylene	Propane
Ethane	Propylene
Acetylene	Isobutane
H ₂ S	n-Butane
Oxygen	Butene-1 (fused with isobutylene)
Nitrogen	Isobutylene
Methane	Trans - Butene - 2
CO	Cis - Butene - 2
	1,3 Butadiene
	Isopentane
	n-Pentane
	Pentene - 1
	Hexane

For the purpose of our analysis, acetylene and oxygen are not considered as possible products. All other components are analyzed with the combined totals of butene-1 and isobutylene considered as one component.

The separations require the four-column, three-detector arrangement shown in Figure 2 along with valve sequencing to perform column switching. As can be seen, valves V1

and V2 act as sample valves for the FID (C_1 - C_6 hydrocarbons) and TCD (fixed gases, ethane, ethylene, and methane). Valve V3 is a column switching valve for the TCD analysis.

When valve V1 samples the SRC-II gas stream, the sample is injected onto a column consisting of bis-(2-ethoxyethyl) adipate and squalane (column 1A) and a column of modified Porasil C (column 1B) where the hydrocarbon separations for the FID analysis are conducted. After pentene-1 has eluted, the column is backflushed to the FID to quantitate the remaining C_5 and C_6 + hydrocarbons.

For the TCD analysis, valve V2 samples the off-gas stream and uses a two-column series arrangement of Porapak N (column 2) in combination with 13X molecular sieve (column 3). (Column 3 is used in a series/bypass mode by proper actuation of valve V3). After hydrogen elutes from column 2, it is separated into a nitrogen carrier (helium being the primary carrier gas) through a hot palladium tube hydrogen transfer system. At this point, column 3 is bypassed sealing nitrogen, methane, and carbon monoxide on column 3. Column 2 continues the separation of carbon dioxide, ethylene, and ethane, at which point valve V2 backflushes column 2 to vent, valve V3 connects column 3 back in line with the detector. Separation of nitrogen, methane, and carbon monoxide is then completed.

FID and TCD Calibration and Data Analysis

As mentioned earlier, since two separate detectors are used, two sets of data are produced for each run. Calibration must be accomplished to allow combination of the two data sets into a final output using a tie compound (methane) present and well separated on both the FID and TCD.

Calibration of the GC to obtain appropriate molar response factors was done using a gas mixture supplied by Phillips Petroleum Co. having the composition given in Table I. Response factors for components not included in the calibration mixture were determined in one of two ways. First, hydrocarbon components with equal carbon numbers were assumed to have equal response factors for a given detector. Second, components with no similar compound were assigned molar response factors using standard factors from available tabulated data. (Only the response factor for H_2S was obtained from standard tables).

As an example of actual run data, TCD and FID chromatograph data are given in Figures 3 and 4 and the associated processed data files in Tables II and III. All peaks are identified by number, retention time, response factor, peak area, mole percent, and component name in the processed data file. The column in Tables II and III labeled

ITM is used by the data system for peak identification and the letters and symbols following peak area are codes describing the method of peak integration.

Combination of the FID and TCD data in an automated mode required two BASIC programs to be written which are called and executed following peak processing and integration on the HP 3354 data system. A flow chart of the procedure is given in Figure 5. As the TCD data are computed, the data system executes a program which copies a duplicate of the component composition data (Table II) into a new computer file. This step is required since only the data file directly associated with a given detector may be transferred to a BASIC program assigned to that detector; hence the TCD processed data file cannot be accessed by the FID channel. Any file not associated with a detector (the duplicate data file) may be accessed by any program or channel.

After the FID data are prepared, the second BASIC program assigned to the FID channel reads the FID and duplicate TCD files as input data. The mole percent of each compound in the FID file is multiplied by the mole percent of methane from the TCD divided by the mole percent of methane from the FID. At this point, the data from each file are merged and the data for ethane from the FID are discarded; the data for ethane and ethylene are supplied by the TCD. The data are then normalized to yield the combined mole percent for the gas sample. The mole percent of each component is then multiplied by molecular weight, summed, and divided by 100 to obtain molecular weight. The product of mole percent multiplied by molecular weight is also normalized to obtain weight percent. Density at STP is calculated from the molecular weight. A combined FID-TCD data output from the data in Tables II and III is shown in Table IV. In the data printout, the compound, mole percent, weight percent, molecular weight, and density are printed. A notation is printed if butene-1 or isobutylene is present in the gas sample. Also, only compounds actually detected are included in the final data report.

The method of GC analysis of SRC-II off-gases provides not only a rapid but also accurate measure of gas composition. Also, with the system being fully automated, unit operators can easily operate the system with a minimum of time, generally less than five minutes per sample.

Simulated Distillation of Coal Liquids

Analysis of coal liquefaction products by distillation is essential for calculating coal conversion to light, middle, and heavy distillates. Since the distillation step is slow, overall data reduction time is also slow.

In an attempt to improve not only the speed at which data may be collected and calculated but also the precision of the distillation, simulated distillation has been implemented to measure the boiling point distribution of coal liquefaction products.

Gas Chromatograph System

The simulated distillation system consists of a Hewlett-Packard 5734A gas chromatograph with dual flame (FID) and dual thermal conductivity (TCD) detectors and a Hewlett-Packard 3354 laboratory automation system. While in principle many alternative gas chromatographs could be used, the 5434A was supplied with simulated distillation accessories such as glass-lined injectors, special flame detectors, columns, and factory-certified calibration. This gas chromatograph when interfaced to the 3354 data system, which contains the simulated distillation programs, operates in tandem as a complete analytical system collecting data, reducing data, and producing a simulated distillation report. In addition, a Perkin-Elmer MS-41 solid sampler has been installed to permit analysis of samples which are not liquid, are too viscous for syringe injection, or contain non-volatile components.

Operation and Calibration

Simulated distillation operates on the principle that components elute from non-polar GC columns in order of their boiling points. Hence, by utilizing a linear temperature-programmed GC, analysis of samples with a wide range of boiling points (0-538°C) is possible.

Table V contains a summary of the operating parameters for the simulated distillation analysis. The columns used (UCW-982) are methyl silicone and have been found to be the best overall column for this analysis. As can be seen in Table V, a wide column temperature range (-30-360°C) is needed to insure adequate separation of low-boiling to high-boiling components. It is also essential that the injector and detector temperatures be sufficiently high to insure samples do not condense within the GC lines. Temperature programming rate as well as carrier flow rate must be selected to yield a column resolution (defined in ASTM D2887) between 3 and 8.

Calibration of the GC system is accomplished using a mixture of C₅ to C₄₀ normal paraffins supplied by Hewlett-Packard. A sample chromatogram with each peak labeled with its respective hydrocarbon is presented in Figure 6. These calibration data are used by the data system to construct a calibration curve as shown in Figure 7 of boiling point versus retention time.

After an analytical run, the boiling point distribution is calculated from the calibration curve in the following manner:

- Total peak area is measured and normalized.
- The final retention times for successive intervals containing 5 percent chromatogram area are determined.
- The calibration curve is then used to convert retention time to boiling point.

It should be noted that the initial boiling and final boiling points are determined at retention times corresponding to 0.5 and 99.5 percent of the peak area.

Simulated Distillation Results

At the present time, simulated distillation has been used for light, middle, and heavy distillates from coal liquefaction units. In an effort to establish the usefulness of the method of these types of samples as well as others, our results have been compared to both true boiling point data and Cushman distillation.

Figure 8 shows the boiling point distribution of a P-99 blend of debutanizer bottoms for both true boiling point and simulated distillation; the sample GC data report is presented in Table VI. As can be seen, there is very good agreement between the two methods with no more than 3% difference in the wt% boiling at any given temperature except the final boiling point where cracking reactions complicate the TBP procedure.

Figures 9 and 10 compare Cushman, TBP, and simulated distillation for Powhatan middle and heavy distillate. Again, excellent agreement between TBP and simulated distillation is observed except for the latter 30% of the heavy distillate sample. However, the simulated distillation results are not corrected for the percent of non-volatile material contained in the sample. If the correction for non-volatiles is made, the agreement between TBP and simulated distillation would improve markedly. Procedures for quantitatively measuring the fraction of non-volatile material in the samples are currently being developed.

The use of simulated distillation appears to provide both a rapid and accurate means of measuring boiling point distribution data for a wide variety of coal liquid samples.

D. CORROSION-EROSION TESTS WITH COAL SLURRIES

1. Test Apparatus and Procedure

The test arrangement used to investigate the corrosion/erosion effects of liquid-gas-coal slurries is shown

schematically in Figure 11. A flow-through type detector was used to measure the loss in wall thickness. The equipment uses two detectors in series, one constructed from Types 304 or 316 stainless steel tubing and the other from carbon steel tubing. Figure 12 shows the configuration of the detector and the three-element arrangement.

Blacksville No. 2 coal pulverized to pass through 200 mesh was mixed in the feed tank with the coal-derived process solvent from the Fort Lewis Pilot Plant. The mixture contained 30% by weight coal and 70% by weight solvent. This coal liquid slurry was pumped at a rate of 10 gal/hr and at a discharge pressure of 1000 psig. Nitrogen gas was added to the stream to produce a uniform flow at the desired test velocity. The gas-solid-liquid stream was heated in a fluidized bed to temperatures up to 430°C (805°F) and flowed through the detectors at calculated superficial velocities up to 15.8 m/s (52 fps). In each test, these flow conditions were maintained at temperature for a six-hour period.

The sensitivity of the electrical resistance detector is approximately ±18 micro-centimeters (7 micro-inches).

2. Velocity Calculations

Superficial velocities in the probes were calculated based on: the sum of the volumetric flow rates of the vapor phase (N_2 and H_2S), the liquid phase (process solvent), and the solid phase (coal) at flowing conditions (temperature and pressure), and the cross-sectional area of the probe.

$$v_s = \frac{q_v + q_l + q_s}{A}$$

v_s = superficial velocity
 q_v = volumetric flow rate of vapor
 q_l = volumetric flow rate of liquid
 q_s = volumetric rate of solid
 A = cross sectional area

Cross sectional flow areas of the probes were based on:

<u>Run No.</u>	<u>Probe Material</u>	<u>OD (in.)</u>	<u>ID (in.)</u>
1-4	CS	1/4	0.1800
1-4	304 SS	1/4	0.1800
5-16	CS	3/16	0.1175
5-16	316 SS	3/16	0.0920

Gas flow rates were measured by rotameters calibrated in SCFH/DIV. Standard conditions are 1 ATM and 60°F. Measured gas flow rates were corrected to temperature, pressure and compressibility factor to obtain q_v . Liquid and solid flow rates were obtained by measurement of slurry flow rate. Slurry flow rate is the average of several timed samples taken during each run which were weighed to give weight rate of flow. The slurry was prepared by weighing coal and process solvent to obtain 30 wt. % coal in process solvent. The density of the slurry was calculated from the specific gravities of the coal and process solvent. Coal was assumed to have a specific gravity of 1.35 at all temperatures. Specific gravity of the process solvent was assumed to vary with temperature according to:

$$S.G. = [1.0833 - (3 \times 10^{-4})] T$$

where T is in °F

The specific gravity of the slurry was assumed not to vary with pressure, and the effect on the specific gravity of coal dissolution in the solvent was not taken into account. The above provided the basis for obtaining $(q_l + q_s)$, the volumetric flow rate of slurry.

3. Test Results

Sixteen tests were completed at velocities ranging from 2 to 52 fps and at temperatures from 213°C (415°F) to 430°C (805°F) and are summarized in Tables VII and VIII. Not all tests were run in duplicate because of the difficulty associated with starting and completing a full six-hour run. Run Nos. 14, 15, and 16 were run for a special purpose. Run 14 contained 30% by weight coal and 10% by weight P-99 recycle slurry. Run 15 contained a total of 10% by weight ash. Run 16 contained approximately 1% by volume of H_2S in the nitrogen gas. The readings for carbon steel and Type 316 stainless steel were not significantly changed by any of these special conditions.

4. Effect of Bend Radius

Table IX shows that bend radii increased the metal loss on carbon steel at temperatures above 232°C (450°F). Radius of bend showed no measurable effect on Type 316 stainless steel at temperatures to 427°C (800°F) and velocities up to 15.2 m/s (50 fps).

5. Effect of Temperature

Based on the results of these tests, temperature had the greatest effect on reducing tube wall thickness. This was more pronounced for carbon steel than it was for

Type 316 stainless steel. A wall loss of 10-20 μ cm (4-8 μ in) for Type 316 stainless steel at 400° to 430°C (750-805°F) could be expected in a solids-free environment if sulfur compounds were present. Cross-sectional examination by scanning electron microscopy indicated that the Type 316 stainless steel tube had developed a protective sulfide scale on the ID surface.

Table X shows that metal loss for carbon steel rapidly increased above 227°C (440°F).

6. Effect of Velocity

Figure 13 shows the effect of velocity on carbon steel and Type 316 stainless steel. Type 316 stainless steel was not affected by velocity to a measurable extent at 427°C (800°F) and 15.2 m/s (50 fps). This further suggests that the minor metal losses measured on Type 316 stainless steel were due primarily to corrosion. Velocity has a significant influence on the corrosion rate of carbon steel due to the less adherent corrosion scale that is found. These data indicate that carbon steel is subject to severe damage by coal slurries at elevated temperatures and at velocities above 3 m/s (10 fps). Table XI shows the metal loss on carbon steel, 304 and 316 stainless steels at velocities from 1.8 to 15.2 m/s (6 to 50 fps) and temperatures of 230-427°C (445-800°F).

E. COAL FEEDSTOCK CORRELATION STUDIES

Among the many parameters one must consider in coal liquefaction processes are source, rank and petrographic properties of the feedstock. The amount of data on raw coals is quite large in comparison to liquefaction process information. This is due to the high cost of obtaining the latter on expensive bench-scale or Process Development Units. While it would be preferable to have much more of the latter data, one would also find desirable a less expensive method of screening and ranking coals as far as their reactivity and behavior in the SRC-II process.

In order to initiate studies aimed at correlating coal properties with SRC-II yields, an effort was directed toward those particular coals used in the Process Development Unit P-99. Since 1976 this unit has operated successfully in the SRC-II mode on bituminous coals from many sources. Data from these operations were combined with petrographic and associated analyses in order to develop regression equations which describe product yield responses for each component; a computerized stepwise regression program was used for this purpose. As a result of this analysis, product yield structures can be predicted for each coal at a set of base conditions. From this one obtains a relative ranking of coal

reactivity. Appendix 7 discusses the details of this study and compares the ranking based on reactivity with similar measures proposed by others.

From the limited amount of work performed, one observes that:

- coal properties do strongly influence SRC-II yield structures.
- a reactivity ranking scale can quite likely be developed with additional data.

This study indicated the feasibility of extending the data base to coals/yields available from other SRC-II units.

APPENDIX

- 1 "Second-Order Models for the SRC Yields from Kentucky Coal,"
G. L. Jones, Report No. 627RK001
- 2 "A Sequel Report: Second-Order Models for the SRC Yields from
Kentucky Coal," G. L. Jones, Report No. 627RK002
- 3 "Second-Order Models for the SRC Yields from Kentucky and Powhatan
Coals," G. L. Jones, Report No. 627RK015
- 4 "Model for an Adiabatic Countercurrent Flow SRC-II Liquefaction
Reactor," G.L. Jones, Report No. 627ORK016
- 5 "Modeling and Simulation of the Thermal Behavior of SRC-II Reactors,"
S.J. Parulekar and Y.T. Shah, Report No. 627RK017
- 6 "Analysis of the Thermal Stability of the Adiabatic SRC Liquefaction
Reactor to Step Changes in Several Key Process Variables," G.L.Jones,
Report No. 627OFT07-30-30
- 7 "Effects of Coal Properties on SRC-II Product Yields", M. E. Prudich,
Report No. 627RK014.

Table I

PHILLIPS GAS STANDARD COMPOSITION

<u>Component</u>	<u>Mole %</u>
Hydrogen	89.85
Carbon Dioxide	0.21
Carbon Monoxide	0.20
Nitrogen	0.03
Methane	5.88
Ethane	2.03
Propane	1.01
Isobutane	0.10
N-Butane	0.51
Isopentane	0.10
N-Pentane	0.10

Blend No. 10-A-5-79

RBP/WPC
2/18/80
241-8300

Table II

TCD PROCESSED DATA FILE

PROCESSED DATA FILE: *PRC08

Jan. 4, 1980 10:08:43

REPORT: 30 CHANNEL: 8 # PEAKS: 14 FIXED GAS ANALYSIS

PEAK	RT	ITM	FACTOR	AREA	MOLE %	NAME
1	.51	0.00	0.00000	1795	BB 0.000	
2	1.12	0.00	0.00000	18778	BH 0.000	
3	2.02	-2.02	1.00000	1135462	HS 88.292	#HYDROGEN
4	2.43	0.00	0.00000	358	TT 0.000	
5	2.83	2.83	.11539	40640	TT .365	CARBON DIOXIDE
6	3.35	3.35	.09844	2397	TV .018	ETHYLENE
7	3.76	3.77	.09844	358477	VB 2.744	ETHANE
8	6.61	6.63	.14830	134887	BB 1.555	HYDROGEN SULFIDE
9	8.51	0.00	0.00000	337	BB 0.000	
10	9.10	0.00	0.00000	32675	BB 0.000	
11	10.24	10.22	.09801	1220	BB .009	NITROGEN
12	11.01	0.00	0.00000	82	BB 0.000	
13	11.46	11.45	.15286	570904	BV 6.786	METHANE
14	12.60	12.58	.10297	28740	++ .230	CARBON MONOXIDE

TOTAL AREA = 2326752 TOTAL MOLE % = 100.000

SAMPLE: INJECTED AT 20:36:54 ON DEC 18,1979

Table III

FID PROCESSED DATA FILE

PROCESSED DATA FILE: *PRC02

JAN 4, 1980 10:09:10

REPORT: 30 CHANNEL: 2 # PEAKS: 16 HYDROCARBON GAS ANALYSIS

PEAK	RT	ITM	FACTOR	AREA	MOLE %	NAME
1	2.54	-2.54	1.00000	993539 HS	51.476	#METHANE
2	2.99	2.99	.46400	863856 HS	20.767	ETHANE
3	3.93	3.93	.31859	844809 BV	13.945	PROPANE
4	4.35	4.35	.48251	23522 VV	.588	PROPYLENE
5	5.31	5.30	.26087	63536 BV	.859	ISOBUTANE
6	5.63	0.00	0.00000	183 VV	0.000	
7	6.36	6.35	.25551	385999 VV	5.110	N-BUTANE
8	6.95	0.00	0.00000	174 VV	0.000	
9	7.10	7.08	.25700	6783 ++	.090	BUTENE-1
10	8.19	8.18	.25700	6313 BV	.084	T-BUTENE-2
11	9.00	8.98	.25700	4528 BV	.060	C-BUTENE-2
12	10.19	10.18	.23899	62334 VV	.772	ISOPENTANE
13	11.50	11.47	.18904	117698 ++	1.153	N-PENTANE
14	12.98	0.00	0.00000	452 VV	0.000	
15	16.10	0.00	0.00000	246 VV	0.000	
16	20.00	19.95	.18500	531640 ++	5.096	HEXANE #

TOTAL AREA = 3905613 TOTAL MOLE % = 100.000

SAMPLE: INJECTED AT 20:36:54 ON DEC 18, 1979

Table IV

OUTPUT FOR MERGED FID-TCD DATA

COMBINED FID-TCD DATA

<u>COMPOUND</u>	<u>MOLE %</u>	<u>WT %</u>
METHANE	6.546	16.651
ETHYLENE	.018	.079
ETHANE	2.647	12.627
PROPANE	1.773	12.407
PROPYLENE	.075	.499
ISOBUTANE	.109	1.007
N-BUTANE	.650	5.989
BUTENE-1	.011	.102
T-BUTENE-2	.011	.095
C-BUTENE-2	.008	.068
ISOPENTANE	.098	1.123
N-PENTANE	.147	1.677
HEXANE +	.643	8.856
HYDROGEN	85.175	27.229
CARBON DIOXIDE	.352	2.455
HYDROGEN SULFIDE	1.501	8.109
NITROGEN	.009	.040
CARBON MONOXIDE	.222	.986

BUTENE-1 ALSO INCLUDES ISOBUTYLENE

MOL WT = 6.31

G/L (STP) = .2815

Table V

SIMULATED DISTILLATION OPERATING EQUIPMENT
AND CONDITIONS

Equipment

Gas Chromatograph - Hewlett-Packard Model 5734A

Columns - 18" long, 1/4" diameter stainless steel packed with 10% UCW-982 on either 80/100 mesh Chromasorb P AW or 80/100 mesh Chromasorb W HP.

Operating Conditions

Initial Column Temperature	-30°C
Final Column Temperature	360°C
Programming Rate	16°C/min
Carrier Gas	N ₂
Carrier Gas Flow Rate	60 ml/min
Detector Temperature	350°C
Injector Temperature	350°C
Sample Size	1.5µl

RBP/WPC
2/18/80
241-8300

Table VI

SIMULATED DISTILLATION PRINTOUT FOR P-99 ALIQUOT BLEND

GC DISTILLATION REPORT

CHANNEL # 12
FID DETECTOR

REPORT # 47
EXTERNAL CALIBRATION

SAMPLE: P-99-36-7

INJECTED AT: 15:15:32 ON JAN. 18, 1980

METHOD: MSD312 SEQ: *SEQ12 SUB SEQ: 1 SAMP: 1

PROC DATA FILE: PSD 312

RAW DATA FILE: SIMRAW

COMPONENT A PCT

NC5 .41

<u>A PCT</u>	<u>DEG C</u>	<u>A PCT</u>	<u>DEG C</u>
IBP	36		
5	91	55	230
10	121	60	237
15	150	65	248
20	168	70	260
25	182	75	277
30	190	80	291
35	202	85	311
40	207	90	332
45	212	95	365
50	223	FBP	450

CUT POINT # CUT POINT % OFF

1 31.1488
2 78.9181
3 100

CUT POINT TEMP (C) 193
DISTILLATE FRACTION % 31.1488

CUT POINT TEMP (C) 288
DISTILLATE FRACTION % 47.7693

CUT POINT TEMP (C) 449.619
DISTILLATE FRACTION % 21.0819

TABLE VII

RESULTS OF CORROSION-EROSION TESTS FOR CARBON STEEL

Run No.	Temp.		Velocity		Solids ^d . % by wt.	Ash % by wt.	Loss of wall Thickness, $\frac{\text{cm}}{\text{hr}}$ ($\frac{\text{in}}{\text{hr}}$)		
	$^{\circ}\text{C}$	($^{\circ}\text{F}$)	m/s	(f/s)			3-D Bend	9-D Bend	Straight
1	227	(440)	0.6	(2)			nil	nil	nil
2	227	(440)	1.5	(5)	27.2	3.64	nil	nil	nil
3	230	(445)	1.5	(5)	26.1	3.57	nil	nil	nil
5	213	(415)	4.9	(16)			nil	nil	nil
6	232	(450)	8.5	(28)			21 (8.3)	11 (4.5)	4 (1.5)
4	371	(700)	1.8	(6)	25.5	3.48	152 (60)	152 (60)	158 (62)
7	393	(740)	5.5	(18)			348 (137)	300 (118)	241 (95)
8	402	(755)	5.8	(19)	30.0	3.63	338 (133)	218 (86)	262 (103)
9	413	(775)	5.5	(18)	28.2	3.58	356 (140)	310 (122)	262 (103)
10	391	(735)	9.1	(30)			559 (220)	424 (167)	267 (105)
11 ^a	363	(685)	8.5	(28)	27.7	2.84	648 (255)	516 (203)	394 (155)
12	430	(805)	9.4	(31)			455 (179)	378 (149)	267 (105)
13	427	(800)	9.4	(31)	22.1	3.18	386 (152)	302 (119)	188 (74)
14	430	(805)	9.8	(32)	42.8		450 (177)	373 (147)	249 (98)
15 ^c	427	(800)	9.4	(31)	14.0	11.3	122 (48)	122 (48)	124 (49)
16 ^b	421	(790)	9.8	(32)	27.7	3.55	495 (195)	452 (178)	363 (143)

a. New carbon steel probe.

b. Nitrogen contained 1% mole H_2S .

c. SRC-II recycle slurry.

d. Ethyl acetate insoluble.

Test Pressure: 1000 psig

TABLE VIII

RESULTS OF CORROSION-EROSION TESTS FOR TYPES 304 & 316 SS

Run No.	Temp.		Velocity		Alloy	Solids ^d % by wt.	Ash % by wt.	Loss of Wall Thickness, $\mu\text{cm/hr}$ ($\mu\text{in/hr}$)		
	$^{\circ}\text{C}$	$(^{\circ}\text{F})$	m/s.	(f/s)				3-D Bend	9-D Bend	Straight
1	227	(440)	0.6	(2)	304			nil	nil	nil
2	227	(440)	1.5	(5)	304	27.2	3.64	nil	nil	nil
3	230	(445)	1.5	(5)	304	26.1	3.57	nil	nil	nil
5	213	(415)	8.2	(27)	316			nil	nil	nil
6	232	(450)	14.0	(46)	316			5.3 (2.1)	nil	nil
4	371	(700)	1.8	(6)	304	25.5	3.48	14.2 (5.6)	10.9 (4.3)	7.1 (2.8)
7 ^a	393	(740)	9.1	(30)	316			19.0 (7.5)	63.5 (25.0)	63.5 (25.0)
8	402	(755)	9.1	(30)	316	30.0	3.63	9.6 (3.8)	35.0 (13.8)	31.8 (12.5)
9	413	(775)	8.8	(29)	316	28.2	3.58	nil	23.9 (9.4)	29.2 (11.5)
10	391	(735)	14.6	(48)	316			15.2 (6.0)	nil	5.1 (2.0)
11	363	(685)	14.0	(46)	316	27.7	2.84	nil	nil	2.3 (0.9)
12	430	(805)	15.5	(51)	316			10.7 (4.2)	16.0 (6.3)	10.7 (4.2)
13	427	(800)	15.2	(50)	316	22.1	3.18	10.7 (4.2)	nil	nil
14	430	(805)	15.5	(51)	316	42.8		9.9 (3.9)	21.1 (8.3)	10.7 (4.2)
15 ^c	427	(800)	15.5	(51)	316	14.0	11.3	18.5 (7.3)	18.5 (7.3)	13.2 (5.2)
16 ^b	421	(790)	15.8	(52)	316	27.7	3.55	10.7 (4.2)	7.9 (3.1)	nil

a. First exposure to elevated temperature.

b. Nitrogen contained 1% mole H_2S .

c. SRC-II recycle slurry.

d. Ethyl acetate insoluble.

Test Pressure: 1000 psig

TABLE IX
EFFECT OF BEND RADIUS ON METAL LOSS

<u>Bend Radius</u>	<u>Wall Loss, μcm/hr (μin/hr)</u>	
	<u>Carbon Steel</u>	<u>Type 316</u>
<u>213°C (415°F)</u>	<u>4 m/s (13 fps)</u>	<u>6.3 m/s (21 fps)</u>
Straight	nil	nil
9-D	nil	nil
3-D	nil	nil
<u>232°C (450°F)</u>	<u>7.5 m/s (25 fps)</u>	<u>14.7 m/s (49 fps)</u>
Straight	2.6 (1)	nil
9-D	10.4 (4)	nil
3-D	20.8 (8)	5.2 (2)
<u>390°C (735°F)</u>	<u>9 m/s (30 fps)</u>	<u>14.7 m/s (49 fps)</u>
Straight	267 (105)	nil
9-D	424 (167)	nil
3-D	559 (220)	15.6 (6)
<u>427°C (800°F)</u>	<u>9 m/s (30 fps)</u>	<u>15.2 m/s (50 fps)</u>
Straight	188 (74)	nil
9-D	302 (119)	nil
3-D	386 (152)	10.4 (4)

TABLE X
EFFECT OF TEMPERATURE ON METAL LOSS

Alloy: Carbon Steel

<u>Velocity, m/s (fps)</u>	<u>Temperature, °C (°F)</u>	<u>Metal Loss, μcm/hr (μin/hr)</u>
1.5 (3)	227 (440)	nil
4 (13)	213 (415)	nil
1.5 (5)	371 (700)	152 (60)
5.5 (18)	393 (740)	241-348 (95-137)
5.5 (18)	413 (775)	262-356 (103-140)
9+ (30+)	427 (800)	188-386 (74-152)

TABLE XI
EFFECT OF ALLOY ON METAL LOSS

<u>Alloy</u>	<u>Temperature, °C (°F)</u>		<u>Velocity, m/s (fps)</u>		<u>Metal loss, cm (in.)</u>
Carbon Steel	230	(445)	1.8	(6)	nil
Type 304	230	(445)	1.8	(6)	nil
Carbon Steel	391	(735)	9.1	(30)	267-559 (105-220)
Type 316	399	(750)	9.1	(30)	10-35 (4-14)
Carbon Steel	427	(800)	9+	(30+)	188-386 (74-152)
Type 316	427	(800)	15+	(50+)	< 10 (< 4)

Figure 1

DRAWING OF LABORATORY HMS EQUIPMENT

SIMPLE CONSTRUCTION makes handling easy. Circulation of medium is down through float funnel to pump suction, up through sink funnel, over lip into float funnel. Circulation merely balances medium's settling tendency.

Figure 2

GC FLOW DIAGRAM AND VALVE SEQUENCE

		FID		TCD	
		COL 1A & 1B		COL 2	COL 3
SEQ.	VALVE POSITION & ACTION	A: EZA & Spectra B: Modified Porasil/QC	Porapak Q	LS x Molecular Sieve	
1	V ₁ : CW V ₂ : CCW V ₃ : CCW	SAMPLE INJECT → To Det.	Parallel operation SERIES To Det.	with Col. 1A & 1B To Det.	
2	V ₁ : CW V ₂ : CW V ₃ : CCW	Completes sample flow through port 1 → To Det.	SAMPLE INJECT SERIES To Det.	Separates hydrogen To Det.	
3	V ₁ : CCW V ₂ : CW V ₃ : CW	→ To Det.	Separates CO, ethylene, ethane and acetylene → To Det.	Stores O ₂ , N ₂ , CH ₄ , and CO BYPASS	
4	V ₁ : CCW V ₂ : CCW V ₃ : CW	BACKFLUSH → To Det.	BACKFLUSH ↓ To Vent	Continues storage BYPASS	
5	V ₁ : CCW V ₂ : CCW V ₃ : CCW	BACKFLUSH → To Det.	BACKFLUSH ↓ To Vent	Separates O ₂ , N ₂ , CH ₄ , and CO To Det.	
6	V ₁ : CCW V ₂ : CW V ₃ : CCW	BACKFLUSH ↓ To Det.

Figure 3

TCD CHROMATOGRAM

Figure 4

FID CHROMATOGRAM

Figure 5

FLOW DIAGRAM FOR OFF-GAS DATA REDUCTION

Figure 6

CALIBRATION CHROMATOGRAM FOR SIMULATED DISTILLATION

Figure 7

SIMULATED DISTILLATION CALIBRATION CURVE

FIGURE 8

COMPARISON OF TBP AND SIMULATED DISTILLATION
P-99 ALIQUOT BLEND

Figure 9

Figure 10

POWHATAN HEAVY DISTILLATE

Figure 11

Simplified Flow of Coal Corrosion Erosion Test Apparatus

Figure 12

TYPICAL CORROSION-EROSION DETECTOR

A - 3 diameter bend, B - 9 diameter bend, C - straight section

Figure 13

EFFECT OF VELOCITY ON METAL LOSS

Carbon Steel

680-740°F
(Average of 3 elements)
Ref. Run No. 4, 7 & 11.

Type 316 Stainless Steel

740-800°F
(Average of 3 elements)
Ref. Run No. 4, 7 & 12

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APPENDIX 1

GULF RESEARCH & DEVELOPMENT COMPANY
Pittsburgh, Pennsylvania

SECOND-ORDER MODELS FOR THE SRC
YIELDS FROM KENTUCKY COAL

by

N. L. Carr
G. L. Jones
M. McMahon

Report No.: 627RK001
Project No.: 238-8515
File FT07-30-30
June 18, 1979

APPROVED Harold Beuther
Harold Beuther

DATE June 18, 1979

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SECOND-ORDER MODELS FOR THE SRC YIELDS FROM KENTUCKY COAL

SUMMARY

One of the main conclusions from this analysis of the data is that a decrease in both pressure (inlet hydrogen partial pressure) and SRT should be possible in the SRC-II process for Kentucky coal. This can be done if the recycle ash (RASH) level is either held at about 10%, or increased somewhat. The extent of the pressure and SRT reduction desired can be determined from the models and/or contour plots. For example, a pressure reduction of approximately 300 psi (2 MPa) with a simultaneous SRT reduction from 1.0 to 0.75 hours shows the following effects:

<u>Yield Response</u>	<u>Change in Yield, % Units, Due to a 2 MPa Pressure Reduction (12.6 → 10.6) and an SRT Reduction (1.0 → 0.75)</u>
SRC	nil change
MD	+1.7
HD	+2.8
ClC4	-2.4
NAP	-0.7
H ₂ Consumption	-0.7

The temperature, feed coal, and recycle ash variables have been held at 455°C, 30%, and 10%, respectively. This trend might be applicable to Powhatan coal.

This report contains the details of two kinds of second-order yield models for SRC and the corresponding SAS output tables and plots for illustration of the results. These results were determined from the so-called "stepwise regression model," but most trends are also the same for the full second-order model.

Simplified Summary of the Effects of Variables Showing the
Direction for Increasing the Responses Shown

<u>Responses</u>	<u>Temp.</u>	<u>SRT</u>	<u>Recycle Ash RASH</u>	<u>H₂ Part. Pres. PH₂</u>	<u>Coal Conc. CIN</u>	<u>Gas Velocity V</u>
SRC	dec.	dec.*	dec.	nil	inc.	inc.
HD	445	dec.	inc.	nil	inc.	dec.
	optimum					
MD	445	inc.	nil	dec.	dec.	inc.
	minimum					
NAP	inc.	inc.	nil	nil	nil	nil
C1-C4	inc.	inc.	inc.	nil	dec.	nil
HY	inc.	inc.	inc.	inc. (small)	dec.	nil

*The SRC slope is taken for a range of RASH from 0 to about 10%. The slope is near zero at the high RASH level for this model.

INTRODUCTION

These correlations and results are based on 79 SRC runs using Kentucky No. 9/14 coal. The data base has been revised to include more variables than were included previously and to include updated yields. The complete data base is now documented and available in a computer data bank. The entire listing of the contents of this data bank is shown in the computer report.

The data were analyzed using our Statistical Analysis System (SAS). Two types of models were selected for study. Both models allow both linear and interaction affects of the five main variables: temperature, inlet hydrogen partial pressure, nominal slurry residence time, coal concentration, and recycle ash concentration in the slurry feed. Also, a linear gas velocity term is allowed. We believe that the previously reported, restrictive, linear model may not be sufficient to describe a complex reaction system such as the SRC reaction section. Using this new approach, we permit non-linear behavior of the yields. That is, no linear restriction is imposed. However, the SAS

determines the coefficients via minimization of residuals, no matter which of its options is used.

In the first model shown in the computer report, all yields are correlated with the full second-order model in five dimensions. No contour plots are shown for this model in this report, but all other model results are shown.

A special second model is the one that is the basis for most of the results discussed and the contour plots shown. This modeling approach is called a stepwise regression procedure whereby only those variables (including all second-order interactions) which have statistically significant coefficients are included in the final yield model for each response. All independent variables are included in the testing procedure, but non-significant ones are discarded at the 0.05 significance level.

The teachings from these correlations are completely unbiased. Neither personal bias nor selection of runs is involved in these correlations. However, empirical correlations of historical data have the drawbacks of being without a theoretical basis and of being weak in extrapolated regions. Care should be exercised in their interpretation. Most of our current use of these models is for interpolation and not for extrapolation.

Both correlations give consistent teachings in the main part of the variable space. For example, the important effects of RASH, SRT, CIN, and temperature are reasonably consistent. They are both remarkably consistent in showing a relatively insignificant effect of pressure near the "design" level. Only in one case is one model superior over another in my opinion. The SRC yield model from the full second-order model appears superior to the stepwise regression model because of the latter's behavior in high RASH region. (This is discussed and illustrated later.) Both models are good near the center of the data base, and at low to moderate RASH levels.

One of the best ways to develop an understanding of the yield behavior in a multi-variable process is to study the two-dimensional contour

plots. These are presented in the computer report for the middle and heavy distillate yields and the SRC yields.

DISCUSSION OF RESULTS

These discussion paragraphs follow the contour plots in the computer report.

Figures 1, 2, and 3 show the temperature-SRT contours for MD, HD, and SRC, respectively, taken at the defined base conditions. Increasing SRT increases MD yield, while the T effect exhibits a minimum valley at about 445°C. Temperatures above and below that value increases the MD yield. The HD yield exhibits a rising ridge increasing with decreasing SRT. The peaks in the ridge occurs at about 445°C with decreasing yields above and below this value. The SRC behavior is anomolous at these conditions, due to the high SRT-RASH interaction term, which is positive. Its influence overwhelms the T, SRT, and T·SRT terms which are all negative, as expected. Increasing temperature decrease SRC yields, as expected. But increasing SRT shows increasing SRC yield at these base conditions. The response shown in this area is suspect.

Figures 4, 5, and 6 show the temperature-coal contours for MD, HD, and SRC, respectively. The MD exhibits a saddle point behavior with a minimum at about 448°C and 32% coal. Increasing coal and decreasing temperature together shows an increase in MD yield. The HD yield exhibits a peak region at about 448°F and 32% coal. Decreasing temperature and increasing coal results in a decrease in HD yield. The SRC response shows only a small effect of coal concentration. Decreasing temperature increases the SRC yield. This behavior is a reflection of what happens in the preheater superimposed on the reactor effect.

Figures 7, 8, and 9 display the pressure-recycle ash (RASH) behavior for MD, HD, and SRC, respectively. The MD shows a saddle point at about 12.5 MPa and 2.5% RASH. The RASH effect is small at this pressure level. The trend is to increase the MD as the pressure is reduced and the RASH increased.

There is no pressure effect observed for the HD yield. It increases strongly with increasing RASH. The SRC yield is unaffected by pressure, but the RASH effect is to drive the SRC yield down.

Figures 10, 11, and 12 show the pressure-coal (CIN) contours for the MD, HD, and SRC yields, respectively. The MD response increases with both decreasing pressure and coal with the steepest ascent toward the lower left corner. The HD response is independent of pressure, but it increases slowly with coal concentration. The SRC response is independent of pressure, but it increases with CIN. These results are probably influenced by the preheater operations.

Figures 13, 14, and 15 illustrate the temperature-pressure behavior for the MD, HD, and SRC yields, respectively. The MD yield valley decreases to the right (with PH2) at about 442°C. Decreasing both pressure and temperature below this valley increases the MD yield. The HD yield is unaffected by pressure, but it follows a maximum behavior with temperature, peaking at about 445°C. The SRC yield is independent of pressure, but it decreases strongly as temperature is increased.

Figures 16, 17, and 18 are contours of MD, HD, and SRC yields, respectively, in the temperature-RASH space. The MD yield is independent of RASH, but it goes through a minimum as temperature is increased. The valley is at about 442°C. The HD yield exhibits a rising ridge to the right, with the "best" temperature at about 445°C. RASH strongly affects the HD yield. The SRC yield picture is a sloping plane with the lowest region at the upper right corner. Increasing both temperature and RASH drive the SRC yield down.

Figures 19, 20, and 21 cover the pressure-SRT space for the MD, HD, and SRC yields, respectively. The MD yield pattern is planar with the highest values occurring at lower pressure and highest SRT, i.e. toward the lower right corner. The HD yield does not depend on pressure, but it decreases sharply with increasing SRT. The SRC yield is independent of pressure and it is shown to increase with SRT. The SRT behavior is anomalous as discussed before, and this result is suspect.

Figures 22, 23, and 24 present the three contours in the SRT-CIN space. The MD yield is planar, the highest value occurring at lower CIN and higher SRT, i.e. in the upper left corner is the steepest ascent direction. The HD yield depends weakly on CIN, increasing with CIN. A reduction in SRT has a large effect on increasing the HD yield. The SRC yield behavior is a rising ridge, increasing slowly as SRT increases. This behavior may not be real. At a given SRT, the CIN effect is to increase SRC up to about 42% CIN. Extrapolation beyond this CIN level is not recommended. The MD and HD responses are strongly dependent on the reactor operation, even though the coal concentration should mainly be influential in the preheater.

Figures 25, 26, and 27 show the three contours in SRT-RASH space. The MD is independent of RASH, essentially. Increasing SRT increases MD. The HD yield pattern is complex. Above a RASH value of about 4%, HD increases with an increase in RASH and a decrease in SRT. The SRC yield is anomalous at RASH values above about 10%. Below this value the behavior appears realistic, i.e. increasing SRC as both RASH and SRT decrease. This contour shows the choice of RASH at 10% should be changed to a lower "base" value of 7 or 8%. This would avoid the anomalies, but the basic problem is with the acceptance of the stepwise regression of the SRT-RASH. The full second-order model is preferred over the "stepwise" model. The former does not have a significant interaction of SRT and RASH, while the other major effects are similar.

Figures 28, 29, and 30 depict the three contours in the CIN-RASH space. The MD yield does not depend on RASH. Decreasing CIN increases MD. The linear term dominates over the Temp.-CIN, PH2-CIN interactions at the "base" values. The HD yield is planar in these two variables, increasing as RASH and CIN increase. The RASH effect is stronger than the Temp.-CIN interaction, the only two variables having effects in this space. The SRC yield is depicted by a rising ridge along a CIN value of about 42%. It slopes down as RASH is increased, being the lowest SRC value at the lower right corner, i.e. at the highest RASH, lowest CIN.

Table I
Summary Data on the Stepwise Regression Models

<u>Response</u>	<u>R² Correl. Coefficient</u>	<u>+s Standard Deviation</u>	<u>Variables Significant</u>	<u>Slope Values in Defined Model</u>
SHY, Hydrogen Consumption, w% MAF Coal	0.75	0.73	SRT RASH T ² (PH2) ² T•CIN	2.32 0.136 0.0014 0.0335 -0.0081
SC1C4, Light Gas w% MAF Coal	0.90	1.87	T SRT CIN T ² (RASH) ² T•SRT T•RASH	0.53 9.7 -0.12 0.0042 0.032 0.42 0.036
SNAP, Naphtha, w% MAF Coal	0.40	2.83	T SRT (SRT) ²	0.15 3.44 -4.83
SMD, Middle Distillate, w% MAF Coal	0.67	3.2	SRT CIN V T ² T•CIN P•CIN P•RASH	4.8 -0.3 1.03 0.011 -0.056 0.059 -0.196
SHD, Heavy Distillate w% MAF Coal	0.83	3.1	RASH V T ² T•CIN SRT•RASH	1.62 -1.67 -0.012 0.050 -2.07
SSRC, SRC w% MAF Coal	0.97	3.5	T, T ² SRT CIN, (CIN) ² RASH V T•SRT SRT•RASH	-0.92, -0.0068 -15.6 0.39, -0.027 -2.09 0.95 -1.11 3.2

Table II
Summary Trends from Contour Plots

		Directions for Increase In			
		MD 445 min	HD 445	SRC --	
T-SRT, T	optimum MD, HD				?
T-CIN
PH2-RASH
PH2-CIN
T-PH2	Optimum MD, HD	445 min	445
T-RASH	Optimum MD, HD	445 min	445
PH2-SRT					?
SRT-CIN	Optimum CIN			41%	? ?
SRT-RASH					*
CIN-RASH	Optimum CIN			41%

? Means SRC model behavior is questionable above approximately 9% RASH

* Region less than 9% RASH

SUMMARY

XX

THE FOLLOWING REPORT IS COMPOSED OF SIX SECTIONS

XX

XX

SECTION ONE IS A COMPLETE LISTING OF THE DATA BASE CONTAINING INDEPENDENT
VARIABLES AND YIELDS WHICH ARE DESCRIBED BELOW.

XX

SECTION TWO CONTAINS THE RESULTS OF A LINEAR REGRESSION ON THE YIELDS IN THE
DATA BASE ASSUMING A LINEAR REGRESSION MODEL IN 21 TERMS IN
WHICH ALL TERMS ARE CONSIDERED SIGNIFICANT. THE COEFFICIENTS AND THE F STA-
TISTICS ARE HIGHLIGHTED FOR EACH REGRESSION MODEL. AN ALGEBRAIC EXPRESSION
FOR EACH OF THE REGRESSION MODELS IS ALSO INCLUDED.

XX

SECTION THREE CONTAINS PARITY OR SCATTER PLOTS IN WHICH THE YIELD PREDICTIONS
OF THE MODELS DERIVED IN SECTION TWO ARE PLOTTED AGAINST THE ACTUAL DATA YIELDS.

XX

SECTION FOUR CONTAINS THE RESULTS OF A LINEAR REGRESSION ON THE YIELDS OF THE
DATA BASE ASSUMING A LINEAR REGRESSION MODEL IN 21 TERMS
IN WHICH ONLY THE TERMS WHICH ARE SIGNIFICANT AT A 95% CONFIDENCE INTERVAL
ARE RETAINED IN THE MODEL. AS IN SECTION TWO, THE COEFFICIENTS AND F STATISTICS
ARE HIGHLIGHTED, AND AN ALGEBRAIC EXPRESSION FOR EACH MODEL IS PROVIDED.

XX

SECTION FIVE CONTAINS A NUMBER OF PLOTS ILLUSTRATING PREDICTED YIELDS OBTAINED
FROM THE MODELS IN SECTION FOUR VERSUS EACH OF THE SIX INDEPENDENT VARIABLES

XX

SECTION SIX IS COMPRISED OF CONTOUR PLOTS SHOWING CONTOURS OF EACH YIELD FOR
SELECTED PAIRS OF INDEPENDENT VARIABLES. AGAIN THE YIELDS ARE THOSE PREDICTED
BY THE MODELS IN SECTION FOUR.

1).XX

XX

TERMS

XX

CODE DESIGNATES ONE OF THE FOUR SRC PILOT PLANTS

.....THOSE BEGINNING WITH FTL ARE FT. LEWIS RUNS

.....THOSE BEGINNING WITH MER ARE MERRIAM RUNS

.....THOSE BEGINNING WITH HRI ARE HYDROCARBON RESEARCH INSTITUTE RUNS

.....THOSE BEGINNING WITH PNN ARE P-99 RUNS

RUN.....A SPECIFIC RUN FOR EACH OF THE PILOT PLANTS

COAL.....KENTUCKY COAL ONLY

MODE.....SRC-1 OR SRC-11

TAVG.....AVERAGE REACTOR TEMPERATURE, DEG C

TPHMT.....PHEATER TEMPERATURE, DEG C

PTOT.....TOTAL AVERAGE REACTOR PRESSURE IN MPA

GASRT.....GAS RATE PER COAL RATE IN MSCF/TON OF COAL

PUR.....GAS PURITY (HYDROGEN CONCENTRATION) IN PER CENT

DIA.....REACTOR DIAMETER IN CM

LEN.....REACTOR LENGTH IN CM

SRT.....NOMINAL SLURRY RESIDENCE TIME (HRS)

CIN.....INLET COAL CONCENTRATION (G COAL/100 G SLURRY FEED)

RMD.....RECYCLE MIDDLE DISTILLATE

RHD.....RECYCLE HEAVY DISTILLATE

NSRC.....RECYCLE SRC

RASH.....RECYCLE ASH

RIOM.....RECYCLE IOM

TOTSOL.....TOTAL SOLIDS IN THE SLURRY FEED

DHY.....NET HYDROGEN CONSUMPTION BASED ON 1 G OF MOISTURE FREE COAL

DC1C4.....NET YIELD OF C1-C4 BASED ON 1 G OF MOISTURE FREE COAL

DBY.....NET YIELD OF BYPRODUCTS BASED ON 1 G OF MOISTURE FREE COAL

DHW.....NET YIELD OF WATER BASED ON 1 G OF MOISTURE FREE COAL

DNAP.....NET YIELD OF NAPHTHA BASED ON 1 G OF MOISTURE FREE COAL

NAPHTHA.....C5-380F

DMD.....NET YIELD OF MIDDLE DISTILLATE BASED ON 1 G OF MOISTURE FREE COAL

MIDDLE DISTILLATE.....380-550F

DHD.....NET YIELD OF HEAVY DISTILLATE BASED ON 1 G OF MOISTURE FREE COAL

HEAVY DISTILLATE.....550-850F

DSRC.....NET YIELD OF SRC BASED ON 1 G OF MOISTURE FREE COAL

DIOM.....NET YIELD OF IOM BASED ON 1 G OF MOISTURE FREE COAL

IOM.....INSOLUBLE ORGANIC MATTER

DASH.....NET YIELD OF ASH BASED ON 1 G OF MOISTURE FREE COAL

PH2.....INLET HYDROGEN PARTIAL PRESSURE IN THE REACTOR (MPA)

V.....GAS LINEAR VELOCITY (CM/SEC)

SHY.....NET HYDROGEN CONSUMPTION PER 100 G OF MAF COAL

SC1C4.....NET YIELD OF C1-C4 PER 100 G OF MAF COAL

SBY.....NET YIELDS

SUY.....NET YIELD OF BYPRODUCTS PER 100 G OF MAF COAL

SHW.....NET YIELD OF WATER PER 100 G OF MAF COAL

SNAP.....NET YIELD OF NAPHTHA PER 100 G OF MAF COAL

SMD.....NET YIELD OF MIDDLE DISTILLATE PER 100 G OF MAF COAL

SHD.....NET YIELD OF HEAVY DISTILLATE PER 100 G OF MAF COAL

SSRC.....NET YIELD OF SRC PER 100 G OF MAF COAL

SIOM.....NET YIELD OF IOM PER 100 G OF MAF COAL

SUMIN.....TOTAL MASS OF COAL AND HYDROGEN IN

SUMOUT.....SUM OF THE NET YIELDS

MTAVG.....MEAN VALUE FOR TEMPERATURE

MPH2.....MEAN VALUE FOR THE AVERAGE HYDROGEN PARTIAL PRESSURE

GLOSSARY

11:10 WEDNESDAY, MAY 23, 1979

3

TERMS

MGASRT.....MEAN VALUE FOR THE GAS RATE
 MSRT.....MEAN VALUE FOR THE NOMINAL SLURRY RESIDENCE TIME
 MCIN.....MEAN VALUE FOR THE INLET COAL CONCENTRATION
 MKASH.....MEAN VALUE FOR THE RECYCLE ASH CONCENTRATION
 MV.....MEAN VALUE FOR THE GAS LINEAR VELOCITY
 VTAVG.....DEVIATION OF THE TEMPERATURE FROM ITS MEAN VALUE
 VPH2.....DEVIATION OF THE H2 PARTIAL PRESSURE FROM ITS MEAN VALUE
 VGASRT.....DEVIATION OF THE GAS RATE FROM ITS MEAN VALUE
 VSRT.....DEVIATION OF THE SLURRY RESIDENCE TIME FROM ITS MEAN VALUE
 VRASH.....DEVIATION OF THE RECYCLE ASH FROM ITS MEAN VALUE
 VV.....DEVIATION OF THE GAS LINEAR VELOCITY FROM ITS MEAN VALUE
 XXX
 XXX
 OBSERVATIONS CORRESPOND TO RUNS IN THE DATA BASE
 XXX

NOTE: THE JOB SFHAGLJ HAS BEEN RUN UNDER RELEASE 76.0C OF SAS AT GULF OIL CORPORATION.

NOTE: SASNEWS SASNEWS SASNEWS SASNEWS SASNEWS SASNEWS

A TEST RELEASE OF SAS79.1 IS NOW AVAILABLE.
TO EXECUTE SAS79 USE // EXEC SAS79

FOR A BRIEF DESCRIPTION OF THE NEW FEATURES OF
SAS79, USE --> PHUC DUC DATA=OUC.SAS79;

1 DATA COAL ;
2 INPUT CODE \$ RUN \$ COAL \$ MODE TAVG TPRHT PTOT PHYOUT GASRT PUR
3 DIA LEN SRT CIN
4 RMD RMD HSRC RASH RICH TOTLUL DHY DCIC4 DBY DHW DNAP DMD DHD DSRC DIOM DASH;
5 PH2=PTOT*PUR/100;
6 CIN=CIN*100;
7 RASH=RASH*100;
8 X=100/(1-DASH);
9 SHY=DHY*X;
10 SCIC4=DCIC4*X;
11 SBY=DBY*X;
12 SHW=DHW*X;
13 SNAP=DNAP*X;
14 SMD=DMD*X;
15 SHD=DHD*X;
16 SSRC=DSRC*X;
17 SIOM=DIOM*X;
18 SUMIN=SHY+100;
19 SUMOUT=SCIC4+SBY+SHW+SNAP+SMD+SHD+SSRC+SIOM;
20 L=LEN;
21 V=71.76*CIN+GASRT*1000*L/(SRT*2000*3600*100);
22 V=V*14.7*6.695*(1.8*TAVG+492)/(520*PTOT*1000);
23 DUM=1;
24 CARDS;

NOTE: DATA SET WORK.COAL HAS 79 OBSERVATIONS AND 46 VARIABLES. 51 OBS/TRK.

NOTE: SAS WENT TO A NEW LINE WHEN INPUT STATEMENT
REACHED PAST THE END OF A LINE.

NOTE: THE DATA STATEMENT USED 0.48 SECONDS AND 108K.

262 PROC PRINT;

NOTE: THE PROCEDURE PRINT USED 1.62 SECONDS AND 152K AND PRINTED PAGES 1 TO 5.

263 PROC MEANS MEAN STD MIN MAX RANGE SUM VAR USS CSS STDERR CV SKEWNESS
264 T PRT;
265 VARIABLES SHY SCIC4 SBY SHW SNAP SMD SHD SSRC SIOM TAVG PH2 SRT CIN
266 RASH DUM SUMIN SUMOUT V;
267 OUTPUT OUT=OUTSTAT MEAN=MSHY MSCIC4 MSBY MSHW MSNAP MSMD MSHD MSSRC
268 MSIOM MTAVG MPH2 MSRT MCIN MRASH DUM MSUMIN MSUMOUT MV ;

NOTE: DATA SET WORK.OUTSTAT HAS 1 OBSERVATIONS AND 18 VARIABLES. 128 OBS/TRK.

NOTE: THE PROCEDURE MEANS USED 0.51 SECONDS AND 146K AND PRINTED PAGE 6.

269 PROC PRINT;

270

NOTE: THE PROCEDURE PRINT USED 0.29 SECONDS AND 120K AND PRINTED PAGE 7.

```

270      DATA DS1 ; MERGE OUTSTAT COAL ; BY DUM ;
271      VI AVG=TA VG-MTAVG; VI AVG2= VI AVG**2;
272      VPH2=PH2-MPH2; VPH22=VPH2**2;
273      VSRT=SRT-MSRT; VSRT2= VSRT**2;
274      VCIN=CIN-MCIN; VCIN2=VCIN**2;
275      VRASH=RASH-MRASH; VRASH2=VRASH**2;
276      VV=V-MV ;
277      VTP=VI AVG*VPH2 ; VTS=VI AVG*VSRT ; VTC=VI AVG*VCIN ; VTR=VI AVG*VRASH ;
278      VPS=VPH2*VSRT ; VPR=VPH2*VRASH ; VPC=VPH2*VCIN ; VSR=VSRT*VRASH ;
279      VCR=VCIN*VRASH ;
280      VSC=VSRT*VCIN ;

```

NOTE: DATA SET WORK.DS1 HAS 79 OBSERVATIONS AND 84 VARIABLES. 28 OBS/TRK.

NOTE: THE DATA STATEMENT USED 0.35 SECONDS AND 124K.

```

281      PROC GLM DATA=DS1;
282      MODEL SHY SC1C4 SHY SHW SNAP SMD SMD SSRC S10M = VI AVG VPH2 VSRT
283      VCIN VRASH VV VI AVG2 VPH22 VSRT2 VCIN2 VRASH2 VTP VTS VTC VTR
284      VPS VPC VPR VSC VSR VCR /
285      SOLUTION P CLM ALPHA=.05L;
286      TITLE1 MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL;
287      TITLE2 INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES;
288      TITLE3 AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY;
289      OUTPUT OUT=PRE DYLO PREDICTED= PSHY PSC1C4 PSHY PSHW PSNAP PSMD PSMD
290      PSSRC PS10M;

```

NOTE: DATA SET WORK.PREDYLO HAS 79 OBSERVATIONS AND 93 VARIABLES. 25 OBS/TRK.

NOTE: THE PROCEDURE GLM USED 4.85 SECONDS AND 202K AND PRINTED PAGES 8 TO 43.

```

291      PROC PLOT NOLEGEN;
292      PLOT SHY*PSHY;
293      TITLE1 PARITY PLOT;
294      TITLE2 FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL CONTAINING 6 VARIABLES;
295      TITLE3 PLOT OF PREDICTED NET HYDROGEN CONSUMPTION;
296      TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
297      TITLE5 (HORIZONTAL AXIS);
298      TITLE6 VS.;
299      TITLE7 ACTUAL YIELD DATA;
300      TITLE8 (VERTICAL AXIS);

```

NOTE: THE PROCEDURE PLOT USED 0.45 SECONDS AND 138K AND PRINTED PAGE 44.

```

301      PROC PLOT NOLEGEN;
302      PLOT SC1C4*PSC1C4;
303      TITLE1 PARITY PLOT;
304      TITLE2 FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL CONTAINING 6 VARIABLES;
305      TITLE3 PLOT OF PREDICTED NET YIELD OF C1-C4;
306      TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
307      TITLE5 (HORIZONTAL AXIS);
308      TITLE6 VS.;
309      TITLE7 ACTUAL YIELD DATA;
310      TITLE8 (VERTICAL AXIS);

```

NOTE: THE PROCEDURE PLOT USED 0.45 SECONDS AND 136K AND PRINTED PAGE 45.

```
311      PROC PLOT NOLEGEND;  
312      PLOT SBY*MSBY;  
313      TITLE1 PARITY PLOT;  
314      TITLE2 FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL CONTAINING 6 VARIABLES;  
315      TITLE3 PLOT OF PREDICTED NET YIELD OF BYPRODUCTS (NH3, H2S, CO, CO2);  
316      TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);  
317      TITLE5 (HORIZONTAL AXIS);  
318      TITLE6 VS.;  
319      TITLE7 ACTUAL YIELD DATA;  
320      TITLE8 (VERTICAL AXIS);
```

NOTE: THE PROCEDURE PLOT USED 0.45 SECONDS AND 138K AND PRINTED PAGE 46.

```
321      PROC PLOT NOLEGEND;  
322      PLOT SHW*PSHW;  
323      TITLE1 PARITY PLOT;  
324      TITLE2 FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL CONTAINING 6 VARIABLES;  
325      TITLE3 PLOT OF PREDICTED NET YIELD OF WATER;  
326      TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);  
327      TITLE5 (HORIZONTAL AXIS);  
328      TITLE6 VS.;  
329      TITLE7 ACTUAL YIELD DATA;  
330      TITLE8 (VERTICAL AXIS);
```

NOTE: THE PROCEDURE PLOT USED 0.45 SECONDS AND 136K AND PRINTED PAGE 47.

```
331      PROC PLOT NOLEGEND;  
332      PLOT SNAP*PSNAP;  
333      TITLE1 PARITY PLOT;  
334      TITLE2 FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL CONTAINING 6 VARIABLES;  
335      TITLE3 PLOT OF PREDICTED NET YIELD OF NAPHTHA;  
336      TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);  
337      TITLE5 (HORIZONTAL AXIS);  
338      TITLE6 VS.;  
339      TITLE7 ACTUAL YIELD DATA;  
340      TITLE8 (VERTICAL AXIS);
```

NOTE: THE PROCEDURE PLOT USED 0.44 SECONDS AND 138K AND PRINTED PAGE 48.

```
341      PROC PLOT NOLEGEND;  
342      PLOT SMD*PSMD;  
343      TITLE1 PARITY PLOT;  
344      TITLE2 FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL CONTAINING 6 VARIABLES;  
345      TITLE3 PLOT OF PREDICTED NET YIELD OF MIDDLE DISTILLATE;  
346      TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);  
347      TITLE5 (HORIZONTAL AXIS);  
348      TITLE6 VS.;  
349      TITLE7 ACTUAL YIELD DATA;  
350      TITLE8 (VERTICAL AXIS);
```

NOTE: THE PROCEDURE PLOT USED 0.44 SECONDS AND 136K AND PRINTED PAGE 49.

```
351      PROC PLOT NOLEGEND;
```

```

352      PLOT SHD*PSHD;
353      TITLE1 PARITY PLOT;
354      TITLE2 FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL CONTAINING 6 VARIABLES;
355      TITLE3 PLOT OF PREDICTED NET YIELD OF HEAVY DISTILLATE;
356      TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
357      TITLES (HORIZONTAL AXIS);
358      TITLE6 VS.;
359      TITLE7 ACTUAL YIELD DATA;
360      TITLE8 (VERTICAL AXIS);

```

NOTE: THE PROCEDURE PLOT USED 0.44 SECONDS AND 138K AND PRINTED PAGE 50.

```

361      PROC PLOT NOLEGEND;
362      PLOT SSRC*PSSRC;
363      TITLE1 PARITY PLOT;
364      TITLE2 FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL CONTAINING 6 VARIABLES;
365      TITLE3 PLOT OF PREDICTED NET YIELD OF SRC BOTTOMS;
366      TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
367      TITLES (HORIZONTAL AXIS);
368      TITLE6 VS.;
369      TITLE7 ACTUAL YIELD DATA;
370      TITLE8 (VERTICAL AXIS);

```

NOTE: THE PROCEDURE PLOT USED 0.45 SECONDS AND 138K AND PRINTED PAGE 51.

```

61 371      PROC PLOT NOLEGEND;
372      PLOT S10M*PS10M;
373      TITLE1 PARITY PLOT;
374      TITLE2 FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL CONTAINING 6 VARIABLES;
375      TITLE3 PLOT OF PREDICTED NET YIELD OF INSOLUBLE ORGANIC MATTER;
376      TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
377      TITLES (HORIZONTAL AXIS);
378      TITLE6 VS.;
379      TITLE7 ACTUAL YIELD DATA;
380      TITLE8 (VERTICAL AXIS);

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NOTE: THE PROCEDURE PLOT USED 0.45 SECONDS AND 136K AND PRINTED PAGE 52.

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381      PROC STEPWISE DATA =DS1;
382      MODEL SHY SC1C4 SBY SHW SNAP SHD SHD SSRC S10M = VTAVG VPH2 VSRT
383      VCIN VRASH VV VTAVG2 VPH2 VSRT2 VCIN2 VRASH2 VTP VTS VTC VTR
384      VPS VPC VPR VSC VSH VCR ;
385      TITLE1 STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL;
386      TITLE2 INVOLVING LINEAR SECOND ORDER AND CROSS PRODUCT TERMS IN FIVE VARIABLES;
387      TITLE3 AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY;
388

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NOTE: THE PROCEDURE STEPWISE USED 3.47 SECONDS AND 150K AND PRINTED PAGES 53 TO 87.

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388      PROC PRINT ;

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NOTE: THE PROCEDURE PRINT USED 2.25 SECONDS AND 160K AND PRINTED PAGES 88 TO 98.

NOTE: SAS USED 202K MEMORY.

5

STATISTICAL ANALYSIS SYSTEM

14:02 FRIDAY, MAY 18, 1979

NOTE: BARR, GOODNIGHT, SALL AND HELWIG
SAS INSTITUTE INC.
P.O. BOX 10066
RALEIGH, N.C. 27605

STATISTICAL ANALYSIS SYSTEM

14:02 FRIDAY, MAY 18, 1979

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OBS	CODE	RUN	COAL	MODL	TAVG	TPRHT	PTOT	PHYOUT	GASRT	PUR	DIA	LEN	SRT	CIN	RMD	RMD	RSRC
1	FTLS1	MHR1	KENT	1	450.0	400.0	10.71	4.18	14.769	94.80	61.00	914.4	0.525	37.3	0.169	0.4580	0.0000
2	FTLS2	MHR2	KENT	1	447.0	374.0	10.37	5.01	21.535	97.10	61.00	914.4	0.926	38.4	0.167	0.4490	0.0000
3	FTLS3	MHR3	KENT	1	461.0	408.0	10.42	4.99	19.498	93.48	61.00	997.0	0.350	37.5	0.168	0.4570	0.0000
4	FTLS4	MHR4	KENT	1	445.0	399.0	10.44	6.14	18.369	93.83	61.00	997.0	0.348	38.6	0.165	0.4490	0.0000
5	FTLS5	MHR5	KENT	1	451.0	406.0	10.36	5.08	15.398	91.46	61.00	997.0	0.275	38.1	0.167	0.4520	0.0000
6	FTLS6	MHR6	KENT	1	462.0	412.0	10.33	4.29	13.789	90.71	61.00	997.0	0.274	38.4	0.166	0.4500	0.0000
7	FTLS7	MHR7	KENT	1	452.0	403.0	10.28	4.57	13.816	91.37	61.00	997.0	0.274	38.4	0.167	0.4490	0.0000
8	FTLS8	MHR8	KENT	1	447.0	398.0	10.34	5.58	18.014	94.10	61.00	997.0	0.346	39.1	0.164	0.4450	0.0000
9	FTLS9	MHR9	KENT	1	457.0	403.0	10.29	4.89	16.082	92.50	61.00	997.0	0.303	39.3	0.164	0.4430	0.0000
10	FTLS10	MHR10	KENT	1	448.0	407.0	7.18	2.94	22.354	96.03	61.00	997.0	0.367	38.0	0.167	0.4530	0.0000
11	FTLS11	MHR11	KENT	1	451.0	402.0	8.80	4.50	22.118	94.21	61.00	997.0	0.366	38.4	0.167	0.4490	0.0000
12	MEHS1	GU120	KENT	1	450.0	402.0	9.93	5.96	20.670	100.00	1.75	184.0	0.367	39.1	0.000	0.6090	0.0000
13	MEHS2	GU122	KENT	1	453.0	402.0	9.34	3.55	12.880	100.00	1.75	184.0	0.283	38.9	0.000	0.6110	0.0000
14	MEHS3	GU123	KENT	1	453.0	400.0	9.34	3.74	13.530	100.00	1.75	184.0	0.288	39.1	0.000	0.6090	0.0000
15	MEHS4	GU127	KENT	1	446.0	396.5	9.83	5.51	18.060	100.00	1.75	184.0	0.353	39.3	0.000	0.6070	0.0000
16	MEHS5	GU131	KENT	1	447.0	397.9	9.83	5.51	19.130	100.00	1.75	184.0	0.358	39.5	0.000	0.6050	0.0000

OBS	RASH	R10M	TUTSOL	DHY	DC1C4	DHY	DHW	DNAP	DMD	DHD	DSRC	D10M	DASH	PH2	X
1	0.0	0.0000	0.3750	0.0250	0.0540	0.0330	0.0490	0.0660	0.0600	0.0010	0.5830	0.0660	0.0930	10.1531	110.254
2	0.0	0.0000	0.3840	0.0270	0.0550	0.0260	0.0530	0.1020	0.1040	-0.0280	0.5750	0.0480	0.0920	10.0693	110.132
3	0.0	0.0000	0.3750	0.0210	0.0790	0.0390	0.0720	0.1520	-0.0420	-0.0290	0.5860	0.0710	0.0680	9.7406	109.649
4	0.0	0.0000	0.3860	0.0200	0.0370	0.0210	0.0460	0.0430	0.0580	0.0210	0.6400	0.0580	0.0930	9.7959	110.254
5	0.0	0.0000	0.3810	0.0200	0.0290	0.0200	0.0560	0.0260	0.0690	0.0090	0.6730	0.0630	0.0930	9.5271	110.254
6	0.0	0.0000	0.3840	0.0200	0.0540	0.0250	0.0540	0.0360	0.0500	0.0190	0.6590	0.0650	0.1010	9.3703	111.235
7	0.0	0.0000	0.3840	0.0190	0.0370	0.0280	0.0550	0.0370	0.0600	0.0090	0.6560	0.0570	0.0980	9.3654	110.865
8	0.0	0.0000	0.3910	0.0240	0.0370	0.0220	0.0500	0.0510	0.0520	0.0320	0.6300	0.0540	0.0960	9.7299	110.619
9	0.0	0.0000	0.3930	0.0210	0.0590	0.0240	0.0500	0.0500	0.0510	-0.0010	0.6420	0.0590	0.0970	9.5182	110.742
10	0.0	0.0000	0.3800	0.0360	0.0450	0.0280	0.0630	0.0150	0.0630	-0.0090	0.6540	0.0630	0.1130	6.8950	112.740
11	0.0	0.0000	0.3660	0.0290	0.0540	0.0280	0.0700	0.0560	0.0280	0.0090	0.6110	0.0610	0.1130	8.2905	112.740
12	0.0	0.0000	0.3910	0.0160	0.0290	0.0300	0.0640	0.1190	0.0460	0.0000	0.5620	0.0530	0.1130	9.9300	112.740
13	0.0	0.0000	0.3890	0.0180	0.0330	0.0310	0.0850	0.0960	0.0020	0.0000	0.5980	0.0580	0.1130	9.3400	112.740
14	0.0	0.0000	0.3910	0.0180	0.0440	0.0310	0.0660	0.0960	0.0000	-0.0290	0.6510	0.0670	0.0910	9.3400	110.011
15	0.0	0.0000	0.3930	0.0175	0.0330	0.0280	0.0560	0.0540	0.0350	0.0420	0.6140	0.0550	0.0960	9.8300	110.619
16	0.0	0.0000	0.3950	0.0144	0.0470	0.0340	0.0470	0.0380	0.0690	0.0070	0.6100	0.0540	0.0960	9.8300	110.619

OBS	SHY	SC1C4	SHY	SHW	SNAP	SMD	SHD	SSRC	SIOM	SUMIN	SUMOUT	L	V	DUM
1	2.75634	5.9537	3.63837	5.4024	7.2767	8.8203	0.1103	64.2778	7.2767	102.756	102.756	914.4	2.26598	1
2	2.97357	6.0573	2.86344	5.8370	11.2335	11.4537	-3.0837	63.3260	5.2863	102.974	102.974	914.4	1.98348	1
3	2.30263	8.6623	4.27632	7.8947	16.6667	-4.6053	-3.1798	64.2544	7.7851	102.303	101.754	997.0	2.55862	1
4	2.20507	4.0794	2.31533	5.2922	4.7409	6.3947	2.3153	70.5623	6.3947	102.205	102.095	997.0	2.50270	1
5	2.20507	3.1974	2.20507	6.1742	2.8666	7.6075	0.9923	74.2007	6.9460	102.205	104.190	997.0	2.59216	1
6	2.22469	6.5628	2.76087	6.0067	4.0044	5.5617	2.1135	73.3037	7.2303	102.225	107.564	997.0	2.39070	1
7	2.10643	4.1020	3.10421	6.0975	4.1020	6.6519	0.9978	72.7273	6.3193	102.106	104.102	997.0	2.38124	1
8	2.65487	4.0929	2.43363	5.5310	5.6416	5.7522	3.5398	69.6903	5.9735	102.655	102.655	997.0	2.46463	1
9	2.32558	6.5336	2.65781	5.5371	5.5371	5.6478	-0.1107	71.0963	6.5338	102.326	103.433	997.0	2.57290	1
10	4.05862	5.1860	3.15671	7.1026	1.6911	7.1026	-1.0147	73.7317	7.1026	104.059	104.059	997.0	4.04121	1
11	3.26945	6.0879	3.15671	7.8947	6.3134	3.1567	1.0147	68.8839	6.8771	103.269	103.382	997.0	3.31956	1
12	1.80383	3.2694	3.38219	7.2153	13.4160	5.1860	0.0000	63.3596	5.9752	101.804	101.804	184.0	1.03212	1
13	2.02931	3.8331	3.44493	9.5829	10.8230	0.2255	0.0000	67.4185	6.5389	102.029	101.917	184.0	0.88584	1
14	1.98020	4.8405	3.41024	7.2607	10.5611	0.0000	-3.1403	71.6172	7.3707	101.980	101.870	184.0	0.91909	1
15	1.93584	3.6504	3.09735	6.1947	5.9735	3.8717	4.6460	67.4204	6.0841	101.936	101.438	184.0	0.94667	1
16	1.59292	5.1991	3.76106	5.1991	4.2035	7.6227	0.7743	67.4779	5.9735	101.593	100.221	184.0	0.99517	1

S - A T I S T I C A L A N A L Y S I S S Y S T E M

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OBS	CODE	RUN	COAL	MODE	TAVG	TPRMT	PTOT	PHYOUT	GASRT	PUR	DIA	LEN	SRT	CIN	RMD	RMD	RSRC
17	MERS6	GUA4	KENT	1	460.0	400.0	13.89	11.67	58.70	100.00	1.75	377.9	1.000	35.0	0.000	0.6500	0.0000
18	MERS7	GUB4	KENT	1	461.0	404.0	13.89	10.42	44.69	100.00	1.75	377.9	1.000	45.0	0.000	0.5500	0.0000
19	MERS8	GUC4	KENT	1	459.0	401.0	13.89	10.14	42.63	100.00	1.75	377.9	1.000	50.0	0.000	0.5000	0.0000
20	MERS9	GU213	KENT	1	456.0	400.0	13.89	11.67	57.10	100.00	1.75	377.9	0.977	30.0	0.000	0.7000	0.0000
21	MERS10	GU214	KENT	1	456.0	401.0	13.89	9.86	38.70	100.00	1.75	377.9	0.993	45.0	0.000	0.5500	0.0000
22	MERS11	GU234	KENT	1	455.0	400.0	13.89	11.39	52.70	100.00	1.75	377.9	1.032	30.0	0.000	0.7000	0.0000
23	MERS12	GU235A	KENT	1	455.0	400.0	13.89	9.58	36.70	100.00	1.75	377.9	1.084	45.0	0.000	0.5500	0.0000
24	MERS13	GU235B	KENT	1	455.0	401.0	13.89	9.58	35.30	100.00	1.75	377.9	1.044	45.0	0.000	0.5500	0.0000
25	HRIS1	HR1A	KENT	1	441.1	432.8	10.45	7.11	28.60	100.00	2.07	299.7	0.700	24.4	0.000	0.7560	0.0000
26	HRIS2	HR1B	KENT	1	426.7	415.0	10.45	7.21	28.40	100.00	2.07	299.7	0.716	24.9	0.000	0.7510	0.0000
27	HRIS3	HR1C	KENT	1	426.7	417.8	10.45	7.21	28.40	100.00	2.07	299.7	0.710	24.8	0.000	0.7520	0.0000
28	HRIS4	HR1D	KENT	1	440.6	436.7	10.45	7.21	28.20	100.00	2.07	299.7	0.671	23.4	0.000	0.7660	0.0000
29	HRIS5	HR1E	KENT	1	412.8	408.9	10.45	7.21	28.90	100.00	2.07	299.7	0.701	24.2	0.000	0.7580	0.0000
30	HRIS6	HR1F	KENT	1	440.6	429.4	10.48	6.81	27.50	100.00	2.07	299.7	0.367	25.5	0.000	0.7450	0.0000
31	HRIS7	HR1G	KENT	1	426.7	415.6	10.55	7.07	27.60	100.00	2.07	299.7	0.357	24.8	0.000	0.7520	0.0000
32	HRIS8	HR1H	KENT	1	426.7	415.6	10.65	11.65	26.90	100.00	2.07	299.7	0.359	24.9	0.000	0.7510	0.0000

OBS	RASH	RIOM	TOTSOL	DHY	DCIC4	DBY	DHW	DNAP	DMD	DMD	DSRC	D10M	DASH	PH2	X
17	0.00	0.0000	0.3500	0.0194	0.1386	0.0403	0.0749	0.1068	0.0466	0.1029	0.3431	0.0440	0.1131	13.8900	112.752
18	0.00	0.0000	0.4500	0.0205	0.1290	0.0423	0.0924	0.0910	0.0615	0.1049	0.3361	0.0444	0.1132	13.8900	112.765
19	0.00	0.0000	0.5000	0.0255	0.1386	0.0451	0.0855	0.1235	0.0524	0.1285	0.3310	0.0448	0.1132	13.8900	112.765
20	0.00	0.0000	0.3000	0.0240	0.1050	0.0360	0.0610	0.1060	0.1210	0.0320	0.4270	0.0410	0.0950	13.8900	110.497
21	0.00	0.0000	0.4500	0.0330	0.1050	0.0360	0.0680	0.1030	0.1050	0.0660	0.4140	0.0440	0.0970	13.8900	110.742
22	0.00	0.0000	0.3000	0.0410	0.0990	0.0230	0.0940	0.1070	0.1410	0.0410	0.3940	0.0430	0.0990	13.8900	110.988
23	0.00	0.0000	0.4500	0.0420	0.1040	0.0350	0.0840	0.0690	0.1130	0.1190	0.3710	0.0460	0.1010	13.8900	111.235
24	0.00	0.0000	0.4500	0.0420	0.0970	0.0350	0.0900	0.0910	0.0860	0.1000	0.3920	0.0470	0.1040	13.8900	111.607
25	0.00	0.0000	0.2440	0.0197	0.0579	0.0240	0.0238	0.0482	0.0742	0.1102	0.5429	0.0510	0.0876	10.4500	109.601
26	0.00	0.0000	0.2490	0.0182	0.0453	0.0241	0.0183	0.0347	0.0576	0.0708	0.6271	0.0562	0.0840	10.4500	109.170
27	0.00	0.0000	0.2480	0.0207	0.0462	0.0250	0.0392	0.0370	0.0730	0.0521	0.5807	0.0450	0.0786	17.1700	108.530
28	0.00	0.0000	0.2340	0.0249	0.0603	0.0307	0.0385	0.0530	0.0868	0.1079	0.5227	0.0447	0.0803	17.2400	108.731
29	0.00	0.0000	0.2420	0.0180	0.0291	0.0226	0.0240	0.0320	0.0609	0.0953	0.6164	0.0569	0.0827	10.4500	109.016
30	0.00	0.0000	0.2550	0.0197	0.0496	0.0247	0.0391	0.0420	0.0716	0.0921	0.5646	0.0515	0.0845	10.4800	109.230
31	0.00	0.0000	0.2460	0.0148	0.0338	0.0216	0.0393	0.0381	0.0349	0.0537	0.6572	0.0569	0.0796	10.5500	108.637
32	0.00	0.0000	0.2490	0.0163	0.0328	0.0215	0.0356	0.0350	0.0403	0.0660	0.6456	0.0571	0.0820	17.6500	108.932

OBS	SHY	SCIC4	SBY	SHW	SNAP	SMD	SHD	SSRC	SIOM	SUMIN	SUMOUT	L	V	DUM
17	2.18739	15.6275	4.54392	8.4451	12.0419	5.2543	11.6022	38.6853	4.9611	102.187	101.161	377.9	1.43335	1
18	2.31168	14.5467	4.76996	10.4195	10.2616	6.9350	11.8290	37.9003	5.0068	102.312	101.669	377.9	1.40495	1
19	2.98827	15.6292	5.08570	9.6414	13.9265	5.9089	14.4903	37.3252	5.0519	102.988	107.059	377.9	1.48504	1
20	2.65193	11.6022	3.97790	6.7403	11.7127	13.3702	3.5359	47.1823	4.5304	102.652	102.652	377.9	1.21656	1
21	4.20819	11.6279	3.98671	7.5395	11.4064	11.6279	7.3090	45.8472	4.8726	104.208	104.208	377.9	1.21687	1
22	4.55050	10.9878	2.55272	10.4329	11.8757	15.6493	4.5505	43.7292	4.7725	104.550	104.550	377.9	1.06152	1
23	4.67186	11.5684	2.89321	9.3437	7.6752	12.5695	13.2369	41.2681	5.1168	104.672	104.672	377.9	1.05566	1
24	4.68750	10.8259	3.90625	10.0446	10.1562	9.5982	11.1607	43.7500	5.2455	104.687	104.687	377.9	1.05430	1
25	2.15914	6.3459	2.63043	2.6085	5.2828	8.1324	12.0780	59.5024	5.5897	102.159	102.170	299.7	0.71427	1
26	1.98690	4.9454	2.63100	1.9978	3.7882	6.2882	7.7293	68.4607	6.1354	101.987	101.976	299.7	0.69337	1
27	2.24658	5.0141	2.71326	4.2544	4.0156	7.9227	5.6544	63.0237	4.8839	102.247	97.482	299.7	0.68663	1
28	2.70740	6.5565	3.33805	4.1861	5.7627	9.4379	11.7321	56.8338	4.8603	102.707	102.707	299.7	0.42680	1
29	1.96228	3.1724	2.46375	2.6164	3.4885	6.6390	10.3892	67.1972	6.2030	101.962	102.169	299.7	0.68651	1
30	2.15183	5.4178	2.64798	4.2709	4.5877	7.8209	10.0601	61.6712	5.6253	102.152	102.152	299.7	1.36415	1
31	1.60782	3.6719	2.34655	4.2694	4.1391	3.7914	5.8538	71.3960	6.1814	101.608	101.630	299.7	1.33326	1
32	1.77560	3.5730	2.34205	3.8730	3.8126	4.3900	7.1895	70.3268	6.2200	101.776	101.732	299.7	0.77551	1

STATISTICAL ANALYSIS SYSTEM

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OBS	CODI	RUN	COAL	MODE	TAVG	TPRH1	P101	PHYOUT	GASRT	PUR	DIA	LEN	SRT	CIN	RMD	RMD	RSRC
33	HRIS9	HR11	KENT	1	441.1	418.3	17.37	11.12	27.10	100.00	2.07	299.70	0.360	25.1	0.000	0.7490	0.0000
34	HRIS10	HR1J	KENT	1	440.6	433.9	6.89	5.03	37.60	100.00	2.07	299.70	0.721	25.1	0.000	0.7490	0.0000
35	PNN1	P99_15	KENT	2	460.0	391.0	13.80	8.76	91.01	85.21	15.20	304.80	1.060	33.2	0.224	0.2560	0.1230
36	PNN2	P99_16	KENT	2	460.0	390.0	15.17	9.36	71.13	85.84	15.20	304.80	1.000	29.6	0.205	0.2330	0.1690
37	PNN3	P99_17	KENT	2	465.0	389.0	13.76	8.00	64.16	84.52	15.20	304.80	1.040	32.8	0.218	0.2480	0.1230
38	PNN4	P99_18	KENT	2	460.0	389.0	15.19	9.11	75.30	83.97	15.20	304.80	1.330	32.7	0.226	0.2570	0.1210
39	PNN5	P99_20	KENT	2	460.0	403.0	13.80	7.83	57.74	83.97	15.20	304.80	0.660	29.8	0.184	0.2060	0.2050
40	PNN6	P99_21	KENT	2	460.0	380.0	17.24	10.62	73.04	84.69	15.20	304.80	0.660	29.6	0.182	0.2070	0.2070
41	PNN7	P99_22	KENT	2	460.0	380.0	17.24	11.13	97.97	85.28	15.20	304.80	1.220	29.6	0.211	0.2400	0.1350
42	PNN8	P99_23	KENT	2	460.0	386.0	13.80	8.98	84.55	85.31	15.20	304.80	1.210	29.7	0.202	0.2300	0.1420
43	FTLL1	77SR_1	KENT	2	461.0	427.0	13.24	10.22	72.63	93.95	61.00	914.40	0.997	26.1	0.025	0.3530	0.2240
44	FTLL2	77SH_2	KENT	2	459.0	429.0	13.24	10.13	78.69	90.54	61.00	914.40	0.984	24.2	0.027	0.3570	0.2230
45	FTLL3	77SH_3	KENT	2	459.0	430.0	13.18	10.11	87.83	92.20	61.00	914.40	0.823	24.6	0.061	0.2500	0.2780
46	FTLL4	77SR_4	KENT	2	461.0	429.0	13.20	9.35	86.20	90.40	61.00	914.40	0.799	29.9	0.062	0.2220	0.2630
47	FTLL5	77SR_5	KENT	2	458.0	429.0	13.28	9.82	87.65	91.80	61.00	914.40	0.780	30.6	0.109	0.3070	0.2020
48	FTLL6	77SR_6	KENT	2	459.0	428.0	13.24	9.69	80.20	90.98	61.00	914.40	0.956	33.5	0.129	0.2300	0.1980

OBS	RASH	R10M	TUTSOL	DHY	DC1C4	DBY	DHW	DNAP	DMD	DHD	DSRC	D10M	DASH	PH2	X
33	0.00	0.0000	0.2510	0.0149	0.0490	0.0247	0.0399	0.0441	0.0596	0.0948	0.5719	0.0519	0.0841	17.3700	109.182
34	0.00	0.0000	0.2510	0.0186	0.0732	0.0244	0.0450	0.0619	0.0445	0.0530	0.5776	0.0537	0.0851	6.8900	109.302
35	3.90	0.0280	0.3990	0.0493	0.1720	0.0404	0.0794	0.0572	0.1613	0.1214	0.2509	0.0679	0.0919	11.7590	110.120
36	5.90	0.0370	0.3920	0.0468	0.1536	0.0385	0.0790	0.1019	0.1620	0.1135	0.2484	0.0580	0.0919	13.0219	110.120
37	4.40	0.0390	0.4110	0.0476	0.1714	0.0423	0.0790	0.1051	0.1386	0.1035	0.2353	0.0804	0.0919	11.6300	110.120
38	4.10	0.0280	0.3960	0.0502	0.1986	0.0425	0.0839	0.0655	0.1422	0.1124	0.2501	0.0632	0.0919	12.7550	110.120
39	5.30	0.0530	0.4040	0.0401	0.1427	0.0409	0.0783	0.0497	0.1316	0.1197	0.2928	0.0926	0.0919	11.5879	110.120
40	7.40	0.0340	0.4040	0.0463	0.1474	0.0402	0.0843	0.0775	0.1477	0.1658	0.2494	0.0422	0.0919	14.6006	110.120
41	7.50	0.0430	0.4140	0.0589	0.2161	0.0463	0.0791	0.1005	0.1985	0.1029	0.1697	0.0539	0.0919	14.7023	110.120
42	6.80	0.0610	0.4260	0.0527	0.2110	0.0438	0.0755	0.0770	0.1749	0.1208	0.1742	0.0832	0.0924	11.7728	110.181
43	8.60	0.0510	0.4080	0.0410	0.1690	0.0600	0.0530	0.0840	0.2050	0.1020	0.2370	0.0520	0.0790	12.4860	108.578
44	10.30	0.0480	0.3930	0.0370	0.1650	0.0560	0.0480	0.0950	0.1830	0.1530	0.1870	0.0540	0.0960	12.0328	110.619
45	10.60	0.0590	0.4110	0.0410	0.1490	0.0680	0.0520	0.1400	0.1610	0.1120	0.2110	0.0540	0.0930	12.1520	110.284
46	9.20	0.0620	0.4530	0.0390	0.1540	0.0570	0.0820	0.0690	0.1820	0.0940	0.2610	0.0650	0.0940	11.9328	110.375
47	5.10	0.0250	0.3820	0.0330	0.1160	0.0440	0.0660	0.0830	0.1600	0.1160	0.3160	0.0480	0.0830	12.1910	109.051
48	6.00	0.0480	0.4430	0.0330	0.1300	0.0550	0.0480	0.1180	0.1700	0.0000	0.3440	0.0760	0.0914	12.0458	110.059

OBS	SHY	SC1C4	SBY	SHW	SNAP	SMD	SHD	SSRC	SIOM	SUMIN	SUMOUT	L	V	DUM
33	2.17273	5.3499	2.69680	4.3564	4.8149	6.5073	10.3505	62.4413	5.6666	102.173	102.184	299.70	0.81444	1
34	2.03301	8.0009	2.66696	4.9186	6.7658	4.8639	5.7930	63.1326	5.8695	102.033	102.011	299.70	1.42142	1
35	5.42842	18.9406	4.44385	8.7435	6.2989	17.7624	13.3686	27.6291	7.4772	105.429	104.669	304.80	1.61447	1
36	5.15362	16.9144	4.23962	6.6995	11.2212	17.6394	12.4986	27.3538	6.3870	105.154	105.154	304.80	1.08479	1
37	5.24171	18.8746	4.65808	8.6995	11.5736	15.2626	11.3974	25.9112	8.8537	105.242	105.231	304.80	1.15724	1
38	5.52803	21.8698	4.68010	9.2391	7.2129	15.6591	12.3775	27.5410	6.9596	105.528	105.539	304.80	0.95262	1
39	4.41581	15.7141	4.50391	8.6224	5.4730	14.4918	13.1814	32.2431	10.1971	104.416	104.427	304.80	1.47658	1
40	5.09856	16.2317	4.42683	9.2831	8.5343	16.2647	18.2579	27.4639	4.6471	105.099	105.110	304.80	1.48511	1
41	6.48607	23.7969	5.09856	8.7105	11.0671	21.8580	11.3314	18.6874	5.9355	106.486	106.486	304.80	1.07764	1
42	5.60652	23.2481	4.82591	6.3166	8.4839	19.2706	13.3098	19.1935	9.1670	105.807	105.818	304.80	1.17542	1
43	4.45168	16.3496	6.51466	5.7546	9.1205	22.2584	11.0749	25.7329	5.6460	104.452	104.452	914.40	3.35921	1
44	4.09292	16.2522	6.19469	5.3097	10.5088	20.2434	16.9248	20.6858	5.9735	104.093	104.093	914.40	3.40981	1
45	4.52040	16.4278	7.49724	5.7332	15.4355	17.7508	12.3484	23.2635	5.9537	104.520	104.410	914.40	4.66421	1
46	4.30464	16.9978	6.29139	9.0508	7.6154	20.0883	10.3753	28.8079	7.1744	104.305	106.402	914.40	5.73797	1
47	3.59869	12.6499	4.79826	7.1974	9.0513	17.4482	12.6499	34.4602	5.2345	103.599	103.490	914.40	6.05484	1
48	3.63196	14.3077	6.05327	5.2829	12.9870	18.7101	0.0000	37.4604	8.3645	103.632	103.566	914.40	4.97037	1

STATISTICAL ANALYSIS SYSTEM

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OBS	CODE	RUN	COAL	MODE	TAVG	TPRH	PTOT	PHYOUT	GASRT	PUR	DIA	LEN	SRT	CIN	RMD	RHD	RSRC
49	FTLL7	77SR_7	KENT	2	461	428.0	13.34	9.67	82.11	89.8	61.00	914.40	0.982	29.5	0.069	0.2650	0.2390
50	MERL1	GUR134	KENT	2	461	399.5	13.89	10.28	52.20	100.0	1.75	189.00	0.955	35.0	0.000	0.3270	0.1920
51	MERL2	GUR138	KENT	2	455	389.0	13.20	9.81	44.50	100.0	1.75	377.90	1.010	40.0	0.000	0.3470	0.1730
52	MERL3	GUR139	KENT	2	455	403.0	13.20	9.31	39.80	100.0	1.75	377.90	1.040	45.0	0.000	0.2430	0.2270
53	MERL4	GUR140	KENT	2	455	401.0	13.20	8.38	39.80	100.0	1.75	377.90	1.490	45.1	0.000	0.3260	0.1430
54	MERL5	GUR141	KENT	2	455	399.0	13.20	9.24	45.00	100.0	1.75	377.90	1.590	40.1	0.000	0.3086	0.1855
55	MERL6	GUR145	KENT	2	455	419.0	13.20	10.36	51.40	100.0	1.75	377.90	1.020	35.0	0.000	0.2898	0.2450
56	MERL7	GUR145	KENT	2	454	421.0	13.20	10.20	50.30	100.0	1.75	377.90	0.980	35.0	0.000	0.2985	0.2330
57	MERL8	GUR146	KENT	2	463	406.0	13.20	9.93	47.80	100.0	1.75	377.90	1.080	40.0	0.000	0.3844	0.1856
58	MERL9	GUR147	KENT	2	455	400.0	13.20	9.21	38.40	100.0	1.75	377.90	0.990	45.0	0.000	0.4311	0.0855
59	MERL10	GUR148	KENT	2	455	438.0	13.20	10.14	48.30	100.0	1.75	377.90	1.040	35.0	0.000	0.2650	0.2667
60	MERL11	GUR152	KENT	2	455	401.0	13.20	11.11	78.90	100.0	1.75	377.90	0.970	30.0	0.000	0.3000	0.2530
61	MERL12	GUR153	KENT	2	455	398.0	13.20	10.30	50.00	100.0	1.75	377.90	0.990	45.0	0.000	0.4280	0.0920
62	MERL13	GUR154	KENT	2	455	387.0	13.20	10.51	58.60	100.0	1.75	377.90	1.000	40.0	0.000	0.3250	0.1950
63	MERL14	GUR155	KENT	2	455	401.0	13.20	11.22	82.90	100.0	1.75	377.90	1.000	30.0	0.000	0.2420	0.3190
64	MERL15	GUR158	KENT	2	455	401.0	13.20	9.11	41.80	100.0	1.75	377.90	1.480	45.0	0.000	0.4498	0.0709

OBS	RASH	R10M	TOTSOL	DHY	DC1C4	DBY	DHW	DNAP	DMD	DHD	DSRC	D10M	DASH	PH2	X
49	8.20	0.0500	0.4270	0.0440	0.1670	0.0480	0.0550	0.1290	0.1780	0.0788	0.2370	0.0600	0.0912	11.9793	110.035
50	8.40	0.0470	0.4810	0.0472	0.1692	0.0422	0.0789	0.1000	0.1044	0.1945	0.2130	0.0520	0.0932	13.8900	110.278
51	5.50	0.0250	0.4500	0.0291	0.1054	0.0441	0.0673	0.1004	0.0726	0.1421	0.3370	0.0510	0.1090	13.2000	112.233
52	5.40	0.0260	0.4800	0.0332	0.1153	0.0383	0.0689	0.0822	0.0485	0.1184	0.4150	0.0480	0.0980	13.2000	110.866
53	5.00	0.0300	0.4800	0.0514	0.2106	0.0413	0.0973	0.0823	0.0564	0.1113	0.2900	0.0620	0.1000	13.2000	111.111
54	6.50	0.0399	0.5159	0.0452	0.1394	0.0267	0.0921	0.1069	0.0770	0.1697	0.2683	0.0577	0.0940	13.2000	110.375
55	6.76	0.0476	0.4652	0.0266	0.0843	0.0349	0.0825	0.0750	0.0714	0.1768	0.3420	0.0664	0.0943	13.2000	110.412
56	6.89	0.0496	0.4675	0.0303	0.1028	0.0436	0.0909	0.0791	0.0734	0.1592	0.3070	0.0652	0.0906	13.2000	109.963
57	5.25	0.0375	0.4900	0.0327	0.1180	0.0437	0.0765	0.0648	0.0663	0.1534	0.3340	0.0675	0.0945	13.2000	110.436
58	2.01	0.0133	0.4834	0.0325	0.1140	0.0375	0.0707	0.0778	0.0484	0.1249	0.4000	0.0530	0.0940	13.2000	110.375
59	7.10	0.0473	0.4683	0.0286	0.1051	0.0321	0.0776	0.0725	0.0651	0.1814	0.3340	0.0592	0.0889	13.2000	109.757
60	9.60	0.0510	0.4470	0.0373	0.1088	0.0559	0.0751	0.0885	0.1036	0.2094	0.2470	0.0493	0.0937	13.2000	110.339
61	2.00	0.0100	0.4800	0.0268	0.0817	0.0453	0.0690	0.0618	0.0598	0.1302	0.4160	0.0466	0.0928	13.2000	110.229
62	5.20	0.0280	0.4800	0.0322	0.0955	0.0454	0.0702	0.0761	0.0630	0.1612	0.3500	0.0508	0.0935	13.2000	110.314
63	9.50	0.0440	0.4390	0.0360	0.1000	0.0537	0.0660	0.0842	0.0803	0.1845	0.3111	0.0431	0.0929	13.2000	110.241
64	2.39	0.0104	0.4843	0.0410	0.1422	0.0383	0.0990	0.1009	0.0870	0.1477	0.2790	0.0410	0.0940	13.2000	110.375

OBS	SHY	SC1C4	SHY	SHW	SNAP	SMD	SHD	SSRC	STOM	SUMIN	SUMOUT	L	V	DUM
49	4.84155	18.3759	5.28169	6.0519	14.1945	19.5863	8.5827	26.0783	6.60211	104.842	104.754	914.40	4.34161	1
50	5.20512	18.6590	4.68373	8.7009	11.0278	11.5130	21.4491	23.4892	5.73445	105.205	105.227	189.00	0.66843	1
51	3.26599	11.8294	4.94949	7.5533	11.2682	8.1481	15.9484	37.8227	5.72391	103.266	103.244	377.90	1.28500	1
52	3.66071	12.7827	4.24612	7.6386	9.1131	5.3769	13.1264	46.0089	5.32152	103.681	103.614	377.90	1.25564	1
53	5.71111	23.4000	4.58889	10.8111	9.1444	6.2667	12.3667	32.2222	6.88889	105.711	105.689	377.90	0.87837	1
54	4.98896	15.3863	2.94702	10.1656	11.7991	8.4989	18.7307	29.6137	6.36865	104.989	103.510	377.90	0.82749	1
55	2.93695	9.3077	3.85337	9.1090	8.0601	7.8834	14.5208	37.7608	7.33135	102.937	102.827	377.90	1.28598	1
56	3.33187	11.3042	4.79437	9.9956	8.6980	8.0713	17.5060	33.7585	7.16950	103.332	101.298	377.90	1.30803	1
57	3.61126	13.0315	4.82506	8.4484	7.1563	7.3219	16.9409	36.8857	7.45445	103.611	102.065	377.90	1.30501	1
58	3.58720	12.5528	4.13907	7.8035	8.5672	5.3422	13.7859	44.1501	5.84989	103.587	102.241	377.90	1.27266	1
59	3.13906	11.5355	3.52321	8.5172	7.9574	7.1452	19.9100	36.6590	6.49764	103.139	101.745	377.90	1.18518	1
60	4.11563	12.0049	6.16794	8.2864	9.7650	11.4311	23.1049	27.2537	5.43970	104.116	103.454	377.90	1.77922	1
61	2.95414	9.0057	4.99339	7.6058	6.8122	6.5917	14.3519	45.8554	5.13668	102.954	100.353	377.90	1.65711	1
62	3.55212	10.5350	5.00327	7.7441	8.3949	6.9498	17.7827	38.6100	5.60397	103.552	100.629	377.90	1.70908	1
63	3.96869	11.0241	5.91996	7.2759	9.2823	8.8524	20.3395	34.2961	4.75141	103.969	101.742	377.90	1.81334	1
64	4.52539	15.6954	4.22737	10.9272	11.1369	9.6026	16.3074	30.7947	4.52539	104.525	103.212	377.90	0.92666	1

STATISTICAL ANALYSIS SYSTEM

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OBS	CODE	RUN	QUAL	MODE	TAVG	TPRNT	PTOT	PHYOUT	GASRT	PUN	DIA	LEN	SRT	CIN	RMD	RMD	RSRC	RASH
65	MERL16	GUR160	KENT	2	465	400	13.89	11.31	71.6	100	1.75	377.90	0.680	30	0.000	0.2512	0.262	10.77
66	MERL17	GUR176	KENT	2	455	406	13.89	10.00	50.0	100	1.75	377.90	1.020	30	0.000	0.2593	0.253	10.78
67	MERL18	GUR177	KENT	2	455	405	13.89	9.17	38.4	100	1.75	377.90	0.990	30	0.000	0.2460	0.263	10.25
68	MERL19	GUR178	KENT	2	455	400	14.48	11.03	60.1	100	1.75	377.90	1.030	30	0.000	0.3000	0.234	10.76
69	MERL20	GUR179	KENT	2	455	405	11.72	9.05	61.9	100	1.75	377.90	1.060	30	0.000	0.1780	0.338	11.02
70	MERL21	GUR180	KENT	2	455	409	13.89	10.70	60.8	100	1.75	377.90	1.040	30	0.000	0.1980	0.309	11.21
71	MERL22	GUR216	KENT	2	455	401	13.89	10.45	58.2	100	1.75	377.90	0.996	30	0.048	0.1910	0.271	12.70
72	MERL23	GUR219	KENT	2	455	400	13.89	10.42	58.2	100	1.75	377.90	0.998	30	0.325	0.3260	0.000	3.70
73	MERL24	GUR219	KENT	2	455	400	13.89	10.79	59.9	100	1.75	377.90	1.026	30	0.325	0.3260	0.003	3.20
74	MERL25	GUR219	KENT	2	455	400	13.89	10.70	59.0	100	1.75	377.90	1.010	30	0.300	0.3000	0.006	6.50
75	MERL26	GUR219	KENT	2	455	400	13.89	10.65	57.9	100	1.75	377.90	0.990	30	0.276	0.2760	0.000	11.00
76	MERL27	DOE237	KENT	2	454	391	13.89	10.63	54.6	100	2.80	157.00	1.070	30	0.000	0.2540	0.269	12.20
77	MERL28	DOE238	KENT	2	455	402	13.89	10.25	53.7	100	2.80	157.00	1.052	30	0.000	0.2430	0.298	10.60
78	MERL29	DOE266	KENT	2	463	402	13.89	10.14	25.6	100	1.75	83.82	0.133	30	0.350	0.2100	0.111	1.00
79	MERL30	DOE267	KENT	2	463	403	13.89	10.14	18.9	100	1.75	83.82	0.130	40	0.300	0.1460	0.122	1.90

OBS	R10M	TOTSUL	DBY	DC1C4	DBY	DMW	DNAP	DMD	DHD	DSRC	D10M	DASH	PM2	X	SMY
65	0.0789	0.4868	0.046	0.1686	0.044	0.0944	0.0924	0.0941	0.191	0.209	0.063	0.086	13.89	109.409	5.03282
66	0.0794	0.4872	0.052	0.1460	0.041	0.1040	0.1150	0.0840	0.190	0.214	0.067	0.091	13.89	110.011	5.72057
67	0.0883	0.4908	0.044	0.1410	0.039	0.0930	0.1030	0.0650	0.187	0.241	0.081	0.094	13.89	110.375	4.85651
68	0.0585	0.4661	0.057	0.1560	0.044	0.0950	0.1080	0.0890	0.221	0.200	0.050	0.082	14.48	108.932	6.20915
69	0.0734	0.4836	0.054	0.1440	0.045	0.0840	0.0810	0.0790	0.195	0.276	0.060	0.090	11.72	109.890	5.93407
70	0.0810	0.4931	0.052	0.1440	0.040	0.0820	0.1030	0.0850	0.195	0.248	0.065	0.090	13.89	109.890	5.71429
71	0.0650	0.4900	0.056	0.1610	0.044	0.1040	0.1000	0.1120	0.177	0.210	0.051	0.097	13.89	110.742	6.20155
72	0.0120	0.3490	0.043	0.1200	0.039	0.0620	0.1140	0.0980	0.115	0.364	0.029	0.102	13.89	111.359	4.78842
73	0.0150	0.3470	0.048	0.1320	0.046	0.0650	0.1230	0.0670	0.137	0.345	0.031	0.102	13.89	111.359	5.34521
74	0.0300	0.3950	0.050	0.1200	0.039	0.0730	0.1730	0.0270	0.178	0.316	0.022	0.102	13.89	111.359	6.66793
75	0.0380	0.4480	0.048	0.1270	0.039	0.0760	0.1480	0.0830	0.139	0.321	0.013	0.102	13.89	111.359	5.34521
76	0.0550	0.4770	0.041	0.1460	0.038	0.0890	0.0740	0.1220	0.199	0.225	0.046	0.102	13.89	111.359	4.56570
77	0.0530	0.4590	0.054	0.1260	0.036	0.0710	0.0690	0.1220	0.201	0.280	0.050	0.099	13.89	110.988	5.99334
78	0.0110	0.3290	0.022	0.0390	0.031	0.0620	0.0480	0.0810	0.020	0.586	0.057	0.098	13.89	110.865	2.43902
79	0.0130	0.4320	0.016	0.0350	0.029	0.0540	0.0420	0.0790	0.071	0.538	0.070	0.098	13.89	110.865	1.77384

OBS	SC1C4	SBY	SHW	SNAP	SMD	SHD	SSRC	SIOM	SUMIN	SUMOUT	L	V	DUM
65	18.4464	4.81400	10.3282	10.1094	10.2954	20.8972	22.8665	6.89278	105.033	104.650	377.90	2.21883	1
66	16.0616	4.51045	11.4411	12.6513	9.2409	20.9021	23.5424	7.37074	105.721	105.721	377.90	1.01898	1
67	15.5629	4.30464	10.2649	11.3687	7.1744	20.6402	26.6004	8.94040	104.857	104.857	377.90	0.80629	1
68	17.2113	4.79303	10.3486	11.7647	9.6950	24.0741	21.7865	5.44662	106.209	105.120	377.90	1.16350	1
69	15.8242	4.94505	9.2308	8.9011	8.0813	21.4286	30.3297	6.59341	105.934	105.934	377.90	1.43865	1
70	15.8242	4.39560	9.0110	11.3187	9.3407	21.4286	27.2527	7.14286	105.714	105.714	377.90	1.21525	1
71	17.8295	4.87265	11.5172	11.0742	12.4031	19.6013	23.2558	5.64784	106.202	106.202	377.90	1.21468	1
72	13.3630	4.34298	6.9042	12.6949	10.9131	12.8062	40.5345	3.22940	104.788	104.788	377.90	1.21224	1
73	14.6993	5.12249	7.2363	13.6971	7.4610	15.2561	38.4187	3.45212	105.345	105.345	377.90	1.21360	1
74	13.3630	4.34298	8.1292	19.2650	3.0067	19.8218	35.1893	2.44989	105.568	105.568	377.90	1.21430	1
75	14.1425	4.34298	8.4633	16.4811	9.2428	15.4788	35.7461	1.44766	105.345	105.345	377.90	1.21574	1
76	16.2584	4.23163	9.9109	8.2405	13.5857	22.1604	25.0557	5.12249	104.566	104.566	157.00	0.44008	1
77	13.9845	3.99556	7.8801	7.6582	13.5405	22.3085	31.0766	5.54939	105.993	105.993	157.00	0.44084	1
78	4.3237	3.43681	6.8736	5.3215	8.9000	2.2173	64.9667	6.31929	102.439	102.439	83.82	0.89722	1
79	3.8603	3.21508	5.9867	4.6563	8.7583	7.8714	59.6452	7.76053	101.774	101.774	83.82	0.90359	1

STATISTICAL ANALYSIS SYSTEM

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VARIABLE	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE	SUM	VARIANCE	UNCORRECTED SS	CORRECTED SS	STD ERROR OF MEAN
SHY	3.7233922	1.42288472	1.5929204	6.4860698	4.8931495	294.1480	2.024601	1253.1	157.9189	0.16008704
SC1C4	11.5896430	5.69911750	3.1724536	23.7969387	20.6245850	915.5818	32.479940	13144.7	2533.4353	0.64120081
SBY	4.0885416	1.12843455	2.2050717	7.4972437	5.2921720	322.9948	1.273365	1419.9	99.3224	0.12695881
SHW	7.5060991	2.17581830	1.9978166	11.5171650	9.5193484	592.9818	4.734185	4820.2	369.2665	0.24479868
SNAP	8.8955598	3.58228743	1.6910936	19.2650334	17.5739398	702.7492	12.832783	7252.3	1000.9571	0.40303882
SMD	9.6579247	5.28816903	-4.6052632	22.2584148	26.8636779	762.9761	27.964732	9550.0	2181.2491	0.59496550
SHD	11.0909697	7.45030030	-3.1903190	24.0740741	27.2643931	876.1866	55.506975	14047.3	4329.5440	0.83822427
SSRC	44.6567180	17.92470026	18.6873692	74.2006615	55.5132923	3527.8807	321.297030	182604.7	25061.1684	2.01669309
S10M	6.0784283	1.38832262	1.4476615	10.1971149	8.7494534	480.1958	1.927440	3069.2	150.3403	0.15619850
TAVG	453.0582278	9.57697034	412.8000000	465.0000000	52.2000000	35791.6000	91.718361	16222832.9	7154.0322	1.07749335
PH2	12.4386611	2.19239224	6.8900000	17.6500000	10.7600000	982.6542	4.806584	12597.8	374.9135	0.24666340
SRT	0.8121013	0.34029021	0.1300000	1.5900000	1.4600000	64.1560	0.115797	61.1	9.0322	0.03828564
CIN	33.9253165	6.62531022	23.4000000	50.0000000	26.6000000	2680.1000	43.894735	94347.0	3423.7894	0.74540564
RASH	4.0403797	4.23115958	0.0000000	12.7000000	12.7000000	319.1900	17.902711	2686.1	1396.4115	0.47604265
DUM	1.0000000	0.0000000	1.0000000	1.0000000	0.0000000	79.0000	0.000000	79.0	0.0000	0.00000000
SUMIN	103.7233922	1.42288472	101.5929204	106.4860698	4.8931495	8194.1480	2.024601	850082.7	157.9189	0.16008704
SUMOUT	103.5638841	1.83970223	97.4820925	107.5639600	10.0818675	8181.5468	3.384504	847576.8	263.9913	0.20698267
V	1.6558431	1.17233215	0.4267959	6.0548440	5.6280480	130.8116	1.374363	323.8	107.2003	0.13189767
VARIABLE	C.V.	SKEWNESS	T	PR> T						
SHY	38.215	0.16372468	23.26	0.0001						
SC1C4	49.174	0.10881695	18.07	0.0001						
SBY	27.600	0.37532906	32.20	0.0001						
SHW	28.987	-0.37084581	30.66	0.0001						
SNAP	40.271	0.30031153	22.07	0.0001						
SMD	54.755	0.46708204	16.23	0.0001						
SHD	67.174	-0.22671318	13.23	0.0001						
SSRC	40.139	0.33415329	22.14	0.0001						
S10M	22.840	-0.14301095	38.91	0.0001						
TAVG	2.114	-2.02834177	420.47	0.0001						
PH2	17.626	-0.21536428	50.43	0.0001						
SRT	41.902	-0.33156473	21.21	0.0001						
CIN	19.529	0.33731492	45.51	0.0001						
RASH	104.722	0.49780687	8.49	0.0001						
DUM	0.000	.	.	.						
SUMIN	1.372	0.16372468	647.92	0.0001						
SUMOUT	1.776	-0.29895046	500.35	0.0001						
V	70.800	2.03781534	12.55	0.0001						

STATISTICAL ANALYSIS SYSTEM

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UB5	MSHY	MSCICR	MSBY	MSHW	MSNAP	MSMD	MSHD	MSSRC	MSION
1	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843
UB5	MTAVG	MPH2	MSHT	MCIN	MRASH	DUM	MSMIN	MSMDUT	MV
1	453.058	12.4387	0.812101	33.9253	4.04036	1	103.723	103.564	1.65584

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODEL: PROCEDURE

DEPENDENT VARIABLE: SHY

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	21	126.65456662	6.03116984	11.00	0.0001	0.802023	19.8906
ERROR	57	81.26430592	0.54849660		STD DEV		SHY MEAN
CORRECTED TOTAL	78	157.91887254			0.74060556		3.72339224

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE IV SS	F VALUE	PR > F
VTAVG	1	38.66419474	70.49	0.0001	1	1.11377064	2.03	0.1596
VPH2	1	15.00200481	27.35	0.0001	1	0.38835750	0.71	0.4036
VSRT	1	39.73839437	72.45	0.0001	1	7.04650675	12.85	0.0007
VCIN	1	12.07046737	22.01	0.0001	1	2.36782051	4.32	0.0423
VRASH	1	4.29484855	16.95	0.0001	1	0.64986534	1.18	0.2810
VV	1	0.56135750	1.02	0.3160	1	0.71247761	1.30	0.2592
VTAVG2	1	0.10651819	0.19	0.6611	1	0.32248604	0.59	0.4464
VPH22	1	2.23413051	4.07	0.0483	1	1.26037591	2.30	0.1351
VSRT2	1	0.22331849	0.41	0.5260	1	0.06485339	0.12	0.7322
VCIN2	1	0.24642514	0.45	0.5054	1	0.05854221	0.11	0.7451
VRASH2	1	0.33070457	0.60	0.4407	1	0.37606928	0.69	0.4111
VTP	1	0.20632440	0.38	0.5421	1	0.01782501	0.03	0.8576
VT5	1	0.64679327	1.18	0.2821	1	0.06302380	0.11	0.7359
VTC	1	0.57137757	0.51	0.0134	1	0.30632095	0.56	0.4579
VTR	1	0.0025419	0.02	0.8971	1	0.02817588	0.05	0.8215
VPS	1	1.87649635	3.42	0.0696	1	0.47526483	0.87	0.3559
VPC	1	0.02044656	0.04	0.8476	1	0.13327196	0.24	0.6240
VPR	1	0.56567592	1.03	0.3141	1	0.38745726	0.71	0.4042
VSC	1	0.06359663	0.12	0.7347	1	0.30030401	0.55	0.4624
VSR	1	0.22470865	0.41	0.5247	1	0.02655429	0.05	0.8266
VCR	1	0.99752825	1.82	0.1828	1	0.99752825	1.82	0.1828

PARAMETER

ESTIMATE

1 FOR H0:
PARAMETER=0

PR > |T|

STD ERROR OF
ESTIMATE

INTERCEPT	2.38406478	11.22	0.0001	0.30158798
VTAVG	0.04246552	1.42	0.1596	0.02980344
VPH2	0.10242855	0.84	0.4036	0.12172647
VSRT	2.23575216	3.56	0.0007	0.62376886
VCIN	-0.05251971	-2.08	0.0423	0.02624014
VRASH	0.09170946	1.09	0.2810	0.08425376
VV	-0.11597502	-1.14	0.2592	0.11044370
VTAVG2	0.00117266	0.77	0.4464	0.00152934
VPH22	0.03411318	1.52	0.1351	0.02250397
VSRT2	0.47137589	0.34	0.7322	1.37084381
VCIN2	-0.00156707	-0.33	0.7451	0.00479669
VRASH2	-0.00965293	-0.03	0.9111	0.01161756
VTP	0.00123117	0.13	0.8976	0.00712354

MULTI-PLI RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SHY

$$\begin{aligned} \text{SHYMD} = & 3.38407 + (0.04247)(VTAVC) + (0.10243)(VPH2) \\ & + (2.23575)(VSR) - (0.08452)(VCMJ) \\ & + (0.09171)(VRASH) - (0.12593)(VV) \\ & + (0.00117)(VTAVC2) + (0.03411)(VPH22) \\ & + (0.47138)(VSR2) - (0.00157)(VCM2) \\ & - (0.00965)(VRASH2) + (0.00128)(VTP) \\ & + (0.02061)(VTS) - (0.00385)(VTC) \\ & + (0.00221)(VTR) + (0.24138)(VPS) \\ & - (0.00734)(VPC) + (0.02620)(VPR) \\ & + (0.06911)(VSC) - (0.06340)(VSR) \\ & - (0.01457)(VCR) \end{aligned}$$

PARAMETER

ESTIMATE

1 FLM H01
PARAMETER=0

PR > |T|

STD ERROR OF
ESTIMATE

VTS
VTC
VTR
VPS
VPC
VPR
VSC
VSR
VCR

0.02069075
-0.00385466
0.00221310
0.24138454
-0.00784498
0.02619728
0.06919353
-0.06340414
-0.01456523

0.34
-0.75
0.23
0.93
-0.49
0.64
0.74
-0.22
-1.35

0.7359
0.4574
0.8215
0.3559
0.6240
0.4042
0.4624
0.8266
0.1828

0.06103950
0.00515804
0.00976448
0.25931556
0.01591510
0.03116960
0.09351298
0.28816236
0.01080045

OBSERVATION

OBSERVED
VALUE

PREDICTED
VALUE

RESIDUAL

LOWER 95% CL
FOR MEAN

UPPER 95% CL
FOR MEAN

72
1
2
3
4
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6
7
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32
33

2.75633958
2.97356628
2.30263158
2.20507166
2.20507166
2.22469410
2.10643016
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2.32558140
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2.98827244
2.65193370
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4.67185762
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2.24658129
2.10740459
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2.15182960
1.60782184
1.77559913
2.17272628

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2.33411054
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2.22141087
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2.34184248
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2.40662663
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3.80654800
3.42564550
3.09230457
3.58721623
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3.70064316
3.74623074
3.58995432
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2.51927755
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1.71298159
1.49383173
1.84301979
2.05947904

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-0.03147896
-0.02136273
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-0.09816279
-0.11498071
0.43172386
0.14750585
0.78995593
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-0.53800933
-0.39252503
-0.44074516
-0.47078592
-0.80048683
-1.61915370
-1.11396305
-0.10403213
-0.93528253
0.83254224
0.84985624
0.92662688
1.09754568
0.13475238
0.17087956
-0.27269626
-0.06544119
0.09064077
0.43884801
0.11399011
-0.06742066
0.11324724

1.84527983
2.18908976
1.57002879
1.59081251
1.68625475
1.48270925
1.78095579
1.68374560
1.61219125
2.21939459
2.12245818
1.88673154
1.89769022
1.89781998
1.79112775
1.82465254
3.02004290
2.64046201
2.11259534
2.77876972
2.72915081
2.86580761
3.05359020
2.90517419
1.12667047
0.98305918
1.33539041
1.65582166
0.52707962
0.80617587
0.44246568
0.59290989
1.00862537

2.97985575
4.39916374
3.09819229
2.86205629
2.59955231
3.16300454
2.66186594
2.76254119
2.74395984
4.31794270
3.22446634
2.79695341
2.94598443
2.94406638
3.02212551
2.96216182
4.59305310
4.21082900
4.07201380
4.39566274
4.02215452
4.53547871
4.43687127
4.27473446
2.92210623
2.64898082
3.70316469
3.89086989
3.21620006
2.61978730
2.54519778
3.09312969
3.11033271

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

14:02 FRIDAY, MAY 18, 1979 10

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SHY

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL FOR MEAN	UPPER 95% CL FOR MEAN
34	2.03308907	2.81756438	-0.78455530	1.46440182	4.17072693
35	5.42891752	4.28864482	1.14027270	3.74205734	4.83523229
36	5.15361744	4.94894001	0.20467743	4.46752217	5.43035786
37	5.24171347	4.71472206	0.52699141	4.491835796	5.51108616
38	5.52802555	5.32313438	0.20489117	4.52249634	6.12377242
39	4.41581324	3.87197742	0.54383581	3.06973855	4.67421629
40	5.09855743	4.85286920	0.24568823	4.05268718	5.65285122
41	6.48606982	6.37235289	0.11371693	5.42618606	7.31851971
42	5.80652270	5.14536269	0.66116001	4.44963871	5.84108667
43	4.45168295	5.29082549	-0.83914254	4.59655531	5.98509567
44	4.09292035	5.30868254	-1.21576218	4.50300567	6.11435940
45	4.52039691	4.96275938	-0.44236246	4.15441389	5.77110486
46	4.30463576	4.05375159	0.25088418	3.27444270	4.83306047
47	3.54869138	3.34413557	0.25455582	2.49200111	4.19627003
48	3.63196326	3.72775284	-0.09579158	3.04766443	4.40785124
49	4.84154930	4.55414088	0.28740842	3.96328099	5.14500077
50	5.20511689	4.81365996	0.39145693	4.08237833	5.54494160
51	3.26599327	3.73615934	-0.47016607	3.23352607	4.23879260
52	3.68070953	3.33649125	0.34421828	2.33420839	4.33877412
53	5.71111111	5.02632287	0.68478824	4.15782461	5.89482112
54	4.98896247	5.61067322	-0.62171074	4.61580346	6.60554297
55	2.93695184	4.25503704	-1.31808220	3.80594382	4.70413026
56	3.33186717	4.10291081	-0.77104364	3.60459816	4.60123346
57	3.61126449	4.28544853	-0.67418404	3.51266500	5.05823207
58	3.58719647	3.33783208	0.24936438	2.84293765	3.83272652
59	3.13906267	4.32928753	-1.19022486	3.68503261	4.77354246
60	4.11563500	4.76350461	-0.64786961	4.34433453	5.18267468
61	2.95414462	3.28961290	-0.33546828	2.79083206	3.78839373
62	3.55212356	3.65600226	-0.10387871	3.16836104	4.14364348
63	3.96859143	4.81368332	-0.84499189	4.42079886	5.20656779
64	4.52538631	5.20073454	-0.67534823	4.19355704	6.20791205
65	5.03282276	5.37030144	-0.33747868	4.19787713	6.54272576
66	5.72857206	5.31042083	0.41015122	4.88339599	5.73744568
67	4.85651214	5.24480734	-0.38829520	4.81377971	5.67583497
68	6.20915033	5.59782275	0.61132758	5.01275465	6.18289085
69	5.93406593	4.47824555	1.45582038	3.46982763	5.48666347
70	5.71428571	5.34664005	0.36764567	4.87321139	5.82006870
71	6.20155039	5.29441764	0.90713275	4.54282750	6.04600777
72	4.78841871	4.40669293	0.38172578	3.89574509	4.91764076
73	5.34521158	4.36381466	0.96139690	3.87358495	4.89404442
74	5.56792873	4.88007015	0.68785858	4.32625700	5.43388330
75	5.34521158	5.23286920	0.11234238	4.77607052	5.68966787
76	4.56570156	5.44845720	-0.88275564	4.79466365	6.10225075
77	5.99334073	5.44305340	0.55028734	4.99511814	5.89098866
78	2.43902439	2.53469834	-0.09567395	1.32846574	3.74093094
79	1.77383592	1.32110322	0.45273270	0.00196209	2.63024436

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SHY

SUM OF RESIDUALS	0.00000000
SUM OF SQUARED RESIDUALS	31.26430592
SUM OF SQUARED RESIDUALS - ERROR SS	-0.00000000
FIRST ORDER AUTOCORRELATION	0.40191011
DURBIN-WATSON D	1.18999873

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SC1C4

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	21	2331.33676719	111.01603653	31.31	0.0001	0.920227	16.2470
ERROR	57	202.09857781	3.54558908			STD DEV	SC1C4 MEAN
CORRECTED TOTAL	78	2533.43534500			1.88297347		11.58964300

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE IV SS	F VALUE	PR > F
VTAVG	1	938.15501492	264.60	0.0001	1	136.94839638	52.73	0.0001
VPH2	1	258.54694254	72.92	0.0001	1	0.01370039	0.00	0.9507
VSRT	1	755.03737901	212.95	0.0001	1	128.40068670	36.21	0.0001
VCIN	1	180.10899173	50.88	0.0001	1	35.04703056	9.88	0.0026
VRASH	1	14.79113135	4.17	0.0457	1	1.34381655	0.38	0.5406
VV	1	1.64136425	0.46	0.4990	1	0.58775727	0.17	0.6854
VTAVG2	1	40.53555089	11.43	0.0013	1	18.92686521	5.34	0.0245
VPH22	1	18.07603494	5.10	0.0278	1	2.19448361	0.62	0.4347
VSRT2	1	0.64101658	0.18	0.6723	1	1.28671975	0.36	0.5493
VCIN2	1	24.26678802	6.84	0.0114	1	18.89531308	5.33	0.0246
VRASH2	1	0.11707060	0.03	0.8565	1	0.87784879	0.25	0.6207
VTP	1	1.07804721	0.30	0.5835	1	2.68422374	0.76	0.3879
VTS	1	72.97079998	20.58	0.0001	1	38.61095911	10.89	0.0017
VTC	1	8.31220251	2.34	0.1313	1	3.24063461	0.91	0.3431
VTR	1	2.80630066	0.79	0.3774	1	0.66889390	0.19	0.6657
VPS	1	6.15499340	1.74	0.1929	1	0.28004177	0.08	0.7797
VPC	1	0.02673291	0.01	0.9311	1	0.05558381	0.02	0.9008
VPR	1	6.54346785	1.85	0.1797	1	7.20756943	2.03	0.1594
VSC	1	0.08488574	0.02	0.8776	1	0.99346514	0.28	0.5986
VSR	1	0.35456554	0.10	0.7530	1	0.76228688	0.21	0.6446
VCR	1	1.08748657	0.31	0.5819	1	1.08748657	0.31	0.5819

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > T	STD ERROR OF ESTIMATE
INTERCEPT	0.40791362	10.97	0.0001	0.76678086
VTAVG	0.55022499	7.26	0.0001	0.07577460
VPH2	0.01923852	0.06	0.9507	0.30949197
VSRT	9.54377447	6.02	0.0001	1.58591871
VCIN	-0.20975134	-3.14	0.0026	0.06671498
VRASH	0.13187302	0.62	0.5406	0.21421340
VV	-0.11432810	-0.41	0.6854	0.28080069
VTAVG2	0.00858372	2.31	0.0245	0.00388831
VPH22	0.04501304	0.79	0.4347	0.05721585
VSRT2	2.09963107	0.60	0.5493	3.48534046
VCIN2	0.02815345	2.31	0.0246	0.01219548
VRASH2	0.01474791	0.50	0.6207	0.02963909
VTP	-0.01575861	-0.87	0.3879	0.01811143

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

$$\begin{aligned} \text{SCIC4MD} = & 8.46791 + (0.55022)(VTAH) + (0.01924)(VPH22) \\ & + (9.54378)(VSRT) - (0.20975)(VCIN) \\ & + (0.13188)(URASH) - (0.11433)(VV) \\ & + (0.00898)(VTAH2) + (0.04501)(VPH22) \\ & + (2.09963)(VSRT2) + (0.02815)(VCIN2) \\ & + (0.01475)(URASH2) - (0.01576)(VTP) \\ & + (0.51213)(VTS) - (0.01259)(VTC) \\ & + (0.01078)(VTR) + (0.18529)(VPS) \\ & - (0.00507)(VPC) + (0.11299)(VPR) \\ & - (0.12585)(VSC) - (0.39771)(VSP) \\ & + (0.01521)(VCR) \end{aligned}$$

DEPENDENT VARIABLE: SCIC4

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > T	STD ERROR OF ESTIMATE
VTS	0.51212890	3.30	0.0017	0.15519159
VTC	-0.01253755	-0.96	0.3431	0.01311420
VTR	0.01078303	0.43	0.6657	0.02483599
VPS	0.18529044	0.28	0.7797	0.65930415
VPC	-0.00506636	-0.13	0.9008	0.04046378
VPR	0.11298965	1.43	0.1594	0.07924802
VSC	-0.12585232	-0.53	0.5986	0.23775470
VSR	-0.33971092	-0.46	0.6446	0.73264652
VCR	0.01520781	0.58	0.5819	0.02745991

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL FOR MEAN	UPPER 95% CL FOR MEAN
1	5.95369350	5.01110837	0.94258512	3.56879111	6.45342564
2	6.05726872	6.94809244	-0.89082372	4.13856002	9.75762486
3	8.66228070	7.49471818	1.16756252	5.55205701	9.43737936
4	4.07938258	3.33793166	0.74145092	1.72187688	4.95398644
5	3.19735391	3.97279947	-0.77544556	2.81177992	5.13381903
6	6.56284761	7.27515609	-0.71230848	5.13909904	9.41121314
7	4.10199557	4.33872041	-0.23672485	3.21887300	5.45856782
8	4.09292035	3.70599304	0.38692731	2.33458593	5.07740016
9	6.53377630	5.73844127	0.79533503	4.29969280	7.17718974
10	5.18602029	6.00663975	-0.82061946	3.33888337	8.67439614
11	6.08793687	5.54688099	0.54105588	4.14596514	6.94779683
12	3.26944758	4.34674394	-1.07729636	3.18963432	5.50385356
13	3.83314543	4.85083785	-1.01769242	3.51820527	6.18347043
14	4.84048405	4.90379741	-0.06331337	3.57376811	6.23382672
15	3.05044248	3.75040078	-0.69995830	2.18550831	5.31529325
16	5.19911504	3.93264407	1.26647098	2.48659781	6.37869033
17	15.62746646	13.85071917	1.77674729	11.85104713	15.85039121
18	14.54668471	13.95700699	0.58967771	11.96069509	15.95331890
19	15.62922869	14.75434739	0.87488129	12.26345807	17.24523672
20	11.60220994	13.03054061	-1.42833067	10.97508301	15.00599821
21	11.62790698	11.19930277	0.42860420	9.55558592	12.84301963
22	10.98779134	13.12843460	-2.14064326	11.00588345	15.25096576
23	11.56840934	11.80431443	-0.23590509	10.04583347	13.56279540
24	10.82589286	11.33072221	-0.50482935	9.58968366	13.07176075
25	6.34590092	7.13195837	-0.78605745	4.84953025	9.41438649
26	4.94541485	3.19559466	1.74982019	1.07780996	5.31337936
27	5.01410896	4.14347316	0.87063580	1.13346595	7.15348037
28	6.55648581	6.89405941	-0.33757360	4.05277874	9.73534008
29	3.17235365	3.47786096	-0.30550732	0.05934596	6.89637597
30	5.41700448	4.84643119	0.57057329	2.54089746	7.15196492
31	3.67191744	4.20451787	-0.53260043	1.53144263	6.87759311
32	3.57792475	4.85727485	-1.28935010	1.67889771	8.03565198
33	5.34492903	4.13635792	1.20857111	1.46458540	6.80813045

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SC1C4

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL FOR MEAN	UPPER 95% CL FOR MEAN
34	8.00087441	8.50400858	-0.50313416	5.06362232	11.94439483
35	18.94064530	16.33778746	2.60285785	14.94610073	17.72747418
36	16.91443674	17.48649937	-0.57206264	16.26250502	18.71049373
37	18.7457328	20.62308193	-1.74850864	18.59634359	22.64782027
38	21.86983812	20.58480698	1.28503115	18.54920224	22.62041171
39	15.71412840	12.62581393	3.08831447	10.58613912	14.86548874
40	16.23164254	14.09987971	2.13181284	12.06594288	16.13381654
41	23.79693866	21.76811722	2.02882145	19.36250872	24.17372572
42	23.24812693	20.16943620	3.07869073	18.40057316	21.93829924
43	18.34961998	20.55694075	-2.20732077	18.79177397	22.32210753
44	18.25221239	19.88783323	-1.63562084	17.83941738	21.93624907
45	16.42778390	17.66341074	-1.23562684	15.60821000	19.71861148
46	16.99779249	15.37740340	1.62038910	13.39602756	17.35877923
47	12.64994547	11.81508172	0.83486376	9.64854845	13.98161499
48	14.30772617	13.87383904	0.43388714	12.14470369	15.60297438
49	18.37588028	17.88257749	0.49330280	16.38032912	19.38482585
50	18.65902073	16.40055977	1.75846097	15.04129217	18.75982736
51	11.82940516	11.62455906	0.20484610	10.34662496	12.90249317
52	12.78270510	13.09204293	-0.30933783	10.54376062	15.64032524
53	23.40000000	17.40894101	5.49105899	15.70080316	20.11707887
54	15.38631347	18.45755686	-3.07124340	15.92812222	20.98699150
55	9.30771779	12.24056491	-2.93284713	11.09875521	13.38237462
56	11.30415659	11.19074174	0.11341485	9.92376728	12.45771620
57	13.03147432	18.03269091	-5.00121659	16.06790564	19.99747618
58	12.58278146	11.46410512	1.11867633	10.20584682	12.72236343
59	11.53550653	12.55221063	-1.01670410	11.42270218	13.68171908
60	12.00485490	13.85157054	-1.84671563	12.78583977	14.91730131
61	9.00573192	11.41728384	-2.41155192	10.14914446	12.68542322
62	10.53502482	11.38197964	-0.84695482	10.14216248	12.62179679
63	11.02414287	14.12020783	-3.09606496	13.12130764	15.11910802
64	15.69536424	17.30961941	-1.61425517	14.74899259	19.87034623
65	18.44638950	19.21165793	-0.76526843	16.23079472	22.19252114
66	16.06160616	15.40983749	0.65176867	14.32413615	16.49553884
67	15.56291391	14.93405120	0.62886271	13.83817286	16.02992954
68	17.21132898	16.05430426	1.15702471	14.56678139	17.54182714
69	15.82417582	13.94959694	1.87457889	11.38571639	16.51347748
70	15.82417582	15.75140330	0.07277252	14.54772128	16.95508532
71	17.82945736	15.96118531	1.86827206	14.05028379	17.87208682
72	13.36302695	13.12991562	0.23311313	11.83084209	14.42898954
73	14.69933165	13.38941928	1.30991257	12.09217131	14.68666724
74	13.36302695	13.69552379	-0.33249684	12.48746595	15.30358164
75	14.14253898	15.18040882	-1.03786984	14.01900815	16.34180948
76	16.25835189	15.70567274	0.55267910	14.04341697	17.36792861
77	13.98446171	15.72747997	-1.74301826	14.58861435	16.86634559
78	4.32372506	5.82269553	-1.49897048	2.75587547	8.88951559
79	3.88026608	5.55367055	-0.32659553	0.22520779	6.88213331

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SCIC4

SUM OF RESIDUALS	0.00000000
SUM OF SQUARED RESIDUALS	202.09857781
SUM OF SQUARED RESIDUALS - ERROR SS	-0.00000000
FIRST ORDER AUTOCORRELATION	0.09553612
DURBIN-WATSON D	1.79649426

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SBY

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	21	81.60395513	3.88590263	12.50	0.0001	0.821606	13.6366
ERROR	57	17.71847868	0.31085050		STD DEV		SBY MEAN
CORRECTED TOTAL	78	99.32243381			0.55753969		4.08854157

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE IV SS	F VALUE	PR > F
VTAVG	1	36.81394408	118.43	0.0001	1	0.68724054	2.21	0.1426
VPH2	1	4.53767746	14.60	0.0003	1	0.44839341	1.44	0.2347
VSRT	1	8.40266202	27.03	0.0001	1	0.00001554	0.00	0.9944
VCIN	1	6.23850792	20.07	0.0001	1	0.62307232	2.00	0.1623
VRASH	1	5.25683233	16.92	0.0001	1	3.22784372	10.38	0.0021
VV	1	9.20150603	29.60	0.0001	1	0.84688602	2.72	0.1043
VTAVG2	1	0.79741757	2.57	0.1148	1	0.06754445	0.22	0.6429
VPH22	1	0.47786676	1.54	0.2201	1	0.01453334	0.05	0.8296
VSRT2	1	2.64781826	8.65	0.0047	1	0.49319665	1.59	0.2129
VCIN2	1	3.16418411	10.18	0.0023	1	0.78991371	2.54	0.1164
VRASH2	1	0.56449040	1.82	0.1831	1	1.12057297	3.60	0.0627
VTP	1	0.32932300	1.06	0.3077	1	0.16425035	0.53	0.4703
VT5	1	0.29111941	0.94	0.3373	1	0.22383422	0.72	0.3997
VTC	1	0.46506595	1.50	0.2263	1	0.01688251	0.05	0.8166
VTR	1	0.62162830	2.00	0.1628	1	0.24850338	0.80	0.3750
VPS	1	0.02090807	0.07	0.7963	1	0.11858091	0.38	0.5393
VPC	1	0.16596439	0.53	0.4680	1	0.26594485	0.86	0.3589
VPR	1	0.79855874	2.57	0.1145	1	0.80278064	2.58	0.1136
VSC	1	0.03782583	0.12	0.7285	1	0.00007898	0.00	0.9873
VSR	1	0.28467421	0.92	0.3426	1	0.10024458	0.32	0.5723
VCR	1	0.44397979	1.43	0.2370	1	0.44397979	1.43	0.2370

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > T	STD ERROR OF ESTIMATE
INTERCEPT	4.34928918	19.16	0.0001	0.22704025
VTAVG	0.03336560	1.49	0.1426	0.02243651
VPH2	-0.11006134	-1.20	0.2347	0.09163913
VSRT	-0.00332508	-0.01	0.9944	0.46958316
VCIN	-0.02796716	-1.42	0.1623	0.01975399
VRASH	0.20438554	3.22	0.0021	0.06342759
VV	0.13723549	1.65	0.1043	0.08314378
VTAVG2	0.00053666	0.47	0.6429	0.00115131
VPH22	-0.00366315	-0.22	0.8296	0.01694135
VSRT2	-1.29990336	-1.26	0.2129	1.03199310
VCIN2	0.00575631	1.59	0.1164	0.00361102
VRASH2	-0.01666252	-1.90	0.0627	0.00877600
VTP	0.00389818	0.73	0.4703	0.00536271

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

$$\begin{aligned} \text{SBYMD} = & 4.34929 + (0.03336)(VTAVC) - (0.11006)(UPH2) \\ & - (0.00332)(VSRT) - (0.02797)(VCIN) \\ & + (0.20439)(VRASH) + (0.13724)(VV) \\ & + (0.00054)(VTAU2) - (0.00366)(UPH2Z) \\ & - (1.29990)(VSRT2) + (0.00576)(VCN2) \\ & - (0.0666)(VRASH2) + (0.00210)(VTP) \\ & + (0.03899)(VTS) + (0.00090)(VTC) \\ & - (0.00657)(VTR) + (0.12057)(VPS) \\ & - (0.01108)(VPC) - (0.03771)(VPR) \\ & + (0.00112)(VSC) - (0.12319)(USR) \\ & - (0.00972)(VCR) \end{aligned}$$

DEPENDENT VARIABLE: SHY

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > T	STD ERROR OF ESTIMATE
VTS	0.03899305	0.85	0.3997	0.04595151
VTC	0.00090493	0.23	0.8166	0.00388305
VTR	-0.00657247	-0.89	0.3750	0.00735086
VPS	0.12047271	0.62	0.5393	0.19521689
VPC	-0.01108200	-0.92	0.3589	0.01198114
VPR	-0.03770880	-1.61	0.1136	0.02346497
VSC	0.00112216	0.02	0.9873	0.07039806
USR	-0.12319150	-0.57	0.5723	0.21693323
VCR	-0.00971710	-1.20	0.2370	0.00813075

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL FOR MEAN	UPPER 95% CL FOR MEAN
1	3.63836825	3.11140082	0.52696742	2.68433739	3.53846426
2	2.86343612	3.12764990	-0.26421378	2.29576042	3.95953939
3	4.27631579	3.40655836	0.86975743	2.83134542	3.98177130
4	2.31532525	2.92860917	-0.61328392	2.45010286	3.40711547
5	2.20507166	2.99106506	-0.78599339	2.64729256	3.33483755
6	2.78086763	3.38023009	-0.59936246	2.74775353	4.01270665
7	3.10421286	3.02666752	0.07754534	2.69508591	3.35824913
8	2.43362832	3.02801462	-0.59438630	2.62194735	3.43408109
9	2.65780731	3.35161628	-0.69380897	2.92560955	3.77762301
10	3.15670800	3.33067989	-0.17397188	2.54076963	4.12059015
11	3.15670800	3.29412829	-0.13742028	2.87932362	3.70893295
12	3.38218715	2.93804745	0.44413970	2.59543267	3.28066222
13	3.49492672	2.91640248	0.57852424	2.52181617	3.31098879
14	3.41034103	2.94911457	0.46122646	2.55529908	3.34293006
15	3.09734513	2.80953641	0.28780872	2.34617903	3.27284379
16	3.76106195	2.87099290	0.89006905	2.44282532	3.29916047
17	4.54391701	3.89488779	0.64902923	3.30279419	4.48698138
18	4.76995940	4.05828101	0.07167839	4.10718234	5.28937968
19	5.08570140	5.31391598	-0.22821458	4.57637523	6.05145672
20	3.97790055	3.03267462	0.34522593	3.02406318	4.24128606
21	3.98671096	4.22643524	-0.23972427	3.73973832	4.71313215
22	2.55271920	3.55355392	-1.00083472	2.92507640	4.18203145
23	3.89321468	4.13441662	-0.24120214	3.61373879	4.65509486
24	3.90625000	4.13012258	-0.22387258	3.61460917	4.64563600
25	2.63042525	2.79305655	-0.16263129	2.11724019	3.46887290
26	2.63100437	2.46529826	0.16570610	1.83823206	3.09230446
27	2.71326243	2.57020948	0.14305294	1.67896034	3.46145862
28	3.33804501	3.39551678	-0.05747176	2.55422678	4.23680677
29	2.46375232	2.49548806	-0.03173575	1.48328167	3.50769446
30	2.69797925	2.62003196	0.07794729	1.93737414	3.30268977
31	2.34655079	2.58866343	-0.24200835	1.79514917	3.37811946
32	2.34204743	2.30786351	0.03418402	1.36676122	3.24896660
33	2.69680096	2.76959284	-0.07279188	1.97849342	3.56069226

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SUY

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL FOR MEAN	UPPER 95% CL FOR MEAN
34	2.66095814	2.43391303	0.23304511	1.41523066	3.45259540
35	4.44884925	4.61203097	-0.16318173	4.20055120	5.02351075
36	4.23962119	4.95662791	-0.71700672	4.59420887	5.31904694
37	4.65807730	4.88452675	-0.22644945	4.28501115	5.48404236
38	4.68010131	4.33756090	0.34254041	3.73482780	4.94029399
39	4.50390926	5.03224397	-0.52833470	4.42830574	5.63618219
40	4.42682524	4.65779558	-0.43097034	4.25555634	5.46003481
41	5.09855743	4.65893238	0.43962504	3.94664289	5.37122187
42	4.82591450	4.98297098	-0.15705648	4.45921886	5.50672310
43	6.51465798	5.99117729	0.52348069	5.46851961	6.51383496
44	6.19469027	6.48964517	-0.29495490	5.88311876	7.09617158
45	7.49724366	6.71147512	0.78576854	6.10293973	7.32001050
46	6.29139073	6.04858003	0.24281070	5.46190386	6.63525620
47	4.79825518	5.49130283	-0.69304765	4.84980210	6.13280326
48	6.05326877	5.32517019	0.72809858	4.81318125	5.83715912
49	5.28165014	5.74727810	-0.46562796	5.30246934	6.19208685
50	4.65372739	4.38543614	0.26829125	3.83491556	4.93595663
51	4.94949495	4.35048046	0.59901449	3.97209012	4.72887081
52	4.24611973	4.58226981	-0.33615008	3.82773527	5.33680435
53	4.58888889	4.03997599	0.54891289	3.38615664	4.69379535
54	2.94701987	3.49093009	-0.54391022	2.74197626	4.23988392
55	3.85337308	4.45457444	-0.60120136	4.11648989	4.79265898
56	4.79436991	4.46232833	0.33204158	4.08718388	4.83747358
57	4.82606295	4.70921651	0.11684644	4.12745273	5.29098029
58	4.13907285	4.45944732	-0.32037447	4.08688289	4.83201175
59	3.52321370	4.43557391	-0.91236021	4.10113171	4.77001611
60	6.16793556	5.06503398	1.10290158	4.74947606	5.38059191
61	4.99338624	4.51119524	0.48219100	4.13570507	4.88668541
62	5.00827356	4.40265233	0.60562125	4.03554824	4.76975642
63	5.91996472	5.04104737	0.87891735	4.74527767	5.33681707
64	4.22737307	4.09539432	0.13197875	3.33717502	4.85361362
65	4.81140038	5.00504272	-0.19103835	4.12242299	5.88766246
66	4.51045105	4.67151739	-0.16106635	4.35004627	4.99298851
67	4.30463576	4.70819196	-0.40355620	4.38370748	5.03267644
68	4.79302032	4.50511224	0.28791609	4.06466363	4.94556084
69	4.94505495	5.30184153	-0.35678659	4.54268842	6.06099464
70	4.39560340	4.63891482	-0.24331042	4.28251017	4.99531946
71	4.87264673	4.52462123	0.34802551	3.95881217	5.09043028
72	4.34298441	4.39988868	-0.05700427	4.01533899	4.78463837
73	5.12244443	4.30941857	0.81307586	3.92530948	4.69352766
74	4.34298441	4.72068500	-0.37770059	4.30376562	5.13760438
75	4.34298441	4.71465243	-0.37166802	4.37076710	5.05853777
76	4.23162584	4.38990808	-0.15828284	3.89772245	4.68209489
77	3.94556049	4.56845528	-0.57289479	4.23124245	4.90566809
78	3.43680710	3.22321054	0.21359655	2.31513933	4.13128170
79	3.21507761	3.21774134	-0.00266378	2.23219901	4.20328373

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SUB

SUM OF RESIDUALS	0.00000000
SUM OF SQUARED RESIDUALS	17.71847868
SUM OF SQUARED RESIDUALS - ERROR SS	-0.00000000
FIRST ORDER AUTOCORRELATION	0.04974926
DURBIN-WATSON D	1.88561127

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SHW

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	21	311.03844436	14.81135449	14.50	0.0001	0.842314	13.4652
ERROR	57	58.22800590	1.02154396		STD DEV		SHW MEAN
CORRECTED TOTAL	78	369.26645026			1.01071458		7.50609907

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE IV SS	F VALUE	PR > F
VTAVG	1	155.01142774	151.74	0.0001	1	1.28239144	1.26	0.2672
VPH2	1	16.31494605	15.97	0.0002	1	0.00107271	0.00	0.9743
VSRT	1	34.05928331	33.34	0.0001	1	1.41732988	1.39	0.2437
VCIN	1	14.41761512	14.11	0.0004	1	7.79607943	7.63	0.0077
VRASH	1	18.00288294	17.62	0.0001	1	13.72462051	13.44	0.0005
VV	1	14.23644808	13.94	0.0004	1	11.20758608	10.97	0.0016
VTAVG2	1	0.09635605	0.09	0.7599	1	1.86312678	1.82	0.1822
VPH22	1	5.25918423	5.15	0.0271	1	7.01972122	6.87	0.0112
VSRT2	1	0.23801475	0.23	0.6312	1	4.59471858	4.50	0.0383
VCIN2	1	4.42637914	4.33	0.0419	1	3.77006977	3.69	0.0597
VRASH2	1	11.29037135	11.05	0.0016	1	4.29336803	4.20	0.0450
VTP	1	1.43445807	1.40	0.2409	1	0.00224463	0.00	0.9628
VT5	1	2.04134630	2.00	0.1629	1	6.46704010	6.33	0.0147
VTC	1	0.01457523	0.01	0.9053	1	0.01291883	0.01	0.9109
VTR	1	1.61843619	1.58	0.2133	1	6.89800592	6.75	0.0119
VPS	1	3.32963965	3.26	0.0763	1	7.81434809	7.65	0.0076
VPC	1	2.30378182	2.26	0.1387	1	0.01160918	0.01	0.9155
VPR	1	0.05356761	0.05	0.8197	1	0.38119304	0.37	0.5437
VSC	1	12.83944542	12.57	0.0008	1	1.98338513	1.94	0.1689
VSR	1	14.03597159	13.74	0.0005	1	12.59961281	12.33	0.0009
VCR	1	0.01431373	0.01	0.9062	1	0.01431373	0.01	0.9062

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > T	STD ERROR OF ESTIMATE
INTERCEPT	7.52343835	18.28	0.0001	0.41158126
VTAVG	0.04557112	1.12	0.2672	0.04067316
VPH2	-0.00538326	-0.03	0.9743	0.16612451
VSRT	-1.00270272	-1.18	0.2437	0.85126593
VCIN	0.09092755	2.76	0.0077	0.03581028
VRASH	0.42145635	3.67	0.0005	0.11498229
VV	-0.49924073	-3.31	0.0016	0.15072403
VTAVG2	0.00281863	1.35	0.1822	0.00208711
VPH22	0.08050671	2.62	0.0112	0.03071147
VSRT2	3.96762361	2.12	0.0383	1.87080938
VCIN2	-0.01257562	-1.92	0.0597	0.00654611
VRASH2	0.03261518	2.05	0.0450	0.01590923
VTP	-0.00045570	-0.05	0.9628	0.00972159

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTION TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODEL: PROCEDURE

$$\begin{aligned} \text{SHWMD} = & 7.52344 + (0.04557)(V_{TAVG}) - (0.00538)(V_{PH2}) \\ & - (1.00270)(V_{SRT}) + (0.09893)(V_{CIN}) \\ & + (0.42146)(V_{RA3H}) - (0.49924)(V_U) \\ & + (0.00282)(V_{TAVG2}) + (0.08051)(V_{PH22}) \\ & + (3.96762)(V_{SRT2}) - (0.01258)(V_{CIN2}) \\ & + (0.03262)(V_{RA3H2}) - (0.00046)(V_{TP}) \\ & + (0.20959)(V_{TS}) - (0.00079)(V_{TC}) \\ & - (0.03463)(V_{TR}) + (0.97871)(V_{PS}) \\ & - (0.00232)(V_{PC}) - (0.02598)(V_{PR}) \\ & + (0.17782)(V_{SC}) - (1.38111)(V_{SR}) \\ & - (0.00174)(V_{CE}) \end{aligned}$$

DEPENDENT VARIABLE: SHW

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	F > T	STD ERROR OF ESTIMATE
VTS	0.20959300	2.52	0.0147	0.06330144
VTC	-0.00079161	-0.11	0.9104	0.00703925
VTR	-0.03462773	-2.60	0.0119	0.01332572
VPS	0.97878654	2.77	0.0076	0.35369151
VPC	-0.00231538	-0.11	0.9155	0.02171955
VPH	-0.02598964	-0.61	0.5437	0.04253758
VSC	0.17782021	1.39	0.1689	0.12761844
VSR	-1.38111196	-3.51	0.0004	0.39325913
VCH	-0.00174474	-0.12	0.9062	0.01473952

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL FOR MEAN	UPPER 95% CL FOR MEAN
1	5.40242553	5.00455044	-0.20212486	4.83036476	6.37873612
2	5.03700441	5.00177572	-0.00477131	4.39371656	7.40983487
3	7.89473684	6.98756660	0.90717024	5.94481374	8.03031946
4	5.29217200	5.51571953	-0.22354754	4.64827761	6.38316146
5	6.17420065	6.21332163	-0.03912097	5.59012676	6.83651649
6	6.00667408	7.42246682	-1.41579274	6.27590579	8.56902785
7	6.09756098	6.50401754	-0.40645661	5.90292249	7.10511268
8	5.53097345	5.63843537	-0.10746192	4.90231179	6.37455895
9	5.53709856	6.54298467	-1.00588611	5.77071460	7.31525474
10	7.10254301	7.21007597	-0.10748296	6.37811725	9.24203468
11	7.69177001	6.78962380	1.10194621	6.03786096	7.54178663
12	7.21533258	6.34830617	0.86702641	5.72721002	6.96940231
13	9.58286359	7.27473078	2.30813280	6.55942002	7.99004154
14	7.26072607	7.22779525	0.03293082	6.51386114	7.94170866
15	5.19465027	6.23412742	-0.03943716	5.39414764	7.07410720
16	5.19911504	6.72424414	-1.03012910	5.45305687	7.00543141
17	8.04514601	9.86328704	-1.41814103	8.78493353	10.93664215
18	10.41945579	9.91233591	0.50711989	8.84078520	10.98388661
19	9.64140731	8.31274515	1.32866216	6.97572251	9.64976779
20	6.74033140	7.45066109	-1.21033040	6.84736364	9.05395995
21	7.53045404	8.70534598	-1.17489194	7.62305602	9.58763594
22	10.43285239	8.13967006	2.29318233	7.05035852	9.32898160
23	9.34271524	9.49365056	-0.15093532	8.53975922	10.42754190
24	10.04464286	9.06940237	0.97524049	8.13487351	10.00393123
25	2.00505050	3.05887875	-0.45027371	1.83375083	4.28400668
26	1.99781659	2.37506666	-0.25464526	1.12075579	3.39426193
27	4.25439549	4.07154368	0.18285180	2.45587664	5.66721073
28	4.18614766	4.26187445	-0.17572679	2.83677394	5.88697496
29	2.51637414	2.33356294	0.28281120	0.49841314	4.16429274
30	4.27085022	4.27521147	-0.00436125	3.01458449	5.48964491
31	4.26961375	4.29477196	-0.02515821	2.81290616	5.68253355
32	3.87799964	4.12432200	-0.24632236	2.52327985	5.93536416
33	4.55037073	4.93536582	-0.41499496	2.50425136	5.37246026

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SHW

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL FOR MEAN	UPPER 95% CL FOR MEAN
34	4.91857034	4.86757890	0.05099143	3.02689938	6.71425843
35	8.74353045	8.14341239	0.60011806	7.39347695	8.88934782
36	8.69948244	7.79014444	0.90933799	7.13314690	8.44714199
37	8.69948244	8.88531255	-0.18583012	7.79850353	9.97212158
38	9.23907059	9.51341745	-0.27434686	8.42077572	10.60605918
39	8.62239841	8.36567373	0.25672468	7.27084733	9.46050013
40	9.28311860	9.13789459	0.14522401	8.04614813	10.22964104
41	8.71049444	8.36578185	0.34471258	7.07453499	9.65702872
42	8.31864257	7.18050023	1.13814235	6.23103615	8.12996430
43	5.75461455	5.96573122	-0.21111667	5.01825117	6.91321128
44	5.30973451	6.02739791	-0.71766340	4.92787963	7.12691620
45	5.73319633	7.27948301	-1.54629668	6.17632283	8.38264319
46	9.05077263	7.29812967	1.75264355	6.23459553	8.36166262
47	7.19738277	6.56283320	0.63454957	4.39991359	6.72575280
48	5.25285274	6.44264954	-1.15979680	5.51450991	7.37078917
49	6.05193662	6.37856662	-0.32663001	5.57221202	7.18492123
50	8.7092633	9.42528479	-0.72435845	8.42729469	10.42327488
51	7.55331089	8.50839333	-0.95508245	7.82244281	9.19434385
52	7.63858093	8.13062766	-0.49204673	6.76279847	9.49845686
53	10.81111111	10.25634331	0.55476780	9.07109181	11.44159481
54	10.16556291	9.91118148	0.25438144	8.55346905	11.26889390
55	9.10897648	8.54441326	0.56456322	7.93152958	9.15729694
56	9.99560150	8.65807227	1.33752923	7.97860450	9.33814004
57	8.44837107	9.26790617	-0.81953510	8.21327786	10.32253448
58	7.80353201	7.66842962	0.13510239	7.19364038	8.54381885
59	8.51717704	8.63114755	-0.11397052	8.02486676	9.23742835
60	8.28543937	8.73912038	-0.45268101	8.16707322	9.31116754
61	7.60582011	7.67713038	-0.07131028	6.99643733	8.35782344
62	7.74407060	8.24430540	-0.50023480	7.57881473	8.90979607
63	7.27593430	8.47231988	-1.19638558	7.93614504	9.00849471
64	10.92715232	11.82135883	-0.89420651	10.44684986	13.19586780
65	10.32822757	10.13681001	0.19141756	8.53678646	11.73683357
66	11.44114411	9.46155594	1.97958817	8.87875927	10.04432261
67	10.26490066	9.53226031	0.73264035	8.94403098	10.12048964
68	10.34858388	9.49563541	0.85294847	8.69719493	10.29408588
69	9.23076923	8.79285603	0.43791320	7.41665424	10.16905782
70	9.01098901	9.41329207	-0.40230306	8.76719748	10.05938666
71	11.51716501	10.64440777	0.87275724	9.61870236	11.67011315
72	6.90423163	7.58343238	-0.67920075	6.88613485	8.28072991
73	7.23530735	7.64916971	-0.41386236	6.95285218	8.34548724
74	8.12917595	7.94146580	0.18771015	7.18566939	8.69726221
75	8.46325167	9.70822769	-1.24497602	9.08482826	10.33162712
76	9.91291314	10.19966895	-0.28675581	9.30742792	11.09190998
77	7.88313319	9.43659942	-1.55346623	8.82524602	10.04790282
78	6.87361419	6.81460637	0.05900782	5.16844417	8.46076857
79	5.98669623	6.32857521	-0.34187898	4.54197232	8.11517810

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MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SHV

SUM OF RESIDUALS	0.00000000
SUM OF SQUARED RESIDUALS	58.22800590
SUM OF SQUARED RESIDUALS - ERROR SS	-0.00000000
FIRST ORDER AUTOCORRELATION	0.11619657
DUNBIN-WATSON D	1.76521275

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

14:02 FRIDAY, MAY 18, 1979 24

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SNAP

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	21	481.55204700	22.93104986	2.52	0.0031	0.481092	33.9346
ERROR	57	519.40504630	9.11236923		STD DEV		SNAP MEAN
CORRECTED TOTAL	78	1000.95709330			3.01867011		8.89555982

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE IV SS	F VALUE	PR > F
VTAVG	1	240.06867589	26.35	0.0001	1	2.41935509	0.27	0.6084
VPH2	1	42.45936719	4.66	0.0351	1	7.98523705	0.88	0.3532
VSRT	1	92.66470437	10.17	0.0023	1	32.89609877	3.61	0.0625
VCIN	1	6.70340413	0.74	0.3947	1	25.48541497	2.80	0.0999
VRASH	1	0.51350685	0.06	0.8132	1	7.68792299	0.84	0.3622
VV	1	0.50862988	0.06	0.8141	1	2.79779174	0.31	0.5817
VTAVG2	1	3.81031104	0.42	0.5205	1	0.01993119	0.00	0.9629
VPH22	1	9.98086031	1.10	0.2997	1	13.44526512	1.48	0.2295
VSRT2	1	18.01267898	1.98	0.1652	1	5.94202968	0.65	0.4227
VCIN2	1	0.18954985	0.02	0.8858	1	0.27797376	0.03	0.8620
VRASH2	1	19.98118832	2.19	0.1442	1	0.06744098	0.01	0.9317
VTP	1	0.27607475	0.03	0.8624	1	2.20638149	0.24	0.6246
VT5	1	1.15951694	0.13	0.7226	1	0.30379457	0.03	0.8558
VTC	1	1.20133622	0.13	0.7179	1	0.00707640	0.00	0.9779
VTR	1	10.29524129	1.13	0.2923	1	2.86796006	0.31	0.5770
VPS	1	6.52125945	0.72	0.4011	1	0.28303421	0.03	0.8607
VPC	1	0.42488468	0.05	0.8298	1	0.57663067	0.06	0.8023
VPR	1	19.44289303	2.13	0.1496	1	17.41546993	1.91	0.1722
VSC	1	0.39299728	0.04	0.8362	1	0.76170728	0.08	0.7735
VSR	1	0.01776349	0.00	0.9649	1	0.40730084	0.04	0.8333
VCR	1	6.92700304	0.76	0.3869	1	6.92700304	0.76	0.3869

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > T	STD ERROR OF ESTIMATE
INTERCEPT	9.23596343	7.51	0.0001	1.22925708
VTAVG	0.06259350	0.52	0.6084	0.12147729
VPH2	0.46446083	0.94	0.3532	0.49615896
VSRT	4.83068724	1.90	0.0625	2.54244974
VCIN	-0.17866484	-1.67	0.0999	0.10695345
VRASH	-0.31543286	-0.92	0.3622	0.34341407
VV	0.24943745	0.55	0.5817	0.45016282
VTAVG2	0.00629153	0.05	0.9629	0.00623351
VPH22	-0.11141838	-1.21	0.2295	0.09172501
VSRT2	-4.51199298	-0.81	0.4227	5.58748875
VCIN2	0.00341473	0.17	0.8620	0.01955106
VRASH2	-0.00408773	-0.09	0.9317	0.04751562
VTP	-0.01426726	-0.49	0.6246	0.02903516

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

$$\begin{aligned} \text{SNAPMD} = & 9.23596 + (0.06259)(V_{TAV}) + (0.46446)(V_{PH2}) \\ & + (4.83069)(V_{SRT}) - (0.17886)(V_{CIN}) \\ & - (0.31543)(V_{RASH}) + (0.24994)(V_U) \\ & + (0.00029)(V_{TAVC2}) - (0.11142)(V_{PH22}) \\ & (-4.51199)(V_{SRT2}) + (0.00341)(V_{CIN2}) \\ & - (0.00409)(V_{RASH2}) - (0.01429)(V_{UP}) \\ & - (0.04543)(V_{TS}) - (0.00039)(V_{TC}) \\ & - (0.02233)(V_{TR}) - (0.18628)(V_{PS}) \\ & - (0.01632)(V_{PC}) + (0.17564)(V_{PR}) \\ & + (0.11020)(V_{SC}) + (0.24852)(V_{JR}) \\ & - (0.03838)(V_{CR}) \end{aligned}$$

DEPENDENT VARIABLE: SNAP

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > T	STD ERROR OF ESTIMATE
VTS	-0.04542699	-0.18	0.8558	0.24879385
VTC	-0.00058587	-0.03	0.9779	0.02102390
VTR	-0.02232795	-0.56	0.5770	0.03979953
VPS	-0.18627779	-0.18	0.8607	1.05695687
VPC	-0.01631816	-0.25	0.8023	0.06486911
VPR	0.17563531	1.38	0.1722	0.12704568
VSC	0.11019933	0.29	0.7735	0.38115407
VSR	0.24831785	0.21	0.8333	1.17453494
VCR	-0.03838199	-0.87	0.3869	0.04402207

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL FOR MEAN	UPPER 95% CL FOR MEAN
1	7.27673649	8.36063779	-1.08390129	6.04840126	10.67287431
2	11.23348018	10.02671396	1.20676622	5.52264013	14.53078779
3	16.66666667	9.17706706	7.48960961	6.06260920	12.29141492
4	4.74090408	5.80981423	-1.06891015	3.21875215	8.40027631
5	2.86659316	6.76532931	-3.39873615	4.40405241	8.12660622
6	4.00444939	8.55420253	-4.54975314	5.12980401	11.97860106
7	4.10199557	6.34181919	-2.23982363	4.54654699	8.13709139
8	5.64159292	6.16456518	-0.52297226	3.96600756	8.36312280
9	5.53709856	7.61874115	-2.28164259	5.51222592	10.12525639
10	1.69109357	4.78877628	-3.09768270	0.51198927	9.06556328
11	6.31341601	6.58174100	-0.26832499	4.33587676	8.82760625
12	13.41600902	6.69610334	6.71990568	4.84109460	8.55111207
13	10.82299887	6.76288505	4.56011383	4.12648843	8.39928166
14	10.56105611	6.32045915	4.24059696	4.18823595	8.45268235
15	5.97345133	5.69280459	0.28064674	3.18376286	8.20124632
16	4.20353982	5.95700325	-1.75346342	3.63878863	8.27521786
17	12.04194385	11.14916218	0.89278167	7.94340792	14.35491645
18	10.26161479	11.37002375	-1.10840896	8.16965627	14.57039124
19	13.92647722	11.46012643	2.46635079	7.46688208	15.45337077
20	11.71270718	10.75086769	0.96183949	7.45568138	14.04605401
21	11.40642303	10.70115098	0.70527205	8.06604273	13.33625924
22	11.87569367	10.65539346	1.22030022	7.25264678	14.05814014
23	7.67519466	10.78295679	-3.10776213	7.96386559	13.60204798
24	10.15625000	10.68597111	-0.52972111	7.89484256	13.47709967
25	5.28277071	7.82044409	-2.53767338	4.16139225	11.47949594
26	3.78820961	5.27247807	-1.48426847	1.87737269	8.66758346
27	4.01567639	5.14761044	-1.13193405	0.32214744	9.97307344
28	5.76274872	6.34422164	-0.58147292	1.78925091	10.89919236
29	3.48849886	2.82189406	0.65960477	-2.65146410	8.30425227
30	4.58765702	5.73014528	-1.14248826	2.03405191	9.42623865
31	4.13905406	3.04793993	1.09111444	-1.23737395	7.33325380
32	3.81263617	2.86830159	0.94433457	-2.22908197	7.96168516
33	4.61493613	4.45325193	0.36168419	0.17002650	8.73647737

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SNAP

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL FOR MEAN	UPPER 95% CL FOR MEAN
34	6.76516675	4.63836150	2.12740525	-0.87705937	10.15378237
35	6.29866576	10.42469636	-4.12583110	8.19683447	12.65255925
36	11.22123114	10.88971270	0.33151844	8.92747837	12.85194702
37	11.57361524	10.31272373	1.26089152	7.06670468	13.55866277
38	7.21286202	10.86268690	-3.64982488	7.59532750	14.12604631
39	5.47256553	8.62232799	-3.14936246	5.35244369	11.89221230
40	8.53430239	10.34109828	-1.80679589	7.08641277	13.60178378
41	11.06706310	12.15959360	-1.09253050	8.30306636	16.01612085
42	8.48391362	10.07455504	-1.59064203	7.23882053	12.91029076
43	9.12052117	11.64001056	-2.51948939	8.81020106	14.46982006
44	10.50884956	11.58703354	-1.07818398	8.30313614	14.87093094
45	15.43550165	11.16293290	4.27256875	7.86615836	14.45770745
46	7.61589404	8.94038039	-1.32448635	5.76395751	12.11680327
47	9.05125409	10.65678744	-1.60553335	7.18353126	14.13004362
48	12.95701299	9.99367359	2.99333940	7.22162753	12.76571964
49	14.19454225	10.06937192	4.12517033	7.66105746	12.47768638
50	11.02779003	8.94629070	2.08149933	5.96562443	11.92695697
51	11.26823793	8.75150711	2.51673083	6.70279982	10.80021440
52	9.11308204	8.09215966	1.02092238	4.00690633	12.17741299
53	9.14444444	9.11899580	0.02544865	5.57904165	12.65894995
54	11.77911700	9.05362672	2.74549028	4.99858884	13.10866460
55	8.06006404	9.50335720	-1.44329316	7.67287637	11.33383803
56	8.69804267	9.34806673	-0.65002606	7.31693127	11.37920618
57	7.15626726	9.20385819	-2.04759093	6.05403230	12.35368407
58	8.58719647	9.92493910	-1.33774264	7.90777487	11.94210334
59	7.95741411	9.46743680	-1.51002268	7.65667661	11.27819699
60	9.76497848	10.68883142	-0.92385294	8.98031578	12.39734706
61	6.81216931	10.02672841	-3.21455910	7.99372342	12.05973340
62	8.39492554	8.94505310	-0.55012757	6.95745262	10.93265359
63	9.28232830	10.82427356	-1.54194526	9.22289670	12.42565042
64	11.13685534	10.39565511	0.74121023	6.29045149	14.50085873
65	10.18940919	9.08634997	1.02305922	4.30750888	13.86509105
66	12.65125513	11.57336326	1.07790187	9.83253200	13.31389453
67	11.36865342	11.38098680	-0.01233337	9.62414037	13.13783322
68	11.76473588	12.38464360	-0.61993792	9.99993637	14.76935124
69	8.90103890	8.36739227	0.53370663	4.25713277	12.47765176
70	11.31865132	11.71725768	-0.39857636	9.78758688	13.64692849
71	11.07413712	11.58412175	-0.50992463	8.52067906	14.64756443
72	12.69487751	11.06214858	1.63272893	8.97955151	13.14474564
73	13.69713468	11.07035980	2.62674487	8.99068969	13.15002992
74	19.26503341	11.33366572	7.93136769	9.07635185	13.59097959
75	16.48105904	11.51095955	4.97010949	9.64907167	13.37284743
76	8.24053452	11.82932149	-3.58878697	9.16449267	14.49415030
77	7.65815760	11.53795959	-3.87980239	9.71219895	13.36372103
78	5.32155776	6.87699219	-1.55548443	1.96045024	11.79353414
79	4.65631929	4.88196116	-0.22566187	-0.45401067	10.21797299

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SNAP

SUM OF RESIDUALS	0.00000000
SUM OF SQUARED RESIDUALS	519.40504630
SUM OF SQUARED RESIDUALS - ERROR SS	-0.00000000
FIRST ORDER AUTOCORRELATION	0.38093587
DURBIN-WATSON D	1.23666776

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SMU

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	21	1945.12706687	75.95843176	7.39	0.0001	0.731291	33.2027
ERROR	57	586.12200268	10.28284215		STD DEV		SMO MEAN
CORRECTED TOTAL	76	2181.24906955			3.20668710		9.65792470

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE IV SS	F VALUE	PR > F
VTAVG	1	303.68776238	29.53	0.0001	1	38.37287612	3.73	0.0584
VPH2	1	97.17421888	9.45	0.0032	1	16.03768111	1.56	0.2168
VSRT	1	162.97746615	15.85	0.0002	1	110.10677735	10.71	0.0018
VCIN	1	515.42161953	50.12	0.0001	1	97.11062916	9.44	0.0032
VRASH	1	9.88580640	0.96	0.3310	1	33.00337891	3.21	0.0785
VV	1	201.52321794	19.60	0.0001	1	82.82551036	8.05	0.0063
VTAVG2	1	14.11622414	1.37	0.2462	1	4.43903334	0.43	0.5138
VPH22	1	19.94480916	1.94	0.1691	1	3.29235865	0.32	0.5737
VSRT2	1	0.08476361	0.01	0.9280	1	2.02872512	0.20	0.6586
VCIN2	1	2.85025729	0.28	0.6006	1	2.84325775	0.28	0.6010
VRASH2	1	0.08147416	0.01	0.9294	1	0.28091006	0.03	0.8693
VTP	1	1.37199022	0.13	0.7163	1	0.15957393	0.02	0.9013
VT5	1	19.52205577	1.90	0.1736	1	0.41220018	0.04	0.8420
VTC	1	144.12861889	14.50	0.0003	1	28.70214310	2.79	0.1003
VTR	1	24.13979058	2.35	0.1310	1	34.28931849	3.33	0.0731
VPS	1	8.71115363	0.85	0.3612	1	10.17266009	0.99	0.3241
VPC	1	0.93100616	0.09	0.7646	1	5.83260521	0.57	0.4545
VPR	1	0.78560954	0.08	0.7832	1	0.00125075	0.00	0.9912
VSC	1	58.63833488	5.70	0.0203	1	20.38424517	1.98	0.1646
VSR	1	1.44470452	0.14	0.7092	1	2.65222849	0.26	0.6138
VCR	1	2.70618305	0.26	0.6099	1	2.70618305	0.26	0.6099

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > T	STD ERROR OF ESTIMATE
INTERCEPT	8.17896367	6.26	0.0001	1.30582100
VTAVG	0.24928240	1.93	0.0584	0.12904347
VPH2	0.65822742	1.25	0.2168	0.52706208
VSRT	8.83779143	3.27	0.0018	2.70080548
VCIN	-0.34915038	-3.07	0.0032	0.11361501
VRASH	-0.65355423	-1.79	0.0785	0.36480351
VV	1.35717555	2.84	0.0063	0.47620108
VTAVG2	0.00435072	0.66	0.5138	0.00662176
VPH22	-0.05513479	-0.57	0.5737	0.09743808
VSRT2	2.63640794	0.44	0.6586	5.93550386
VCIN2	0.01092101	0.53	0.6010	0.02076879
VRASH2	-0.00834260	-0.17	0.8693	0.05047511
VTP	0.00384229	0.12	0.9013	0.03084361

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

$$\begin{aligned} \text{SMBMD} = & 8.17896 + (0.24928)(\text{VTAUG}) + (0.65823)(\text{VPH2}) \\ & + (8.83779)(\text{VSRT}) - (0.34915)(\text{VCIN}) \\ & - (0.65355)(\text{VRASH}) + (1.35718)(\text{VV}) \\ & + (0.00435)(\text{VTAUG}^2) - (0.06513)(\text{VPH2}^2) \\ & + (2.63641)(\text{VSRT}^2) + (0.01092)(\text{VCIN}^2) \\ & - (0.00834)(\text{VRASH}^2) + (0.00384)(\text{VTP}) \\ & + (0.05291)(\text{VTS}) - (0.03731)(\text{VTC}) \\ & + (0.07720)(\text{VTR}) - (1.11676)(\text{VPS}) \\ & + (0.05189)(\text{VPC}) + (0.00149)(\text{VPR}) \\ & - (0.57008)(\text{VSC}) + (0.63366)(\text{VSR}) \\ & - (0.02399)(\text{VCR}) \end{aligned}$$

DEPENDENT VARIABLE: SMH

PARAMETER	ESTIMATE	T FOR HO: PARAMETER=0	PR > T	STD ERROR OF ESTIMATE
VTS	0.05291491	0.20	0.8420	0.26420991
VTC	-0.03731234	-1.67	0.1003	0.02233337
VTR	0.07720434	1.63	0.0731	0.04227843
VPS	-1.11675750	-0.99	0.3241	1.12278912
VPC	0.05189515	0.75	0.4545	0.06890946
VPR	0.00148843	0.01	0.9912	0.13495868
VSC	-0.57007530	-1.41	0.1646	0.40489414
VSR	0.63365922	0.51	0.6135	1.24769051
VCR	-0.02349014	-0.51	0.6099	0.04676398

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL FOR MEAN	UPPER 95% CL FOR MEAN
1	6.82028666	7.53088894	1.28939771	5.07463544	9.98714244
2	11.45374449	10.14239610	1.31134840	5.35778933	14.92700686
3	-4.60526316	4.13743969	-8.74270285	0.82910496	7.44577442
4	6.39470783	6.13652705	-1.74181926	5.38440014	10.88865404
5	7.60749724	5.56449415	2.04300309	3.58728816	7.54170015
6	5.56173526	2.38684457	3.17484029	-1.25084122	6.02453116
7	6.65188470	4.72084665	1.93103765	2.81375665	6.62793706
8	5.75221239	7.40291464	-1.65070245	5.06742070	9.73840898
9	5.64784053	3.96489572	1.68294481	1.51471986	6.41507159
10	7.10259301	4.02250013	3.08009288	-0.52066530	8.56566557
11	3.15670800	4.78186916	-1.62516116	2.39612192	7.16761641
12	5.18602029	4.68575638	0.50026391	2.91520897	6.85630379
13	0.22547914	2.40647442	-2.18094528	0.13701297	4.67593587
14	0.00000000	2.47196403	-2.47196403	0.20693593	4.73699214
15	3.87160142	5.43603147	-2.06435005	3.27103349	8.60102945
16	7.63274336	5.70764264	1.92510073	3.24503870	8.17024658
17	5.25425640	11.49144279	-6.23718639	8.08601905	14.89686652
18	6.93504736	6.95382339	-0.01877603	3.55412195	10.35352484
19	5.90886586	6.81633495	-0.90744907	2.57437254	11.05829736
20	13.37016575	13.31516225	0.05500350	9.81473621	16.81558829
21	11.62790698	8.76730308	2.86060389	5.96806788	11.56653829
22	15.64527858	13.42602679	2.22325174	9.81134102	17.04071256
23	12.56952169	8.95522014	3.61430155	5.96054267	11.94989761
24	9.59871429	8.96239204	0.63632225	5.99741885	11.92736522
25	6.13239807	8.02214592	-0.11025215	4.13519110	11.90910074
26	6.28820961	6.80849587	-0.51768627	3.19932733	10.41246441
27	7.92712629	6.05155831	1.27116798	1.52554275	11.77757387
28	9.43786017	7.62064462	1.81721555	2.78196887	12.45932037
29	6.63404938	6.22385335	0.41019604	0.50215265	12.14555405
30	7.82066292	5.09444270	2.72242021	1.17213923	9.02474618
31	3.79141771	3.80973642	-0.01831871	-0.74248698	8.36195982
32	4.34997821	6.01467104	-1.66469287	0.60692304	11.43241913
33	6.70726022	7.64369319	-1.13663298	3.09388831	12.19389808

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MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

14:02 FRIDAY, MAY 18, 1979 30

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SMD

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL FOR MEAN	UPPER 95% CL FOR MEAN
34	4.86391955	6.77293109	-1.90901153	0.91398383	12.63187834
35	17.76255097	12.77099958	4.99136140	10.40437543	15.13762373
36	17.83944500	14.76072107	3.07872392	12.67626955	16.84517259
37	15.26263627	14.25322369	1.00941258	10.80511228	17.70133511
38	15.65906838	15.78486266	-0.12579428	12.31824587	19.25147946
39	14.49179606	10.12898375	4.36281231	6.65543565	13.60253185
40	16.26472855	11.65924180	4.60548675	8.19546545	15.12301816
41	21.85882612	17.85502365	4.00380247	13.75829373	21.95175357
42	19.27068379	17.81634022	1.45426357	14.80398217	20.82869827
43	22.25841477	22.12774383	0.13067094	19.12168047	25.13380719
44	20.24336283	21.97238007	-1.72901724	18.48394638	25.46081407
45	17.75082690	20.14322702	-2.39240011	16.64323810	23.64321563
46	20.08838022	18.35426140	1.73404882	14.97998595	21.72851686
47	17.44820065	16.65979992	0.78840074	12.97021299	20.34938685
48	18.71010346	15.54280678	3.16729668	12.59810455	18.48760891
49	19.58626761	19.66489601	-0.07862841	17.10658038	22.22321164
50	11.51301279	10.39102837	1.12198443	7.22471216	13.55734457
51	8.14814815	6.97096038	1.17718777	4.79464995	9.14727081
52	5.37694013	5.39740186	-0.02046173	1.05769972	9.73710401
53	6.26666667	7.23563294	-0.96896627	3.47519377	10.99607210
54	8.49889625	10.79932571	-2.30042946	6.49172098	15.10693044
55	7.88340510	6.78266232	-0.89925722	6.83817053	10.72715411
56	8.07125577	7.89048565	0.18077012	5.73283939	10.04813192
57	7.32192159	9.07640904	-1.75448745	5.73039717	12.42242091
58	5.34216336	7.43813632	-2.09597297	5.29533360	9.58093904
59	7.14520909	9.70594794	-1.56073886	6.78240568	10.62949081
60	11.43109346	10.71452261	0.71657085	8.89959257	12.52945265
61	6.59171076	7.96611664	-1.37440588	5.80648653	10.12574675
62	6.94980695	7.64612441	-0.69631746	5.53472681	9.75752202
63	8.85238573	11.24182622	-2.38943949	9.54070807	12.94294437
64	9.60264901	8.18206372	1.42058529	3.82116888	12.54295875
65	10.29540481	16.66519902	-6.36979420	11.58881543	21.74158260
66	9.24092409	18.05734678	-0.81642269	8.20840703	11.90628653
67	7.17439294	9.53671979	-2.36232686	7.67044870	11.40299088
68	9.69496911	18.43190277	-0.73691366	7.89866452	12.96514101
69	8.68131868	18.80396894	-2.12265026	6.43770313	15.17023475
70	9.34065934	18.46031768	-1.11965834	8.41045789	12.51017747
71	12.40310078	9.16130659	3.24179419	5.90705827	12.41555490
72	10.91314031	12.42032092	-1.50718061	10.20800990	14.63263194
73	7.46102450	12.84421086	-5.38318637	10.63500910	15.05341263
74	3.00668151	11.70850727	-8.70182575	9.31059725	14.10641727
75	9.24276169	9.78907108	-0.54630939	7.81121606	11.76692611
76	13.58574610	6.44417726	5.14156884	5.61337035	11.27498416
77	13.54051854	5.81890452	3.72160603	7.87942648	11.75838255
78	8.98004435	8.54045495	0.43958939	3.31768762	13.76322229
79	8.75831486	6.70453102	2.05378384	1.03618849	12.37287355

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
 INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
 AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

14:02 FRIDAY, MAY 18, 1979 31

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SMD

SUM OF RESIDUALS	0.00000000
SUM OF SQUARED RESIDUALS	580.12200264
SUM OF SQUARED RESIDUALS - ERROR SS	-0.00000000
FIRST ORDER AUTOCORRELATION	0.28337908
DURBIN-WATSON D	1.42605332

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SHD

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	21	3761.93998974	179.13999951	17.99	0.0001	0.868900	28.4522
ERROR	57	567.60402784	9.95796540		STD DEV		SHD MEAN
CORRECTED TOTAL	76	4329.54401758			3.15562441		11.09096973

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE IV SS	F VALUE	PR > F
VTAVG	1	259.33526449	26.04	0.0001	1	14.85124234	1.49	0.2270
VPH2	1	1319.50797008	132.51	0.0001	1	9.09975966	0.91	0.3431
VSRT	1	776.31311291	78.01	0.0001	1	15.10846852	1.52	0.2231
VCIN	1	171.78894170	17.25	0.0001	1	0.05847609	0.01	0.9392
VRASH	1	754.83345749	75.73	0.0001	1	321.96787084	32.33	0.0001
VV	1	124.71155819	12.52	0.0008	1	121.70923169	12.22	0.0009
VTAVG2	1	0.38972876	0.04	0.8439	1	35.13886347	3.53	0.0654
VPH22	1	9.80477292	0.98	0.3253	1	4.85923707	0.49	0.4877
VSRT2	1	45.57437404	4.58	0.0367	1	0.46491198	0.05	0.8297
VCIN2	1	47.88127404	4.81	0.0324	1	2.22005410	0.22	0.6386
VRASH2	1	44.52372064	4.47	0.0389	1	39.98266641	4.02	0.0499
VTP	1	53.56582851	5.38	0.0240	1	24.97069253	2.51	0.1188
VT5	1	3.70398223	0.37	0.5444	1	8.93745263	0.90	0.3474
VTC	1	79.26185292	7.96	0.0066	1	49.86369318	5.01	0.0292
VTR	1	2.37171291	0.24	0.6274	1	4.85003332	0.49	0.4881
VPS	1	0.93852900	0.09	0.7600	1	13.91095882	1.40	0.2421
VPC	1	7.83151898	0.79	0.3789	1	0.28782784	0.03	0.8656
VPR	1	7.13552908	0.71	0.4019	1	10.42475277	1.05	0.3106
VSC	1	12.13455176	1.22	0.2743	1	5.23977674	0.53	0.4712
VSR	1	30.58497770	3.07	0.0851	1	19.11506695	1.92	0.1713
VCR	1	9.97933139	1.00	0.3210	1	9.97933139	1.00	0.3210

PARAMETER

ESTIMATE

T FOR H0:
PARAMETER=0

PR > |T|

STD ERROR OF
ESTIMATE

INTERCEPT	14.14419187	11.01	0.0001	1.28502735
VTAVG	-0.15508180	-1.22	0.2270	0.12698860
VPH2	0.49581555	0.96	0.3431	0.51866924
VSRT	-3.27376080	-1.23	0.2231	2.65779836
VCIN	-0.00856778	-0.08	0.9392	0.11180583
VRASH	2.04130873	5.69	0.0001	0.35894445
VV	-1.64518873	-3.50	0.0009	0.47058629
VTAVG2	-0.01224082	-1.88	0.0654	0.00651632
VPH22	0.06698170	0.70	0.4877	0.09588649
VSRT2	-1.26207852	-0.22	0.8297	5.84098800
VCIN2	-0.00965020	-0.47	0.6386	0.02043807
VRASH2	-0.09953059	-2.00	0.0499	0.04957136
VTP	0.04806444	1.58	0.1188	0.03035246

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

$$\begin{aligned} \text{SHQMD} = & 14.14419 - (0.18508)(V_{TAVL}) + (0.49582)(V_{PH2}) \\ & - (3.27376)(V_{SRT}) - (0.00857)(V_{CIN}) \\ & + (2.04131)(V_{RASH}) - (1.64519)(V_U) \\ & - (0.01224)(V_{TAVL2}) + (0.06698)(V_{PH22}) \\ & - (1.26208)(V_{SRT2}) - (0.00965)(V_{CIN2}) \\ & - (0.09953)(V_{RASH2}) + (0.04806)(V_{TP}) \\ & + (0.24637)(V_{TS}) + (0.04918)(V_{TC}) \\ & - (0.02904)(V_{TR}) + (1.30593)(V_{PS}) \\ & + (0.01153)(V_{PC}) - (0.13589)(V_{PR}) \\ & + (0.28903)(V_{SC}) - (1.70113)(V_{SR}) \\ & - (0.04607)(V_{CR}) \end{aligned}$$

DEPENDENT VARIABLE: SHQ

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > T	STD ERROR OF ESTIMATE
VTS	0.24639442	0.95	0.3474	0.26008140
VTC	0.04918016	2.24	0.0292	0.02197774
VTR	-0.02903586	-0.70	0.4881	0.04160520
VPS	1.30593073	1.18	0.2421	1.10491003
VPC	0.01152892	0.17	0.8656	0.06781216
VPR	-0.13588675	-1.02	0.3106	0.13280962
VSC	0.28902892	0.73	0.4712	0.39844668
VSR	-1.70113273	-1.39	0.1713	1.22782252
VCR	-0.04606866	-1.00	0.3210	0.04601932

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL FOR MEAN	UPPER 95% CL FOR MEAN
1	0.11025358	1.11537151	-1.00511792	-1.30176907	3.53251208
2	-3.08370044	1.26689910	-4.35059954	-3.44152044	5.97531863
3	-3.17982456	-1.53671422	-1.64311034	-4.79236764	1.71893920
4	2.31532525	-0.30397935	2.61930460	-3.01228194	2.40432323
5	0.99228225	-0.04954357	1.04182581	-1.99526490	1.89617777
6	2.11345940	-1.76448744	3.87794684	-5.34424779	1.81527290
7	0.99778271	0.19403621	0.80374650	-1.68268585	2.07075826
8	3.53982301	-0.17674808	3.71657109	-2.47505225	2.12155608
9	-0.11074197	-0.57619511	0.46545314	-2.98735483	1.83496461
10	-1.01465614	-1.47081178	0.45615563	-5.94163269	3.00000913
11	1.01465614	-1.06735611	2.08201225	-3.41511316	1.28040094
12	0.00000000	2.47623511	-2.47623511	0.53706634	4.41540389
13	0.00000000	2.53753309	-2.53753309	0.30421012	4.77085606
14	-3.19031903	2.47226813	-5.66258716	0.24330791	4.70122834
15	4.64601770	2.08934286	2.55667484	-0.53321819	4.71190390
16	0.77433628	2.08772922	-1.31339294	-0.33566067	4.51111911
17	11.60220994	7.85971898	3.74249096	4.50852258	11.21091538
18	11.82904826	13.07481218	-1.24576392	9.72924695	16.42037741
19	14.49030221	13.43118950	1.05911271	9.25677532	17.60560369
20	3.53591160	5.96505720	-2.42914560	2.52037130	9.40974310
21	7.30897010	10.87294896	-3.56397886	8.11828826	13.62760966
22	4.55049945	6.03975577	-2.08925633	3.08262959	10.19688195
23	13.23692992	11.35957781	1.87735211	8.41258703	14.30656859
24	11.16071429	11.02029319	0.14042109	8.10253369	13.93805269
25	12.07803595	7.01607047	4.46196548	3.79101080	11.44113014
26	7.72925764	9.33731813	-1.60806049	5.78817992	12.86645634
27	5.65443890	7.99315056	-2.33871166	2.94876072	13.03754039
28	11.73206655	10.92295410	0.80913245	6.16132853	15.68457968
29	10.36918565	7.70889142	2.66029424	1.97989440	13.43788843
30	10.06007646	7.01343590	2.44664056	3.74965416	11.47721765
31	5.83376599	10.93465062	-5.10088463	6.45491598	15.41438526
32	7.18954248	6.79260153	0.39694095	1.46604509	12.11915798
33	10.35047494	8.16245070	1.98801624	3.88490725	12.84001015

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SHD

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL FOR MEAN	UPPER 95% CL FOR MEAN
34	5.79298284	7.30211858	-1.50913574	1.53646812	13.06776904
35	13.36857174	10.81642540	2.55214635	8.48748693	13.14536386
36	12.49862350	14.55034675	-2.05172325	12.49908765	16.60160585
37	11.39742319	9.95198329	1.44543991	6.55877896	13.34518761
38	12.37749147	12.41707805	-0.03958658	9.00566302	15.82849308
39	13.18136769	14.04803091	-0.86666322	10.62979495	17.46626687
40	18.25790111	18.71554022	-0.45763911	15.30692040	22.12416004
41	11.33135117	16.16316364	-4.83183247	12.13168929	20.19467799
42	13.30982812	12.78355457	0.52627355	9.81916475	15.74794438
43	11.07491857	11.46902761	-0.39410905	8.51083225	14.42722298
44	16.92477876	14.16763069	2.75714807	10.73474587	17.60051551
45	12.34840132	15.04372258	-2.69532126	11.59946714	18.48797803
46	10.37527594	11.48760913	-1.11233319	8.16707486	14.80814340
47	12.64994547	7.04830662	5.60163886	3.41747199	10.67914125
48	0.00000000	9.48555108	-9.48555108	6.58773984	12.38336232
49	8.58274648	20.61269280	-2.02994632	8.09511531	13.13027028
50	21.44905161	19.56521771	1.88383390	16.44932134	22.68111408
51	15.94837262	16.69558442	-0.74721180	14.55392916	18.83723968
52	13.12638581	16.22579962	-3.09941381	11.95520209	20.49639715
53	12.36666667	15.92955085	-3.56288419	12.22899223	19.63010948
54	18.73064433	15.16468703	3.56599730	10.92567580	19.40369826
55	19.52081263	17.90430861	1.61650403	15.99078054	19.81783667
56	17.50604794	15.40295368	-0.89690574	16.27966538	20.52624199
57	16.94091662	16.74998118	0.19093544	13.45725058	20.04271178
58	13.78587196	12.42003087	1.36584110	10.31134974	14.52871200
59	19.90999890	18.23228487	1.67771403	16.33937215	20.12519759
60	23.10443214	19.95778236	3.14714978	18.17175293	21.74381179
61	14.35185185	11.77280097	2.57905088	9.64756041	13.89804154
62	17.78268064	15.72166264	2.06101800	13.64388654	17.79943874
63	20.33954360	19.45216926	0.88737434	17.77813940	21.12619912
64	16.30242826	15.07307479	1.22935347	10.78162184	19.36452774
65	20.89715535	17.04762815	3.84952721	12.05207996	22.04317634
66	20.90209021	21.17044228	-0.26835207	19.35094470	22.98993985
67	20.64017660	21.74010172	-1.09992512	19.90354879	23.57665466
68	24.07407407	20.87522440	3.19884967	18.38232497	23.36812383
69	21.42857143	20.02939754	1.39917389	15.73265933	24.32613574
70	21.42857143	20.65102748	0.77754395	18.63380928	22.66824568
71	19.60132890	21.42052816	-1.81919926	18.21809989	24.62295643
72	12.80623608	13.97148600	-1.16525192	11.79440541	16.14857059
73	15.25612472	13.05327118	2.20285354	10.87924834	15.22729402
74	19.82182628	17.92351271	1.89831357	15.56378659	20.28323884
75	15.47884187	21.33286572	-5.85402385	19.38650569	23.27922574
76	22.16035635	21.97211211	0.18824424	19.18638245	24.75784176
77	22.30854605	21.62891423	0.67963183	19.72032008	23.53750837
78	2.21729493	4.57818060	-2.36088570	-0.56142035	9.71778155
79	7.87139693	8.56275901	-0.79136212	3.08467812	14.24083991

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SHD

SUM OF RESIDUALS	0.00000000
SUM OF SQUARED RESIDUALS	567.60402784
SUM OF SQUARED RESIDUALS - ERROR SS	-0.00000000
FIRST ORDER AUTOCORRELATION	-0.05401157
DURBIN-WATSON D	2.10498420

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SSRC

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	Cov.
MODEL	21	24333.34080716	1158.73051463	90.75	0.0001	0.970958	8.0018
ERROR	57	727.82756392	12.76890463			STD DEV	SSRC MEAN
CORRECTED TOTAL	78	25061.16837108				3.57336041	44.65671796

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SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE IV SS	F VALUE	PR > F
VTAVG	1	8484.07897399	664.43	0.0001	1	374.39163802	29.32	0.0001
VPH2	1	4918.01981596	385.16	0.0001	1	31.07814135	2.43	0.1243
VSRT	1	6617.34425765	518.24	0.0001	1	389.09074009	30.47	0.0001
VCIN	1	2284.81904316	178.94	0.0001	1	192.13994884	15.05	0.0003
VRASH	1	1178.52714450	92.30	0.0001	1	282.41455920	22.12	0.0001
VV	1	14.23969624	1.12	0.2954	1	34.03679437	2.67	0.1081
VTAVG2	1	139.38172009	10.92	0.0017	1	2.54414202	0.20	0.6570
VPH22	1	26.51310133	2.08	0.1551	1	0.78904373	0.06	0.8046
VSRT2	1	105.23373194	8.24	0.0057	1	0.00209387	0.00	0.9898
VCIN2	1	98.71715328	7.73	0.0073	1	0.39042919	0.03	0.8618
VRASH2	1	16.93426851	1.33	0.2543	1	35.91201795	2.81	0.0990
VTP	1	12.86525212	1.01	0.3197	1	0.67557985	0.05	0.8189
VT5	1	248.51884860	19.46	0.0001	1	124.66647642	9.76	0.0028
VTC	1	37.29562894	2.92	0.0929	1	0.21971606	0.02	0.8961
VTR	1	7.58137751	0.59	0.4442	1	4.41274055	0.35	0.5589
VPS	1	0.86673741	0.07	0.7954	1	8.58758157	0.67	0.4156
VPC	1	31.89734563	2.50	0.1195	1	9.80646531	0.77	0.3845
VPR	1	1.31845614	0.10	0.7491	1	1.68659544	0.13	0.7176
VSC	1	1.14603347	0.09	0.7656	1	0.15288229	0.01	0.9133
VSR	1	66.30790608	5.19	0.0264	1	34.94264298	2.74	0.1036
VCR	1	41.73431461	3.27	0.0759	1	41.73431461	3.27	0.0759

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > T	STD ERROR OF ESTIMATE
INTERCEPT	44.22412776	30.39	0.0001	1.45513700
VTAVG	-0.77865039	-5.41	0.0001	0.14379913
VPH2	-0.91628949	-1.56	0.1243	0.58732976
VSRT	-16.61353955	-5.52	0.0001	3.00963302
VCIN	0.49112039	3.88	0.0003	0.12660649
VRASH	-1.91181545	-4.70	0.0001	0.40651750
VV	0.87001811	1.63	0.1081	0.53288168
VTAVG2	-0.00329373	-0.45	0.6570	0.00737893
VPH22	-0.02699123	-0.25	0.8046	0.10857978
VSRT2	0.08469847	0.01	0.9898	6.61420771
VCIN2	-0.00404693	-0.17	0.8618	0.02314363
VRASH2	0.09432600	1.68	0.0990	0.05624676
VTP	-0.00790582	-0.23	0.8189	0.03437047

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

$$\begin{aligned} \text{SSRCMD} = & 44.22413 - (0.77865)(VTA V6) - (0.91629)(VPH2) \\ & - (16.61364)(VSR) + (0.49112)(VCIN) - (1.91182)(VRAH2) \\ & + (0.87002)(VV) - (0.00329)(VTA V62) \\ & - (0.02499)(VPH22) + (0.08470)(VSR2) \\ & - (0.00405)(VCIN2) + (0.09433)(VRAH2) \\ & - (0.00791)(VTP) - (0.92024)(VTS) \\ & - (0.00326)(VTC) - (0.02770)(VTR) \\ & - (1.02607)(VPS) - (0.06729)(VPC) \\ & + (0.05466)(VPR) + (0.04937)(VSC) \\ & + (2.30000)(VSR) + (0.09421)(VCR) \end{aligned}$$

DEPENDENT VARIABLE: SSHA

PARAMETER	ESTIMATE	1 FOR HQ: PARAMETER=0	PR > t	STD ERROR OF ESTIMATE
VTS	-0.92023518	-3.12	0.0028	0.29451052
VTC	-0.00326459	-0.13	0.8961	0.02488711
VTR	-0.02769596	-0.59	0.5589	0.04711282
VPS	-1.02607014	-0.82	0.4156	1.25117608
VPC	-0.06729434	-0.88	0.3845	0.07678901
VPR	0.05465749	0.36	0.7176	0.15039073
VSC	0.04937004	0.11	0.9133	0.45119235
VSR	2.30000173	1.65	0.1036	1.39035950
VCR	0.09421097	1.81	0.0759	0.05211127

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL FOR MEAN	UPPER 95% CL FOR MEAN
1	64.27783903	65.22538138	-0.94754235	62.48826399	67.96249876
2	63.32599119	59.32393147	4.00205971	53.99221965	64.65564330
3	64.25438596	66.71729368	-2.46290772	63.03066259	70.40392477
4	70.56229327	70.64914050	-0.08684723	67.58231759	73.71596342
5	74.20066152	71.13899646	3.06166506	68.93570396	73.34228896
6	73.30367075	69.14060969	4.16306106	65.08696697	73.19425241
7	72.72727273	71.01473836	1.71253436	68.88957915	73.13989758
8	69.69026549	70.45218634	-0.76192086	67.84963672	73.05473697
9	71.09634551	69.64961228	1.44673323	66.91926748	72.37995708
10	73.73167982	72.92963686	0.80204296	67.86697655	77.99229718
11	68.88387824	70.90330761	-2.01942937	68.24475862	73.56185660
12	63.35963923	68.00044214	-4.64080290	65.80456961	70.19631466
13	67.41826381	69.49831734	-2.08005353	66.96935101	72.02728367
14	71.61716172	69.46510827	2.15205344	66.94108223	71.98913432
15	67.92035398	69.17365671	-1.25330273	66.20392565	72.14338777
16	67.47787611	68.97834125	-1.50046514	66.23414727	71.72253523
17	38.68530838	40.37068419	-1.68537582	36.57586231	44.16550607
18	37.90031574	38.91218844	-1.01187270	35.12374318	42.70063370
19	37.32521425	40.31196734	-2.98675308	35.58495155	45.03898312
20	47.18232044	44.30691343	2.87540701	40.40622608	48.20760079
21	45.114717608	43.57090508	1.54381252	40.45158724	46.69022292
22	43.72918979	43.39135889	0.33783090	39.36334661	47.41937117
23	41.26807564	41.72521746	-0.45714182	38.38810922	45.06232569
24	43.75000000	42.86775066	0.88224934	39.56374329	46.17175802
25	59.50241122	60.56752767	-1.06511645	56.23611334	64.89894201
26	68.46069869	66.37227247	2.08842622	62.35330559	70.39123935
27	63.02365965	64.22931949	-1.20565985	58.51716221	69.94147677
28	56.83375014	58.77491842	-1.94116829	53.38295724	64.16687961
29	67.19720920	70.22381724	-3.02660804	63.73642569	76.71120879
30	61.67121791	66.02504398	-4.35382606	61.64978161	70.40030634
31	71.39598645	66.95332124	4.44266521	61.88056722	72.02607526
32	70.32674739	66.86732151	3.45942587	60.85564490	72.91899813
33	62.44131455	64.99395072	-2.55263616	59.92366889	70.06423255

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SSRC

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL FOR MEAN	UPPER 95% CL FOR MEAN
34	63.13258280	61.90483252	1.22775027	55.37593540	68.43372964
35	27.62911574	33.59587077	-5.96675504	30.95863153	36.23311001
36	27.35381566	27.70260224	-0.34878658	25.37980107	30.02540340
37	25.91124326	27.47713217	-1.56588891	23.63474143	31.31952291
38	27.54101971	25.03523756	2.50578215	21.17222542	28.89824971
39	32.24314503	36.98264090	-4.73949587	33.11190488	40.85337692
40	27.46393569	30.53211883	-3.06818314	26.67227191	34.39196574
41	18.68736923	20.08837537	-1.40100613	15.52319889	24.65355184
42	19.19347730	23.92438111	-4.73090381	20.56757059	27.28119163
43	25.73289902	21.73466757	3.99823145	18.38487151	25.08446363
44	20.68584071	19.65295673	1.03288398	15.76563266	23.54028079
45	23.26350606	21.93654995	1.32695611	18.03635003	25.83674987
46	28.80794702	29.36371593	-0.55576491	25.60361518	33.12381669
47	34.46019629	40.86530602	-6.40510973	36.75382790	44.97678415
48	37.86044464	36.22722807	1.63321657	32.94580968	39.50864647
49	26.07834507	26.87122069	-0.79287562	24.02037073	29.72207064
50	23.48912277	26.98325758	-3.49406482	23.45488434	30.51163083
51	37.82267116	34.29553932	-1.47286816	36.87037550	41.72070313
52	46.00885918	41.37894086	4.62992832	36.54309915	46.21487258
53	32.22222222	33.79456590	-1.57234368	29.60413384	37.98499797
54	29.61363653	30.81377473	-1.20008820	26.01361066	35.61393880
55	37.76084796	35.18210100	2.57874696	33.01526346	37.34893854
56	33.75852210	36.62759008	-2.86906798	34.22322461	39.03195555
57	36.88569851	29.36053261	7.52516590	25.63191614	33.08914909
58	44.15011038	43.98014569	0.16996468	41.59232107	46.36797032
59	36.65898365	34.58151066	2.07747298	32.43881749	36.72500384
60	27.25366876	29.44283584	-2.18916707	27.42037498	31.46529670
61	45.85537919	44.32317805	1.53220114	41.91660188	46.72975421
62	38.61003861	40.02114752	-1.41110891	37.66831908	42.37397597
63	34.29610848	29.35797019	4.93813829	27.46233520	31.25360518
64	30.79470199	32.41209316	-1.61739118	27.55254523	37.27164110
65	22.86652079	21.01930394	1.84721685	15.36245387	26.67615401
66	23.54235424	27.28531560	-3.74296137	25.22495614	29.34567506
67	26.60044150	27.56823873	-0.96779722	25.48856615	29.64791130
68	21.78645237	27.01063936	-5.22414699	24.18773429	29.83354443
69	30.32967033	28.59015867	1.73951166	23.72462583	33.45569151
70	27.25274725	27.18462116	0.06812609	24.90036717	29.46887516
71	23.25581395	26.83413454	-3.57832059	23.20777446	30.46049463
72	40.53852116	36.22568875	4.30883241	33.76040780	38.69096970
73	38.41870824	36.58130836	1.83739988	34.11949220	39.04312452
74	35.18930958	31.49466411	3.69464547	26.82256159	34.16676663
75	35.74510245	27.47095340	8.27514905	25.26693766	29.67496914
76	25.05567929	27.43900352	-2.38332424	24.28450388	30.59350317
77	31.07658158	26.71786748	4.35871409	24.55661701	28.87911796
78	64.96674058	50.71807515	14.24866543	54.89810287	66.53804743
79	59.64523282	51.54554772	8.100031490	55.22905030	67.86204514

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SIOM

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	21	72.03361976	3.43017237	2.50	0.0033	0.479137	19.2828
ERROR	57	78.30667693	1.37380135		STD DEV		SIOM MEAN
CORRECTED TOTAL	78	150.34029669			1.17209272		6.07842826

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE IV SS	F VALUE	PR > F
VTAVG	1	3.36793788	2.45	0.1229	1	11.66219025	8.49	0.0051
VPH2	1	18.26176247	13.29	0.0006	1	16.00940417	11.65	0.0012
VSRT	1	1.63229810	1.19	0.2803	1	0.18879706	0.14	0.7122
VCIN	1	1.38855901	1.01	0.3190	1	3.52807506	2.57	0.1146
VRASH	1	1.60034862	1.16	0.2850	1	0.80490702	0.59	0.4472
VV	1	0.36090521	0.26	0.6102	1	3.18409806	2.32	0.1334
VTAVG2	1	11.40451535	8.30	0.0056	1	0.28510732	0.21	0.6504
VPH22	1	2.16597452	1.58	0.2144	1	0.13893506	0.10	0.7516
VSRT2	1	2.76316794	2.01	0.1616	1	0.04479109	0.03	0.8573
VCIN2	1	1.32457634	0.96	0.3303	1	1.50939308	1.10	0.2990
VRASH2	1	3.45596808	2.52	0.1183	1	0.00966685	0.01	0.9334
VTP	1	9.64127244	7.02	0.0104	1	0.71753007	0.52	0.4728
VTS	1	2.12365154	1.55	0.2188	1	0.10862348	0.08	0.7796
VTC	1	1.21512510	0.88	0.3509	1	0.70084843	0.51	0.4780
VTR	1	2.00468778	1.46	0.2320	1	1.61586701	1.18	0.2827
VPS	1	5.76050107	4.19	0.0452	1	1.17228576	0.85	0.3595
VPC	1	0.07084692	0.05	0.8212	1	0.00214024	0.00	0.9687
VPR	1	2.39172647	1.74	0.1923	1	2.55251769	1.86	0.1782
VSC	1	0.16222945	0.12	0.7324	1	0.31002597	0.23	0.6356
VSR	1	0.90140492	0.66	0.4213	1	0.72766093	0.53	0.4697
VCR	1	0.03616056	0.03	0.8717	1	0.03616056	0.03	0.8717

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > T	STD ERROR OF ESTIMATE
INTERCEPT	6.01627365	12.60	0.0001	0.47729736
VTAVG	0.13742619	2.91	0.0051	0.04716734
VPH2	-0.65764689	-3.41	0.0012	0.19264918
VSRT	-0.36596060	-0.37	0.7122	0.98716533
VCIN	0.06655000	1.60	0.1146	0.04152801
VRASH	0.10206463	0.77	0.4472	0.13334121
VV	-0.26610141	-1.52	0.1334	0.17478974
VTAVG2	0.00110261	0.46	0.6504	0.00242035
VPH22	0.01132604	0.32	0.7516	0.03561509
VSRT2	-0.39173899	-0.18	0.8573	2.16951660
VCIN2	-0.00795712	-1.05	0.2990	0.00759131
VRASH2	-0.00154752	-0.08	0.9334	0.01844942
VTP	-0.00814756	-0.72	0.4728	0.01127381

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SSRC

SUM OF RESIDUALS	0.00000000
SUM OF SQUARED RESIDUALS	727.82756392
SUM OF SQUARED RESIDUALS - ERROR SS	0.00000000
FIRST ORDER AUTOCORRELATION	-0.07605901
DURBIN-WATSON D	2.14545136

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

$$\begin{aligned} \text{SIOMMD} = & 6.01627 + (0.13743)(VTAVC) - (0.65765)(VPH2) \\ & - (0.36596)(VSR1) + (0.06655)(VCIN) \\ & + (0.10206)(VRASH) - (0.26610)(VV) \\ & + (0.00110)(VTA62) + (0.01133)(VPH22) \\ & - (0.39174)(VSR2) - (0.00796)(VCIN2) \\ & - (0.00155)(VRASH2) - (0.00815)(VTP) \\ & + (0.02716)(VTS) + (0.00583)(VTC) \\ & + (0.01676)(VTR) - (0.37910)(VPS) \\ & - (0.00099)(VPC) - (0.06724)(VPR) \\ & + (0.07030)(VSC) + (0.33191)(VSR) \\ & + (0.00277)(VCR) \end{aligned}$$

DEPENDENT VARIABLE: SIOM

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PH > T	STD ERROR OF ESTIMATE
VTS	0.02716351	0.28	0.7796	0.09660146
VTC	0.00583055	0.71	0.4780	0.00816319
VTR	0.01675966	1.08	0.2827	0.01545341
VPS	-0.37910399	-0.92	0.3595	0.41039643
VPC	-0.00099415	-0.04	0.9687	0.02518745
VPR	-0.06724014	-1.36	0.1782	0.04932944
VSC	0.07030463	0.48	0.6366	0.14799494
VSR	0.33190578	0.73	0.4697	0.45604979
VCR	0.00277314	0.16	0.8717	0.01709294

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL FOR MEAN	UPPER 95% CL FOR MEAN
1	7.27673649	6.30617854	0.97055756	5.40638107	7.20397681
2	5.28634361	5.83144147	-0.54509786	4.08259447	7.58028847
3	7.78508772	7.54791499	0.23717273	6.33868852	8.75716146
4	6.39470783	5.85817054	0.53653729	4.85222644	8.86411463
5	6.94597574	6.49936007	0.44661568	5.77666132	7.22205882
6	7.23025584	7.82349648	-0.59324064	6.49386706	9.15312500
7	6.31929047	6.56784784	-0.24855737	5.98140006	7.37554079
8	5.97345133	6.01994051	-0.04648918	5.16628202	6.87359901
9	6.53377630	7.10780146	-0.57402515	6.21222505	8.00337766
10	7.10259301	6.55486612	0.54772689	4.89426932	8.21846093
11	6.87711387	6.64319276	0.23392110	5.77116600	7.51521953
12	5.97519729	6.64663303	-0.67143573	5.92636409	7.36689797
13	6.53889515	7.16253464	-0.62363949	6.33301209	7.99205719
14	7.37073707	7.14292494	0.22781213	6.31502285	7.97082703
15	6.08407080	6.28614326	-0.20207246	5.31204612	7.26024040
16	5.97345133	6.34858586	-0.37513454	5.44846681	7.24870492
17	4.96110046	5.26038821	-0.29928775	4.01565423	6.60512218
18	5.00676590	5.52104940	-0.51428350	4.27840701	6.76369179
19	5.05187190	4.64262684	0.40924506	3.09212530	6.19312837
20	4.53038674	4.52232707	0.00805967	3.24286832	5.80178583
21	4.87264673	4.88409073	-0.01144400	3.86092785	5.90725362
22	4.77247503	4.37400760	0.39846743	3.05278518	5.69823002
23	5.11674644	4.64834007	0.46840638	3.55374007	5.74294006
24	5.24553571	4.71363190	0.53190381	3.62988928	5.79737453
25	5.58965366	5.38140004	0.20825362	3.96065916	6.80214093
26	6.13517118	5.56790247	0.56726870	4.26964703	6.90615792
27	4.88387237	5.03622813	-0.15235577	3.16259178	6.90986449
28	4.86028053	4.09641631	0.76386421	2.32780701	5.86502561
29	6.20246703	6.24845940	-0.04597237	4.12054958	8.37637921
30	5.62534134	5.88992936	-0.26458802	4.45480595	7.32505277
31	6.18142314	6.16213297	0.01929017	4.49822634	7.82603960
32	6.22004357	6.64303052	-0.42298695	4.66458910	8.62147194
33	5.66655748	5.49374771	0.17280977	3.83065199	7.15684344

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SION

OBSERVATION	OBSERVED VALUE	PREDICTED VALUE	RESIDUAL	LOWER 95% CL FOR MEAN	UPPER 95% CL FOR MEAN
34	5.86949393	6.40294309	-0.53344915	4.26140909	8.54447708
35	7.47715009	7.37756971	0.09958038	6.51253273	8.24260670
36	6.38696179	6.42904329	-0.04208150	5.66714467	7.19094190
37	8.85365048	8.57714773	0.27650274	7.31681077	9.83748470
38	6.95958595	6.56110295	0.39848300	5.29400198	7.82820391
39	10.19711486	7.38620849	2.81090636	6.11657403	8.65584296
40	4.64706530	5.18208440	-0.53501910	3.91602166	6.44814714
41	5.93546966	5.04232689	0.89314277	3.54491003	6.53974375
42	9.16703394	7.93100002	1.23603392	6.82993751	9.03206253
43	5.64603692	6.38005943	-0.73402252	5.28129773	7.47882114
44	6.97345133	6.37573710	-0.40228577	5.10066162	7.65081258
45	5.95369358	5.86474356	0.08894993	4.58544469	7.14404243
46	7.17439294	7.14477486	0.02961807	5.91142971	8.37812001
47	5.23446020	5.52162191	-0.28716171	4.17302198	6.87022184
48	8.36451684	6.73611994	1.62839690	5.65978669	7.81245319
49	6.60211268	7.34277538	-0.74066271	6.48767226	8.27787851
50	5.73445082	7.21883824	-1.48438742	6.06150169	8.37617479
51	5.72390572	6.24359969	-0.51969397	5.44812526	7.03907413
52	5.32150776	6.04078373	-0.71927597	4.45455684	7.62701062
53	6.88888889	6.12493678	0.76395211	4.75043928	7.49943427
54	6.36865342	6.67975582	-0.31110239	5.10526102	8.25425061
55	7.33134592	6.23804616	1.09329976	5.52730495	6.94878738
56	7.16956235	6.04738086	1.12218149	5.25872846	6.83603326
57	7.45444506	7.85927662	-0.40483156	6.63625859	9.08229466
58	5.94588962	5.42222744	0.52366218	4.63900058	6.20545430
59	6.49764022	6.32103323	0.17660699	5.61794917	7.02411729
60	5.43569988	5.82137161	-0.38567173	5.15798718	6.48475604
61	5.13668430	5.31813019	-0.18144589	4.52875266	6.10750772
62	5.60397132	6.08159448	-0.47762316	5.30984667	6.85334230
63	4.75140558	5.82546840	-1.07406282	5.20368394	6.44725286
64	4.52538631	5.23811494	-0.71272863	3.64414173	6.83208815
65	6.89277899	6.98789492	-0.09511593	5.13239981	8.84339004
66	7.37073707	5.39764903	1.97308805	4.72183353	6.07346452
67	8.94039735	5.39133016	3.54906720	4.70917979	6.07348052
68	5.44652309	4.67992591	0.76669718	3.75398895	5.60586267
69	6.59340659	8.00094503	-1.40753843	6.40500871	9.59688134
70	7.14255719	5.39846415	1.74439299	4.64920934	6.14771896
71	5.64744053	5.44452905	0.20331148	4.25505198	6.63400612
72	3.72939866	4.77371445	-1.04431579	3.96508125	5.58234765
73	3.45211581	4.68442304	-1.23230722	3.87692632	5.49191975
74	2.44488864	5.00424044	-2.55435180	4.12776800	5.88071288
75	1.44706147	5.33097540	-3.88331393	4.60803942	6.05391138
76	5.12249443	5.47371401	-0.35121958	4.43901120	6.50841683
77	5.54938957	5.65670004	-0.10731047	4.85676143	6.27457865
78	6.31579047	6.62330664	-0.30751617	4.71430605	6.53230724
79	7.76053215	7.13987015	0.62066200	5.06800507	9.21173524

MULTIPLE RESPONSE MULTIPLE VARIABLE LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND INTERACTIVE TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: SUM

SUM OF RESIDUALS	0.00000000
SUM OF SQUARED RESIDUALS	78.30667693
SUM OF SQUARED RESIDUALS - ERROR SS	-0.00000000
FIRST ORDER AUTOCORRELATION	0.30084963
DURBIN-WATSON D	1.38645481

PARITY PLOT
 FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL CONTAINING 6 VARIABLES
 PLOT OF PREDICTED NET HYDROGEN CONSUMPTION
 (WEIGHT % BASED ON INLET MAFC COAL CONCENTRATION)
 (HORIZONTAL AXIS)
 VS.
 ACTUAL YIELD DATA
 (VERTICAL AXIS)

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PARITY PLOT
 FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL CONTAINING 6 VARIABLES
 PLOT OF PREDICTED NHT YIELD OF C1-C4
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 (HORIZONTAL AXIS)
 VS.
 ACTUAL YIELD DATA
 (VERTICAL AXIS)

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PARITY PLOT
 FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL CONTAINING 6 VARIABLES
 PLOT OF PREDICTED NET YIELD OF BYPRODUCTS(NH₃,H₂S,CO,CO₂)
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 (HORIZONTAL AXIS)
 VS.
 ACTUAL YIELD DATA
 (VERTICAL AXIS)

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PARITY PLOT
 FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL CONTAINING 6 VARIABLES
 PLOT OF PREDICTED NIT YIELD OF WATER
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 (HORIZONTAL AXIS)
 VS.
 ACTUAL YIELD DATA
 (VERTICAL AXIS)

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PARITY PLOT
 FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL CONTAINING 6 VARIABLES
 PLOT OF PREDICTED NET YIELD OF NAPHTHA
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 (HORIZONTAL AXIS)
 VS.
 ACTUAL YIELD DATA
 (VERTICAL AXIS)

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PARITY PLOT
 FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL CONTAINING 6 VARIABLES
 PLOT OF PREDICTED NET YIELD OF MIDDLE DISTILLATE
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 (HORIZONTAL AXIS)
 VS.
 ACTUAL YIELD DATA
 (VERTICAL AXIS)

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PARITY PLOT
 FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL CONTAINING 6 VARIABLES
 PLOT OF PREDICTED NET YIELD OF HEAVY DISTILLATE
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 (HORIZONTAL AXIS)
 VS.
 ACTUAL YIELD DATA
 (VERTICAL AXIS)

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PARITY PLOT
 FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL CONTAINING 6 VARIABLES.
 PLOT OF PREDICTED NET YIELD OF SRC BUTTOMS
 (WEIGHT % BASED ON INLET MAP LOAL CONCENTRATION)
 (HORIZONTAL AXIS)
 VS.
 ACTUAL YIELD DATA
 (VERTICAL AXIS)

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PARITY PLOT
 FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL CONTAINING 6 VARIABLES
 PLOT OF PREDICTED NET YIELD OF INSOLUBLE ORGANIC MATTER
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 (HORIZONTAL AXIS)
 VS.
 ACTUAL YIELD DATA
 (VERTICAL AXIS)

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STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND CROSS PRODUCT TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SHY

STEP 1 VARIABLE VRASH ENTERED		R SQUARE = 0.55424005				
		DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION		1	87.52496366	87.52496366	95.74	0.0001
ERROR		77	70.39390888	0.91420661		
TOTAL		78	157.91887254			
		B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT		3.72339224				
VRASH		0.25035673	0.02558677	87.52496366	95.74	0.0001
<hr/>						
STEP 2 VARIABLE VSRT ENTERED		R SQUARE = 0.69839636				
		DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION		2	110.28996572	55.14498286	87.99	0.0001
ERROR		76	47.62890681	0.62669614		
TOTAL		78	157.91887254			
		B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT		3.72339224				
VSRT		1.86601891	0.30960695	22.76500206	36.33	0.0001
VRASH		0.17149122	0.02490008	29.72619343	47.43	0.0001
<hr/>						
STEP 3 VARIABLE VTC ENTERED		R SQUARE = 0.73131014				
		DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION		3	115.48767346	38.49589115	68.04	0.0001
ERROR		75	42.43119907	0.56574932		
TOTAL		78	157.91887254			
		B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT		3.60040129				
VSRT		1.91641597	0.29463670	23.93460718	42.31	0.0001
VRASH		0.14149826	0.02564434	17.22435607	30.45	0.0001
VTC		-0.00365227	0.00120495	5.19770774	9.19	0.0033

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND CROSS PRODUCT TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SHY

STEP 4 VARIABLE VPM22 ENTERED

R SQUARE = 0.74356936

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	4	117.42363528	29.35590682	53.64	0.0001
ERROR	74	40.49523725	0.54723294		
TOTAL	78	157.91887254			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	3.67987839				
VSRT	2.14048435	0.31340825	25.53749830	46.67	0.0001
VRASH	0.14921811	0.02555296	18.66088542	34.10	0.0001
VPM22	0.02799894	0.01488605	1.93596182	3.54	0.0639
VTC	-0.00423813	0.00122532	6.54669119	11.96	0.0009

STEP 5 VARIABLE VTAVG2 ENTERED

R SQUARE = 0.75361866

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	5	119.01060966	23.80212193	44.66	0.0001
ERROR	73	38.90826288	0.53298990		
TOTAL	78	157.91887254			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	3.61198097				
VSRT	2.32037769	0.32630754	26.95144950	50.57	0.0001
VRASH	0.13590102	0.02637275	14.15317051	26.55	0.0001
VTAVG2	0.00136197	0.00078930	1.58697438	2.98	0.0887
VPM22	0.03348598	0.01503125	2.64517679	4.96	0.0290
VTC	-0.00810239	0.00254509	5.40181935	10.13	0.0021

STEP 6 VARIABLE VTAVG ENTERED

R SQUARE = 0.75076771

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	6	120.13957634	20.02326306	38.16	0.0001
ERROR	72	37.77929419	0.52471242		
TOTAL	78	157.91887254			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	3.50807375				
VTAVG	0.02540395	0.01731893	1.12896868	2.15	0.1468
VSRT	2.30730086	0.32388652	26.62833802	50.75	0.0001
VRASH	0.13265860	0.02626036	13.39031821	25.52	0.0001
VTAVG2	0.00181204	0.00084111	2.43530007	4.64	0.0346
VPM22	0.04237494	0.01609951	3.63593936	6.93	0.0104
VTC	-0.00710921	0.00261445	3.87975090	7.39	0.0082

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND CROSS PRODUCT TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SHY

STEP 7 VARIABLE VTAVG REMOVED

R SQUARE = 0.75361866

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	5	119.01060966	23.80212193	44.66	0.0001
ERROR	73	310.90826288	0.53298990		
TOTAL	78	157.91887254			

	COEFFICIENTS B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	3.61198097				
VSRT	2.32037769	0.32630754	26.95144950	50.57	0.0001
VRASH	0.13590102	0.02637275	14.15317051	26.55	0.0001
VTAVG2	0.00156197	0.00078930	1.58697438	2.98	0.0887
VPH22	0.03348598	0.01503125	2.64517679	4.96	0.0290
UTC	-0.00810239	0.00254509	5.40181935	10.13	0.0021

NO OTHER VARIABLES MET THE 0.5000 SIGNIFICANCE LEVEL FOR ENTRY INTO THE MODEL.

$$SHY_{MD} = 3.61198 + (2.32038)(VSRT) + (0.13590)(VRASH) + (0.00136)(VTAVG2) + (0.033486)(VPH22) - (0.00810)(UTC)$$

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND CROSS PRODUCT TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SC104

STEP 1	VARIABLE VSRT ENTERED	R SQUARE = 0.62932823				
		DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
	REGRESSION	1	1594.36238046	1594.36238046	130.73	0.0001
	ERROR	77	939.07296454	12.19575279		
	TOTAL	78	2533.43534500			
		B VALUE	STD ERROR	TYPE II SS	F	PROB>F
	INTERCEPT	11.58964300				
	VSRT	13.28607703	1.16200381	1594.36238046	130.73	0.0001

STEP 2	VARIABLE VTAVG ENTERED	R SQUARE = 0.76804033				
		DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
	REGRESSION	2	1945.78052866	972.89026433	125.82	0.0001
	ERROR	76	587.65481634	7.73230021		
	TOTAL	78	2533.43534500			
		B VALUE	STD ERROR	TYPE II SS	F	PROB>F
	INTERCEPT	11.58964300				
	VTAVG	0.23416354	0.03473454	351.41814820	45.45	0.0001
	VSRT	11.15926118	0.97755279	1007.62551374	130.31	0.0001

STEP 3	VARIABLE VTR ENTERED	R SQUARE = 0.85797134				
		DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
	REGRESSION	3	2198.94928054	732.98309351	164.35	0.0001
	ERROR	75	334.48606446	4.45981419		
	TOTAL	78	2533.43534500			
		B VALUE	STD ERROR	TYPE II SS	F	PROB>F
	INTERCEPT	10.10455133				
	VTAVG	0.48416598	0.04238980	581.81199618	130.46	0.0001
	VSRT	10.41165034	0.74901246	861.74313105	193.22	0.0001
	VTR	0.08640586	0.01146823	253.16875187	56.77	0.0001

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND CROSS PRODUCT TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SCICA

STEP 4 VARIABLE VCIN ENTERED

R SQUARE = 0.87912722

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	4	2227.21196219	556.80299055	134.55	0.0001
ERROR	74	206.22338281	4.13815382		
TOTAL	78	2533.43534500			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	10.46265383				
VTAVG	0.45268006	0.04255126	468.75736551	113.28	0.0001
VSRT	10.47968796	0.72196563	871.90724068	210.70	0.0001
VCIN	-0.11915160	0.04559283	28.26268165	6.83	0.0109
VTR	0.06555904	0.01362594	95.79415680	23.15	0.0001

STEP 5 VARIABLE VTS ENTERED

R SQUARE = 0.89136596

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	5	2258.21802287	451.64360457	119.80	0.0001
ERROR	73	275.21732213	3.77010030		
TOTAL	78	2533.43534500			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	10.28147625				
VTAVG	0.49350965	0.04301502	496.25391382	131.63	0.0001
VSRT	9.90544077	0.71761501	718.31922688	190.53	0.0001
VCIN	-0.13116605	0.04371926	33.93517175	9.00	0.0037
VTS	0.32603271	0.11368792	31.00606069	8.22	0.0054
VTR	0.05641371	0.01339113	66.90949232	17.75	0.0001

STEP 6 VARIABLE VTAVG2 ENTERED

R SQUARE = 0.89553231

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	6	2268.77321305	378.12886884	102.87	0.0001
ERROR	72	264.66213195	3.67586294		
TOTAL	78	2533.43534500			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	10.18151425				
VTAVG	0.52642312	0.04670441	466.99630254	127.04	0.0001
VSRT	9.80266819	0.71118028	698.37471088	189.99	0.0001
VCIN	-0.14071694	0.04353579	38.40247971	10.45	0.0019
VTAVG2	0.00308892	0.00182286	10.55519017	2.87	0.0945
VTS	0.37242776	0.11554862	38.18685214	10.39	0.0019
VTR	0.04315164	0.01536527	28.99169994	7.89	0.0064

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SC1C4

STEP 7 VARIABLE VRASH2 ENTERED

R SQUARE = 0.90167183

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	7	2284.32728200	326.33246886	93.01	0.0001
ERROR	71	249.10806300	3.50856427		
TOTAL	78	2533.43534500			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	9.58493760				
VTAVG	0.53344998	0.04575110	476.99500249	135.95	0.0001
VSRT	9.69784485	0.69658929	680.02725309	193.82	0.0001
VCIN	-0.1196371	0.04366068	26.48794432	7.55	0.0076
VTAVG2	0.00418104	0.00185489	17.82625089	5.08	0.0273
VRASH2	0.03202550	0.01521033	15.55406895	4.43	0.0388
VT5	0.41969157	0.11509874	46.64969481	13.30	0.0005
VTR	0.03631588	0.01535860	19.61639071	5.59	0.0208

STEP 8 VARIABLE VCIN2 ENTERED

R SQUARE = 0.90477278

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	8	2292.18333089	286.52291636	83.14	0.0001
ERROR	70	241.25201411	3.44645734		
TOTAL	78	2533.43534500			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	9.29286203				
VTAVG	0.54604820	0.04610574	483.42030999	140.27	0.0001
VSRT	9.42946550	0.71291356	602.93891045	174.94	0.0001
VCIN	-0.15251572	0.04834639	34.29841123	9.95	0.0024
VTAVG2	0.00294015	0.00184531	15.71295604	4.56	0.0362
VCIN2	0.00832219	0.00551216	7.85604890	2.28	0.1356
VRASH2	0.03099197	0.01509064	14.53637436	4.22	0.0437
VT5	0.41824750	0.11407949	46.32596636	13.44	0.0005
VTR	0.03474392	0.01525763	17.87131645	5.19	0.0258

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SC1C4

STEP 9 VARIABLE VCIN2 REMOVED

R SQUARE = 0.90167183

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	7	2284.32728200	326.33246886	93.01	0.0001
ERROR	71	249.10806300	3.50856427		
TOTAL	78	2533.43534500			

	COEFFICIENTS B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	9.58493760				
VTAW	0.53344998	0.04575110	476.99500249	135.95	0.0001
VSRT	9.69784485	0.69658929	680.02725309	193.82	0.0001
VCIN	-0.11996371	0.04366068	26.48794432	7.55	0.0076
VTAVG2	0.00418104	0.00185489	17.82625089	5.08	0.0273
VRASH2	0.03202550	0.01521033	15.55406895	4.43	0.0388
VTS	0.41969157	0.11509874	46.64969481	13.30	0.0005
VTR	0.03631588	0.01535860	19.61639071	5.59	0.0208

NO OTHER VARIABLES MET THE 0.5000 SIGNIFICANCE LEVEL FOR ENTRY INTO THE MODEL.

$$SC1C4MD = 9.58494 + (0.53345)(VTAVG) + (9.69784)(VSRT) - (0.11996)(VCIN) + (0.00418)(VTAVG2) + (0.03203)(VRASH2) + (0.41969)(VTS) + (0.03632)(VTR)$$

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SBV

STEP 1 VARIABLE VRASH ENTERED

R SQUARE = 0.46234665

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	1	45.92139479	45.92139479	66.21	0.0001
ERROR	77	53.40103902	0.69351999		
TOTAL	78	99.32243381			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	4.04854157				
VRASH	0.18134301	0.02228552	45.92139479	66.21	0.0001

STEP 2 VARIABLE VSR ENTERED

R SQUARE = 0.59730943

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	2	59.32622657	29.66311329	56.37	0.0001
ERROR	76	39.99620724	0.52626588		
TOTAL	78	99.32243381			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	4.40504180				
VRASH	0.18444531	0.01942287	47.45843694	90.18	0.0001
VSR	-0.42365922	0.08394379	13.40483178	25.47	0.0001

STEP 3 VARIABLE VV ENTERED

R SQUARE = 0.68323738

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	3	67.86079943	22.62026648	53.92	0.0001
ERROR	75	31.46163438	0.41948846		
TOTAL	78	99.32243381			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	4.40024050				
VRASH	0.17469169	0.01747518	41.92001526	99.93	0.0001
VV	0.28437547	0.06304654	8.53457285	20.35	0.0001
VSR	-0.41723232	0.07495912	12.99651705	30.98	0.0001

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SBY

STEP 4 VARIABLE VTAVG ENTERED

R SQUARE = 0.72444034

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	4	71.95317762	17.98829440	48.64	0.0001
ERROR	74	27.36925619	0.36985481		
TOTAL	78	99.32243381			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	4.35337078				
VTAVG	0.02816890	0.00846833	4.09237819	11.06	0.0014
VRASH	0.14844476	0.01820741	24.58470085	66.47	0.0001
VV	0.23742395	0.06085879	5.62903224	15.22	0.0002
VSH	-0.35449369	0.07286825	8.75329582	23.67	0.0001

STEP 5 VARIABLE VCIN2 ENTERED

R SQUARE = 0.75385064

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	5	74.87428034	14.97485607	44.71	0.0001
ERROR	73	24.44815347	0.33490621		
TOTAL	78	99.32243381			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	4.07123080				
VTAVG	0.03424826	0.00831707	5.67884438	16.96	0.0001
VRASH	0.15952476	0.01772773	27.12067827	80.98	0.0001
VV	0.25244262	0.05813494	6.31501104	18.86	0.0001
VCIN2	0.00490897	0.00166218	2.92110272	8.72	0.0042
VSR	-0.26161066	0.07613913	3.95383278	11.81	0.0010

STEP 6 VARIABLE VPR ENTERED

R SQUARE = 0.76432974

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	6	75.91508956	12.65251493	38.92	0.0001
ERROR	72	23.40734424	0.32510200		
TOTAL	78	99.32243381			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	4.11041170				
VTAVG	0.03451152	0.00819574	5.76462532	17.73	0.0001
VRASH	0.15900582	0.01746673	26.93672743	82.86	0.0001
VV	0.26178366	0.05751511	6.73505039	20.72	0.0001
VCIN2	0.00423881	0.00167996	2.06972243	6.37	0.0138
VPR	-0.01556438	0.00869871	1.04080922	3.20	0.0778
VSH	-0.21062051	0.08024699	2.23956411	6.89	0.0106

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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SBY

STEP 7 VARIABLE VSL ENTERED

R SQUARE = 0.77639471

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	7	77.11341223	11.01620175	35.22	0.0001
ERROR	71	22.20402158	0.31280312		
TOTAL	78	99.32243381			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	4.09164773				
VTAVG	0.03130594	0.00820435	4.55444682	14.56	0.0003
VRASH	0.16537702	0.01744118	28.12350921	89.91	0.0001
VV	0.24379360	0.05716052	5.69014491	18.19	0.0001
VCIN2	0.00538244	0.00184951	3.16427830	10.12	0.0022
VPR	-0.01932762	0.00874655	1.52740491	4.88	0.0303
VSC	-0.07850200	0.04010785	1.19832266	3.83	0.0542
VSR	-0.24098522	0.08124320	2.96159520	9.47	0.0030

STEP 8 VARIABLE VTS ENTERED

R SQUARE = 0.78656920

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	8	78.12396751	9.76549594	32.25	0.0001
ERROR	70	21.19846630	0.30283523		
TOTAL	78	99.32243381			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	4.02711966				
VTAVG	0.04141388	0.00978694	5.42256450	17.91	0.0001
VRASH	0.16220920	0.01724844	26.78291683	88.44	0.0001
VV	0.23300055	0.05655189	5.14074454	16.98	0.0001
VCIN2	0.00616215	0.00182623	3.44794135	11.39	0.0012
VTS	0.05816024	0.03183826	1.01055528	3.34	0.0720
VPR	-0.01661611	0.00873313	1.09628962	3.62	0.0612
VSC	-0.09621873	0.04063791	1.69770744	5.61	0.0207
VSR	-0.26848271	0.08057704	3.36214445	11.10	0.0014

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STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SBY

STEP 9 VARIABLE VPM2 ENTERED

R SQUARE = 0.79364013

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	9	78.83024233	8.75891581	29.49	0.0001
ERROR	69	20.49219147	0.29698828		
TOTAL	78	99.32243381			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	4.09879815				
VTAVG	0.04059413	0.00970656	5.19439393	17.49	0.0001
VPM2	-0.09956227	0.06456209	0.70627483	2.38	0.1276
VRASH	0.18522007	0.02268081	19.80607200	66.69	0.0001
VV	0.17398586	0.06782962	1.95401758	6.58	0.0125
VCIN2	0.00602323	0.00181076	3.28608059	11.06	0.0014
VT5	0.05367836	0.01166307	0.85355614	2.87	0.0945
VPR	-0.03460906	0.01452343	1.68647617	5.68	0.0199
VSC	-0.09011764	0.04043770	1.47497989	4.97	0.0291
VSR	-0.27669445	0.07997287	3.55512515	11.97	0.0009

STEP 10 VARIABLE VPM2 REMOVED

R SQUARE = 0.78656920

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	8	78.12396751	9.76549594	32.25	0.0001
ERROR	70	21.19846630	0.30283523		
TOTAL	78	99.32243381			

	COEFFICIENTS B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	4.02711966				
VTAVG	0.04141388	0.00978694	5.42256450	17.91	0.0001
VRASH	0.16220920	0.01724844	26.78291683	88.44	0.0001
VV	0.23300055	0.05655189	5.14074464	16.98	0.0001
VCIN2	0.00616215	0.00182623	3.44794135	11.39	0.0012
VT5	0.05816024	0.03183876	1.01055528	3.34	0.0720
VPR	-0.01661611	0.00873313	1.09628962	3.62	0.0612
VSC	-0.09621873	0.04063791	1.69770744	5.61	0.0207
VSR	-0.26848271	0.08057704	3.36214445	11.10	0.0014

NO OTHER VARIABLES MET THE 0.5000 SIGNIFICANCE LEVEL FOR ENTRY INTO THE MODEL.

$$SBY_{MD} = 4.02712 + (0.04141)(VTAVG) + (0.16221)(VRASH) + (0.23300)(VV) + (0.00616)(VCIN2) + (0.05816)(VT5) - (0.01662)(VPR) - (0.09622)(VSC) - (0.26848)(VSR)$$

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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SHW

STEP 1 VARIABLE VTAVG ENTERED

R SQUARE = 0.41978205

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	1	155.01142774	155.01142774	55.71	0.0001
ERROR	77	214.25502253	2.78253276		
TOTAL	78	369.26645026			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	7.50509907				
VTAVG	0.14719953	0.01972172	155.01142774	55.71	0.0001

STEP 2 VARIABLE VSRT ENTERED

R SQUARE = 0.55304229

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	2	204.21996451	102.10998226	47.02	0.0001
ERROR	76	165.04648575	2.17166429		
TOTAL	78	369.26645026			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	7.50509907				
VTAVG	0.11892083	0.01840787	90.63617014	41.74	0.0001
VSRT	2.46607392	0.51806256	49.20853677	22.66	0.0001

STEP 3 VARIABLE VV ENTERED

R SQUARE = 0.60360060

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	3	222.88945032	74.29648344	38.07	0.0001
ERROR	75	146.37699994	1.95169333		
TOTAL	78	369.26645026			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	7.50609907				
VTAVG	0.13758343	0.01847508	108.39327115	55.54	0.0001
VSRT	2.06170884	0.50822894	32.11792323	16.46	0.0001
VV	-0.44700454	0.14452785	18.66948581	9.57	0.0028

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SHW

STEP 4 VARIABLE VRASH2 ENTERED

R SQUARE = 0.64309047

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	4	237.47173688	59.36793422	33.33	0.0001
ERROR	74	131.79471336	1.78100964		
TOTAL	78	369.26645026			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	7.01679302				
VTAVG	0.13921493	0.01765685	110.71624809	62.16	0.0001
VSRT	2.01253257	0.48580130	30.56572927	17.16	0.0001
VV	-0.45450890	0.13808841	19.29463569	10.83	0.0015
VRASH2	0.02768180	0.00967419	14.58228656	8.19	0.0055

STEP 5 VARIABLE VCIN ENTERED

R SQUARE = 0.69593964

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	5	256.96716200	51.39743240	33.42	0.0001
ERROR	73	112.27928626	1.53807244		
TOTAL	78	369.26645026			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	6.80715664				
VTAVG	0.11553429	0.01770409	65.50153296	42.59	0.0001
VSRT	2.14263027	0.45242942	34.41994714	22.38	0.0001
VCIN	0.06665495	0.02432723	19.51542512	12.69	0.0007
VV	-0.38093006	0.12997723	13.21090920	8.59	0.0045
VRASH2	0.03954166	0.00958694	26.16535469	17.01	0.0001

STEP 6 VARIABLE VCIN2 ENTERED

R SQUARE = 0.71830295

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	6	265.24518076	44.20753013	30.60	0.0001
ERROR	72	104.02126950	1.44473985		
TOTAL	78	369.26645026			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	7.15958466				
VTAVG	0.09373252	0.01943121	33.61791061	23.27	0.0001
VSRT	2.44693876	0.45705311	41.40974071	28.66	0.0001
VCIN	0.11525447	0.02643860	27.45543893	19.00	0.0001
VV	-0.36964550	0.12606030	12.42235103	8.60	0.0045
VCIN2	-0.00642777	0.00352508	8.25801876	5.72	0.0194
VRASH2	0.04624453	0.00929617	27.07669384	18.74	0.0001

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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SHV

STEP 7 VARIABLE VSC ENTERED

R SQUARE = 0.75093524

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	7	277.29518951	39.61359850	30.58	0.0001
ERROR	71	91.97126076	1.29536987		
TOTAL	78	369.26645026			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	7.24561653				
VTAVG	0.10397770	0.01870344	40.03421405	30.91	0.0001
VSRT	1.79552678	0.48261366	17.92991977	13.84	0.0004
VCIN	0.12134028	0.02511398	30.23935986	23.34	0.0001
VV	-0.34152929	0.11472138	10.54159397	8.14	0.0057
VCIN2	-0.01463604	0.00390958	18.15437264	14.01	0.0004
VRASH2	0.04346701	0.00920608	35.90348813	27.72	0.0001
VSC	0.26227555	0.08599259	12.05000875	9.30	0.0032

STEP 8 VARIABLE VPS ENTERED

R SQUARE = 0.75835562

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	8	280.03528920	35.00441115	27.46	0.0001
ERROR	70	89.23116106	1.27473087		
TOTAL	78	369.26645026			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	7.12116648				
VTAVG	0.11334026	0.01462204	42.53031783	33.36	0.0001
VSRT	1.77613640	0.47893615	17.53137174	13.75	0.0004
VCIN	0.09646725	0.03014093	13.05765011	10.24	0.0021
VV	-0.37950076	0.12155492	12.42506667	9.75	0.0026
VCIN2	-0.01364724	0.00393651	15.32092481	12.02	0.0009
VRASH2	0.04660000	0.00922080	32.55764800	25.54	0.0001
VPS	0.33084617	0.22565875	2.74009969	2.15	0.1471
VSC	0.30626268	0.09042694	14.62214097	11.47	0.0012

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SHW

STEP 9 VARIABLE VPS REMOVED

R SQUARE = 0.75093524

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	7	277.29518951	39.61359850	30.58	0.0001
ERROR	71	91.97126076	1.29536987		
TOTAL	78	369.26645026			

	COEFFICIENTS B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	7.24561653				
VTAVG	0.10397770	0.01870344	40.01421405	30.91	0.0001
VSRT	1.79552678	0.48261366	17.92991977	13.84	0.0004
VCIN	0.12134028	0.02511398	30.23935986	23.34	0.0001
VV	-0.34152929	0.11972138	10.54159397	8.14	0.0057
VCIN2	-0.01463604	0.00390958	18.15437264	14.01	0.0004
VHSH2	0.04846701	0.00920608	35.90348813	27.72	0.0001
VSC	0.26227555	0.08599259	12.05000875	9.30	0.0032

NO OTHER VARIABLES MET THE 0.5000 SIGNIFICANCE LEVEL FOR ENTRY INTO THE MODEL.

$$\text{SHWMD} = 7.24562 + (0.10398)(\text{VTAVG}) + (1.79553)(\text{VSRT}) + (0.12134)(\text{VCIN}) - (0.34153)(\text{VV}) - (0.01464)(\text{VCIN}^2) + (0.04847)(\text{VHSH}^2) + (0.26228)(\text{VSC})$$

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND CROSS PRODUCT TERMS IN FIVE VARIABLES
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SNAP

STEP 1 VARIABLE VSRT ENTERED

R SQUARE = 0.25229346

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	1	252.53492495	252.53492495	25.98	0.0001
ERROR	77	744.42216835	9.71976842		
TOTAL	78	1000.95709330			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	8.89555982				
VSRT	5.28766547	1.03736406	252.53492495	25.98	0.0001

STEP 2 VARIABLE VTAVG ENTERED

R SQUARE = 0.37211671

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	2	372.47285696	186.23642949	22.52	0.0001
ERROR	76	628.48423432	8.26952940		
TOTAL	78	1000.95709330			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	8.89555982				
VTAVG	0.13679580	0.03592093	119.93793403	14.50	0.0003
VSRT	4.04516638	1.01094205	132.40398309	16.01	0.0001

STEP 3 VARIABLE VSRT2 ENTERED

R SQUARE = 0.40091794

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	3	401.30165466	133.76721829	16.73	0.0001
ERROR	75	599.65543844	7.99540585		
TOTAL	78	1000.95709330			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	9.44774353				
VTAVG	0.14483597	0.03557319	132.54024584	16.58	0.0001
VSRT	3.44104972	1.04371611	86.90757585	10.87	0.0015
VSRT2	-4.82966690	2.54345573	28.82879588	3.61	0.0614

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SNAP

STEP 4 VARIABLE VCR ENTERED

R SQUARE = 0.41874702

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	4	419.14780176	104.78695044	13.33	0.0001
ERROR	74	581.80929154	7.86228772		
TOTAL	78	1000.95709330			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	9.16451396				
VTAVG	0.10647164	0.04350641	47.08800733	5.99	0.0168
VSRT	3.63949494	1.04333444	45.67102416	12.17	0.0008
VSRT2	-4.27088784	2.54931705	22.06670878	2.81	0.0981
VCR	-0.02414896	0.01602874	17.84614690	2.27	0.1362

STEP 5 VARIABLE VCR REMOVED

R SQUARE = 0.40091794

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	3	401.30165486	133.76721829	16.73	0.0001
ERROR	75	599.65543844	7.99540585		
TOTAL	78	1000.95709330			

	COEFFICIENTS B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	9.44774353				
VTAVG	0.14483597	0.03557319	132.54024584	16.58	0.0001
VSRT	3.44104972	1.04371611	86.90757585	10.87	0.0015
VSRT2	-4.82966690	2.54345573	28.82879588	3.61	0.0614

NO OTHER VARIABLES MET THE 0.5000 SIGNIFICANCE LEVEL FOR ENTRY INTO THE MODEL.

$$\text{SNAPMD} = 9.44774 + (0.14484)(\text{VTAVG}) + (3.44105)(\text{VSRT}) - (4.82967)(\text{VSRT}^2)$$

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SMD

STEP 1 VARIABLE VRASH ENTERED

R SQUARE = 0.24052168

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	1	524.63769735	524.63769735	24.39	0.0001
ERROR	77	1656.61137220	21.51443341		
TOTAL	78	2181.24906955			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	9.65792470				
VRASH	0.61244716	0.12412471	524.63769735	24.39	0.0001

STEP 2 VARIABLE VSR ENTERED

R SQUARE = 0.35562110

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	2	775.69819263	387.84909631	20.97	0.0001
ERROR	76	1405.55087692	18.49409049		
TOTAL	78	2181.24906955			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	11.02764707				
VRASH	0.62637294	0.11514031	547.32371884	29.59	0.0001
VSR	-1.83347576	0.49762532	251.06049528	13.58	0.0004

STEP 3 VARIABLE VV ENTERED

R SQUARE = 0.43759581

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	3	954.50545697	318.16848566	19.45	0.0001
ERROR	75	1226.74361258	16.35658150		
TOTAL	78	2181.24906955			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	11.00567046				
VRASH	0.58172855	0.10912086	464.85521837	28.42	0.0001
VV	1.30164877	0.39368376	178.80726434	10.93	0.0015
VSR	-1.80405843	0.46806941	242.96098426	14.86	0.0002

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SMD

STEP 4 VARIABLE VCIN ENTERED

R SQUARE = 0.50295727

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	4	1047.07506749	274.26876687	18.72	0.0001
ERROR	74	1044.17400206	14.65100003		
TOTAL	78	2181.24906955			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	11.16717209				
VCIN	-0.21665225	0.07009291	142.56961052	9.73	0.0026
VRASH	0.47098729	0.10920614	272.51569718	18.60	0.0001
VV	1.30073853	0.37259326	178.55716267	12.19	0.0008
VSH	-2.02024043	0.44638213	297.42453088	20.30	0.0001

STEP 5 VARIABLE VTC ENTERED

R SQUARE = 0.55468042

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	5	1209.49614676	241.97922935	18.19	0.0001
ERROR	73	971.35292279	13.30620442		
TOTAL	78	2181.24906955			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	11.66944302				
VCIN	-0.32067031	0.07542909	240.48631004	18.07	0.0001
VRASH	0.27836413	0.12331808	67.79961961	5.10	0.0270
VV	0.91528900	0.37895347	77.62451729	5.83	0.0182
VTC	-0.02020013	0.00693723	112.82107928	8.48	0.0048
VSH	-2.12243585	0.42874761	326.07681736	24.51	0.0001

STEP 6 VARIABLE VSRT ENTERED

R SQUARE = 0.59683717

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	6	1301.85052063	216.97508677	17.76	0.0001
ERROR	72	879.39854892	12.21386874		
TOTAL	78	2181.24906955			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	10.96400691				
VSRT	5.50205154	2.00523411	91.95437387	7.53	0.0077
VCIN	-0.38175677	0.07561829	311.29568520	25.49	0.0001
VRASH	-0.01939294	0.16042175	0.17849015	0.01	0.9041
VV	1.24527939	0.38246654	129.47918635	10.60	0.0017
VTC	-0.02219748	0.00668613	134.62036551	11.02	0.0014
VSH	-1.12178331	0.54930199	50.93881706	4.17	0.0448

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SMD

STEP 7 VARIABLE VRSR REMOVED

R SQUARE = 0.59675534

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	5	1301.67203048	260.33440610	21.61	0.0001
ERROR	73	879.57703907	12.04900054		
TOTAL	78	2181.24906955			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	10.97670838				
VSRT	5.33807382	1.46682052	159.57550333	13.24	0.0005
VCIN	-0.37676992	0.06294581	431.68788679	35.83	0.0001
VV	1.23851697	0.37579124	130.87649200	10.86	0.0015
VTC	-0.02182053	0.00587442	166.24590830	13.80	0.0004
VSR	-1.14942437	0.49606846	64.68872621	5.37	0.0233

STEP 8 VARIABLE VTAVG2 ENTERED

R SQUARE = 0.62135026

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	6	1355.31967251	225.88661209	19.69	0.0001
ERROR	72	825.92939704	11.47124163		
TOTAL	78	2181.24906955			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	10.64874593				
VSRT	5.54488839	1.43441248	171.41465072	14.94	0.0002
VCIN	-0.32343312	0.06618519	273.94145078	23.88	0.0001
VV	1.08667683	0.37353274	97.16944176	8.47	0.0048
VTAVG2	0.00812993	0.00375439	53.64764203	4.68	0.0339
VTC	-0.04233873	0.01108486	167.35012970	14.59	0.0003
VSR	-1.11580558	0.48426388	61.01005608	5.32	0.0240

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STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SMD

STEP 9 VARIABLE VPR ENTERED

R SQUARE = 0.65350626

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	7	1425.45992203	203.63713172	19.13	0.0001
ERROR	71	755.76914752	10.64491757		
TOTAL	78	2181.24906955			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	10.66058133				
VSRT	5.34096966	1.38308389	161.72569829	15.19	0.0002
VCIN	-0.29187980	0.06493100	215.10267791	20.21	0.0001
VV	1.09895574	0.35966736	99.38065533	9.34	0.0032
VTAWG2	-0.01005189	0.00369804	78.64906304	7.39	0.0082
VTC	-0.05016155	0.01110452	217.21229964	20.41	0.0001
VPR	-0.13140274	0.05119080	70.14024952	6.59	0.0124
VSH	-0.61049830	0.50648142	15.46622055	1.45	0.2321

STEP 10 VARIABLE VSR REMOVED

R SQUARE = 0.64641573

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	6	1409.99370147	234.99895025	21.94	0.0001
ERROR	72	771.25536808	10.71188011		
TOTAL	78	2181.24906955			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	10.25127559				
VSRT	6.23951524	1.19426254	292.39354647	27.30	0.0001
VCIN	-0.27182368	0.06295498	199.66919706	18.64	0.0001
VV	1.17761023	0.35480871	117.99953367	11.02	0.0014
VTAWG2	0.01052859	0.00368838	87.28389360	8.15	0.0056
VTC	-0.05051640	0.01113548	220.45127244	20.60	0.0001
VPR	-0.15543259	0.04729749	115.68408505	10.80	0.0016

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SMD

EP 11 VARIABLE VPC ENTERED

R SQUARE = 0.66513431

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	7	1450.63231879	207.26175983	20.15	0.0001
ERROR	71	710.41675076	10.28755987		
TOTAL	78	2161.24906955			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	10.59854774				
VSRT	4.80085255	1.37519149	125.37841012	12.19	0.0008
VCIN	-0.29810927	0.06309509	229.65308106	22.32	0.0001
VV	1.03128558	0.35538156	86.63242793	8.42	0.0049
VTAVG2	0.01096722	0.00362129	94.35796120	9.17	0.0034
VTC	-0.05591627	0.01124421	254.40792696	24.73	0.0001
VPC	0.05855241	0.02938769	40.83861731	3.97	0.0502
VPR	-0.19567878	0.05056152	154.08472244	14.98	0.0002

EP 12 VARIABLE VSC ENTERED

R SQUARE = 0.57180633

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	8	1465.37694168	183.17211771	17.91	0.0001
ERROR	70	715.87212787	10.22674468		
TOTAL	78	2181.24906955			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	10.67494391				
VSRT	5.35841207	1.44863921	139.92301619	13.68	0.0004
VCIN	-0.28332684	0.06411789	199.68910479	19.53	0.0001
VV	1.04079106	0.35441922	88.19216311	8.62	0.0045
VTAVG2	0.01026638	0.00365808	80.54978215	7.88	0.0065
VTC	-0.05079728	0.01200457	183.11537231	17.91	0.0001
VPC	0.06429327	0.02969351	47.94524607	4.69	0.0338
VPR	-0.21693996	0.05347145	168.33431555	16.46	0.0001
VSC	-0.27840396	0.23344946	14.54462289	1.42	0.2371

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SMD

STEP 13 VARIABLE VSC REMOVED

R SQUARE = 0.66513831

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	7	1450.81231879	207.26175983	20.15	0.0001
ERROR	71	730.41675076	10.28755987		
TOTAL	78	2181.24906955			

	COEFFICIENTS B VALUE	STD ERROR	TYPE III SS	F	PROB>F
INTERCEPT	10.59854774				
VSRT	4.80085256	1.37519149	125.37841012	12.19	0.0008
VCIN	-0.29810927	0.06309509	229.65308106	22.32	0.0001
VV	1.03128558	0.35538156	86.63242793	8.42	0.0049
VTAVG2	0.01096722	0.00362129	94.35796120	9.17	0.0034
VTC	-0.05591627	0.01124421	254.40792896	24.73	0.0001
VPC	0.05855241	0.02438769	40.83861731	3.97	0.0502
VPR	-0.19567874	0.05056152	154.08472244	14.98	0.0002

NO OTHER VARIABLES MET THE 0.5000 SIGNIFICANCE LEVEL FOR ENTRY INTO THE MODEL.

$$\text{SMDMD} = 10.5985 + (4.80085)(\text{VSRT}) - (0.29811)(\text{VCIN}) + (1.03129)(\text{VV}) + (0.01097)(\text{VTAVG2}) - (0.05592)(\text{VTC}) + (0.05855)(\text{VPC}) - (0.19568)(\text{VPR})$$

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SHD

STEP 1 VARIABLE VRASH ENTERED

R SQUARE = 0.58050120

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	1	2513.30550508	2513.30550508	106.55	0.0001
ERROR	77	1816.23851250	23.58751315		
TOTAL	78	4329.54401758			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	11.09096973				
VRASH	1.34157802	0.12996738	2513.30550508	106.55	0.0001

STEP 2 VARIABLE VV ENTERED

R SQUARE = 0.70309364

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	2	3044.07465482	1522.03742741	39.99	0.0001
ERROR	76	1285.46916275	16.91406793		
TOTAL	78	4329.54401758			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	11.09096973				
VRASH	1.41811101	0.11090166	2765.61932220	163.51	0.0001
VV	-2.24220686	0.40026424	530.76934974	31.38	0.0001

STEP 3 VARIABLE VSR ENTERED

R SQUARE = 0.78328289

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	3	3391.25777141	1130.41925714	90.36	0.0001
ERROR	75	938.28624617	12.51048328		
TOTAL	78	4329.54401758			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	12.70196999				
VRASH	1.43507880	0.09543303	2828.97068048	226.13	0.0001
VV	-2.27668363	0.34430093	547.01962243	43.72	0.0001
VSR	-2.15647193	0.40935632	347.16291659	27.75	0.0001

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SHD

STEP 4 VARIABLE VSC ENTERED

R SQUARE = 0.80790511

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	4	3497.86073436	874.46518359	77.81	0.0001
ERROR	74	831.68328322	11.23896329		
TOTAL	78	4329.54401758			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	12.19265007				
VRASH	1.45590487	0.09070576	2895.49283784	257.63	0.0001
VV	-2.00852133	0.33775188	397.45101059	35.36	0.0001
VSC	0.60233929	0.19557785	106.60296295	9.49	0.0029
VSR	-1.59177009	0.42913905	154.62853813	13.76	0.0004

STEP 5 VARIABLE VTC ENTERED

R SQUARE = 0.81546957

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	5	3530.61139780	706.12227956	64.52	0.0001
ERROR	73	796.93261978	10.91428246		
TOTAL	78	4329.54401758			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	12.08983525				
VRASH	1.52397007	0.09777514	2658.78513864	242.94	0.0001
VV	-1.87152089	0.34257462	326.63768196	29.85	0.0001
VTC	0.01044557	0.00603832	32.75066344	2.99	0.0879
VSC	0.46285741	0.20916290	53.59353680	4.90	0.0300
VSR	-1.72184847	0.43010057	175.40303813	16.03	0.0001

STEP 6 VARIABLE VTAG2 ENTERED

R SQUARE = 0.83716821

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	6	3624.55660207	604.09276701	61.70	0.0001
ERROR	72	704.98741551	9.79149188		
TOTAL	78	4329.54401758			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	12.48166557				
VRASH	1.60583013	0.09600892	2732.36845554	279.06	0.0001
VV	-1.63876049	0.31266614	237.46389520	24.25	0.0001
VTAG2	-0.01079995	0.00348665	93.94520427	9.59	0.0028
VTC	0.04361167	0.01213539	126.45807392	12.92	0.0006
VSC	0.26116315	0.20828073	15.39481535	1.57	0.2139
VSR	-1.63407470	0.40842878	197.44665954	20.17	0.0001

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SHD

STEP 7 VARIABLE VSC REMOVED

R SQUARE = 0.83361245

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	5	3609.16178672	721.83235734	73.15	0.0001
ERROR	73	720.38223086	9.86824974		
TOTAL	78	4329.54401758			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	12.67508769				
VRASH	1.62408813	0.09501005	2883.50154523	292.20	0.0001
VV	-1.66366272	0.33334768	245.79657418	24.91	0.0001
VTAVG2	-0.01216674	0.00332484	132.14392572	13.39	0.0005
UTC	0.05043139	0.01069081	211.60289449	21.44	0.0001
VSR	-2.06401825	0.36433354	318.25150705	32.25	0.0001

STEP 8 VARIABLE VTS ENTERED

R SQUARE = 0.83945948

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	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	6	3634.47677323	605.74612887	62.75	0.0001
ERROR	72	695.06724435	9.65371173		
TOTAL	78	4329.54401758			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	12.57969881				
VRASH	1.62429449	0.09397169	2884.22906613	292.77	0.0001
VV	-1.66870545	0.32971895	247.26684318	25.61	0.0001
VTAVG2	-0.01267963	0.00330372	142.20067010	14.73	0.0003
VTS	0.24635788	0.15213347	25.31498651	2.62	0.1097
UTC	0.04764549	0.01093829	184.17226796	19.08	0.0001
VSR	-2.14297370	0.36323392	336.01233717	34.81	0.0001

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SHD

STEP 9 VARIABLE VTS REMOVED

R SQUARE = 0.83361245

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	5	3609.16178672	721.83235734	73.15	0.0001
ERROR	73	720.38223086	9.86824974		
TOTAL	78	4329.54401758			

	COEFFICIENTS B VALUE	STD ERROR	TYPE III SS	F	PROB>F
INTERCPT	12.67508769				
VRASH	1.62408813	0.09501005	2883.50154523	292.20	0.0001
VV	-1.66366272	0.33334768	245.79657418	24.91	0.0001
VTAVG2	-0.01216674	0.00332484	132.14392572	13.39	0.0005
UTC	0.05043135	0.01089081	211.60289449	21.44	0.0001
VSR	-2.06901825	0.36433354	318.25150705	32.25	0.0001

NO OTHER VARIABLES MET THE 0.5000 SIGNIFICANCE LEVEL FOR ENTRY INTO THE MODEL.

$$SHDMD = 12.67509 + (1.62409)(VRASH) - (1.66366)(VV) - (0.01217)(VTAVG2) + (0.05043)(UTC) - (2.06902)(VSR)$$

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SSRC

STEP 1 VARIABLE VRASH ENTERED

R SQUARE = 0.67395537

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	1	16890.10909106	16890.10909106	159.16	0.0001
ERROR	77	8171.05928002	106.11765299		
TOTAL	78	25061.16837108			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	44.65671796				
VRASH	-3.47743938	0.27566848	16890.10909106	159.16	0.0001

STEP 2 VARIABLE VSRT ENTERED

R SQUARE = 0.87043497

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	2	21814.11744734	10907.05872367	255.29	0.0001
ERROR	76	3247.05092374	42.72435426		
TOTAL	78	25061.16837108			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	44.65671796				
VSRT	-27.44363180	2.55634784	4924.00835628	115.25	0.0001
VRASH	-2.31796051	0.20559379	5430.84722567	127.11	0.0001

STEP 3 VARIABLE VTAVG ENTERED

R SQUARE = 0.91020488

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	3	22810.79778772	7603.59926257	253.41	0.0001
ERROR	75	2250.37058336	30.00494111		
TOTAL	78	25061.16837108			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	44.65671796				
VTAVG	-0.41666838	0.07229512	996.68034039	33.22	0.0001
VSRT	-25.87267070	2.15956237	4306.69163014	143.53	0.0001
VRASH	-1.97920712	0.18204303	3546.72203016	118.20	0.0001

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SSRC

STEP 4 VARIABLE VSR ENTERED

R SQUARE = 0.93344503

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	4	23393.22307159	5848.30576790	259.47	0.0001
ERROR	74	1667.94529949	22.53980134		
TOTAL	78	25061.16837108			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	41.84546670				
VTAVG	-0.34111014	0.06439849	632.39432380	28.06	0.0001
VSRT	-17.93172704	2.43798148	1219.36441638	54.10	0.0001
VRASH	-2.41584827	0.17964678	4076.15355290	180.84	0.0001
VSR	3.76306992	0.74028205	582.42528387	25.84	0.0001

STEP 5 VARIABLE VTS ENTERED

R SQUARE = 0.94927941

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	5	23790.05120446	4758.01024089	273.25	0.0001
ERROR	73	1271.11716662	17.41256393		
TOTAL	78	25061.16837108			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	42.62894270				
VTAVG	-0.55481755	0.07216507	1029.22184225	59.11	0.0001
VSRT	-14.45777591	2.26301795	710.70554877	40.82	0.0001
VRASH	-2.489984001	0.15865657	4288.34275186	246.28	0.0001
VTS	-1.14860327	0.24060253	396.82813287	22.79	0.0001
VSR	4.31090515	0.66070156	741.29145906	42.57	0.0001

STEP 6 VARIABLE VCI ENTERED

R SQUARE = 0.95717370

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	6	23987.89136516	3997.98189419	268.20	0.0001
ERROR	72	1073.27700593	14.90662508		
TOTAL	78	25061.16837108			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	42.92957404				
VTAVG	-0.67247674	0.07417137	1225.35311807	82.20	0.0001
VSRT	-17.44459996	2.24864413	897.13933570	60.18	0.0001
VCI	0.32984947	0.09054161	197.84016069	13.27	0.0005
VRASH	-2.06404977	0.10764182	1803.68364862	121.00	0.0001
VTS	-1.03628140	0.27438188	324.11622397	21.74	0.0001
VSR	3.76625865	0.62932857	533.88130518	35.82	0.0001

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SSRC

STEP 7 VARIABLE VCIN2 ENTERED

R SQUARE = 0.96049319

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	1	24071.00154122	24071.00154122	246.59	0.0001
ERROR	71	940.0862766	13.24064460		
TOTAL	72	25061.16837108			
	B VALUE	STD ERROR	TYPE III SS	F	PROB>F
INTERCEPT	44.51770929				
VTAVG	-0.73900135	0.07573520	1293.35025526	92.75	0.0001
VSRT	-17.31485602	2.17554460	843.31710780	63.34	0.0001
VCIN	0.41741997	0.09468956	271.51208131	19.47	0.0001
VRASH	-2.05604000	0.18150440	1792.8664479	128.57	0.0001
VCIN2	-0.02872186	0.01175937	83.19017806	5.97	0.0171
VT5	-1.00875439	0.21756610	249.79047811	21.50	0.0001
VSR	3.25448841	0.64374283	356.41468203	25.56	0.0001

STEP 8 VARIABLE VV ENTERED

R SQUARE = 0.96362294

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	8	24149.51669915	3018.68958739	231.79	0.0001
ERROR	70	911.65167193	13.02359531		
TOTAL	78	25061.16837108			
	B VALUE	STD ERROR	TYPE III SS	F	PROB>F
INTERCEPT	44.33181433				
VTAVG	-0.78370299	0.07636141	1371.78492367	105.33	0.0001
VSRT	-15.36520927	2.24754353	608.68363783	46.74	0.0001
VCIN	0.41991394	0.09151219	274.21650210	21.06	0.0001
VRASH	-2.13867967	0.17445763	1870.47587717	143.62	0.0001
VV	0.96019782	0.39126480	78.43515593	6.02	0.0166
VCIN2	-0.02810368	0.01136707	79.60858494	6.11	0.0159
VT5	-1.09521881	0.21318795	343.72202794	26.39	0.0001
VSR	3.58764720	0.63675462	413.43395574	31.74	0.0001

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SSNC

STEP 9 VARIABLE VTAVG2 ENTERED

R SQUARE = 0.96613533

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	9	24212.48027492	2690.27558610	218.72	0.0001
ERROR	69	848.68809616	12.29982748		
TOTAL	78	25061.16837108			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	45.19364045				
VTAVG	-0.91707582	0.09477304	1151.70146864	93.64	0.0001
VSHT	-15.94040499	2.19894422	646.35229964	52.55	0.0001
VCIN	0.39049018	0.08987884	232.16895290	18.88	0.0001
VRASH	-2.09200127	0.17465082	1764.74382393	143.48	0.0001
VV	0.95063225	0.38026091	76.87068199	6.25	0.0148
VTAVG2	-0.00678190	0.00299748	62.96357577	5.12	0.0268
VCIN2	-0.02705648	0.01105640	73.65705601	5.99	0.0169
VT5	-1.11284930	0.20732673	354.40272331	28.81	0.0001
VSR	3.21993581	0.63979461	311.53890561	25.33	0.0001

STEP 10 VARIABLE VCR ENTERED

R SQUARE = 0.96738995

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	10	24243.92251636	2424.39225164	201.72	0.0001
ERROR	68	817.24585472	12.01832139		
TOTAL	78	25061.16837108			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	45.35269422				
VTAVG	-0.89152725	0.09500450	1058.33878907	88.06	0.0001
VSHT	-15.90875736	2.25457601	675.98558768	56.25	0.0001
VCIN	0.45088557	0.09637202	263.07199088	21.89	0.0001
VRASH	-1.95724414	0.19169240	1252.92199320	104.25	0.0001
VV	1.08426464	0.38485678	95.39291243	7.94	0.0063
VTAVG2	-0.00729279	0.00297977	71.98907645	5.99	0.0170
VCIN2	-0.02110054	0.01153279	40.23113235	3.35	0.0717
VT5	-1.10717401	0.20497098	350.66372953	29.18	0.0001
VSR	3.20060307	0.63254368	307.69922554	25.60	0.0001
VCR	0.03990036	0.02466846	31.44224144	2.62	0.1104

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STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SSR

STEP 11 VARIABLE VCR REMOVED

R SQUARE = 0.96613531

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	9	24212.48027492	2690.27558610	218.72	0.0001
ERROR	69	848.68809616	12.29982748		
TOTAL	78	25061.16837108			

	COEFFICIENTS B VALUE	STD ERROR	TYPE III SS	F	PROB>F
INTERCEPT	45.19364045				
VTAVG	-0.91707582	0.09477304	1151.70146864	93.64	0.0001
VSRT	-15.94040499	2.19894422	646.35229964	52.55	0.0001
VCIN	0.39049010	0.08987884	232.16295290	18.88	0.0001
VRASH	-2.09200127	0.17465082	1764.74382393	143.48	0.0001
VV	0.95063225	0.38026091	76.87068199	6.25	0.0148
VTAVG2	-0.00678190	0.00299748	62.96357577	5.12	0.0268
VCIN2	-0.02705648	0.01105640	73.65705601	5.99	0.0169
VT5	-1.11269530	0.20732673	354.40272331	28.81	0.0001
VSR	3.21993581	0.63979461	311.53890561	25.33	0.0001

NO OTHER VARIABLES MET THE 0.5000 SIGNIFICANCE LEVEL FOR ENTRY INTO THE MODEL.

$$\text{SSRCMD} = 45.19364 - (0.91708)(\text{VTAVG}) - (15.94040)(\text{VSRT}) + (0.39049)(\text{VCIN}) - (2.09200)(\text{VRASH}) + (0.95063)(\text{VV}) - (0.00678)(\text{VTAVG}^2) \\ - (0.02706)(\text{VCIN}^2) - (1.11290)(\text{VT5}) + (3.21994)(\text{VSR})$$

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SION

STEP 1 VARIABLE VPH2 ENTERED

R SQUARE = 0.11016968

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	1	16.56294186	16.56294186	9.53	0.0028
ERROR	77	133.77735484	1.73736824		
TOTAL	78	150.34029669			
<hr/>					
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	6.07842826				
VPH2	-0.21018571	0.06807286	16.56294186	9.53	0.0028

STEP 2 VARIABLE VPS ENTERED

R SQUARE = 0.16876726

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	2	25.37251979	12.68625990	7.72	0.0009
ERROR	76	124.96777690	1.64431286		
TOTAL	78	150.34029669			
<hr/>					
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	6.29357745				
VPH2	-0.37906108	0.09853382	24.33504881	14.80	0.0002
VPS	-0.65760858	0.26419354	8.80957794	5.36	0.0233

STEP 3 VARIABLE VTAVG ENTERED

R SQUARE = 0.22297490

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	3	33.52211190	11.17403730	7.17	0.0003
ERROR	75	116.81818479	1.55757580		
TOTAL	78	150.34029669			
<hr/>					
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	6.33287006				
VTAVG	0.03452556	0.01509376	8.14959211	5.23	0.0250
VPH2	-0.42489641	0.09797090	29.29686324	18.81	0.0001
VPS	-0.77794391	0.28153858	11.89241155	7.64	0.0072

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE S104

STEP 4 VARIABLE VSR ENTERED

R SQUARE = 0.28297759

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	4	42.54293442	10.63573360	7.30	0.0001
ERROR	74	107.79736227	1.45672111		
TOTAL	78	150.34029669			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	6.08440055				
VTAVG	0.04293816	0.01498327	11.96327262	8.21	0.0054
VPH2	-0.39864445	0.09533146	25.47272588	17.49	0.0001
VPS	-0.89446633	0.27626816	15.27013064	10.48	0.0018
VSR	0.38360937	0.15415384	9.02082251	6.19	0.0151

STEP 5 VARIABLE VTAVG2 ENTERED

R SQUARE = 0.34924433

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	5	52.50549615	10.50109923	7.84	0.0001
ERROR	73	97.83480054	1.34020275		
TOTAL	78	150.34029669			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	5.73408367				
VTAVG	0.09347262	0.02345377	21.28697124	15.88	0.0002
VPH2	-0.36933700	0.09206903	21.56696396	16.09	0.0001
VTAVG2	0.00266034	0.00097575	9.96256173	7.43	0.0080
VPS	-0.71860569	0.27272623	9.30460597	6.94	0.0103
VSR	0.45306111	0.15003843	12.22022071	9.12	0.0035

STEP 6 VARIABLE VTP ENTERED

R SQUARE = 0.33283022

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	6	57.55480832	9.59246805	7.44	0.0001
ERROR	72	92.78548837	1.28868734		
TOTAL	78	150.34029669			
	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	5.77608307				
VTAVG	0.10070659	0.02324899	23.94138904	18.58	0.0001
VPH2	-0.45104489	0.09027120	26.60360900	20.64	0.0001
VTAVG2	0.00259711	0.00097182	12.25698286	9.51	0.0029
VTP	-0.01154860	0.00583428	5.04931217	3.92	0.0516
VPS	-0.63710679	0.27057947	7.14601839	5.55	0.0213
VSR	0.35222441	0.15509627	6.59523591	5.12	0.0267

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STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE STOM

STEP 7 VARIABLE VV ENTERED

R SQUARE = 0.39657189

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	7	59.62073557	8.51724794	6.67	0.0001
ERROR	71	90.71956112	1.27774030		
TOTAL	78	150.34029669			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	5.80771078				
VTAVG	0.10930601	0.02423038	26.00220201	20.35	0.0001
VPH2	-0.52032476	0.11286979	27.15414588	21.25	0.0001
VV	-0.16771966	0.13190090	2.06592725	1.62	0.2077
VTAVG2	0.00312982	0.00097329	13.21279353	10.34	0.0020
VTP	-0.01374566	0.00606095	6.57191978	5.14	0.0264
VPS	-0.64561477	0.27210849	8.11182795	6.35	0.0140
VSR	0.32107327	0.15695719	5.34673244	4.18	0.0445

STEP 8 VARIABLE VY REMOVED

R SQUARE = 0.38283022

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	6	57.55480832	9.59246805	7.44	0.0001
ERROR	72	92.78548837	1.28868734		
TOTAL	78	150.34029669			

	COEFFICIENTS B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	5.77608307				
VTAVG	0.10020859	0.02324899	23.94138904	18.58	0.0001
VPH2	-0.45104489	0.09927120	26.60360900	20.64	0.0001
VTAVG2	0.00249711	0.00097182	12.25640286	9.51	0.0029
VTP	-0.01154860	0.00583428	5.04931217	3.92	0.0516
VPS	-0.63716679	0.27057947	7.14601839	5.56	0.0213
VSR	0.35222441	0.15569622	6.59523591	5.12	0.0267

NO OTHER VARIABLES MET THE 0.5000 SIGNIFICANCE LEVEL FOR ENTRY INTO THE MODEL.

$$\text{STOMAD} = 5.77608 + (0.10021)(VTAVG) - (0.45104)(VPH2) + (0.00219)(VTAVG2) - (0.01155)(VTP) - (0.63717)(VPS) + (0.35222)(VSR)$$

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND CROSS PRODUCT TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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OBS	MSHY	MSC1C4	MSBY	MSHW	MSNAP	MSMD	MSHD	MSSRC	MSIOM	MTAVG	MPH2	MSRT	MCIN	MRASH	DUM
1	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
2	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
3	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
4	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
5	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
6	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
7	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
8	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
9	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
10	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
11	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
12	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
13	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
14	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
15	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1

OBS	MSMIN	MSMOUT	MV	CODE	RUN	COAL	MODE	TAVG	TPRHT	PTOT	PHYOUT	GASRT	PJR	DIA	LEN	SRT	CIN	RMD
1	103.723	103.564	1.65584	FTLS1	MBR1	KENT	1	450	400.0	10.71	4.18	14.769	94.50	61.00	914.4	0.525	37.3	0.169
2	103.723	103.564	1.65584	FTLS2	MBR2	KENT	1	447	374.0	10.37	5.81	21.535	97.10	61.00	914.4	0.926	38.4	0.167
3	103.723	103.564	1.65584	FTLS3	MBR3	KENT	1	461	408.0	10.42	4.99	19.498	93.48	61.00	997.0	0.350	37.5	0.168
4	103.723	103.564	1.65584	FTLS4	MBR4	KENT	1	445	399.0	10.44	6.14	18.869	93.33	61.00	997.0	0.348	38.6	0.165
5	103.723	103.564	1.65584	FTLS5	MBR5	KENT	1	451	406.0	10.36	5.08	15.398	91.96	61.00	997.0	0.275	38.1	0.167
6	103.723	103.564	1.65584	FTLS6	MBR6	KENT	1	462	412.0	10.33	4.29	13.789	90.71	61.00	997.0	0.274	38.4	0.166
7	103.723	103.564	1.65584	FTLS7	MBR7	KENT	1	452	403.0	10.25	4.57	13.816	91.17	61.00	997.0	0.274	38.4	0.167
8	103.723	103.564	1.65584	FTLS8	MBR8	KENT	1	447	398.0	10.34	5.58	18.014	94.10	61.00	997.0	0.346	39.1	0.164
9	103.723	103.564	1.65584	FTLS9	MBR9	KENT	1	457	403.0	10.29	4.89	16.082	92.50	61.00	997.0	0.303	39.3	0.164
10	103.723	103.564	1.65584	FTLS10	MBR10	KENT	1	448	407.0	7.18	2.94	22.354	96.03	61.00	997.0	0.367	38.0	0.167
11	103.723	103.564	1.65584	FTLS11	MBR11	KENT	1	451	402.0	8.80	4.50	22.118	94.21	61.00	997.0	0.366	38.4	0.167
12	103.723	103.564	1.65584	MEHS1	GU120	KENT	1	450	402.0	9.93	5.96	20.670	100.00	1.75	184.0	0.367	39.1	0.000
13	103.723	103.564	1.65584	MEHS2	GU122	KENT	1	453	402.0	9.34	3.55	12.880	100.00	1.75	184.0	0.283	38.9	0.000
14	103.723	103.564	1.65584	MEHS3	GU123	KENT	1	453	400.0	9.34	3.74	13.530	100.00	1.75	184.0	0.288	39.1	0.000
15	103.723	103.564	1.65584	MEHS4	GU127	KENT	1	446	396.5	9.83	5.51	18.060	100.00	1.75	184.0	0.353	39.3	0.000

OBS	RHD	RSRC	RASH	RIOM	10TSOL	DHY	DC1C4	DBY	DHW	DNAP	DMD	DHD	DSRC	D1OM	DASH	PH2	X
1	0.458	0	0	0	0.373	0.0250	0.0540	0.0330	0.0490	0.0660	0.0800	0.0010	0.5830	0.0660	0.0930	10.1531	110.254
2	0.449	0	0	0	0.384	0.0270	0.0550	0.0260	0.0530	0.1020	0.1040	-0.0280	0.5750	0.0480	0.0920	10.0693	110.132
3	0.457	0	0	0	0.375	0.0210	0.0790	0.0390	0.0720	0.1520	-0.0420	-0.0290	0.5860	0.0710	0.0880	9.7406	109.649
4	0.449	0	0	0	0.386	0.0200	0.0370	0.0210	0.0480	0.0430	0.0580	0.0210	0.6400	0.0580	0.0930	9.7959	110.254
5	0.452	0	0	0	0.381	0.0200	0.0290	0.0200	0.0560	0.0260	0.0690	0.0090	0.6730	0.0630	0.0930	9.5271	110.254
6	0.450	0	0	0	0.384	0.0200	0.0540	0.0250	0.0540	0.0360	0.0500	0.0190	0.6590	0.0650	0.1010	9.3703	111.235
7	0.449	0	0	0	0.384	0.0190	0.0370	0.0260	0.0550	0.0370	0.0600	0.0090	0.6560	0.0570	0.0980	9.3654	110.865
8	0.445	0	0	0	0.391	0.0240	0.0370	0.0220	0.0500	0.0510	0.0520	0.0320	0.6300	0.0540	0.0960	9.7299	110.619
9	0.443	0	0	0	0.393	0.0210	0.0540	0.0240	0.0500	0.0500	0.0510	-0.0010	0.6420	0.0590	0.0970	9.5182	110.742
10	0.453	0	0	0	0.380	0.0360	0.0460	0.0260	0.0630	0.0150	0.0630	-0.0090	0.6540	0.0630	0.1130	8.8950	112.740
11	0.449	0	0	0	0.366	0.0290	0.0540	0.0290	0.0700	0.0560	0.0280	0.0090	0.6110	0.0610	0.1130	8.2905	112.740
12	0.609	0	0	0	0.391	0.0160	0.0290	0.0300	0.0640	0.1190	0.0460	0.0000	0.5620	0.0530	0.1130	9.9300	112.740
13	0.611	0	0	0	0.389	0.0160	0.0340	0.0310	0.0850	0.0660	0.0020	0.0000	0.5980	0.0580	0.1130	9.3400	112.740
14	0.609	0	0	0	0.391	0.0180	0.0440	0.0310	0.0660	0.0960	0.0000	-0.0290	0.6510	0.0670	0.0910	9.3400	110.011
15	0.607	0	0	0	0.393	0.0175	0.0350	0.0280	0.0560	0.0540	0.0350	0.0420	0.6140	0.0550	0.0960	9.8300	110.619

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STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND CROSS PRODUCT TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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OBS	SHY	SC1C4	SBY	SHW	SNAP	SMD	SHD	SSRC	SIOM	SUMIN	SUMOUT	L	V	VTAVG	VTAVG2
1	2.75634	5.9537	3.63837	5.4024	7.2767	6.8203	0.1103	64.2778	7.27674	102.756	102.756	914.4	2.26598	-3.0582	9.3528
2	2.97357	6.0573	2.86344	5.8370	11.2335	11.4537	-3.0837	63.3260	5.28634	102.974	102.974	914.4	1.98348	-6.0582	36.7021
3	2.30263	8.6623	4.27632	7.8947	16.6667	-4.86053	-3.1798	64.2544	7.78509	102.307	101.754	497.0	2.55862	7.9418	63.0717
4	2.20507	4.0794	2.31533	5.2922	4.7409	6.3947	2.3153	70.5623	6.39471	102.205	102.095	497.0	2.50270	-8.0582	64.9350
5	2.20507	3.1974	2.20507	6.1742	2.8666	7.6075	0.9923	74.2007	6.94598	102.205	104.190	497.0	2.59216	-2.0582	4.2363
6	2.22469	6.5628	2.78067	6.0067	4.0044	5.5617	2.1135	73.3037	7.23026	102.225	107.564	497.0	2.39070	8.9418	79.9553
7	2.10643	4.1020	3.10421	6.0976	4.1020	6.6519	0.9978	72.7273	6.31929	102.106	104.102	497.0	2.38124	-1.0582	1.1198
8	2.65487	4.0929	2.43363	5.5310	5.6416	5.7522	3.5398	69.6903	5.97345	102.675	102.655	497.0	2.46463	-6.0582	36.7021
9	2.32558	6.5338	2.65781	5.5371	5.5371	5.6478	-0.1107	71.0963	6.53378	102.326	103.433	497.0	2.57290	3.9418	15.5376
10	4.05862	5.1860	3.15671	7.1026	1.6911	7.1026	-1.0147	73.7317	7.10259	104.059	104.059	497.0	4.04121	-5.0582	25.5857
11	3.26945	6.0879	3.15671	7.8918	6.3134	3.1567	1.0147	68.6839	6.87711	103.269	103.382	497.0	3.31955	-2.0582	4.2363
12	1.80383	3.2694	3.38219	7.2153	13.4160	5.1860	0.0000	63.3596	5.97520	101.804	101.804	184.0	1.03212	-3.0582	9.3528
13	2.02931	3.8331	3.49493	9.5829	10.8230	0.2255	0.0000	67.4183	6.53890	102.029	101.917	184.0	0.88584	-0.0582	0.0034
14	1.98020	4.8405	3.41034	7.2607	10.5611	0.0000	-3.1903	71.6172	7.37074	101.980	101.870	184.0	0.91909	-0.0582	0.0034
15	1.93584	3.6504	3.09735	6.1947	5.9735	3.6717	4.6460	67.9204	6.08407	101.936	101.438	184.0	0.94667	-7.0582	49.8186

OBS	VPH2	VPH22	VSRT	VSRT2	VCIN	VCIN2	VHASH	VRASH2	VV	VTP	VT5	VTC	VTR	VPS
1	-2.2856	5.2239	-0.2871	0.082427	3.3747	11.388	-4.0404	16.3247	0.61014	6.990	0.8780	-10.321	12.356	0.65619
2	-2.3694	5.6140	0.1139	0.012973	4.4747	20.023	-4.0404	16.3247	0.32763	14.354	-0.6900	-27.109	24.478	-0.26987
3	-2.6980	7.2794	-0.4621	0.213538	3.5747	12.778	-4.0404	16.3247	0.90278	-21.427	-3.6699	28.389	-32.088	1.24677
4	-2.6428	6.9844	-0.4641	0.215390	4.6747	21.853	-4.0404	16.3247	0.84686	21.296	3.7398	-37.670	32.558	1.22663
5	-2.9116	8.4774	-0.5371	0.288478	4.1747	17.428	-4.0404	16.3247	0.93632	5.993	1.1055	-8.592	8.316	1.56383
6	-3.0683	9.4146	-0.5381	0.269553	4.4747	20.023	-4.0404	16.3247	0.73485	-27.436	-4.8116	-40.012	-36.128	1.65107
7	-3.0732	9.4448	-0.5381	0.289553	4.4747	20.023	-4.0404	16.3247	0.72540	3.252	0.5694	-4.735	4.276	1.66371
8	-2.67087	7.3372	-0.4661	0.217250	5.1747	26.777	-4.0404	16.3247	0.80878	16.410	2.8237	-31.349	24.478	1.26254
9	-2.9204	8.5288	-0.5091	0.259184	5.3747	28.887	-4.0404	16.3247	0.91706	-11.6512	-2.0068	21.186	-15.926	1.48679
10	-5.6437	30.7327	-0.4451	0.198115	4.0747	16.603	-4.0404	16.3247	2.38537	28.041	2.2514	-20.611	20.437	2.46751
11	-4.1482	17.2074	-0.4461	0.199006	4.4747	20.023	-4.0404	16.3247	1.66370	8.538	0.9182	-9.210	8.316	1.85861
12	-2.5087	6.2934	-0.4451	0.198115	5.1747	26.777	-4.0404	16.3247	-0.62373	7.672	1.3612	-15.825	12.356	1.11461
13	-3.0987	9.6017	-0.5291	0.279946	4.9747	24.747	-4.0404	16.3247	-0.77000	0.180	0.0308	-0.290	0.235	1.63961
14	-3.0987	9.6017	-0.5241	0.274682	5.1747	26.777	-4.0404	16.3247	-0.73675	0.180	0.0305	-0.301	0.235	1.62401
15	-2.6087	6.8051	-0.4591	0.210774	5.3747	28.887	-4.0404	16.3247	-0.70917	18.413	3.2404	-37.936	28.518	1.19764

OBS	VPR	VPC	VSR	VCR	VSC	PSHY	PSC1C4	PSBY	PSHW	PSNAP	PSMD	PSMD	PSSRC	PSIOM
1	9.2346	-7.713	1.1600	-13.635	-0.9689	2.41257	5.0111	3.11140	5.60455	8.3606	7.5309	1.1154	65.2254	6.30618
2	9.5732	-10.602	-0.4602	-18.079	0.5097	3.29413	6.9481	3.12765	5.90178	10.0267	10.1424	1.2669	69.3239	5.83144
3	10.9011	-9.645	1.8671	-14.443	-1.6519	2.33411	7.4947	3.40656	6.98757	9.1771	4.1374	-1.5367	66.7173	7.54791
4	10.6780	-12.354	1.8751	-18.867	-2.1695	2.22643	3.3379	2.92861	5.51572	5.8095	8.1365	-0.3040	70.6491	5.85817
5	11.7640	-12.155	2.1701	-16.867	-2.2422	2.14290	3.9728	2.99107	6.21332	6.2653	5.5645	-0.0495	71.1390	6.49936
6	12.3972	-13.730	2.1741	-16.079	-2.4078	2.32286	7.2752	3.38023	7.42247	8.5542	2.3868	-1.7645	69.1406	7.02350
7	12.4170	-13.752	2.1741	-18.079	-2.4078	2.22141	4.3387	3.02667	6.50402	6.3418	4.7208	0.1940	71.0147	6.67847
8	10.9443	-14.017	1.8632	-20.908	-2.4119	2.22314	3.7060	3.02801	5.63844	6.1646	7.4029	-0.1767	70.4522	6.01994
9	11.7996	-15.696	2.0570	-21.716	-2.7363	2.17808	5.7384	3.35162	6.54298	7.8187	3.9649	-0.5762	69.6496	7.10780
10	22.3987	-22.589	1.7984	-16.463	-1.8136	3.26867	6.0066	3.33068	7.81008	4.7888	4.0225	-1.4708	72.9296	6.55487
11	16.7602	-16.562	1.8024	-18.079	-1.9462	2.67346	5.5469	3.29413	6.78982	6.5817	4.7819	-1.0674	70.9033	6.64319
12	10.1359	-12.982	1.7984	-20.908	-2.3033	2.34184	4.3467	2.93805	6.34831	6.6961	4.8858	2.4762	68.0004	6.64663
13	12.5198	-15.415	2.1378	-20.100	-2.6321	2.42184	4.8508	2.91640	7.27473	6.2629	2.4065	2.5375	69.4983	7.16253
14	12.5198	-16.035	2.1176	-20.908	-2.7121	2.42094	4.9038	2.94911	7.22780	6.3205	2.4720	2.6293	69.4651	7.14292
15	10.5400	-14.021	1.8549	-21.716	-2.4675	2.40663	3.7504	2.80954	6.23413	5.6925	5.9360	2.0893	69.1737	6.28614

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IS	RMD	RSRC	RASH	RIOM	TOTSOL	DMY	DCIC4	DBY	DMH	DNAP	DMD	DHD	DSRC	DIOM	DASH	PH2	X
1	0.605	0.000	0.0	0.000	0.395	0.0144	0.0470	0.0340	0.0470	0.0380	0.0690	0.0070	0.6190	0.0540	0.0960	9.8300	110.619
2	0.650	0.000	0.0	0.000	0.350	0.0194	0.1386	0.0403	0.0749	0.1088	0.0466	0.1029	0.3431	0.0440	0.1131	13.8900	112.752
3	0.550	0.000	0.0	0.000	0.450	0.0205	0.1290	0.0423	0.0924	0.0910	0.0615	0.1049	0.3361	0.0444	0.1132	13.8900	112.765
4	0.500	0.000	0.0	0.000	0.500	0.0265	0.1386	0.0451	0.0855	0.1235	0.0524	0.1285	0.3310	0.0448	0.1132	13.8900	112.765
5	0.700	0.000	0.0	0.000	0.300	0.0240	0.1050	0.0360	0.0610	0.1060	0.1210	0.0320	0.4270	0.0410	0.0950	13.8900	110.497
6	0.550	0.000	0.0	0.000	0.450	0.0380	0.1050	0.0360	0.0680	0.1030	0.1050	0.0660	0.4140	0.0440	0.0970	13.8900	110.742
7	0.700	0.000	0.0	0.000	0.300	0.0410	0.0990	0.0230	0.0940	0.1070	0.1410	0.0410	0.3940	0.0430	0.0990	13.8900	110.988
8	0.550	0.000	0.0	0.000	0.450	0.0420	0.1040	0.0350	0.0840	0.0690	0.1130	0.1190	0.3710	0.0460	0.1010	13.8900	111.235
9	0.550	0.000	0.0	0.000	0.450	0.0420	0.0970	0.0350	0.0900	0.0910	0.0860	0.1000	0.3920	0.0470	0.1040	13.8900	111.607
10	0.756	0.000	0.0	0.000	0.244	0.0197	0.0579	0.0240	0.0238	0.0482	0.0742	0.1102	0.5429	0.0510	0.0876	10.4500	109.601
11	0.751	0.000	0.0	0.000	0.249	0.0182	0.0453	0.0241	0.0183	0.0347	0.0576	0.0708	0.6271	0.0562	0.0840	10.4500	109.170
12	0.752	0.000	0.0	0.000	0.248	0.0207	0.0462	0.0250	0.0392	0.0370	0.0730	0.0521	0.5807	0.0450	0.0786	17.1700	108.530
13	0.766	0.000	0.0	0.000	0.234	0.0249	0.0603	0.0307	0.0385	0.0530	0.0868	0.1079	0.5227	0.0447	0.0803	17.2400	108.731
14	0.758	0.000	0.0	0.000	0.242	0.0180	0.0291	0.0226	0.0240	0.0320	0.0609	0.0953	0.6164	0.0569	0.0827	10.4500	109.016
15	0.745	0.000	0.0	0.000	0.255	0.0197	0.0496	0.0247	0.0391	0.0420	0.0716	0.0921	0.5646	0.0585	0.0845	10.4800	109.233

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND CROSS PRODUCT TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

14:02 FRIDAY, MAY 18, 1979 91

OBS	SHY	SCIC4	SBY	SHW	SNAP	SMD	SHD	SSRC	STOM	SUMIN	SUMOUT	L	V	VTAVG	VTAVG2
16	1.59242	5.1991	3.76106	5.1991	4.2035	7.6327	0.7743	67.4779	5.9735	101.593	100.221	184.0	0.99517	-6.058	36.70
17	2.18739	15.6275	4.54392	8.4451	12.0419	5.2543	11.6022	38.6853	4.9611	102.187	101.161	377.9	1.43335	6.942	48.19
18	2.31168	14.5467	4.76996	10.4195	10.2616	6.9350	11.8290	37.9003	5.0068	102.312	101.669	377.9	1.40495	7.942	63.07
19	2.98827	15.6292	5.08570	9.6414	13.9265	5.9089	14.4903	37.3252	5.0519	102.988	107.059	377.9	1.48504	5.942	35.30
20	2.65193	11.6022	3.97790	6.7403	11.7127	13.3702	3.5359	47.1823	4.5304	102.652	102.652	377.9	1.21656	2.942	8.65
21	4.20819	11.6279	3.98671	7.5305	11.4054	11.6279	7.3090	45.8472	4.8726	104.208	104.208	377.9	1.21687	2.942	8.65
22	4.55050	10.9878	2.55272	10.4329	11.6757	15.6493	4.5505	43.7292	4.7725	104.550	104.550	377.9	1.06152	1.942	3.77
23	4.67186	11.5684	3.69321	9.3437	7.6752	12.5695	13.2369	41.2681	5.1168	104.672	104.672	377.9	1.05566	1.942	3.77
24	4.68750	10.8259	3.90625	10.0446	10.1562	9.5982	11.1607	43.7500	5.2455	104.687	104.687	377.9	1.05430	1.942	3.77
25	2.15914	6.3459	2.63043	2.6085	5.2828	8.1324	12.0780	59.5024	5.5897	102.159	102.170	299.7	0.71427	-11.958	143.00
26	1.98690	4.9454	2.63100	1.9978	3.7882	6.2882	7.7293	68.4607	6.1354	101.987	101.976	299.7	0.69337	-26.358	694.76
27	2.24658	5.0141	2.71326	4.2544	4.0156	7.9227	5.6544	63.0237	4.8839	102.247	97.482	299.7	0.46863	-26.358	694.76
28	2.70740	6.5565	3.33805	4.1861	5.7627	9.4379	11.7321	56.8336	4.8603	102.707	102.707	299.7	0.42680	-12.458	155.21
29	1.96228	3.1724	2.46375	2.6164	3.4885	6.6390	10.3892	67.1972	6.2030	101.962	102.169	299.7	0.68651	-40.258	1620.72
30	2.15183	5.4178	2.69798	4.2709	4.5877	7.8209	10.0601	61.6712	5.6253	102.152	102.152	299.7	1.36415	-12.458	155.21

OBS	VPH2	VPH22	VSRT	VSRT2	VCIN	VCIN2	VKASH	VKASH2	VV	VTP	VTS	VTC	VTR	VPS
16	-2.6087	6.8051	-0.4541	0.206208	5.575	31.077	-4.0404	16.3247	-0.6607	15.80	2.7510	-33.773	24.478	1.1844
17	1.4513	2.1064	0.1879	0.035306	1.075	1.155	-4.0404	16.3247	-0.2225	10.07	1.3044	7.460	-28.047	0.2727
18	1.4513	2.1064	0.1879	0.035306	11.075	122.649	-4.0404	16.3247	-0.2509	11.53	1.4922	87.953	-32.088	0.2727
19	1.4513	2.1064	0.1879	0.035306	16.075	258.395	-4.0404	16.3247	-0.1708	8.62	1.1165	95.512	-24.007	0.2727
20	1.4513	2.1064	0.1649	0.027192	-3.925	15.408	-4.0404	16.3247	-0.4393	4.27	0.4851	-11.547	-11.886	0.2393
21	1.4513	2.1064	0.1809	0.032724	11.075	122.649	-4.0404	16.3247	-0.4390	4.27	0.5322	32.579	-11.886	0.2625
22	1.4513	2.1064	0.2199	0.048355	-3.925	15.408	-4.0404	16.3247	-0.5943	2.82	0.4270	-7.622	-7.845	0.3191
23	1.4513	2.1064	0.2719	0.073929	11.075	122.649	-4.0404	16.3247	-0.6002	2.82	0.5280	21.505	-7.845	0.3946
24	1.4513	2.1064	0.2319	0.053777	11.075	122.649	-4.0404	16.3247	-0.6015	2.82	0.4503	21.505	-7.845	0.3366
25	-1.9887	3.9548	-0.1121	0.012567	-9.525	90.732	-4.0404	16.3247	-0.9416	23.78	1.3405	113.906	48.316	0.2229
26	-1.9887	3.9548	-0.0961	0.009235	-9.025	81.456	-4.0404	16.3247	-0.9625	52.42	2.5331	237.891	106.497	0.1911
27	4.7313	22.3856	-0.1021	0.010425	-9.125	83.271	-4.0404	16.3247	-1.1872	-124.71	2.6912	240.527	106.497	-0.4831
28	4.8013	23.0529	-0.1411	0.019910	-10.625	110.782	-4.0404	16.3247	-1.2290	-59.82	1.7579	131.127	50.336	-0.6775
29	-1.9887	3.9548	-0.1111	0.012343	-9.725	94.582	-4.0404	16.3247	-0.9693	80.06	4.4727	391.524	162.659	0.2289
30	-1.9587	3.8364	-0.4451	0.198115	-8.425	70.986	-4.0404	16.3247	-0.2917	24.40	5.5452	104.965	60.336	0.0718

OBS	VPR	VPC	VSR	VCR	VSC	PSHY	PSCIC4	PSBY	PSHW	PSNAP	PSMD	PSHD	PSSRC	PSTOM
16	10.540	-14.542	1.8347	-22.524	-2.5315	2.39341	3.9326	2.87099	6.22924	6.9570	5.7076	2.0877	68.9783	6.34859
17	-5.864	1.560	-0.7592	-4.342	0.2019	3.80655	13.8507	3.89489	9.86329	11.1492	11.4914	7.8597	40.3707	5.26039
18	-5.864	16.073	-0.7592	-44.746	2.0809	3.42565	13.9570	4.69828	9.91234	11.3700	6.9538	13.0748	38.9122	5.52105
19	-5.864	23.430	-0.7592	-64.948	3.0204	3.09230	14.7543	5.31392	8.31275	11.4601	6.8163	13.4312	40.3120	4.64263
20	-5.864	-5.697	-0.6663	15.860	-0.6473	3.58722	13.0305	6.3267	7.95066	10.7509	13.3152	5.9651	44.3069	4.52233
21	-5.864	16.073	-0.7309	-44.746	2.0034	3.37565	11.1993	4.22644	8.70535	10.7012	8.7673	10.8729	43.8709	4.88409
22	-5.864	-5.697	-0.8885	15.860	-0.8632	3.70064	13.1284	3.55355	8.18967	10.6554	13.4260	6.6398	43.3914	4.37401
23	-5.864	16.073	-1.0986	-44.746	3.0112	3.74523	11.8043	4.13442	9.48365	10.7830	8.9552	11.3596	41.7252	4.64834
24	-5.864	16.073	-0.7370	-44.746	2.5682	3.58995	11.3307	4.13012	9.06940	10.6860	8.9624	11.0203	42.8678	4.71363
25	8.035	18.943	0.4529	36.486	1.0678	2.02439	7.1320	2.79306	3.05888	7.8204	8.0221	7.6161	60.5675	5.38140
26	8.035	17.948	0.3863	36.486	0.8673	1.81602	3.1956	2.46530	2.25751	5.2725	6.8059	9.3373	66.3723	5.58790
27	-19.116	-43.175	0.4125	36.870	0.9317	2.51928	4.1435	2.57021	4.07154	5.1476	6.6516	7.9932	64.2293	5.03623
28	-19.399	-50.336	0.5701	42.526	1.4851	2.77335	6.4941	3.39552	4.36187	6.3442	7.6206	10.9230	58.7749	4.09642
29	8.035	19.340	0.4489	39.294	1.0805	1.87164	3.4779	2.49549	2.33335	2.8289	6.3239	7.7089	70.2238	6.24846
30	7.914	16.502	1.7484	34.041	3.7501	1.71298	4.8464	2.62003	4.25211	5.7301	5.0984	7.6134	66.0250	5.88983

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND CROSS PRODUCT TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

14:02 FRIDAY, MAY 18, 1979 92

OBS	MSHY	MSC1C4	MSHY	MSHW	MSAP	MSMD	MSHD	MSRC	MSUM	MTAVG	MPH2	MSRT	MCIN	MRASH	DUM
31	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
32	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
33	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
34	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
35	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
36	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
37	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
38	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
39	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
40	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
41	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
42	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
43	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
44	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
45	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1

OBS	MSMIN	MSHOUT	MV	CODE	RUN	COAL	MODE	TAVG	TPRHT	PTOT	PHYOUT	GASRT	PUR	DJA	LEN	SRT	CIN	RMD
31	103.723	103.564	1.65584	HRIS7	HRIG	KENT	1	426.7	415.6	10.55	7.07	27.60	100.00	2.07	299.7	0.357	24.8	0.000
32	103.723	103.564	1.65584	HRIS8	HRIG	KENT	1	426.7	415.6	17.65	11.65	26.90	100.00	2.07	299.7	0.359	24.9	0.000
33	103.723	103.564	1.65584	HRIS9	HRIG	KENT	1	441.1	418.3	17.37	11.12	27.10	100.00	2.07	299.7	0.360	25.1	0.000
34	103.723	103.564	1.65584	HRIS10	HRIG	KENT	1	440.6	433.9	6.89	5.03	37.60	100.00	2.07	299.7	0.721	25.1	0.000
35	103.723	103.564	1.65584	PMN1	P99_15	KENT	2	460.0	391.0	13.80	8.76	91.01	85.21	15.20	304.8	1.060	33.2	0.224
36	103.723	103.564	1.65584	PMN2	P99_16	KENT	2	460.0	390.0	15.17	9.36	71.13	85.84	15.20	304.8	1.000	29.6	0.205
37	103.723	103.564	1.65584	PMN3	P99_17	KENT	2	465.0	389.0	13.76	8.00	64.16	84.52	15.20	304.8	1.040	32.8	0.218
38	103.723	103.564	1.65584	PMN4	P99_18	KENT	2	460.0	389.0	15.19	9.11	75.30	83.97	15.20	304.8	1.330	32.7	0.226
39	103.723	103.564	1.65584	PMN5	P99_20	KENT	2	460.0	403.0	13.80	7.83	57.74	83.97	15.20	304.8	0.660	29.8	0.184
40	103.723	103.564	1.65584	PMN6	P99_21	KENT	2	460.0	380.0	17.24	10.62	73.04	84.69	15.20	304.8	0.660	29.6	0.182
41	103.723	103.564	1.65584	PMN7	P99_22	KENT	2	460.0	380.0	17.24	11.13	97.97	85.28	15.20	304.8	1.220	29.6	0.211
42	103.723	103.564	1.65584	PMN8	P99_23	KENT	2	460.0	386.0	13.80	8.98	84.55	85.31	15.20	304.8	1.210	29.7	0.202
43	103.723	103.564	1.65584	FILL1	77SR_1	KENT	2	461.0	427.0	13.29	10.22	72.63	93.95	61.00	914.4	0.997	26.1	0.025
44	103.723	103.564	1.65584	FILL2	77SR_2	KENT	2	456.0	429.0	13.29	10.13	78.69	90.54	61.00	914.4	0.984	24.2	0.027
45	103.723	103.564	1.65584	FILL3	77SR_3	KENT	2	459.0	430.0	13.18	10.11	87.83	92.20	61.00	914.4	0.823	24.6	0.061

OBS	RMD	MSRC	RASH	MIUM	TOTSUL	DHY	DC1C4	DBY	DHW	DNAP	DMD	DMD	DSRC	D1OM	DASH	PH2	X
31	0.7520	0.0000	0.0	0.0000	0.7480	0.0148	0.0338	0.0216	0.0393	0.0381	0.0349	0.0537	0.6572	0.0569	0.0795	10.5500	108.637
32	0.7510	0.0000	0.0	0.0000	0.7490	0.0163	0.0328	0.0215	0.0356	0.0350	0.0403	0.0660	0.6456	0.0571	0.0820	17.6500	108.932
33	0.7490	0.0000	0.0	0.0000	0.2510	0.0199	0.0490	0.0247	0.0399	0.0441	0.0596	0.0948	0.5719	0.0519	0.0841	17.3700	109.182
34	0.7490	0.0000	0.0	0.0000	0.2510	0.0186	0.0732	0.0244	0.0450	0.0619	0.0445	0.0530	0.5776	0.0537	0.0851	6.8900	109.302
35	0.2560	0.1230	3.9	0.0260	0.3990	0.0493	0.1720	0.0404	0.0794	0.0572	0.1613	0.1214	0.2509	0.0679	0.0919	11.7590	110.120
36	0.2330	0.1690	5.4	0.0370	0.3920	0.0468	0.1536	0.0385	0.0790	0.1019	0.1620	0.1135	0.2484	0.0580	0.0919	13.0219	110.120
37	0.2480	0.1230	4.4	0.0390	0.4110	0.0476	0.1714	0.0423	0.0790	0.1051	0.1386	0.1035	0.2353	0.0804	0.0919	11.6300	110.120
38	0.2570	0.1210	4.1	0.0280	0.3960	0.0502	0.1986	0.0425	0.0839	0.0655	0.1422	0.1124	0.2501	0.0632	0.0919	12.7550	110.120
39	0.2080	0.2050	5.3	0.0530	0.4040	0.0401	0.1427	0.0439	0.0763	0.0497	0.1316	0.1197	0.2928	0.0926	0.0919	11.5879	110.120
40	0.2070	0.2070	7.4	0.0340	0.4040	0.0463	0.1474	0.0402	0.0843	0.0775	0.1477	0.1658	0.2494	0.0422	0.0919	14.6006	110.120
41	0.2400	0.1350	7.5	0.0430	0.4140	0.0569	0.2161	0.0463	0.0751	0.1005	0.1985	0.1029	0.1697	0.0539	0.0919	14.7023	110.120
42	0.2300	0.1420	6.8	0.0610	0.4260	0.0527	0.2110	0.0438	0.0755	0.0770	0.1749	0.1208	0.1742	0.0832	0.0924	11.7728	110.181
43	0.3530	0.2240	8.6	0.0510	0.4080	0.0410	0.1690	0.0600	0.0530	0.0840	0.2050	0.1020	0.2370	0.0520	0.0790	12.4860	108.578
44	0.3570	0.2230	10.3	0.0480	0.3930	0.0370	0.1650	0.0560	0.0480	0.0580	0.1830	0.1530	0.1870	0.0540	0.0960	12.0328	110.619
45	0.2500	0.2780	10.6	0.0590	0.4110	0.0410	0.1490	0.0680	0.0520	0.1400	0.1610	0.1120	0.2110	0.0540	0.0930	12.1520	110.254

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STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND CROSS PRODUCT TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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OBS	SHY	SC1C4	SHY	SHW	SNAP	SMD	SMD	SSRC	SIUM	SUMIN	SUMOUT	L	V	VTAVG	VTAVG2
31	1.60782	3.6719	2.34655	4.2694	4.1391	3.7914	5.8338	71.3960	6.1814	101.608	101.630	299.7	1.33326	-26.358	694.756
32	1.77560	3.5730	2.34205	3.6780	3.8120	4.3900	7.1495	70.3268	6.2200	101.776	101.732	299.7	0.77551	-26.358	694.756
33	2.17273	5.3499	2.64680	4.3564	4.6149	6.5073	10.3505	62.4413	5.6666	102.173	102.184	299.7	0.81444	-11.958	142.999
34	2.03301	8.0009	2.66696	4.9186	6.7656	4.8639	5.7930	63.1326	5.8695	102.033	102.011	299.7	1.42142	-12.458	155.207
35	5.42892	18.9406	4.44885	8.7435	6.2969	17.7624	13.3686	27.6291	7.4772	105.429	104.669	304.8	1.61447	6.942	48.188
36	5.15362	16.9144	4.23962	8.6995	11.2212	17.8394	12.4986	27.5338	6.3870	105.154	105.154	304.8	1.08479	6.942	48.188
37	5.24171	18.8746	4.65808	8.6995	11.5736	15.2626	11.3974	25.9112	8.8517	105.242	105.231	304.8	1.15724	11.942	142.606
38	5.52803	21.8698	4.68010	9.2391	7.2129	15.6591	12.3775	27.5410	6.9546	105.528	105.539	304.8	0.95262	6.942	48.188
39	4.41581	15.7141	4.58391	8.6224	5.4730	14.4918	13.1814	32.2431	10.1971	104.416	104.427	304.8	1.47658	6.942	48.188
40	5.09856	16.2317	4.42683	9.2831	8.5343	16.2647	18.2579	27.4639	4.6471	105.099	105.110	304.8	1.48511	6.942	48.188
41	6.46607	23.7969	5.09856	8.7105	11.0671	21.8588	11.3314	18.6874	5.9355	106.486	106.486	304.8	1.07764	6.942	48.188
42	5.80652	23.2481	4.82591	8.3186	8.4839	19.2706	13.3098	19.1935	9.1670	105.807	105.818	304.8	1.17542	6.942	48.188
43	4.45168	18.3496	6.51466	5.7546	9.1205	22.2584	11.0749	25.7329	5.6460	104.452	104.452	914.4	3.35921	7.942	63.072
44	4.09292	18.2522	6.19469	5.3097	10.5066	20.2434	16.9248	20.6858	5.9735	104.093	104.093	914.4	3.40981	5.942	35.305
45	4.52040	16.4278	7.49724	5.7332	15.4355	17.7508	12.3484	23.2635	5.9537	104.520	104.410	914.4	4.66421	5.942	35.305

OBS	VPH2	VPH22	VSRT	VSRT2	VCIN	VCIN2	VHASH	VHASH2	VV	VTP	VTS	VTC	VTR	VPS
31	-1.8887	3.5670	-0.4551	0.207117	-9.1253	83.271	-4.0404	16.3247	-0.32258	49.78	11.9957	240.527	106.497	0.8595
32	6.2113	27.1581	-0.4531	0.205301	-9.0253	81.456	-4.0404	16.3247	-0.88033	-137.36	11.9429	237.891	106.497	-2.3613
33	4.9313	24.3181	-0.4521	0.204396	-8.8253	77.886	-4.0404	16.3247	-0.84140	-58.97	5.4063	105.535	48.316	-2.2296
34	-5.5487	30.7876	-0.0911	0.008299	-8.8253	77.886	-4.0404	16.3247	-0.23442	69.13	1.1360	109.948	50.336	0.5066
35	-0.6797	0.4620	0.2479	0.061454	-0.7253	0.526	-0.1404	0.0197	-0.04138	-4.72	1.7209	-5.035	-0.974	-0.1688
36	0.5833	0.3402	0.1879	0.035306	-4.3253	18.708	1.8596	3.4562	-0.57105	4.05	1.3044	-30.025	12.909	0.1096
37	-0.8087	0.6540	0.2279	0.051938	-1.1253	1.266	0.3596	0.1293	-0.49860	-9.66	2.7215	-13.438	4.295	-0.1843
38	0.3164	0.1001	0.5179	0.268219	-1.2253	1.501	0.0596	0.0036	-0.70322	2.20	3.5951	-8.506	0.414	0.1639
39	-0.8508	0.7239	-0.1521	0.023135	-4.1253	17.018	1.2596	1.5866	-0.17926	-5.91	-1.0559	-28.637	8.744	0.1294
40	2.1619	4.6738	-0.1521	0.023135	-4.3253	18.708	3.3596	11.2870	-0.17073	15.01	-1.0559	-30.025	23.322	-0.3288
41	2.2636	5.1239	0.4079	0.166381	-4.3253	18.708	3.4596	11.9690	-0.57820	15.71	2.6815	-30.025	24.016	0.9233
42	-0.6659	0.4434	0.3979	0.158323	-4.2253	17.853	2.7596	7.6155	-0.48042	-4.62	2.7621	-29.331	19.157	-0.2650
43	0.0473	0.0022	0.1849	0.034188	-7.8253	61.236	4.5596	20.7901	1.70336	0.38	1.4684	-62.147	36.211	0.0067
44	-0.4059	0.1648	0.1719	0.029549	-9.7253	94.582	6.2596	39.1828	1.75397	-2.41	1.0214	-57.786	37.193	-0.0698
45	-0.2867	0.0822	0.0109	0.000119	-9.3253	86.962	6.5596	43.0286	3.00837	-1.70	0.0648	-65.409	38.976	-0.0031

OBS	VPR	VPC	VSR	VCR	VSC	PSHY	PSC1C4	PSBY	PSHW	PSNAP	PSMD	PSMD	PSSRC	PSIOM
31	7.631	17.235	1.83878	36.870	4.1529	1.49363	4.2045	2.58663	4.2477	3.0479	3.8097	10.9347	66.9533	6.16213
32	-21.056	-47.034	1.83070	36.466	4.0894	1.84302	4.8573	2.30786	4.2293	2.8663	6.0197	6.7926	66.8873	6.64303
33	-19.924	-43.521	1.82666	35.658	3.9899	2.05948	4.1364	2.76959	3.9384	4.4533	7.6439	8.3625	64.9940	5.49375
34	22.419	48.969	0.36808	35.658	0.3040	2.81756	8.5040	2.43391	4.8676	4.6384	6.7729	7.3021	61.9048	6.40294
35	0.095	0.493	-0.03463	0.102	-0.1798	4.28864	16.3378	4.61203	6.1434	10.4247	12.7710	10.8164	33.5959	7.37757
36	1.085	-2.523	0.34942	-6.043	-0.8127	4.94894	17.4865	4.95663	7.7901	10.8897	14.7607	14.5503	27.7026	6.42904
37	-0.291	0.910	0.08196	-0.405	-0.2565	4.71472	20.6231	4.66453	8.8853	10.3127	14.2532	9.9520	27.4771	8.57716
38	0.019	-0.388	0.03068	-0.073	-0.6346	5.32313	20.5848	4.33756	9.5134	10.8627	15.7849	12.4171	25.0352	6.86110
39	-1.072	3.510	-0.19159	-5.196	0.6275	3.87198	12.6258	5.03224	8.3657	8.6223	10.1290	14.0480	36.9826	7.38621
40	7.263	-9.351	-0.51100	-14.531	0.6579	4.85287	14.0999	4.85780	9.1379	10.3411	11.6592	16.7155	30.6321	5.18208
41	7.831	-9.791	1.41117	-14.964	-1.7643	6.37235	21.7681	4.65693	8.3658	12.1596	17.8550	16.1632	20.0884	5.04233
42	-1.838	2.814	1.09805	-11.060	-1.6812	5.14536	20.1694	4.98297	7.1605	10.0746	17.8163	12.7836	23.9244	7.93100
43	0.216	-0.370	0.84307	-35.680	-1.4469	5.29083	20.5569	5.99118	5.9657	11.6400	22.1277	11.4690	21.7347	6.38006
44	-2.541	3.947	1.07602	-60.877	-1.6718	5.30868	19.8878	4.88965	6.0274	11.8570	21.9724	14.1676	19.6530	6.37574
45	-1.881	2.674	0.07149	-61.171	-0.1016	4.96276	17.6634	6.71148	7.2795	11.1629	20.1432	15.0437	21.9365	6.86474

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND CROSS PRODUCT TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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OBS	MSHY	MSC1C4	MSHY	MSHW	MSNAP	MSMD	MSMD	MSRC	MS10M	MTAVG	MPH2	MSRT	MCIN	MRASH	DUM
46	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
47	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
48	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
49	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
50	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
51	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
52	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
53	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
54	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
55	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
56	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
57	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
58	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
59	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
60	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1

OBS	MSMIN	MSMUUT	MV	CODE	RUN	COAL	MODE	TAVG	TPRHT	PTOT	PHYOUT	GASRT	PUR	DIA	LEN	SRT	CIN	RMD
46	103.723	103.564	1.65584	FTLL4	775H_4	KENT	2	461	429.0	13.20	9.35	86.20	90.40	61.00	914.4	0.799	29.9	0.062
47	103.723	103.564	1.65584	FTLL5	775H_5	KENT	2	458	429.0	13.28	9.82	87.65	91.80	61.00	914.4	0.780	30.6	0.109
48	103.723	103.564	1.65584	FTLL6	775H_6	KENT	2	459	426.0	13.24	9.69	80.20	90.98	61.00	914.4	0.956	33.5	0.129
49	103.723	103.564	1.65584	FTLL7	775H_7	KENT	2	461	428.0	13.34	9.67	82.11	89.80	61.00	914.4	0.982	29.5	0.069
50	103.723	103.564	1.65584	MERL1	GUR134	KENT	2	461	399.5	13.89	10.28	52.20	100.00	1.75	189.0	0.955	35.0	0.000
51	103.723	103.564	1.65584	MERL2	GUR138	KENT	2	455	389.0	13.20	9.81	44.50	100.00	1.75	377.9	1.010	40.0	0.000
52	103.723	103.564	1.65584	MERL3	GUR139	KENT	2	455	403.0	13.20	9.31	39.80	100.00	1.75	377.9	1.040	45.0	0.000
53	103.723	103.564	1.65584	MERL4	GUR140	KENT	2	455	401.0	13.20	8.38	39.80	100.00	1.75	377.9	1.490	45.1	0.000
54	103.723	103.564	1.65584	MERL5	GUR141	KENT	2	455	399.0	13.20	9.24	45.00	100.00	1.75	377.9	1.590	40.1	0.000
55	103.723	103.564	1.65584	MERL6	GUR145	KENT	2	455	419.0	13.20	10.36	51.40	100.00	1.75	377.9	1.020	35.0	0.000
56	103.723	103.564	1.65584	MERL7	GUR145	KENT	2	454	421.0	13.20	10.20	50.30	100.00	1.75	377.9	0.980	35.0	0.000
57	103.723	103.564	1.65584	MERL8	GUR146	KENT	2	463	406.0	13.20	9.93	47.80	100.00	1.75	377.9	1.080	40.0	0.000
58	103.723	103.564	1.65584	MERL9	GUR147	KENT	2	455	400.0	13.20	9.21	38.40	100.00	1.75	377.9	0.990	45.0	0.000
59	103.723	103.564	1.65584	MERL10	GUR148	KENT	2	455	438.0	13.20	10.14	48.30	100.00	1.75	377.9	1.040	35.0	0.000
60	103.723	103.564	1.65584	MERL11	GUR152	KENT	2	455	401.0	13.20	11.11	76.90	100.00	1.75	377.9	0.970	30.0	0.000

OBS	RMD	RSRC	RASH	R10M	TOTISOL	DHY	DLIC4	DHY	DHW	DNAP	DMD	DHD	DSRC	D10M	DASH	PH2	X
46	0.2220	0.2630	9.20	0.0620	0.4530	0.0390	0.1540	0.0570	0.0820	0.0690	0.1820	0.0940	0.2610	0.0650	0.0940	11.9328	110.375
47	0.3070	0.2020	5.10	0.0250	0.3820	0.0330	0.1160	0.0440	0.0660	0.0830	0.1600	0.1160	0.3160	0.0480	0.0830	12.1910	109.051
48	0.2300	0.1980	6.00	0.0460	0.4430	0.0330	0.1300	0.0550	0.0480	0.1180	0.1700	0.0000	0.3440	0.0760	0.0914	12.0458	110.059
49	0.2650	0.2390	8.20	0.0500	0.4270	0.0440	0.1670	0.0480	0.0550	0.1290	0.1780	0.0780	0.2370	0.0600	0.0912	11.9793	110.035
50	0.3270	0.1920	8.40	0.0470	0.4810	0.0472	0.1692	0.0422	0.0789	0.1000	0.1044	0.1945	0.2130	0.0520	0.0932	13.8900	110.278
51	0.3470	0.1730	5.50	0.0250	0.4800	0.0291	0.1054	0.0441	0.0673	0.1004	0.0726	0.1421	0.3370	0.0510	0.1090	13.2000	112.233
52	0.2430	0.2270	5.40	0.0260	0.4800	0.0332	0.1153	0.0383	0.0689	0.0822	0.0485	0.1184	0.4150	0.0480	0.0980	13.2000	110.865
53	0.3260	0.1430	5.00	0.0300	0.4800	0.0514	0.2106	0.0413	0.0973	0.0823	0.0564	0.1113	0.2900	0.0620	0.1000	13.2000	111.111
54	0.3086	0.1855	6.50	0.0359	0.5059	0.0452	0.1394	0.0267	0.0921	0.1069	0.0770	0.1697	0.2683	0.0577	0.0940	13.2000	110.375
55	0.2898	0.2450	6.76	0.0476	0.4652	0.0266	0.0843	0.0349	0.0825	0.0730	0.0714	0.1768	0.3420	0.0664	0.0943	13.2000	110.412
56	0.2985	0.2530	6.89	0.0496	0.4675	0.0303	0.1028	0.0436	0.0909	0.0791	0.0734	0.1592	0.3070	0.0652	0.0906	13.2000	109.963
57	0.3844	0.1864	5.25	0.0375	0.4900	0.0327	0.1180	0.0437	0.0765	0.0648	0.0663	0.1534	0.3340	0.0675	0.0945	13.2000	110.436
58	0.4311	0.0855	2.01	0.0133	0.4834	0.0325	0.1140	0.0375	0.0707	0.0778	0.0484	0.1249	0.4000	0.0530	0.0940	13.2000	110.375
59	0.2650	0.2667	7.10	0.0473	0.4083	0.0286	0.1051	0.0371	0.0776	0.0725	0.0651	0.1814	0.3340	0.0592	0.0889	13.2000	109.757
60	0.3000	0.2530	9.60	0.0510	0.4470	0.0373	0.1088	0.0554	0.0751	0.0865	0.1036	0.2094	0.2470	0.0493	0.0937	13.2000	110.339

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
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AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

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OBS	SHY	SC1C4	SHY	SHW	SNAP	SMD	SHD	SSRC	SIOM	SUMIN	SUMOUT	L	V	VTAVG	VTAVG2
46	4.30464	16.9978	6.29139	9.0506	7.6159	20.0883	10.3753	20.8079	7.17439	104.305	106.402	914.4	5.73797	7.9418	63.072
47	3.59869	12.6499	4.79826	7.1974	9.0513	17.4482	12.6499	34.4602	5.23446	103.599	103.490	914.4	6.05484	4.9418	24.421
48	3.63196	14.3077	6.05327	5.2629	12.9670	18.7101	0.0000	37.8604	8.36452	103.632	103.566	914.4	4.97037	5.9418	35.305
49	4.84155	18.3759	5.28169	6.0519	14.1946	19.5863	8.5827	26.0783	6.60211	104.842	104.754	914.4	4.34161	7.9418	63.072
50	5.20512	18.6590	4.65373	8.7009	11.0278	11.5130	21.4491	21.4892	5.73445	105.205	105.227	189.0	0.66843	7.9418	63.072
51	3.26599	11.6294	4.94949	7.5533	11.2682	8.1481	15.9484	37.8227	5.72391	103.266	103.244	377.9	1.28500	1.9418	3.770
52	3.68071	12.7827	4.24612	7.6386	9.1131	6.3769	13.1264	46.0089	5.32151	103.681	103.614	377.9	1.25564	1.9418	3.770
53	5.71111	23.4000	4.58889	10.8111	9.1444	6.2667	12.3667	32.2222	6.88889	105.711	105.689	377.9	0.87837	1.9418	3.770
54	4.98896	15.3863	2.94702	10.1656	11.7991	6.4969	18.7307	29.6137	6.36665	104.989	103.510	377.9	0.82749	1.9418	3.770
55	2.93695	9.3077	3.85337	9.1090	8.0601	7.8834	19.5208	37.7608	7.33135	102.937	102.827	377.9	1.28598	1.9418	3.770
56	3.33187	11.3042	4.75437	9.9956	8.6980	8.0713	17.5060	33.7585	7.16956	103.332	101.298	377.9	1.30803	0.9418	0.887
57	3.61126	13.0315	4.82606	8.4484	7.1563	7.3219	16.9409	36.8857	7.45445	103.611	102.065	377.9	1.30501	9.9418	98.839
58	3.58720	12.5828	4.13907	7.8035	8.5872	5.3422	13.7859	44.1501	5.84989	103.587	102.241	377.9	1.27266	1.9418	3.770
59	3.13906	11.5355	3.52321	8.5172	7.9574	7.1452	19.9100	36.6500	6.49764	103.139	101.745	377.9	1.18518	1.9418	3.770
60	4.11563	12.0049	6.16794	8.2864	9.7650	11.4311	23.1049	27.2537	5.43970	104.116	103.454	377.9	1.77922	1.9418	3.770

OBS	VPH2	VPH22	VSRT	VSRT2	VCIN	VCIN2	VRASH	VRASH2	VV	VTP	VTS	VTC	VTR	VPS
46	-0.50586	0.25590	-0.0131	0.000172	-4.0253	16.203	5.1596	26.6217	4.08212	-4.0174	-0.1040	-31.968	40.9765	0.00663
47	-0.24762	0.06132	-0.0321	0.001030	-3.3253	11.058	1.0596	1.1228	4.39900	-1.2237	-0.1586	-16.433	5.2364	0.00795
48	-0.39291	0.15438	0.1439	0.020707	-0.4253	0.181	1.9596	3.8401	3.31453	-2.3346	0.8550	-2.527	11.6436	-0.05654
49	-0.45934	0.21099	0.1699	0.028866	-4.4253	19.583	4.1596	17.3024	2.68577	-3.6480	1.3493	-35.145	33.0348	-0.07804
50	1.45134	2.10638	0.1429	0.020420	1.0747	1.155	4.3596	19.0063	-0.98741	11.5262	1.1349	8.535	34.6231	0.20739
51	0.76134	0.57964	0.1979	0.039164	6.0747	36.902	1.4596	2.1305	-0.37085	1.4783	0.3843	11.796	2.8342	0.15067
52	0.76134	0.57964	0.2279	0.051938	11.0747	122.649	1.3596	1.8486	-0.40020	1.4783	0.4425	21.505	2.6401	0.17351
53	0.76134	0.57964	0.6779	0.459547	11.1747	124.874	0.9596	0.9209	-0.77747	1.4783	1.3163	21.699	1.8634	0.51611
54	0.76134	0.57964	0.7779	0.605126	6.1747	38.127	2.4596	6.0497	-0.82835	1.4783	1.5105	11.990	4.7760	0.59224
55	0.76134	0.57964	0.2079	0.043222	1.0747	1.155	2.7196	7.3963	-0.36986	1.4783	0.4037	2.087	5.2809	0.15828
56	0.76134	0.57964	0.1679	0.028190	1.0747	1.155	2.8496	8.1203	-0.34781	0.7170	0.1581	1.012	2.6837	0.12783
57	0.76134	0.57964	0.2679	0.071770	6.0747	36.902	1.2096	1.4632	-0.35084	7.5691	2.6634	60.393	12.0258	0.20396
58	0.76134	0.57964	0.1779	0.031648	11.0747	122.649	-2.0304	4.1224	-0.38318	1.4783	0.3454	21.505	-3.9425	0.13544
59	0.76134	0.57964	0.2279	0.051938	1.0747	1.155	3.0596	9.3613	-0.47066	1.4783	0.4425	2.087	5.9411	0.17351
60	0.76134	0.57964	0.1579	0.024932	-3.9253	15.408	5.5596	30.9094	0.12338	1.4783	0.3066	-7.622	10.7955	0.12021

OBS	VPR	VPC	VSR	VCR	VSC	PSHY	PSC1C4	PSHY	PSHW	PSNAP	PSMD	PSHD	PSSRC	PSIOM
46	-2.6101	2.0363	-0.0676	-20.769	0.05274	4.05375	15.3774	6.04858	7.2981	8.9404	18.3543	11.4876	29.3637	7.14477
47	-0.2624	0.8234	-0.0340	-3.524	0.10675	3.34414	11.8151	5.49130	5.5628	10.6568	16.6598	7.0483	40.8653	5.82162
48	-0.7700	0.1671	0.2820	-0.833	-0.06120	3.72775	13.8738	5.32517	6.4426	9.9937	15.5428	9.4856	36.2272	6.73612
49	-1.9107	2.0327	0.7067	-18.408	-0.75186	4.55414	17.8826	5.74728	6.3786	10.0694	19.6649	10.6127	26.8712	7.34278
50	6.3273	1.5597	0.6230	4.685	0.15357	4.81366	16.9006	4.38544	9.4253	8.9463	10.3910	19.5652	26.9833	7.21884
51	1.1113	4.6249	0.2889	8.867	1.20217	3.73616	11.6246	4.35048	8.5084	8.7515	6.9710	16.6956	39.2955	6.24360
52	1.0351	8.4316	0.3099	15.057	2.52391	3.33649	13.0920	4.58227	8.1306	8.0922	5.3974	16.2258	41.3789	6.04078
53	0.7306	8.5077	0.6505	10.723	7.57530	5.02632	17.9084	4.03998	10.2563	9.1190	7.2356	15.9296	33.7946	6.12494
54	1.8726	4.7010	1.9133	15.187	4.80328	5.61067	18.4576	3.49093	9.9112	9.0536	10.7993	15.1647	30.8138	6.67976
55	2.0706	0.8182	0.5654	2.423	0.22343	4.25504	12.2406	4.45457	8.5444	9.5034	8.7827	17.9043	36.1821	6.23805
56	2.1695	0.8182	0.4784	3.062	0.18044	4.10291	11.1907	4.46243	8.6581	9.3481	7.8905	18.4030	36.6276	6.04738
57	0.9209	4.6249	0.3241	7.348	1.62740	4.28545	16.0327	4.70922	9.2679	9.2039	9.0764	16.7500	29.3605	7.86928
58	-1.5458	8.4316	-0.3612	-22.486	1.97017	3.53783	11.4641	4.45945	7.8684	9.9249	7.4381	12.4200	43.9801	5.42223
59	2.3294	0.8182	0.6973	3.288	0.24492	4.32929	12.5572	4.43557	8.6311	9.4674	8.7059	18.2323	34.5815	6.32103
60	4.2328	-2.9885	0.8779	-21.823	-0.61980	4.76350	13.8516	5.06503	8.7391	10.6888	10.7145	19.9578	29.4428	5.82137

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND CROSS PRODUCT TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

14:02 FRIDAY, MAY 18, 1979 96

OBS	MSHY	MSC1C4	MSBY	MSHW	MSNAP	MSMD	MSHD	MSSRC	MSIOM	MTAVG	MPH2	MSR1	MCIN	MRASH	DUM
61	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
62	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
63	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
64	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
65	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
66	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
67	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
68	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
69	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
70	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
71	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
72	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
73	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
74	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1
75	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038	1

OBS	MSMIN	MSMOUT	MV	CODE	RUN	COAL	MODE	TAVG	TPRHT	PTOT	PHYOUT	GASRT	PUR	DIA	LEN	SRT	CIN	RMD	RMD
61	103.723	103.564	1.65584	MERL12	GUR153	KENT	2	455	398	13.20	10.30	50.0	100	1.75	377.90	0.990	45	0.000	0.4280
62	103.723	103.564	1.65584	MERL13	GUR154	KENT	2	455	387	13.20	10.51	58.6	100	1.75	377.90	1.000	40	0.000	0.3250
63	103.723	103.564	1.65584	MERL14	GUR155	KENT	2	455	401	13.20	11.22	82.9	100	1.75	377.90	1.000	30	0.000	0.2420
64	103.723	103.564	1.65584	MERL15	GUR158	KENT	2	455	401	13.20	9.11	41.8	100	1.75	377.90	1.480	45	0.000	0.4496
65	103.723	103.564	1.65584	MERL16	GUR160	KENT	2	465	400	13.89	11.31	71.6	100	1.75	377.90	0.680	30	0.000	0.2512
66	103.723	103.564	1.65584	MERL17	GUR176	KENT	2	455	406	13.89	10.00	50.0	100	1.75	377.90	1.020	30	0.000	0.2593
67	103.723	103.564	1.65584	MERL18	GUR177	KENT	2	455	405	13.89	9.17	38.4	100	1.75	377.90	0.990	30	0.000	0.2460
68	103.723	103.564	1.65584	MERL19	GUR178	KENT	2	455	400	14.48	11.03	60.1	100	1.75	377.90	1.030	30	0.000	0.3000
69	103.723	103.564	1.65584	MERL20	GUR179	KENT	2	455	405	11.72	9.05	61.9	100	1.75	377.90	1.060	30	0.000	0.1780
70	103.723	103.564	1.65584	MERL21	GUR180	KENT	2	455	409	13.89	10.70	60.8	100	1.75	377.90	1.040	30	0.000	0.1980
71	103.723	103.564	1.65584	MERL22	GUR216	KENT	2	455	401	13.89	10.45	58.2	100	1.75	377.90	0.996	30	0.048	0.1910
72	103.723	103.564	1.65584	MERL23	GUR219	KENT	2	455	400	13.89	10.42	58.2	100	1.75	377.90	0.998	30	0.325	0.3260
73	103.723	103.564	1.65584	MERL24	GUR219	KENT	2	455	400	13.89	10.79	59.9	100	1.75	377.90	1.026	30	0.325	0.3250
74	103.723	103.564	1.65584	MERL25	GUR219	KENT	2	455	400	13.89	10.70	59.0	100	1.75	377.90	1.010	30	0.300	0.3000
75	103.723	103.564	1.65584	MERL26	GUR219	KENT	2	455	400	13.89	10.65	57.9	100	1.75	377.90	0.990	30	0.276	0.2760

OBS	RSRC	RASH	RIOM	TOTSOL	DHY	DC1C4	DBY	DHW	DNAP	DMD	DHD	DSRC	DICM	DASH	PH2	X	SHY
61	0.0920	2.00	0.0100	0.4800	0.0268	0.0817	0.0453	0.0690	0.0618	0.0598	0.1302	0.4160	0.0466	0.0928	13.20	110.229	2.95414
62	0.1950	5.20	0.0280	0.4800	0.0322	0.0955	0.0454	0.0702	0.0761	0.0630	0.1612	0.3500	0.0508	0.0935	13.20	110.314	3.55212
63	0.3190	9.50	0.0440	0.4390	0.0360	0.1000	0.0537	0.0660	0.0842	0.0803	0.1845	0.3111	0.0431	0.0929	13.20	110.241	3.96869
64	0.0709	2.39	0.0104	0.4843	0.0410	0.1422	0.0383	0.0390	0.1009	0.0870	0.1477	0.2790	0.0410	0.0940	13.20	110.375	4.52539
65	0.2620	10.77	0.0789	0.4864	0.0460	0.1686	0.0440	0.0944	0.0924	0.0941	0.1910	0.2090	0.0630	0.0860	13.89	109.409	5.03282
66	0.2530	10.78	0.0794	0.4872	0.0520	0.1460	0.0410	0.1040	0.1150	0.0840	0.1900	0.2140	0.0670	0.0910	13.89	110.011	5.72057
67	0.2630	10.25	0.0883	0.4904	0.0440	0.1410	0.0390	0.0930	0.1030	0.0650	0.1870	0.2410	0.0810	0.0940	13.89	110.375	4.85651
68	0.2340	10.76	0.0585	0.4661	0.0570	0.1580	0.0440	0.0950	0.1080	0.0890	0.2210	0.2000	0.0500	0.0820	14.48	108.932	6.20915
69	0.3380	11.02	0.0734	0.4836	0.0540	0.1440	0.0450	0.0840	0.0810	0.0790	0.1950	0.2760	0.0600	0.0900	11.72	109.890	5.93407
70	0.3090	11.21	0.0810	0.4921	0.0520	0.1440	0.0400	0.0820	0.1030	0.0850	0.1950	0.2480	0.0650	0.0900	13.89	109.890	5.71429
71	0.2710	12.70	0.0650	0.4900	0.0560	0.1610	0.0440	0.1040	0.1000	0.1120	0.1770	0.2100	0.0530	0.0970	13.89	110.742	6.20155
72	0.0000	3.70	0.0120	0.3490	0.0430	0.1200	0.0390	0.0620	0.1140	0.0980	0.1150	0.3640	0.0290	0.1020	13.89	111.359	4.78842
73	0.0030	3.20	0.0150	0.3470	0.0480	0.1320	0.0460	0.0650	0.1230	0.0670	0.1370	0.3450	0.0310	0.1020	13.89	111.359	5.34521
74	0.0050	6.50	0.0300	0.3950	0.0500	0.1200	0.0390	0.0730	0.1730	0.0270	0.1780	0.3160	0.0220	0.1020	13.89	111.359	5.56793
75	0.0000	11.00	0.0380	0.4480	0.0480	0.1270	0.0390	0.0760	0.1480	0.0830	0.1340	0.3210	0.0130	0.1020	13.89	111.359	5.34521

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STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND CROSS PRODUCT TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

14:02 FRIDAY, MAY 18, 1979 97

OBS	SC1C4	S0Y	SNW	SNAP	SND	SHD	SSRC	STOM	SUMTN	SUMINT	L	V	VTAVG	VTAVG2
61	9.0057	4.99334	7.6058	6.8122	6.5917	14.3519	45.8554	5.13668	102.954	100.353	377.90	1.65711	1.9418	3.770
62	10.5350	5.00827	7.7441	8.3949	6.9498	17.7827	38.6100	5.60397	103.552	100.629	377.90	1.70908	1.9418	3.770
63	11.0241	5.91996	7.2759	9.2823	8.8524	20.3345	34.2961	4.75141	103.969	101.742	377.90	1.81334	1.9418	3.770
64	15.6954	4.22737	10.9272	11.1369	9.6026	16.3024	30.7147	4.52539	104.525	103.212	377.90	0.92668	1.9418	3.770
65	18.4464	4.81400	10.3282	10.1094	10.2954	20.8972	22.8665	6.89278	105.033	104.650	377.90	2.21883	1.9418	142.606
66	16.0616	4.51045	11.4411	12.6513	9.2409	20.9021	23.5424	7.37074	105.721	105.721	377.90	1.01898	1.9418	3.770
67	15.5629	4.30464	10.2649	11.3687	7.1744	20.6402	26.6004	8.94040	104.857	104.857	377.90	0.80629	1.9418	3.770
68	17.2113	4.79303	10.3486	11.7647	9.6950	24.0741	21.7465	5.44662	106.209	105.120	377.90	1.16350	1.9418	3.770
69	15.8242	4.94505	9.2308	8.9011	8.6813	21.4286	30.3297	6.59341	105.934	105.934	377.90	1.43865	1.9418	3.770
70	15.8242	4.34560	9.0110	11.3167	9.3407	21.4286	27.2527	7.14286	105.714	105.714	377.90	1.21525	1.9418	3.770
71	17.8295	4.87265	11.5172	11.0742	12.4031	19.6013	23.2558	5.64784	106.202	106.202	377.90	1.21468	1.9418	3.770
72	13.3630	4.34298	6.9042	12.6949	10.9131	12.6062	40.5345	3.22940	104.768	104.768	377.90	1.21224	1.9418	3.770
73	14.6993	5.12249	7.2383	13.6971	7.4610	15.2561	38.4187	3.45212	105.345	105.345	377.90	1.21360	1.9418	3.770
74	13.3630	4.34298	8.1292	19.2650	3.0067	19.8216	35.1893	2.44989	105.568	105.568	377.90	1.21430	1.9418	3.770
75	14.1425	4.34298	8.4633	16.4811	9.2428	15.4788	35.7461	1.44766	105.345	105.345	377.90	1.21574	1.9418	3.770

OBS	VPH2	VPH22	VSHT	VSHT2	VCIN	VCIN2	VRASH	VRASH2	VV	VTP	VTS	VTC	VTR	VPS
61	0.76134	0.57964	0.1779	0.031648	11.0747	122.649	-2.0404	4.1631	0.0013	1.4783	0.3454	21.505	-3.962	0.13544
62	0.76134	0.57964	0.1879	0.035306	6.0747	36.902	1.1596	1.3447	0.0532	1.4783	0.3649	11.796	2.252	0.14308
63	0.76134	0.57964	0.1879	0.035306	-3.9253	15.408	5.4596	29.8075	0.1575	1.4783	0.3649	-7.622	10.601	0.14305
64	0.76134	0.57964	0.6679	0.446089	11.0747	122.649	-1.6504	2.7238	-0.7292	1.4783	1.2969	21.505	-3.205	0.50858
65	1.45134	2.10638	-0.1321	0.017451	-3.9253	15.408	6.7296	45.2878	0.5630	17.3316	-1.5775	-46.875	80.364	-0.19172
66	1.45134	2.10638	0.2079	0.043222	-3.9253	15.408	6.7396	45.4225	-0.6369	2.8182	0.4037	-7.622	13.087	0.30173
67	1.45134	2.10638	0.1779	0.031648	-3.9253	15.408	6.2096	38.5594	-0.8496	2.8182	0.3454	-7.622	12.068	0.25819
68	2.04134	4.16706	0.2179	0.047480	-3.9253	15.408	6.7196	45.1533	-0.4923	3.4638	0.4231	-7.622	13.048	0.44481
69	-0.71866	0.51647	0.2479	0.061454	-3.9253	15.408	6.9796	48.7151	-0.2172	-1.3955	0.4814	-7.622	13.553	-0.17816
70	1.45134	2.10638	0.2279	0.051936	-3.9253	15.408	7.1696	51.4035	-0.4406	2.8182	0.4425	-7.622	13.922	0.33076
71	1.45134	2.10638	0.1839	0.033819	-3.9253	15.408	8.6596	74.9090	-0.4412	2.8182	0.3571	-7.622	16.815	0.26690
72	1.45134	2.10638	0.1859	0.034558	-3.9253	15.408	-0.3404	0.1159	-0.4436	2.8182	0.3610	-7.622	-0.661	0.26980
73	1.45134	2.10638	0.2139	0.045753	-3.9253	15.408	-0.8404	0.7062	-0.4422	2.8182	0.4153	-7.622	-1.632	0.31044
74	1.45134	2.10638	0.1979	0.039164	-3.9253	15.408	2.4596	6.0497	-0.4415	2.8182	0.3843	-7.622	4.776	0.28722
75	1.45134	2.10638	0.1779	0.031648	-3.9253	15.408	6.9596	48.4363	-0.4401	2.8182	0.3454	-7.622	13.514	0.25819

OBS	VPR	VPC	VSR	VCR	VSC	PSHY	PS1C4	PSBY	PSHW	PSNAP	PSND	PSMD	PSSRC	PSION
61	-1.5534	8.4316	-0.3630	-22.597	1.9702	3.28961	11.4173	4.51120	7.6771	10.0267	7.9661	11.7728	44.3232	5.31813
62	0.8829	4.6249	0.2179	7.044	1.1414	3.65600	11.3820	4.40265	8.2443	8.9451	7.6461	15.7217	40.0211	6.08159
63	4.1566	-2.9805	1.0259	-21.431	-0.7376	4.81368	14.1202	5.04105	8.4723	10.8243	11.2418	19.4522	29.3580	5.82347
64	-1.2565	8.4316	-1.1023	-18.277	7.3968	5.20073	17.3096	4.09539	11.8214	10.3957	8.1821	15.0731	32.4121	5.23811
65	9.7670	-5.6970	-0.8890	-26.416	0.5185	5.37030	19.2117	5.00504	10.1368	9.0863	16.6652	17.0476	21.0193	6.98789
66	9.7815	-5.6970	1.4012	-26.455	-0.8161	5.31042	15.4098	4.67152	9.4616	11.5734	10.0573	21.1704	27.2853	5.39765
67	9.0123	-5.6970	1.1047	-24.375	-0.6983	5.24481	14.9341	4.70819	9.5323	11.3810	9.5367	21.7401	27.5682	6.39133
68	13.7170	-8.0129	1.4642	-26.377	-0.8553	5.59782	16.0543	4.50511	9.4956	12.3846	10.4319	20.8752	27.0106	4.67993
69	-5.0160	2.8210	1.7302	-27.397	-0.9731	4.47825	13.9496	5.30184	8.7929	8.3674	10.8040	20.0294	28.5902	8.00095
70	10.4055	-5.6970	1.6339	-28.143	-0.8946	5.34664	15.7514	4.63891	9.4133	11.7173	10.4603	20.6510	27.1846	5.39846
71	12.5680	-5.6970	1.5925	-33.992	-0.7219	5.29442	15.9612	4.52462	10.6444	11.5841	9.1613	21.4205	26.8341	5.44453
72	-0.4940	-5.6970	-0.0633	1.336	-0.7297	4.40669	13.1299	4.39999	7.5834	11.0621	12.4203	13.9715	36.2257	4.77371
73	-1.2197	-5.6970	-0.1798	3.299	-0.8396	4.38381	13.3894	4.30942	7.6492	11.0704	12.8442	13.0533	36.5813	4.68442
74	3.5697	-5.6970	0.4861	-9.655	-0.7768	4.88007	13.8955	4.72069	7.9415	11.3337	11.7085	17.9235	31.4947	5.00424
75	10.1008	-5.6970	1.2381	-27.319	-0.6983	5.23287	15.1804	4.71465	9.7082	11.5110	9.7891	21.3329	27.4710	5.33098

STEPWISE REGRESSION UNCONSTRAINED LINEAR REGRESSION MODEL
INVOLVING LINEAR SECOND ORDER AND CROSS PRODUCT TERMS IN FIVE VARIABLES
AND A SINGLE LINEAR TERM IN SUPERFICIAL LINEAR GAS VELOCITY

14:02 FRIDAY, MAY 18, 1979 98

JBS	MSHY	MSC1C4	MSBY	MSHW	MSNAP	MSND	MSHD	MSSRC	MS10M	MTAVG	MPH2	MSRT	MCIN	MRASH
76	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038
77	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038
78	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038
79	3.72339	11.5896	4.08854	7.5061	8.89556	9.65792	11.091	44.6567	6.07843	453.058	12.4387	0.812101	33.9253	4.04038

JBS	DUM	MSMIN	MSMOUT	MV	CODE	RUN	COA	MODE	TAVG	THRHT	PTOT	PHYOUT	GASRT	PUR	DIA	LEN	SRT	CIN	RMD
76	1	103.723	103.564	1.65584	MEHL27	DOER237	KENT	2	454	391	13.89	10.63	54.6	100	2.80	157.00	1.070	30	0.00
77	1	103.723	103.564	1.65584	MEHL28	DOER238	KENT	2	455	402	13.89	10.25	53.7	100	2.80	157.00	1.052	30	0.00
78	1	103.723	103.564	1.65584	MEHL29	DUE266	KENT	2	463	402	13.89	10.14	25.6	100	1.75	83.82	0.133	30	0.35
79	1	103.723	103.564	1.65584	MEHL30	DUE267	KENT	2	463	403	13.89	10.14	18.9	100	1.75	83.82	0.130	40	0.30

JBS	RMD	RSRC	RASH	R10M	TOTSOL	DHY	DL1C4	DBY	CHW	DNAP	DMD	DHD	DSRC	D10M	DASH	PH2	X	SHY
76	0.254	0.269	12.2	0.055	0.477	0.041	0.146	0.033	0.089	0.074	0.122	0.199	0.225	0.046	0.102	13.89	111.359	4.56570
77	0.243	0.298	10.6	0.053	0.459	0.054	0.126	0.035	0.071	0.069	0.122	0.201	0.280	0.050	0.099	13.89	110.988	5.99334
78	0.210	0.111	1.8	0.011	0.329	0.022	0.039	0.031	0.062	0.048	0.081	0.020	0.586	0.057	0.098	13.89	110.865	2.43902
79	0.146	0.122	1.9	0.013	0.432	0.016	0.035	0.029	0.054	0.042	0.079	0.071	0.538	0.070	0.098	13.89	110.865	1.77384

OUT

JBS	SC1C4	SBY	SHF	SNAP	SMD	SFD	SSRC	S10M	SUMIN	SUMJUT	L	V	VTAVG	VTAVG2
76	16.2584	4.23163	9.91091	8.24053	13.5457	22.1604	25.0557	5.12249	104.566	104.566	157.00	0.440080	0.94177	0.8869
77	13.9845	3.99556	7.68013	7.65816	13.5465	22.3085	31.0766	5.54939	105.993	105.993	157.00	0.440837	1.94177	3.7705
78	4.3237	3.43681	6.87361	5.32151	8.91100	2.2173	64.9667	6.31929	102.439	102.439	83.82	0.897222	9.94177	98.8388
79	3.8803	3.21508	5.98570	4.65632	8.7583	7.8714	59.6452	7.76053	101.774	101.774	83.82	0.903585	9.94177	98.8388

JBS	VPH2	VPH22	VERT	VSRT2	VCIN	VCIN2	VRASH	VRASH2	VV	VTP	VTS	VTC	VTR	VPS
76	1.45134	2.10638	0.2579	0.066512	-3.9253	15.4081	8.1596	66.5794	-1.2158	1.3668	0.2429	-3.697	7.685	0.37430
77	1.45134	2.10638	0.2399	0.057551	-3.9253	15.4081	6.5546	43.0286	-1.2150	2.8182	0.4658	-7.622	12.737	0.34817
78	1.45134	2.10638	-0.6791	0.461179	-3.9253	15.4081	-2.2404	5.0193	-0.7586	14.4289	-6.7515	-39.025	-22.273	-0.98561
79	1.45134	2.10638	-0.6821	0.465262	6.0747	36.9018	-2.1404	4.5812	-0.7523	14.4289	-6.7813	60.393	-21.279	-0.98896

JBS	VPR	VPC	VSR	VCR	VSC	PSHY	PSC1C4	PSBY	PSHW	PSNAP	PSMD	PSHD	PSSRC	PS10M
76	11.8424	-5.6970	2.10436	-32.029	-1.0123	5.44846	15.7057	4.38991	10.1997	11.8293	6.44418	21.9721	27.4390	5.47371
77	9.5202	-5.6970	1.57364	-25.749	-0.9417	5.44305	15.7275	4.56846	9.4366	11.5380	9.81890	21.6289	26.7179	5.56567
78	-3.2516	-5.6970	1.52144	8.794	2.6057	2.53470	5.0227	3.22321	6.8146	6.8770	8.54045	4.5782	60.7181	6.62331
79	-3.1064	8.8164	1.45996	-13.002	-4.1435	1.32110	3.5537	3.21774	6.3286	4.8820	6.70453	8.6628	61.5456	7.13987

NOTE: THE JOB SFMAHES HAS BEEN RUN UNDER RELEASE 76.6C OF SAS AT GULF OIL CORPORATION.

NOTE: SASNEWS SASNEWS SASNEWS SASNEWS SASNEWS SASNEWS

A TEST RELEASE OF SAS79.1 IS NOW AVAILABLE.
TO EXECUTE SAS79 USL // EXEC SAS79

FOR A BRIEF DESCRIPTION OF THE NEW FEATURES OF
SAS79, USE --> PROC DUC DATA=DOC.SAS79;

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1  DATA DSI;
2  MSHW=3.72339; MSCIC4=11.5896; MSBY=4.08854; MSHW=7.5061; MSNP=8.89556;
3  MSMD=9.65792; MSMD=11.091; MSSRC=44.6567; MS10M=6.07843; MTAVG=453.05H;
4  MPH2=12.4387; MSRT=0.812101; MCIN=33.4253; MRASH=4.04038; MGASRT=46.682H; DUM=1;
5  MV=1.65584;
6  TAVGB=455.; PH2B=.91*13.79; GASRTB=56.04; CINB=30.; SRTB=1.; WASHB=10.17;
7  VB=1.65584;
8  TAVGMX=465.; TAVGMN=412.80;
9  PH2MX=17.650; PH2MN=6.890;
10 SRTMX=1.590; SRTMN=0.130;
11 CINMX=50.00; CINMN=23.40;
12 RASHMX=12.70; RASHMN=0.00;
13 GASRTMX=97.970; GASRTMN=12.880;
14 VMX=6.05484; VMN=0.42680;
15 DTAVG=(TAVGMX-TAVGMN)/50.; DPH2=(PH2MX-PH2MN)/50.;
16 DSRT=(SRTMX-SRTMN)/50.; DCIN=(CINMX-CINMN)/50.;
17 DRASH=(RASHMX-RASHMN)/50.; DGASRT=(GASRTMX-GASRTMN)/50.;
18 DV=(VMX-VMN)/50.;
19 RASH=RASHMN-DRASH;
20 TAVG=TAVGB;
21 PH2=PH2B;
22 GASRT=GASRTB;
23 SRT=SRTB;
24 CIN=CINB;
25 V=VB;
26 F=RASH+DNASH;
27 VRASH=RASH-MRASH; VRASH2=VRASH**2;
28 VTAVG=TAVGB-MTAVG; VTAVG2=VTAVG**2;
29 VPH2=PH2B-MPH2; VPH22=VPH2**2;
30 VGASRT=GASRTB-MGASRT; VGASRT2=VGASRT**2;
31 VSRT=SRTB-MSRT; VSRT2=VSRT**2;
32 VCIN=CINB-MCIN; VCIN2=VCIN**2;
33 VV=V-V;
34 VTP=VTAVG*VPH2; VTS=VTAVG*VSRT; VTC=VTAVG*VCIN;
35 VTR=VTAVG*VRASH; VTG=VTAVG*VGASRT; VPH=VPH2*VSRT;
36 VSC=VSRT*VCIN; VSH=VSRT*VRASH; VSG=VSRT*VGASRT;
37 VCN=VCIN*VRASH; VCG=VCIN*VGASRT; VRG=VRASH*VGASRT;
38 VPC=VPH2*VCIN; VPK=VPH2*VRASH; VPL=VPH2*VGASRT;
39 SHYMD=3.61198*2.37038*VSRT+0.13590*VRASH+0.00136*VTAVG2+0.03349*VPH22
40 -0.00110*VTC;
41 SCIC4MD=9.58444+0.53145*VTAVG+4.69784*VSRT-0.11996*VCIN+0.00418*VTAVG2
42 +0.03203*VRASH2+0.41969*VTS+0.0632*VTR;
43 SBYMD=4.02712+0.09141*VTAVG+0.16671*VRASH+0.21300*VV+0.0016*VCIN2+0.05816*VTS
44 -0.01662*VPH2-0.09622*VPL-0.21480*VSH;
45 SHYMD=7.24562+0.10398*VTAVG+1.79553*VSRT+0.12134*VCIN-0.34153*VV-0.01464*VCIN2

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46 +0.04847*VRASH+0.2621*H*VSC;
47 SNAPMD=9.44774+0.1444*VTAVG+3.44105*VSRT-4.82967*VSRT2;
48 SMDMD=10.59855+4.10085*VSRT-0.29811*VCIN+1.03129*VV+0.01097*VTAVG2
49 -0.05592*VTC+0.05855*VPC-0.19568*VPH;
50 SMDMD=12.67509+1.62409*VRASH-1.66366*VV-0.01217*VTAVG2+0.05043*VTC-2.06902*VSH;
51 SSRMD=45.19364-0.91706*VTAVG-15.94040*VSRT+0.39049*VCIN-2.09200*VRASH
52 +0.95063*VV-0.00678*VTAVG2-0.02706*VCIN2-1.11290*VTS+3.21994*VSR;
53 SIOMMD=5.77608+0.10021*VTAVG-0.45104*VPH2+0.00300*VTAVG2-0.01155*VTP-0.63717*VPS
54 +0.35222*VSR;
55 OUTPUT;
56 IF RASH < RASHMX THEN GO TO F;

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NOTE: DATA SET WORK.DS1 HAS 52 OBSERVATIONS AND 84 VARIABLES. 26 OBS/TRK.
 NOTE: THE DATA STATEMENT USED 0.52 SECONDS AND 108K.

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57 PROC PLOT NOLEGEND;
58 PLOT SHYMD*VRASH;
59 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
60 TITLE2 NLT HYDROGEN CONSUMPTION;
61 TITLE3 (WEIGHT % BASED ON INLET MAP COAL CONCENTRATION);
62 TITLE4 VS. RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED);
63 TITLES BASIS VALUES;;
64 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
65 TITLE7 TEMPERATURE(TAVG)= 455 C;
66 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
67 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
68 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

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NOTE: THE PROCEDURE PLOT USED 0.46 SECONDS AND 136K AND PRINTED PAGE 1.

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69 PROC PLOT NOLEGEND;
70 PLOT SCIC4MD*VRASH;
71 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
72 TITLE2 NET YIELD OF C1-C4;
73 TITLE3 (WEIGHT % BASED ON INLET MAP COAL CONCENTRATION);
74 TITLE4 VS. RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED);
75 TITLES BASIS VALUES;;
76 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
77 TITLE7 TEMPERATURE(TAVG)= 455 C;
78 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
79 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
80 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

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NOTE: THE PROCEDURE PLOT USED 0.45 SECONDS AND 136K AND PRINTED PAGE 2.

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81 PROC PLOT NOLEGEND;
82 PLOT SBYMD*VRASH;
83 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
84 TITLE2 NLT YIELD OF BYPRODUCTS(NH3,H2S,CO,CO2);
85 TITLE3 (WEIGHT % BASED ON INLET MAP COAL CONCENTRATION);
86 TITLE4 VS. RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED);
87 TITLES BASIS VALUES;;
88 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
89 TITLE7 TEMPERATURE(TAVG)= 455 C;
90 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
91 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;

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92 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

NOTE: THE PROCEDURE PLOT USED 0.45 SECONDS AND 136K AND PRINTED PAGE 3.

93 PROC PLOT NOLEGEND;
 94 PLOT SHMDRASH;
 95 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 96 TITLE2 NET YIELD OF WATER;
 97 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 98 TITLE4 VS. RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED);
 99 TITLES BASIS VALUES;;
 100 TITLE6 GAS LINEAR VELOCITY(V)= 1.68584 CM/SEC;
 101 TITLE7 TEMPERATURE(TAVG)= 455 C;
 102 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 103 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 104 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

NOTE: THE PROCEDURE PLOT USED 0.44 SECONDS AND 136K AND PRINTED PAGE 4.

105 PROC PLOT NOLEGEND;
 106 PLOT SHMDRASH;
 107 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 108 TITLE2 NET YIELD OF NAPHTHA(C5-380F);
 109 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 110 TITLE4 VS. RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED);
 111 TITLES BASIS VALUES;;
 112 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 113 TITLE7 TEMPERATURE(TAVG)= 455 C;
 114 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 115 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

NOTE: THE PROCEDURE PLOT USED 0.44 SECONDS AND 136K AND PRINTED PAGE 5.

117 PROC PLOT NOLEGEND;
 118 PLOT SHMDRASH;
 119 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 120 TITLE2 NET YIELD OF MIDDLE DISTILLATE(380-550F);
 121 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 122 TITLE4 VS. RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED);
 123 TITLES BASIS VALUES;;
 124 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 125 TITLE7 TEMPERATURE(TAVG)= 455 C;
 126 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 127 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 128 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

NOTE: THE PROCEDURE PLOT USED 0.46 SECONDS AND 136K AND PRINTED PAGE 6.

129 PROC PLOT NOLEGEND;
 130 PLOT SHMDRASH;
 131 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 132 TITLE2 NET YIELD OF HEAVY DISTILLATE(550-650F);
 133 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 134 TITLE4 VS. RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED);
 135 TITLES BASIS VALUES;;

136 TITLE6 GAS LINEAR VELOCITY(V)= 1.655E4 CM/SEC;
 137 TITLE7 TEMPERATURE(TAVG)= 455 C;
 138 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 139 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 140 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

NOTE: THE PROCEDURE PLOT USED 0.46 SECONDS AND 136K AND PRINTED PAGE 7.

141 PROC PLOT NOLEGEND;
 142 PLOT SSRCONDASH;
 143 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 144 TITLE2 NET YIELD OF SRC BOTTOMS(850+)%;
 145 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 146 TITLE4 VS. RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED);
 147 TITLE5 BASIS VALUES;;
 148 TITLE6 GAS LINEAR VELOCITY(V)= 1.655E4 CM/SEC;
 149 TITLE7 TEMPERATURE(TAVG)= 455 C;
 150 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 151 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 152 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

NOTE: THE PROCEDURE PLOT USED 0.46 SECONDS AND 136K AND PRINTED PAGE 8.

153 PROC PLOT NOLEGEND;
 154 PLOT STOMDASH;
 155 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 156 TITLE2 NET YIELD OF INSOLUBLE ORGANIC MATTER;
 157 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 158 TITLE4 VS. RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED);
 159 TITLE5 BASIS VALUES;;
 160 TITLE6 GAS LINEAR VELOCITY(V)= 1.655E4 CM/SEC;
 161 TITLE7 TEMPERATURE(TAVG)= 455 C;
 162 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 163 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 164 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

NOTE: THE PROCEDURE PLOT USED 0.46 SECONDS AND 136K AND PRINTED PAGE 9.

NOTE: SAS USED 136K MEMORY.

NOTE: BARR, GOODNIGHT, SALL AND HELMIG
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 RALEIGH, N.C. 27605

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET HYDROGEN CONSUMPTION
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED)

17:15 MONDAY, MAY 21, 1979

BASIS VALUES:
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL

NET YIELD OF C1-C4

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED)

FASTS VALUES:

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

TEMPERATURE(TAVG)= 455 C

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

SLURRY RESIDENCE TIME(SRT)= ONE HOUR

2
17:15 MONDAY, MAY 21, 1979

92 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.42 SECONDS AND 136K AND PRINTED PAGE 3.

93 PROC PLOT NOLEGEND;
 94 PLOT SHMMD+SRT;
 95 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 96 TITLE2 NET YIELD OF WATER;
 97 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 98 TITLE4 VS. SRT, NOMINAL SLURRY RESIDENCE TIME(HRS);
 99 TITLES BASIS VALUES;;
 100 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 101 TITLE7 TEMPERATURE(TAVG)= 455 C;
 102 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 103 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 104 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.42 SECONDS AND 136K AND PRINTED PAGE 4.

105 PROC PLOT NOLEGEND;
 106 PLOT SNAPMD+SRT;
 107 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 108 TITLE2 NET YIELD OF NAPHTHA(C5-380F);
 109 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 110 TITLE4 VS. SRT, NOMINAL SLURRY RESIDENCE TIME(HRS);
 111 TITLES BASIS VALUES;;
 112 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 113 TITLE7 TEMPERATURE(TAVG)= 455 C;
 114 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 115 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 116 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.42 SECONDS AND 136K AND PRINTED PAGE 5.

117 PROC PLOT NOLEGEND;
 118 PLOT SHMMD+SRT;
 119 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 120 TITLE2 NET YIELD OF MIDDLE DISTILLATE(380-550F);
 121 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 122 TITLE4 VS. SRT, NOMINAL SLURRY RESIDENCE TIME(HRS);
 123 TITLES BASIS VALUES;;
 124 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 125 TITLE7 TEMPERATURE(TAVG)= 455 C;
 126 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 127 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 128 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.44 SECONDS AND 136K AND PRINTED PAGE 6.

129 PROC PLOT NOLEGEND;
 130 PLOT SHMMD+SRT;
 131 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 132 TITLE2 NET YIELD OF HEAVY DISTILLATE(550-850F);
 133 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 134 TITLE4 VS. SRT, NOMINAL SLURRY RESIDENCE TIME(HRS);
 135 TITLES BASIS VALUES;;

136 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 137 TITLE7 TEMPERATURE(TAVG)= 455 C;
 138 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 139 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 140 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.43 SECONDS AND 136K AND PRINTED PAGE 7.

141 PROC PLOT NOLEND;
 142 PLOT SSRMD+SRT;
 143 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 144 TITLE2 NET YIELD OF SRC BOTTOMS(R50+)F;
 145 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 146 TITLE4 VS. SRT, NOMINAL SLURRY RESIDENCE TIME(HRS);
 147 TITLE5 BASIS VALUES;;
 148 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 149 TITLE7 TEMPERATURE(TAVG)= 455 C;
 150 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 151 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 152 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.43 SECONDS AND 136K AND PRINTED PAGE 8.

153 PROC PLOT NOLEND;
 154 PLOT SIOMMD+SRT;
 155 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 156 TITLE2 NET YIELD OF INSOLUBLE ORGANIC MATTER;
 157 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 158 TITLE4 VS. SRT, NOMINAL SLURRY RESIDENCE TIME(HRS);
 159 TITLE5 BASIS VALUES;;
 160 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 161 TITLE7 TEMPERATURE(TAVG)= 455 C;
 162 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 163 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 164 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.44 SECONDS AND 136K AND PRINTED PAGE 9.

NOTE: SAS USED 136K MEMORY.

NOTE: BARR, GOODNIGHT, SALL AND MELWIG
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NOTE: THE JOB SFHAHES HAS BEEN RUN UNDER RELEASE 76.00 OF SAS AT GULF OIL CORPORATION.

NOTE: SASNEWS SASNEWS SASNEWS SASNEWS SASNEWS SASNEWS

A TEST RELEASE OF SAS79.1 IS NOW AVAILABLE.
TO EXECUTE SAS79 USE // EXEC SAS79

FOR A BRIEF DESCRIPTION OF THE NEW FEATURES OF
SAS79, USE ---> PHDC DUC DATA=UOC.SAS79;

1 DATA US1;
2 MSHY=3.72339; MSC1C4=11.5696; MSHY=4.0854; MSHW=7.5061; MSNAP=8.49556;
3 MSMD=9.65792; MSMD=11.091; MSSRC=44.6567; MS10M=6.07843; MTAVG=453.058;
4 MPH2=12.4387; MSRT=0.612101; MCIN=33.9253; MRASH=4.04038; MGASRT=46.6828; DUM=1;
5 MV=1.65584;
6 TAVGB=455.; PH2B=.91+13.79; GASRTB=56.04; CINB=30.; SRTB=1.; RASHB=10.17;
7 VB=1.65584;
8 TAVGMX=465.; TAVGMN=412.80;
9 PH2MX=17.650; PH2MN=6.890;
10 SRTMX=1.590; SRTMN=0.130;
11 CINMX=50.00; CINMN=23.40;
12 RASHMX=12.70; RASHMN=0.00;
13 GASRTMX=97.970; GASRTMN=12.680;
14 VMX=0.05484; VMN=0.42680;
15 DTAVG=(TAVGMX-TAVGMN)/50.; DPH2=(PH2MX-PH2MN)/50.;
16 DSRT=(SRTMX-SRTMN)/50.; DCIN=(CINMX-CINMN)/50.;
17 DRASH=(RASHMX-RASHMN)/50.; DGASRT=(GASRTMX-GASRTMN)/50.;
18 DV=(VMX-VMN)/50.;
19 PH2=PH2MN-DPH2;
20 TAVG=TAVGB;
21 GASRT=GASRTB;
22 V=VB;
23 CIN=CINB;
24 SRT=SRTB;
25 RASH=RASHB;
26 B=PH2+DPH2;
27 VPH2=PH2-MPH2; VPH22=VPH2**2;
28 VTAVG=TAVGB-MTAVG; VTAVG2=VTAVG**2;
29 VGASRT=GASRTB-MGASRT; VGASRT2=VGASRT**2;
30 VCIN=CINB-MCIN; VCIN2=VCIN**2;
31 VRASH=RASHB-MRASH; VRASH2=VRASH**2;
32 VSRT=SRTB-MSRT; VSRT2=VSRT**2;
33 VV=VB-MV;
34 VTP=VTAVG+VPH2; VTS=VTAVG+VSRT; VTC=VTAVG+VCIN;
35 VTR=VTAVG+VRASH; VVG=VTAVG+VGASRT; VPS=VPH2+VSRT;
36 VSC=VSRT+VCIN; VSK=VSRT+VRASH; VSG=VSRT+VGASRT;
37 VCR=VCIN+VRASH; VCG=VCIN+VGASRT; VRG=VRASH+VGASRT;
38 VPC=VPH2+VCIN; VPR=VPH2+VRASH; VPG=VPH2+VGASRT;
39 SHYMD=3.61198+2.32038*VSRT+0.13590*VRASH+0.00136*VTAVG2+0.03349*VPH22
40 -0.00810*VTC;
41 SC1C4MD=9.58494+0.53345*VTAVG+9.99784*VSRT-0.11946*VCIN+0.00418*VTAVG2
42 +0.03203*VRASH2+0.41969*VTS+0.03632*VTR;
43 SHYMD=4.02712+0.04141*VTAVG+0.16521*VRASH+0.23300*VV+0.00616*VCIN2+0.05816*VTS
44 -0.01662*VPH2-0.05622*VSC-0.26048*VSR;
45 SHWMD=7.24562+0.10398*VTAVG+1.74553*VSRT+0.12134*VCIN-0.34154*VV-0.01464*VCIN2

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46      +0.04847*VHASH2+0.26228*VSC;
47      SNAPMD=9.44774+0.14484*VTAVG+3.44105*VSRT-4.82967*VSRT2;
48      SHMD=10.59855+4.60885*VSRT-0.29811*VCIN+1.03129*VV+0.01097*VTAVG2
49      -0.05592*VTC+0.05655*VPC-0.14568*VPR;
50      SHMD=12.67509+1.62409*VRASH-1.66366*VV-0.01217*VTAVG2+0.05043*VTC-2.06902*VSR;
51      SSRMD=45.19364-0.91708*VTAVG-15.94040*VSRT+0.39047*VCIN-2.09200*VRASH
52      +0.95063*VV-0.00678*VTAVG2-0.02706*VCIN2-1.11290*VTS+3.21994*VSR;
53      S10MD=5.77608+0.10C21*VTAVG-0.45104*VPH2+0.00300*VTAVG2-0.01155*VTP-0.63717*VFS
54      +0.35222*VSR;
55      OUTPUT;
56      IF PH2 < PH2MX THEN GO TO B;

```

NOTE: DATA SET WORK.DS1 HAS 52 OBSERVATIONS AND 89 VARIABLES. 26 OHS/TRK.

NOTE: THE DATA STATEMENT USED 0.52 SECONDS AND 108K.

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57      PROC PLOT NOLEGEND;
58      PLOT SHYMD*PH2;
59      TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
60      TITLE2 NET HYDROGEN CONSUMPTION;
61      TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
62      TITLE4 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA);
63      TITLE5 BASIS VALUES;;
64      TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
65      TITLE7 TEMPERATURE(TAVG)= 455 C;
66      TITLE8 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
67      TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
68      TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

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NOTE: THE PROCEDURE PLOT USED 0.44 SECONDS AND 136K AND PRINTED PAGE 1.

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69      PROC PLOT NOLEGEND;
70      PLOT SC1C4MD*PH2;
71      TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
72      TITLE2 NET YIELD OF C1-C4;
73      TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
74      TITLE4 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA);
75      TITLE5 BASIS VALUES;;
76      TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
77      TITLE7 TEMPERATURE(TAVG)= 455 C;
78      TITLE8 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
79      TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
80      TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

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NOTE: THE PROCEDURE PLOT USED 0.44 SECONDS AND 136K AND PRINTED PAGE 2.

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81      PROC PLOT NOLEGEND;
82      PLOT SBYMD*PH2;
83      TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
84      TITLE2 NET YIELD OF R/PRODUCTS(NH3,H2S,CO,C02);
85      TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
86      TITLE4 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA);
87      TITLE5 BASIS VALUES;;
88      TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
89      TITLE7 TEMPERATURE(TAVG)= 455 C;
90      TITLE8 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
91      TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

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92 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.46 SECONDS AND 136K AND PRINTED PAGE 3.

93 PROC PLOT NOLEGEND;
 94 PLOT SHWMD*PH2;
 95 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 96 TITLE2 NET YIELD OF WATER;
 97 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 98 TITLE4 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA);
 99 TITLES BASIS VALUES;;
 100 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 101 TITLE7 TEMPERATURE(TAVG)= 455 C;
 102 TITLE8 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 103 TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
 104 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.44 SECONDS AND 136K AND PRINTED PAGE 4.

105 PROC PLOT NOLEGEND;
 106 PLOT SNAPMD*PH2;
 107 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 108 TITLE2 NET YIELD OF NAPHTHAICS-JHOF;;
 109 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 110 TITLE4 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA);
 111 TITLES BASIS VALUES;;
 112 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 113 TITLE7 TEMPERATURE(TAVG)= 455 C;
 114 TITLE8 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 115 TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
 116 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.43 SECONDS AND 136K AND PRINTED PAGE 5.

117 PROC PLOT NOLEGEND;
 118 PLOT SNOMD*PH2;
 119 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 120 TITLE2 NET YIELD OF MIDDLE DISTILLATE(380-550F);
 121 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 122 TITLE4 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA);
 123 TITLES BASIS VALUES;;
 124 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 125 TITLE7 TEMPERATURE(TAVG)= 455 C;
 126 TITLE8 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 127 TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
 128 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.44 SECONDS AND 136K AND PRINTED PAGE 6.

129 PROC PLOT NOLEGEND;
 130 PLOT SHOMD*PH2;
 131 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 132 TITLE2 NET YIELD OF HEAVY DISTILLATE(550-850F);
 133 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 134 TITLE4 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA);
 135 TITLES BASIS VALUES;;

STATISTICAL ANALYSIS SYSTEM

17:20 MONDAY, MAY 21, 1979

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136      ..TLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
137      TITLE7 TEMPERATURE(TAVG)= 455 C;
138      TITLE8 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
139      TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
140      TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;
    
```

NOTE: THE PROCEDURE PLOT USED 0.43 SECONDS AND 136K AND PRINTED PAGE 7.

```

141      PROC PLOT NOLEGEND;
142      PLOT SSRCHD*PH2;
143      TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
144      TITLE2 NET YIELD OF SRC BOTTOMS(H50+1F;
145      TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
146      TITLE4 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA);
147      TITLE5 BASIS VALUES;;
148      TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
149      TITLE7 TEMPERATURE(TAVG)= 455 C;
150      TITLE8 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
151      TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
152      TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;
    
```

172 NOTE: THE PROCEDURE PLOT USED 0.43 SECONDS AND 136K AND PRINTED PAGE 8.

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153      PROC PLOT NOLEGEND;
154      PLOT STONMD*PH2;
155      TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
156      TITLE2 NET YIELD OF INSOLUBLE ORGANIC MATTER;
157      TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
158      TITLE4 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA);
159      TITLE5 BASIS VALUES;;
160      TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
161      TITLE7 TEMPERATURE(TAVG)= 455 C;
162      TITLE8 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
163      TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
164      TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;
    
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NOTE: THE PROCEDURE PLOT USED 0.45 SECONDS AND 136K AND PRINTED PAGE 9.

NOTE: SAS USED 136K MEMORY.

NOTE: BARR, GOODNIGHT, SALL AND MELWIG
 SAS INSTITUTE INC.
 P.O. BOX 10066
 RALEIGH, N.C. 27605

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET HYDROGEN CONSUMPTION
 (WEIGHT % BASED ON INLET MAI COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)

17:20 MONDAY, MAY 21, 1979

BASE VALUES:
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 COAL CONCENTRATION(INCIN)= 30 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME(SHT)= ONE HOUR
 RECYCLE ASH CONCENTRATION(RASHI)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLUT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
NET YIELD OF C1-C4

2
17:20 MONDAY, MAY 21, 1979

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)

BASIS VALUES:

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

TEMPERATURE(TAVG)= 455 C

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

SLURRY RESIDENCE TIME(SRT)= ONE HOUR

RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET YIELD OF HYDROGEN (IN H₂, H₂S, CO, CO₂)
 (WEIGHT % BASED ON INLET MAE COAL CONCENTRATION (IN)
 VS. PM2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)

3
 17:20 MONDAY, MAY 21, 1979

BASE VALUES:
 GAS LINEAR VELOCITY (V) = 1.65584 CM/SEC
 TEMPERATURE (TAVG) = 455 C
 COAL CONCENTRATION (CIN) = 30 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME (SRT) = ONE HOUR
 RECYCLE ASH CONCENTRATION (HASH) = 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
NET YIELD OF WATER
(WEIGHT % BASED ON INLET WAF COAL CONCENTRATION)
VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)

17:20 MONDAY, MAY 21, 1979

BASIS VALUES:
GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
TEMPERATURE(TAVG)= 455 C
COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
SLURRY RESIDENCE TIME(SRT)= ONE HOUR
RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
NET YIELD OF NAPHTHA(C5-380F)

8
17:20 MONDAY, MAY 21, 1979

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)

BASIS VALUES:

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

TEMPERATURE(TAVG)= 455 C

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

SLURRY RESIDENCE TIME(SRT)= ONE HOUR

RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL

NET YIELD OF MIDDLE DISTILLATE(380-550F)
(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)

BASIS VALUES:

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
TEMPERATURE(TAVG)= 455 C
COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
SLURRY RESIDENCE TIME(SRT)= ONE HOUR
RECYCLE ASH CONCENTRATION(HASH)= 10.17 G/100 G SLURRY FEED

17:20 MONDAY, MAY 21, 1979

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
NET YIELD OF HEAVY DISTILLATE (550-850F)
(WEIGHT % BASED ON INLET MAX COAL CONCENTRATION)
VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)

17:20 MONDAY, MAY 21, 1979

HASIS VALUES:
GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
TEMPERATURE (TAVG)= 455 C
COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
SLURRY RESIDENCE TIME(SRT)= ONE HOUR
RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET YIELD OF SHC BOTTOMS(650+)*F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)

8
 17:20 MONDAY, MAY 21, 1979

BASIS VALUES:
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL

NET YIELD OF INSOLUBLE ORGANIC MATTER
(WEIGHT % BASED ON INLET RAF CHAL CONCENTRATION)
VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)

BASIS VALUES:

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

TEMPERATURE(TAVG)= 455 C

CHAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

SLURRY RESIDENCE TIME (SH)= ONE HOUR

RECYCLE ASH CONCENTRATION(MASH)= 10.17 G/100 G SLURRY FEED

17120 MONDAY, MAY 21, 1979

NOTE: THE JOB SFHARES HAS BEEN RUN UNDER RELEASE 76.6C OF SAS AT GULF OIL CORPORATION.

NOTE: SASNEWS SASNEWS SASNEWS SASNEWS SASNEWS SASNEWS

A TEST RELEASE OF SAS79.1 IS NOW AVAILABLE.
TO EXECUTE SAS79 USE // EXEC SAS79

FOR A BRIEF DESCRIPTION OF THE NEW FEATURES OF
SAS79, USE --> PHOC DOC DATA=DOC.SAS79;

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1 DATA DS1;
2 MSHV=3.72339; MSCIC4=11.5896; MSBY=4.08854; MSHW=7.5061; MSNAP=8.89556;
3 MSND=9.65792; MSMD=11.091; MSSRC=44.6567; MS10M=6.07843; MTAVG=453.05H;
4 MPH2=12.4387; MSRT=0.812101; MCIN=33.9253; MRASH=4.04038; MGASRT=46.6828; DUM=1;
5 MV=1.65584;
6 TAVGH=455.; PH2B=.91*13.79; GASRTB=56.04; CINB=30.; SRTB=1.; RASHB=10.17;
7 VB=1.65584;
8 TAVGMX=465.; TAVGMN=412.80;
9 PH2MX=17.650; PH2MN=6.850;
10 SRTMX=1.590; SRTMN=0.13C;
11 CINMX=50.00; CINMN=23.4C;
12 RASHMX=12.70; RASHMN=0.00;
13 GASRTMX=97.970; GASRTMN=12.880;
14 VMX=6.05484; VMN=0.42680;
15 DTAVG=(TAVGMX-TAVGMN)/50.; DMH2=(PH2MX-PH2MN)/50.;
16 DSRT=(SRTMX-SRTMN)/50.; DCIN=(CINMX-CINMN)/50.;
17 DRASH=(RASHMX-RASHMN)/50.; DGASRT=(GASRTMX-GASRTMN)/50.;
18 DV=(VMX-VMN)/50.;
19 V=VMN-DV;
20 TAVG=TAVGB;
21 PH2=PH2B;
22 GASRT=GASRTB;
23 SRT=SRTB;
24 CIN=CINB;
25 RASH=RASHB;
26 A=V*DV;
27 VV=V-MV;
28 VRASH=RASHB-MRASH; VRASH2=VRASH**2;
29 VTAVG=TAVGH-MTAVG; VTAVG2=VTAVG**2;
30 VPH2=PH2B-MPH2; VPH22=VPH2**2;
31 VGASRT=GASRTB-MGASRT; VGASRT2=VGASRT**2;
32 VSRT=SRTB-MSRT; VSRT2=VSRT**2;
33 VCIN=CINB-MCIN; VCIN2=VCIN**2;
34 VTP=VTAVG*VPH2; VTS=VTAVG*VSRT; VTC=VTAVG*VCIN;
35 VTR=VTAVG*VRASH; VTG=VTAVG*VGASRT; VPS=VPH2*VSRT;
36 VSC=VSRT*VCIN; VSR=VSRT*VRASH; VSG=VSRT*VGASRT;
37 VCR=VCIN*VRASH; VCG=VCIN*VGASRT; VRG=VRASH*VGASRT;
38 VPC=VPH2*VCIN; VPH=VPH2*VRASH; VPG=VPH2*VGASRT;
39 SHYMD=3.61198+2.32038*VSRT+0.13590*VRASH+0.00136*VTAVG2+0.03349*VPH22
40 -0.00810*VTC;
41 SCIC4MD=9.58494+0.53345*VTAVG+9.59784*VSRT-0.141996*VCIN+0.00418*VTAVG2
42 +0.03203*VRASH2+0.41969*VTS+0.03532*VTH;
43 SBYMD=4.02712+0.04141*VTAVG+0.16521*VRASH+0.23300*VV+0.00616*VCIN2+0.05816*VTS
44 -0.01662*VPR-0.09622*VSC-0.26148*VSR;
45 SHYMD=7.24562+0.10391*VTAVG+1.74553*VSRT+0.12134*VCIN-0.34153*VV-0.01464*VCIN2

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46 +0.04H47*VRASH2+0.26228*VSC;
47 SNAPMD=9.44774+0.14484*VTAVG+J.44105*VSHT-4.82967*VSR12;
48 SHMDMD=10.59855+4.80085*VSHT-0.24811*VCIN+1.03129*VV+0.01097*VTAVG2
49 -0.05592*VTC+0.05H55*VPL-0.19568*VPR;
50 SHMDMD=12.67509+1.62409*VHASH-1.66366*VV-0.01217*VTAVG2+0.05043*VTC-2.06902*VSR;
51 SSRCMD=45.19364-0.9170H*VTAVG-15.94040*VSHT+0.39049*VCIN-2.09200*VRASH
52 +0.95063*VV-0.00678*VTAVG2-0.02706*VCIN2-1.11290*VTS+3.21994*VSR;
53 SIONMU=5.77608+0.10021*VTAVG-0.45104*VPH2+0.00300*VTAVG2-0.01155*VTP-0.63717*VPS
54 +0.35222*VSR;
55 OUTPUT;
56 IF V < VMX THEN GO TO A;

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NOTE: DATA SET WORK.051 HAS 52 OBSERVATIONS AND 89 VARIABLES. 26 OBS/TMK.

NOTE: THE DATA STATEMENT USED 0.52 SECONDS AND 108K.

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57 PROC PLOT NOLEGEN;
58 PLOT SHYMD*V;
59 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
60 TITLE2 NET HYDROGEN CONSUMPTION;
61 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
62 TITLE4 VS. V. GAS LINEAR VELOCITY(CM/SEC);
63 TITLE5 BASIS VALUES;;
64 TITLE6 TEMPERATURE(TAVG)= 455 C;
65 TITLE7 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
66 TITLE8 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
67 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
68 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

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NOTE: THE PROCEDURE PLOT USED 0.44 SECONDS AND 136K AND PRINTED PAGE 1.

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69 PROC PLOT NOLEGEN;
70 PLOT SCIC4MD*V;
71 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
72 TITLE2 NET YIELD OF C1-C4;
73 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
74 TITLE4 VS. V. GAS LINEAR VELOCITY(CM/SEC);
75 TITLE5 BASIS VALUES;;
76 TITLE6 TEMPERATURE(TAVG)= 455 C;
77 TITLE7 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
78 TITLE8 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
79 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
80 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

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NOTE: THE PROCEDURE PLOT USED 0.43 SECONDS AND 136K AND PRINTED PAGE 2.

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81 PROC PLOT NOLEGEN;
82 PLOT SBYMD*V;
83 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
84 TITLE2 NET YIELD OF BYPRODUCTS(NH3,H2S,CO,CO2);
85 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
86 TITLE4 VS. V. GAS LINEAR VELOCITY(CM/SEC);
87 TITLE5 BASIS VALUES;;
88 TITLE6 TEMPERATURE(TAVG)= 455 C;
89 TITLE7 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
90 TITLE8 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
91 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;

```

92 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.44 SECONDS AND 136K AND PRINTED PAGE 3.

93 PROC PLOT NOLLEGEND;
 94 PLOT SHMMD*V;
 95 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 96 TITLE2 NET YIELD OF WATER;
 97 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 98 TITLE4 VS. V. GAS LINEAR VELOCITY(CM/SEC);
 99 TITLES BASIS VALUES;;
 100 TITLE6 TEMPERATURE(TAVG)= 455 C;
 101 TITLE7 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 102 TITLE8 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
 103 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 104 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.44 SECONDS AND 136K AND PRINTED PAGE 4.

105 PROC PLOT NOLLEGEND;
 106 PLOT SNAPMD*V;
 107 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 108 TITLE2 NET YIELD OF NAPHTHA(C5-380F);
 109 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 110 TITLE4 VS. V. GAS LINEAR VELOCITY(CM/SEC);
 111 TITLES BASIS VALUES;;
 112 TITLE6 TEMPERATURE(TAVG)= 455 C;
 113 TITLE7 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 114 TITLE8 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
 115 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 116 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.43 SECONDS AND 136K AND PRINTED PAGE 5.

117 PROC PLOT NOLLEGEND;
 118 PLOT SMDMD*V;
 119 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 120 TITLE2 NET YIELD OF MIDDLE DISTILLATE(380-550F);
 121 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 122 TITLE4 VS. V. GAS LINEAR VELOCITY(CM/SEC);
 123 TITLES BASIS VALUES;;
 124 TITLE5 TEMPERATURE(TAVG)= 455 C;
 125 TITLE7 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 126 TITLE8 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
 127 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 128 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.45 SECONDS AND 136K AND PRINTED PAGE 6.

129 PROC PLOT NOLLEGEND;
 130 PLOT SHMDMD*V;
 131 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 132 TITLE2 NET YIELD OF HEAVY DISTILLATE(550-850);
 133 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 134 TITLE4 VS. V. GAS LINEAR VELOCITY(CM/SEC);
 135 TITLES BASIS VALUES;;

136 TITLE6 TEMPERATURE(TAVG)= 455 C;
 137 TITLE7 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 138 TITLE8 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
 139 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 140 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.43 SECONDS AND 136K AND PRINTED PAGE 7.

141 PROC PLOT NOLEGEND;
 142 PLOT SSRMD*V;
 143 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 144 TITLE2 NET YIELD OF SHC BOTTOMS;
 145 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 146 TITLE4 VS. V. GAS LINEAR VELOCITY(CM/SEC);
 147 TITLES BASIS VALUES;;
 148 TITLE6 TEMPERATURE(TAVG)= 455 C;
 149 TITLE7 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 150 TITLE8 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
 151 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 152 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.43 SECONDS AND 136K AND PRINTED PAGE 8.

153 PROC PLOT NOLEGEND;
 154 PLOT SIOMD*V;
 155 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 156 TITLE2 NET YIELD OF INSOLUBLE ORGANIC MATTER;
 157 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 158 TITLE4 VS. V. GAS LINEAR VELOCITY(CM/SEC);
 159 TITLES BASIS VALUES;;
 160 TITLE6 TEMPERATURE(TAVG)= 455 C;
 161 TITLE7 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 162 TITLE8 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
 163 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 164 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.42 SECONDS AND 136K AND PRINTED PAGE 9.

NOTE: SAS USED 136K MEMORY.

NOTE: BARR, GOODNIGHT, SALL AND HELWIG
 SAS INSTITUTL INC.
 P.O. BOX 10066
 RALEIGH, N.C. 27605

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
NET YIELD OF INSOLUBLE ORGANIC MATTER
(WEIGHT % BASED ON INLET HAF COAL CONCENTRATION)
VS. V. GAS LINEAR VELOCITY(CM/SEC)

9
17:22 MONDAY, MAY 21, 1979

BASIS VALUES:

TEMPERATURE(TAVG)= 455 C

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

SLURRY RESIDENCE TIME(SRT)= ONE HOUR

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET YIELD OF SRC BOTTOMS
 (WEIGHT % BASED ON INLET MAE COAL CONCENTRATION)
 VS. V. GAS LINEAR VELOCITY (CM/SEC)
 BASIS VALUES:

8
 17:22 MONDAY, MAY 21, 1979

TEMPERATURE (TAVG) = 455 C
 PRESSURE (PH2) = 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 SLURRY RESIDENCE TIME (SRT) = ONE HOUR
 COAL CONCENTRATION (CIN) = 30 G/100 G SLURRY FEED
 RECYCLE ASH CONCENTRATION (RASH) = 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL

NET YIELD OF HEAVY DISTILLATE(550-850)

(WEIGHT % BASED ON INLET MAX COAL CONCENTRATION)

VS. V, GAS LINEAR VELOCITY(CM/SEC)

HASIS VALUES:

TEMPERATURE(TAVG)= 455 C

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPa

SLURRY RESIDENCE TIME(SRT)= ONE HOUR

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

17:22 MONDAY, MAY 21, 1979

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NLT YIELD OF MIDDLE DISTILLATE(380-550F)
 (WEIGHT % BASED ON INLET NAF COAL CONCENTRATION)
 VS. V.GAS LINEAR VELOCITY(CM/SEC)

6
 17:22 MONDAY, MAY 21, 1979

BASIS VALUES:
 TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET YIELD OF NAPHTHA(C5-380F)
 (WEIGHT % BASED ON INLET NAH COAL CONCENTRATION)
 VS. V, GAS LINEAR VELOCITY(CM/SEC)

5
 17:22 MONDAY, MAY 21, 1979

BASIS VALUES:
 TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 RECYCLE ASH CONCENTRATION(HASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET YIELD OF WATER
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. V, GAS LINEAR VELOCITY(CM/SEC)

17:22 MONDAY, MAY 21, 1979

BASIS VALUES:
 TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 RECYCLE ASH CONCENTRATION(WASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET YIELD OF HYPRODUCTS(NH3,H2S,CO,CO2)
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. V. GAS LINEAR VELOCITY(CM/SEC)

17:22 MONDAY, MAY 21, 1979

BASIS VALUES:
 TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET YIELD OF C1-C4
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. V. GAS LINEAR VELOCITY(CM/SEC)

2
 17:22 MONDAY, MAY 21, 1979

BASIS VALUES:
 TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET HYDROGEN CONSUMPTION
 (WEIGHT % BASED ON INLET MAX COAL CONCENTRATION)
 VS. V, GAS LINEAR VELOCITY (CM/SEC)

17:22 MONDAY, MAY 21, 1979

BASIS VALUES:
 TEMPERATURE (TAVG) = 455 C
 PRESSURE (PH2) = 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 SLURRY RESIDENCE TIME (SRT) = ONE HOUR
 COAL CONCENTRATION (CIN) = 30 G/100 G SLURRY FEED
 RECYCLE ASH CONCENTRATION (IRASH) = 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET HYDROGEN CONSUMPTION
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)

17:24 MONDAY, MAY 21, 1979

BASIS VALUES:
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 RECYCLE ASH CONCENTRATION(HASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL

NET YIELD OF C1-C4

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. SRT, NOMINAL SLURRY RESIDENCE TIME(HRS)

BASES VALUES:

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

TEMPERATURE(TAVG)= 455 C

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

17:24 MONDAY, MAY 21, 1979

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET YIELD OF BYPRODUCTS(NH3,H2S,CO,CO2)
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. SRT, NOMINAL SLURRY RESIDENCE TIME(MRS)

3
 17:24 MONDAY, MAY 21, 1979

FAST VALUES:
 GAS LINEAR VELOCITY(V)= 1.65584 (M/SEC)
 TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL

NET YIELD OF WATER

17:24 MONDAY, MAY 21, 1979

(WEIGHT % BASED ON INLET MAE COAL CONCENTRATION)

VS. SRT, NOMINAL SLURRY RESIDENCE TIME(HRS)

BASIS VALUES:

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

TEMPERATURE(TAVG)= 455 C

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SRT

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET YIELD OF NAPHTHA(C5-380F)
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. SRT, NOMINAL SLURRY RESIDENCE TIME(HRS)

17:24 MONDAY, MAY 21, 1979

BASIS VALUES:
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 MFCYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET YIELD OF MIDDLE DISTILLATE(380-550F)
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. SRT, NOMINAL SLURRY RESIDENCE TIME(HRS)

6
 17:24 MONDAY, MAY 21, 1979

BASIS VALUES:
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL

NET YIELD OF HEAVY DISTILLATE(550-850F)
(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
VS. SRT, NOMINAL SLURRY RESIDENCE TIME(MRS)

BASIS VALUES:

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

TEMPERATURE(TAVG)= 455 C

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

7
17:24 MONDAY, MAY 21, 1979

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NLI YIELD OF SRC BOTTOMS(650+)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. SRT, NOMINAL SLURRY RESIDENCE TIME(HRS)

8
 17:24 MONDAY, MAY 21, 1979

BASIS VALUES:
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET YIELD OF INSOLUBLE ORGANIC MATTER
 (WEIGHT % BASED ON INLET MAFCOAL CONCENTRATION)
 VS. SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)

9
 17:24 MONDAY, MAY 21, 1979

BASES VALUES:
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

NOTE: THE JOB SFMAKES HAS BEEN RUN UNDER RELEASE 7600C OF SAS AT GULF OIL CORPORATION.

NOTE: SASNEWS SASNEWS SASNEWS SASNEWS SASNEWS SASNEWS

A TEST RELEASE OF SAS79.1 IS NOW AVAILABLE.
TO EXECUTE SAS79 USE // EXEC SAS79

FOR A BRIEF DESCRIPTION OF THE NEW FEATURES OF
SAS79, USE --> PROC DOC DATA=DOC.SAS79;

204

```
1 DATA DS1;
2 MSMT=3.72339; MSC1C4=11.5896; MSRY=4.08654; MSNW=7.50611; MSNAP=8.89556;
3 MSND=9.65792; MSMD=11.0911; MSSRC=44.6567; MS10M=6.07843; MTAVG=453.058;
4 MPH2=12.4387; MSRT=0.812101; MCIN=33.9253; MRASH=4.04038; MGASRT=46.6828; DUM=1;
5 MV=1.65584;
6 TAVGR=455.; PH2B=.9113.79; GASRTB=56.04; CINB=30.; SRTB=1.; RASHU=10.17;
7 VB=1.65584;
8 TAVGMX=465.; TAVGMN=412.00;
9 PH2MX=17.650; PH2MN=6.890;
10 SRTMX=1.590; SRTMN=0.130;
11 CINMX=50.00; CINMN=23.40;
12 RASHMX=12.70; RASHMN=0.00;
13 GASRTMX=97.970; GASRTMN=12.800;
14 VMX=6.05484; VMN=0.42688;
15 DTAVG=(TAVGMX-TAVGMN)/50.; DPH2=(PH2MX-PH2MN)/50.;
16 DSRT=(SRTMX-SRTMN)/50.; DCIN=(CINMX-CINMN)/50.;
17 DRASH=(RASHMX-RASHMN)/50.; DGASRT=(GASRTMX-GASRTMN)/50.;
18 DV=(VMX-VMN)/50.;
19 SRT=SRTMN-DSRT;
20 TAVG=TAVGB;
21 PH2=PH2B;
22 GASRT=GASRTB;
23 CIN=CINB;
24 RASH=RASHB;
25 V=VB;
26 D: SRT+DSRT;
27 VSRT=SRT-MSRT; VSRT2=VSRT**2;
28 VTAVG=TAVGB-MTAVG; VTAVG2=VTAVG**2;
29 VPH2=PH2B-MPH2; VPH22=VPH2**2;
30 VGASRT=GASRTB-MGASRT; VGASRT2=VGASRT**2;
31 VCIN=CINB-MCIN; VCIN2=VCIN**2;
32 VRASH=RASHB-MRASH; VRASH2=VRASH**2;
33 VV=VB-MV;
34 VTP=VTAVG+VPH2; VTS=VTAVG+VSRT; VTC=VTAVG+VCIN;
35 VTR=VTAVG+VRASH; VTG=VTAVG+VGASRT; VPS=VPH2+VSRT;
36 VPC=VPH2+VCIN; VPR=VPH2+VRASH; VPG=VPH2+VGASRT;
37 VSC=VSRT+VCIN; VSN=VSRT+VRASH; VSG=VSRT+VGASRT;
38 VCR=VCIN+VRASH; VCG=VCIN+VGASRT; VRG=VRASH+VGASRT;
39 SHYMD=3.61198+2.32038*VSRT+0.13590*VRASH+0.00136*VTAVG2+0.03349*VPH22
40 -0.00810*VTC;
41 SC1C4MD=9.58494+0.53345*VTAVG+9.6974*VSRT-0.11996*VCIN+0.00418*VTAVG2
42 +0.03203*VRASH2+0.41969*VTS+0.03632*VTR;
43 SBYMD=4.02712+0.04141*VTAVG+0.16621*VRASH+0.23300*VV+0.00616*VCIN2+0.05816*VTS
44 -0.01662*VPH2-0.04622*VSC-0.26848*VSN;
45 SHWMD=7.24562+0.10398*VTAVG+1.70553*VSRT+0.12134*VCIN-0.34153*VV-0.01464*VCIN2
```

```

46      +0.04847*VRASH2+0.26228*VSC;
47      SNAPMD=9.44774+0.14484*VTAVG+3.44105*VSRT-4.82967*VSRT2;
48      SMDMD=10.59855+4.60085*VSRT-0.24611*VCIN+1.03124*VV+0.01097*VTAVG2
49      -0.05592*VTC+0.05655*VPC-0.19568*VPR;
50      SHOMD=12.07509+1.62409*VRASH-1.66366*VV-0.01217*VTAVG2+0.05043*VTC-2.06902*VSR;
51      SSRMD=45.10364-0.91708*VTAVG-15.94040*VSRT+0.39049*VCIN-2.09200*VRASH
52      +0.95063*VV-0.00678*VTAVG2-0.02706*VCIN2-1.11290*VTS+3.21494*VSR;
53      SIOMD=5.77608+0.10021*VTAVG-0.45104*VPH2+0.00300*VTAVG2-0.01155*VTP-0.63717*VPS
54      +0.35222*VSR;
55      OUTPUT;
56      IF SRT < SRTMX THEN GO TO D;

```

NOTE: DATA SET WORK.DS1 HAS 52 OBSERVATIONS AND 89 VARIABLES. 26 OBS/TRK.

NOTE: THE DATA STATEMENT USED 0.50 SECONDS AND 108K.

```

57      PROC PLOT NOLEGEND;
58      PLOT SHYMD*SRT;
59      TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
60      TITLE2 NET HYDROGEN CONSUMPTION;
61      TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
62      TITLE4 VS. SRT, NOMINAL SLURRY RESIDENCE TIME(HRS);
63      TITLES BASIS VALUES;;
64      TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
65      TITLE7 TEMPERATURE(TAVG)= 455 C;
66      TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
67      TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
68      TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

```

NOTE: THE PROCEDURE PLOT USED 0.43 SECONDS AND 136K AND PRINTED PAGE 1.

```

69      PROC PLOT NOLEGEND;
70      PLOT SCICAMD*SRT;
71      TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
72      TITLE2 NET YIELD OF C1-C4;
73      TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
74      TITLE4 VS. SRT, NOMINAL SLURRY RESIDENCE TIME(HRS);
75      TITLES BASIS VALUES;;
76      TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
77      TITLE7 TEMPERATURE(TAVG)= 455 C;
78      TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
79      TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
80      TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

```

NOTE: THE PROCEDURE PLOT USED 0.42 SECONDS AND 136K AND PRINTED PAGE 2.

```

81      PROC PLOT NOLEGEND;
82      PLOT SBYMD*SRT;
83      TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
84      TITLE2 NET YIELD OF BYPRODUCTS(NH3,H2S,CO,CO2);
85      TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
86      TITLE4 VS. SRT, NOMINAL SLURRY RESIDENCE TIME(HRS);
87      TITLES BASIS VALUES;;
88      TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
89      TITLE7 TEMPERATURE(TAVG)= 455 C;
90      TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
91      TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;

```

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL

NET YIELD OF BYPRODUCTS(NH₃,H₂S,CO,CO₂)

(WEIGHT % BASED ON INLET NAF COAL CONCENTRATION)

VS. RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED)

HASIS VALUES:

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

TEMPERATURE(TAVG)= 455 C

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPa

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

SLURRY RESIDENCE TIME(SRT)= ONE HOUR

17:15 MONDAY, MAY 21, 1979

206

SINGLE VARIABLE PLOT. UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL

NET YIELD OF WATER

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED)

BASIS VALUES:

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

TEMPERATURE(TAVG)= 455 C

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPa

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

SLURRY RESIDENCE TIME(SRT)= ONE HOUR

17:15 MONDAY, MAY 21, 1979

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
NET YIELD OF NAPHTHA(C5-380F)

17:15 MONDAY, MAY 21, 1979

(WEIGHT % BASED ON INLET MAP COAL CONCENTRATION)
VS. RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED)

BASIS VALUES:

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

TEMPERATURE(TAVG)= 455 C

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPa

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

SLURRY RESIDENCE TIME(SRT)= ONE HOUR

SNAPWD

208

10.20507

AA

0.000 1.016 2.032 3.048 4.064 5.080 6.096 7.112 8.128 9.144 10.160 11.176 12.192

RASH

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET YIELD OF MIDDLE DISTILLATE(380-550F)
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. RASH. RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED)

6
 17:15 MONDAY, MAY 21, 1979

BASIS VALUES:
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
NET YIELD OF HEAVY DISTILLATE(150-850F)

(WEIGHT % BASED ON INLET MAP COAL CONCENTRATION)

VS. RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED)

BASIS VALUES:

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

TEMPERATURE(TAVG)= 455 C

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

SLURRY RESIDENCE TIME(SRT)= ONE HOUR

17:15 MONDAY, MAY 21, 1979

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
NET YIELD OF SRC BOTTOMS(850+)F
(WEIGHT % BASED ON INLET MAP COAL CONCENTRATION)
VS. RASH. RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED)

8
17:15 MONDAY, MAY 21, 1979

BASIS VALUES:
GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
TEMPERATURE(TAVG)= 455 C
PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
SLURRY RESIDENCE TIME(SRT)= ONE HOUR

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET YIELD OF INSOLUBLE ORGANIC MATTER
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. RASH, RECYCLE ASH CONCENTRATION (G ASH/100 G SLURRY FEED)
 BASIS VALUES:

17:15 MONDAY, MAY 21, 1979

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.5E MPA
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR

NOTE: THE JOB SFHARE HAS BEEN RUN UNDER RELEASE 76.0C OF SAS AT GULF OIL CORPORATION.

NOTE: SASNEWS SASNEWS SASNEWS SASNEWS SASNEWS SASNEWS

A TEST RELEASE OF SAS79.1 IS NOW AVAILABLE.
TO EXECUTE SAS79 USE // EXEC SAS79

FOR A BRIEF DESCRIPTION OF THE NEW FEATURES OF
SAS79, USE --> PRIC DOC DATA=DUL,SAS79;

```

1  DATA DS1;
2  MSNV=3.72339; MSCIC4=11.5896; MSBY=4.08854; MSBW=7.5061; MSNAP=8.89556;
3  MSND=9.65792; MSMD=11.091; MSSRC=44.6567; MS1UM=6.07843; MTAVG=453.058;
4  MPH2=12.4387; MSRT=0.812101; MCIN=33.9253; MHASH=4.04038; MGASRT=46.6828; DUM=1;
5  MV=1.65584;
6  TAVG=455.; PH2B=.91813.79; GASRTB=56.04; CINB=30.; SRTB=1.; HASHB=10.17;
7  VB=1.65584;
8  TAVGMX=465.; TAVGMN=412.80;
9  PH2MX=17.650; PH2MN=6.890;
10 SRTMX=1.690; SRTMN=0.130;
11 CINMX=50.00; CINMN=23.40;
12 RASHMX=12.70; RASHMN=0.00;
13 GASRTMX=97.970; GASRTMN=12.880;
14 VMX=6.05484; VMN=0.42680;
15 DTAVG=(TAVGMX-TAVGMN)/50.; DPH2=(PH2MX-PH2MN)/50.;
16 DSRT=(SRTMX-SRTMN)/50.; DCIN=(CINMX-CINMN)/50.;
17 DRASH=(RASHMX-RASHMN)/50.; DGASRT=(GASRTMX-GASRTMN)/50.;
18 DV=(VMX-VMN)/50.;
19 TAVG=TAVGMN-DTAVG;
20 PH2=PH2B;
21 GASRT=GASRTB;
22 CIN=CINB;
23 SRT=SRTB;
24 RASH=HASHB;
25 V=VB;
26 A: TAVG+DTAVG;
27 VTAVG=TAVG-MTAVG; VTAVG2=VTAVG**2;
28 VPH2=PH2B-MPH2; VPH22=VPH2**2;
29 VGASRT=GASRTB-MGASRT; VGASRT2=VGASRT**2;
30 VCIN=CINB-MCIN; VCIN2=VCIN**2;
31 VSRT=SRTB-MSRT; VSRT2=VSRT**2;
32 VRASH=RASHB-MHASH; VRASH2=VRASH**2;
33 VV=VB-MV;
34 VTP=VTAVG+VPH2; VTS=VTAVG+VSRT; VTC=VTAVG+VCIN;
35 VTR=VTAVG+VRASH; VTG=VTAVG+VGASRT; VPS=VPH2+VSRT;
36 VSC=VSRT+VCIN; VSR=VSRT+VRASH; VSG=VSRT+VGASRT;
37 VCR=VCIN+VRASH; VCG=VCIN+VGASRT; VRG=VRASH+VGASRT;
38 VPC=VPH2+VCIN; VPR=VPH2+VRASH; VPG=VPH2+VGASRT;
39 SHYMD=3.61148+2.37038*VPH2+0.13590*VRASH+0.00130*VTAVG2+0.03549*VPH22
40 -0.00810*VTC;
41 SCIC4MD=4.58994+0.55345*VTAVG+9.69784*VSRT-0.11996*VCIN+0.00418*VTAVG2
42 +0.03201*VRASH2+0.41964*VTS+0.03632*VTR;
43 SHYMD=4.07712+0.04141*VTAVG+0.16621*VRASH+0.23300*VV+0.00616*VCIN2+0.05116*VTS
44 -0.01667*VPH2-0.04621*VSC-0.26848*VSR;
45 SHYMD=7.24512+0.10590*VTAVG+1.79553*VSRT+0.12134*VCIN-0.34153*VV-0.01464*VCIN2

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```

46 +0.04847*VRASH2+0.28228*VSC;
47 SNAPMD=9.44774+0.14484*VTAVG+3.44105*VSR1-4.62967*VSR12;
48 SHMD=10.59855+4.80085*VSR1-0.29811*VCIN+1.03129*VV+0.01097*VTAVG2
49 -0.35592*VTC+0.05055*VPC-0.19568*VPR;
50 SHMD=12.67509+1.66240*VRASH-1.66366*VV-0.01217*VTAVG2+0.05043*VTC-2.06902*VSR;
51 SSRMD=45.19364-0.91708*VTAVG-15.94040*VSR1+0.39049*VCIN-2.09200*VRASH
52 +0.95063*VV-0.00678*VTAVG2-0.02706*VCIN2-1.11290*VTS+3.21994*VSR;
53 SIOMD=5.77608+0.10021*VTAVG-0.45104*VPH2+0.00300*VTAVG2-0.01155*VTP-0.63717*VPS
54 +0.35222*VSR;
55 OUTPUT;
56 IF TAVG < TAVCMX THEN GO TO A;

```

NOTE: DATA SET WORK.DS1 HAS 52 OBSERVATIONS AND 84 VARIABLES. 26 OBS/TRK.

NOTE: THE DATA STATEMENT USED 0.50 SECONDS AND 108K.

```

57 PROC PLOT NOLEGEND;
58 PLOT SHMD*TAVG;
59 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
60 TITLE2 NET HYDROGEN CONSUMPTION;
61 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
62 TITLE4 VS. TAVG, AVERAGE REACTOR TEMPERATURE (C);
63 TITLE5 BASIS VALUES;
64 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
65 TITLE7 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
66 TITLE8 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
67 TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
68 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

```

NOTE: THE PROCEDURE PLOT USED 0.43 SECONDS AND 136K AND PRINTED PAGE 1.

```

69 PROC PLOT NOLEGEND;
70 PLOT SCICMD*TAVG;
71 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
72 TITLE2 NET YIELD OF C1-C4;
73 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
74 TITLE4 VS. TAVG, AVERAGE REACTOR TEMPERATURE (C);
75 TITLE5 BASIS VALUES;
76 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
77 TITLE7 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
78 TITLE8 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
79 TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
80 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

```

NOTE: THE PROCEDURE PLOT USED 0.43 SECONDS AND 136K AND PRINTED PAGE 2.

```

81 PROC PLOT NOLEGEND;
82 PLOT SBYMD*TAVG;
83 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
84 TITLE2 NET YIELD OF BYPRODUCTS(NH3,H2S,CO,CO2);
85 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
86 TITLE4 VS. TAVG, AVERAGE REACTOR TEMPERATURE (C);
87 TITLE5 BASIS VALUES;
88 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
89 TITLE7 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
90 TITLE8 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
91 TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

```

92 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.44 SECONDS AND 136K AND PRINTED PAGE 3.

93 PROC PLOT NOLEGEND;
 94 PLOT SHMMD*TAVG;
 95 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 96 TITLE2 NET YIELD OF WATER;
 97 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 98 TITLE4 VS. (TAVG, AVERAGE REACTION TEMPERATURE(C);
 99 TITLES BASIS VALUES;;
 100 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 101 TITLE7 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 102 TITLE8 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 103 TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
 104 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.42 SECONDS AND 136K AND PRINTED PAGE 4.

105 PROC PLOT NOLEGEND;
 106 PLOT SNAPMD*TAVG;
 107 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 108 TITLE2 NET YIELD OF NAPHTHA(C5-380F);
 109 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 110 TITLE4 VS. TAVG, AVERAGE REACTOR TEMPERATURE(C);
 111 TITLES BASIS VALUES;;
 112 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 113 TITLE7 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 114 TITLE8 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 115 TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
 116 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.43 SECONDS AND 136K AND PRINTED PAGE 5.

117 PROC PLOT NOLEGEND;
 118 PLOT SHMD*TAVG;
 119 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 120 TITLE2 NET YIELD OF MIDDLE DISTILLATE(380-550F);
 121 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 122 TITLE4 VS. TAVG, AVERAGE REACTOR TEMPERATURE(C);
 123 TITLES BASIS VALUES;;
 124 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 125 TITLE7 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 126 TITLE8 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 127 TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
 128 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.43 SECONDS AND 136K AND PRINTED PAGE 6.

129 PROC PLOT NOLEGEND;
 130 PLOT SHMD*TAVG;
 131 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 132 TITLE2 NET YIELD OF HEAVY DISTILLATE(550-850F);
 133 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 134 TITLE4 VS. TAVG, AVERAGE REACTOR TEMPERATURE(C);
 135 TITLES BASIS VALUES;;

4

STATISTICAL ANALYSIS SYSTEM

17:26 MONDAY, MAY 21, 1979

136 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 137 TITLE7 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 138 TITLE8 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 139 TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
 140 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.43 SECONDS AND 136K AND PRINTED PAGE 7.

141 PROC PLOT NOLEGENE;
 142 PLOT SSRMD+TAVG;
 143 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 144 TITLE2 NET YIELD OF SRC HOTTONS(R50+)%;
 145 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 146 TITLE4 VS. TAVG, AVERAGE REACTOR TEMPERATURE(C);
 147 TITLE5 BASIS VALUES;
 148 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 149 TITLE7 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 150 TITLE8 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 151 TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
 152 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.44 SECONDS AND 136K AND PRINTED PAGE 8.

216 153 PROC PLOT NOLEGENE;
 154 PLOT S10MMD+TAVG;
 155 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 156 TITLE2 NET YIELD OF INSOLUBLE ORGANIC MATTER;
 157 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 158 TITLE4 VS. TAVG, AVERAGE REACTOR TEMPERATURE(C);
 159 TITLE5 BASIS VALUES;
 160 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 161 TITLE7 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 162 TITLE8 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 163 TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
 164 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.43 SECONDS AND 136K AND PRINTED PAGE 9.

NOTE: SAS USED 136K MEMORY.

NOTE: BARR, GOODNIGHT, SALL AND HELLWIG
 SAS INSTITUTE INC.
 P.O. BOX 10066
 RALEIGH, N.C. 27605

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET HYDROGEN CONSUMPTION
 (WEIGHT % BASED ON INLET HAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTION TEMPERATURE (C)

17:26 MONDAY, MAY 21, 1979

BASIS VALUES:
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPa
 COAL CONCENTRATION(IN(CIN)= 30 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 RECYCLE ASH CONCENTRATION(WASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
NET YIELD OF C1-C4

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
VS. TAVG, AVERAGE REACTOR TEMPERATURE(C)

BASIS VALUES:

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPa
COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
SLURRY RESIDENCE TIME(SRT)= ONE HOUR
RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

17:26 MONDAY, MAY 21, 1979

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL

NET YIELD OF BYPRODUCTS(NH₃,H₂S,CO,CO₂)

(WEIGHT % BASED ON INLET MAE COAL CONCENTRATION)

VS. TAVG, AVERAGE REACTOR TEMPERATURE(C)

BASIS VALUES:

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

SLURRY RESIDENCE TIME(SRT)= ONE HOUR

RECYCLE ASH CONCENTRATION(HASH)= 10.17 G/100 G SLURRY FEED

17:26 MONDAY, MAY 21, 1979

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL

NET YIELD OF WATER

(WEIGHT % BASED ON INLET MAE COAL CONCENTRATION)

VS. TAVG. AVERAGE REACTION TEMPERATURE(C)

BASIS VALUES:

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

SLURRY RESIDENCE TIME(SRT)= ONE HOUR

RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

17:26 MONDAY, MAY 21, 1979

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET YIELD OF NAPHTHA(C5-THOP)
 (WEIGHT % BASED ON INLET NAT COAL CONCENTRATION)
 VS. TAVG. AVERAGE REACTION TEMPERATURE(C)

17:26 MONDAY, MAY 21, 1979

BASIS VALUES:
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET YIELD OF MIDDLE DISTILLATE (380-550F)
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE (C)

6
 17:26 MONDAY, MAY 21, 1979

BASIS VALUES:
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET YIELD OF HEAVY DISTILLATE(550-650F)
 (WEIGHT % BASED ON INLET NAFCOAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE(C)

7
 17:26 MONDAY, MAY 21, 1979

BASE VALUES:
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPa
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET YIELD OF SRC BOTTOMS(850+)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. TAVG. AVERAGE REACTOR TEMPERATURE(C)

17:26 MONDAY, MAY 21, 1979

BASIS VALUES:
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, (UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
NET YIELD OF INSOLUBLE ORGANIC MATTER
(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
VS. TAVG, AVERAGE REACTOR TEMPERATURE(C)

17:26 MONDAY, MAY 21, 1979

BASE VALUES:
GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
SLURRY RESIDENCE TIME(SRT)= ONE HOUR
RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

NOTE: THE JOB SFHARES HAS BEEN RUN UNDER RELEASE 76.6C OF SAS AT GULF OIL CORPORATION.

NOTE: SASNEWS SASNEWS SASNEWS SASNEWS SASNEWS SASNEWS

A TEST RELEASE OF SAS79.1 IS NOW AVAILABLE.
TO EXECUTE SAS79 USE // EXEC SAS79

FOR A BRIEF DESCRIPTION OF THE NEW FEATURES OF
SAS79, USE --> PROC DOC DATA=DOC.SAS79;

226

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1      DATA DS1;
2      MSBY=3.72339; MSC1C4=11.5896; MSBY=4.08854; MSHW=7.5061; MSNAP=8.89556;
3      MSND=9.65792; MSND=11.091; MSSRC=44.6567; MS10M=6.07843; MTAVG=453.058;
4      MPH2=12.4387; MSRT=0.812101; MCIN=33.9253; MHASH=4.04038; MGASRT=46.6828; DUM=1;
5      MV=1.65584;
6      TAVG8=455.; PH2B=.91*13.79; GASRTB=56.04; CINB=30.; SRTB=1.; RASMB=10.17;
7      VB=1.65584;
8      TAVGMX=465.; TAVGMN=412.80;
9      PH2MX=17.650; PH2MN=6.890;
10     SRTMX=1.590; SRTMN=0.130;
11     CINMX=50.00; CINMN=23.40;
12     RASHMX=12.70; RASHMN=0.00;
13     GASRTMX=97.970; GASRTMN= 12.880;
14     VMX=6.05484; VMN=0.42680;
15     DTAVG=(TAVGMX-TAVGMN)/50.; DPH2=(PH2MX-PH2MN)/50.;
16     DSRT=(SRTMX-SRTMN)/50.; DCIN=(CINMX-CINMN)/50.;
17     DRASH=(RASHMX-RASHMN)/50.; DGASRT=(GASRTMX-GASRTMN)/50.;
18     DV=(VMX-VMN)/50.;
19     TAVG=TAVGMN-DTAVG;
20     PH2=PH2B;
21     GASRT=GASRTB;
22     V=VB;
23     CIN=CINB;
24     RASH=RASHB;
25     A: TAVG+DTAVG;
26     SRT=SRTMN-DSRT;
27     B: SRT+DSRT;
28     VTAVG=TAVG-MTAVG; VTAVG2= VTAVG**2;
29     VSRT=SRT-MSRT; VSRT2= VSRT**2;
30     VPH2=PH2B-MPH2; VPH22=VPH2**2;
31     VGASRT=GASRTB-MGASRT; VGASRT2=VGASRT**2;
32     VCIN=CINB-MCIN; VCIN2=VCIN**2;
33     VRASH=RASHB-MHASH; VRASH2=VRASH**2;
34     VV=VB-MV;
35     VTP=VTAVG*VPH2; VTS=VTAVG*VSRT; VTC=VTAVG*VCIN;
36     VTR=VTAVG*VRASH; VTG=VTAVG*VGASRT; VPS=VPH2*VSRT;
37     VPC=VPH2*VCIN; VPR=VPH2*VRASH; VPG=VPH2*VGASRT;
38     VSC=VSRT*VCIN; VSR=VSRT*VRASH; VSG=VSRT*VGASRT;
39     VCR=VCIN*VRASH; VCG=VCIN*VGASRT; VRG=VRASH*VGASRT;
40     SHDMD=10.59856+4.80085*VSRT-0.29811*VCIN+1.03129*VV+0.01097*VTAVG2
41     -0.05592*VTC+0.05855*VPC-0.19568*VPR;
42     SHDMD=12.67509+1.62409*VRASH-1.66366*VV-0.01217*VTAVG2+0.05043*VTC-2.06902*VSR;
43     SSRDMD=45.19364-0.91708*VTAVG-15.44040*VSRT+0.39049*VCIN-2.09200*VRASH
44     +0.95063*VV-0.00678*VTAVG2-0.02706*VCIN2-1.11290*VTS+3.21994*VSR;
45     OUTPUT;

```

46 IF SRT < SRTMX THEN GO TO B;
47 IF TAVG < TAVGMX THEN GO TO A;

NOTE: DATA SET WORK.DS1 HAS 2704 OBSERVATIONS AND 83 VARIABLES. 28 OBS/TRK.
NOTE: THE DATA STATEMENT USED 1.81 SECONDS AND 108K.

48 PROC PLOT NOLEGEND;
49 PLOT TAVG*SRT=SMOHD/ CONTOUR=10;
50 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
51 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
52 TITLE3 SMOHD, MIDDLE DISTILLATE (380-550)F;
53 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
54 TITLE5 VS. TAVG, AVERAGE REACTOR TEMPERATURE(C);
55 TITLE6 AND SRT, NOMINAL SLURRY RESIDENCE TIME(HRS);
56 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
57 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA;
58 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
59 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 1.73 SECONDS AND 136K AND PRINTED PAGE 1.

60 PROC PLOT NOLEGEND;
61 PLOT TAVG*SRT=SHOHD/ CONTOUR=10;
62 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
63 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
64 TITLE3 SHOHD, HEAVY DISTILLATE (550-850)F;
65 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
66 TITLE5 VS. TAVG, AVERAGE REACTOR TEMPERATURE(C);
67 TITLE6 AND SRT, NOMINAL SLURRY RESIDENCE TIME(HRS);
68 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
69 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA;
70 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
71 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 1.75 SECONDS AND 136K AND PRINTED PAGE 2.

72 PROC PLOT NOLEGEND;
73 PLOT TAVG*SRT=SSRCMD/ CONTOUR=10;
74 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
75 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
76 TITLE3 SSRCMD, SRC BOTTOMS (850+)F;
77 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
78 TITLE5 VS. TAVG, AVERAGE REACTOR TEMPERATURE(C);
79 TITLE6 AND SRT, SLURRY RESIDENCE TIME(HRS);
80 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
81 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA;
82 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
83 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 1.75 SECONDS AND 136K AND PRINTED PAGE 3.

84 DATA DS2;
85 MSHY=3.72339; MSC1C4=11.5896; MSBY=4.08854; MSHW=7.5061; MSNAP=8.89556;
86 MSMD=9.65792; MSMD=11.091; MSSRC=44.6567; MS10M=6.07843; MTAVG=453.058;
87 MPH2=12.4387; MSRT=0.812101; MCIN=33.9253; MRASH=4.04038; MGASRT=46.6828; DUM=1;
88 MV=1.65584;

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99 TAVGB=455.; PH2B=.91*13.79; GASRTB=56.04; CINB=30.; SRTB=1.; RASHB=10.17;
90 VB=1.65584;
91 TAVGMX=465.; TAVGMN=412.80;
92 PH2MX=17.650; PH2MN=6.890;
93 SRTMX=1.590; SRTMN=0.130;
94 CINMX=50.00; CINMN=23.40;
95 RASHMX=12.70; RASHMN=0.00;
96 GASRTMX=97.970; GASRTMN=12.880;
97 VMX=6.05484; VMN=0.42680;
98 DTAVG=(TAVGMX-TAVGMN)/50.; DPH2=(PH2MX-PH2MN)/50.;
99 DSRT=(SRTMX-SRTMN)/50.; DCIN=(CINMX-CINMN)/50.;
100 DRASH=(RASHMX-RASHMN)/50.; DGASRT=(GASRTMX-GASRTMN)/50.;
101 DV=(VMX-VMN)/50.;
102 TAVG=TAVGMN-DTAVG;
103 PH2=PH2B;
104 V=VB;
105 GASRT=GASRTB;
106 RASH=RASHB;
107 SRT=SRTB;
108 A=TAVG+DTAVG;
109 CIN=CINMN-DCIN;
110 B=CIN+DCIN;
111 VTAVG=TAVG-MTAVG; VTAVG2=VTAVG**2;
112 VCIN=CIN-MCIN; VCIN2=VCIN**2;
113 VPH2=PH2B-MPH2; VPH22=VPH2**2;
114 VGASRT=GASRTB-MGASRT; VGASRT2=VGASRT**2;
115 VRASH=RASHB-MRASH; VRASH2=VRASH**2;
116 VSRT=SRTB-MSRT; VSRT2=VSRT**2;
117 VV=VB-MV;
118 VTP=VTAVG+VPH2; VTS=VTAVG+VSRT; VTC=VTAVG+VCIN;
119 VTR=VTAVG+VRASH; VTG=VTAVG+VGASRT; VPS=VPH2+VSRT;
120 VPC=VPH2+VCIN; VPR=VPH2+VRASH; VPG=VPH2+VGASRT;
121 VSC=VSRT+VCIN; VSR=VSRT+VRASH; VSG=VSRT+VGASRT;
122 VCR=VCIN+VRASH; VCG=VCIN+VGASRT; VRC=VRASH+VGASRT;
123 SMDMD=10.59855+4.80085*VSRT-0.29811*VCIN+1.03129*VV+0.01097*VTAVG2
124 -0.05592*VTC+0.05855*VPC-0.19568*VPE;
125 SMDMD=12.67509+1.62409*VRASH-1.66366*VV-0.01217*VTAVG2+0.05043*VTC-2.06902*VSR;
126 SSRMD=45.19364-0.91708*VTAVG-15.94640*VSRT+0.39049*VCIN-2.09200*VRASH
127 +0.95063*VV-0.00578*VTAVG2-0.02706*VCIN2-1.11290*VTS+3.21994*VSR;
128 OUTPUT;
129 IF CIN < CINMX THEN GO TO B;
130 IF TAVG < TAVGMX THEN GO TO A;

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NOTE: DATA SET WORK.DS2 HAS 2652 OBSERVATIONS AND 83 VARIABLES. 28 OBS/TRK.
 NOTE: THE DATA STATEMENT USED 1.75 SECONDS AND 103K.

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131 PROC PLOT NOLEGEND;
132 PLOT TAVG+CIN=SMDMD/ CONTOUR=10;
133 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
134 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
135 TITLE3 SMDMD, MIDDLE DISTILLATE (38C-550)F;
136 TITLE4 (WEIGHT X BASED UN INLET MAF COAL CONCENTRATION);
137 TITLES VS. TAVG, AVERAGE REACTOR TEMPERATURE (C);
138 TITLE6 AND CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED);
139 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
140 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA;

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141 TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
 142 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 1.74 SECONDS AND 136K AND PRINTED PAGE 4.

143 PROC PLOT NOLEGEND;
 144 PLOT TAVG*CM=SHMD/ CONTOUR=10;
 145 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 146 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
 147 TITLE3 SHMD, HEAVY DISTILLATE (550-850)F;
 148 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 149 TITLES VS. TAVG, AVERAGE REACTOR TEMPERATURE(C);
 150 TITLE6 AND CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED);
 151 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 152 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA;
 153 TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
 154 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G /100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 1.76 SECONDS AND 136K AND PRINTED PAGE 5.

155 PROC PLOT NOLEGEND;
 156 PLOT TAVG*CM=SSRCMD/ CONTOUR=10;
 157 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 158 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
 159 TITLE3 SSRCMD, SRC BOTTOMS (850+)F;
 160 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 161 TITLES VS. TAVG, AVERAGE REACTOR TEMPERATURE(C);
 162 TITLE6 AND CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED);
 163 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 164 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA;
 165 TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
 166 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 1.71 SECONDS AND 136K AND PRINTED PAGE 6.

167 DATA DS3;
 168 MSBY=3.72339; MSC1C4=11.5896; MSBY=4.08854; MSBW=7.5061; MSNAP=8.89556;
 169 MSMD=9.65792; MSMD=11.091; MSSRC=44.6567; MSIDM=6.07843; MTAVG=453.058;
 170 MPH2=12.4387; MSRT=0.812101; MCIN=33.9253; MRASH=4.04038; MGASRT=46.6828; DUM=1;
 171 MV=1.65584;
 172 TAVGB=455.; PH2B=.91*13.79; GASRTB=56.04; CINB=30.; SRTB=1.; RASHB=10.17;
 173 VB=1.65584;
 174 TAVGMX=465.; TAVGMN=412.80;
 175 PH2MX=17.650; PH2MN=6.890;
 176 SRTMX=1.590; SRTMN=0.130;
 177 CINMX=50.00; CINMN=23.40;
 178 RASHMX=12.70; RASHMN=0.00;
 179 GASRTMX=97.970; GASRTMN= 12.880;
 180 VMX=6.05484; VMN=0.42680;
 181 DTAVG=(TAVGMX-TAVGMN)/50.; DPH2=(PH2MX-PH2MN)/50.;
 182 DSRT=(SRTMX-SRTMN)/50.; DCIN=(CINMX-CINMN)/50.;
 183 DRASH=(RASHMX-RASHMN)/50.; DGASRT=(GASRTMX-GASRTMN)/50.;
 184 DV=(VMX-VMN)/50.;
 185 PH2=PH2MN-DPH2;
 186 TAVG=TAVGB;
 187 GASRT=GASRTB;

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188 SRT=SRTB;
189 CIN=CINB;
190 V=VR;
191 A: PH2+DPH2;
192 RASH=RASHM-DHASH;
193 B: RASH+DRASH;
194 VPH2=PH2-MPH2; VPH22=VPH2**2;
195 VRASH=RASH-MRASH; VRASH2=VRASH**2;
196 VTAVG=TAVGB-MTAVG; VTAVG2=VTAVG**2;
197 VSRT=SRTB-MSRT; VSRT2=VSRT**2;
198 VGASRT=GASRTB-MGASRT; VGASRT2=VGASRT**2;
199 VCIN=CINB-MCIN; VCIN2=VCIN**2;
200 VV=VB-MV;
201 VTP=VTAVG+VPH2; VTS=VTAVG+VSRT; VTC=VTAVG+VCIN;
202 VTR=VTAVG+VRASH; VTC=VTAVG+VGASRT; VPS=VPH2+VSRT;
203 VPC=VPH2+VCIN; VPR=VPH2+VRASH; VPG=VPH2+VGASRT;
204 VSC=VSRT+VCIN; VSR=VSRT+VRASH; VSG=VSRT+VGASRT;
205 VCR=VCIN+VRASH; YCG=VCIN+VGASRT; VRG=VRASH+VGASRT;
206 SHDND=10.59855+4.80085*VSRT-0.29811*VCIN+1.03129*VV+0.01097*VTAVG2
207 -0.05592*VTC+0.05855*VPC-0.19588*VPR;
208 SHDND=12.67509+1.62409*VRASH-1.66366*VV-0.01217*VTAVG2+0.05043*VTC-2.06902*VSR;
209 SSRDND=45.19364-0.91708*VTAVG-15.94040*VSRT+0.39049*VCIN-2.09200*VRASH
210 +0.95063*VV-0.00578*VTAVG2-0.02706*VCIN2-1.11290*VTS+3.21994*VSR;
211 OUTPUT;
212 IF RASH < RASHMX THEN GO TO B;
213 IF PH2 < PH2MX THEN GO TO A;

```

NOTE: DATA SET WORK.DS3 HAS 2704 OBSERVATIONS AND 83 VARIABLES. 28 OBS/TRK.
 NOTE: THE DATA STATEMENT USED 1.77 SECONDS AND 10RK.

```

214 PROC PLOT NOLEGEND;
215 PLOT PH2+RASH=SHDND/ CONTOUR=10;
216 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
217 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
218 TITLE3 SHDND, MIDDLE DISTILLATE (380-550)F;
219 TITLE4 (WEIGHT % BASED ON INLET WAF COAL CONCENTRATION);
220 TITLE5 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA);
221 TITLE6 AND RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED);
222 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
223 TITLE8 TEMPERATURE(TAVG)= 455 C;
224 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
225 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

```

NOTE: THE PROCEDURE PLOT USED 1.77 SECONDS AND 136K AND PRINTED PAGE 7.

```

226 PROC PLOT NOLEGEND;
227 PLOT PH2+RASH=SHDND/ CONTOUR=10;
228 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
229 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
230 TITLE3 SHDND, HEAVY DISTILLATE (550-850)F;
231 TITLE4 (WEIGHT % BASED ON INLET WAF COAL CONCENTRATION);
232 TITLE5 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA);
233 TITLE6 AND RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED);
234 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
235 TITLE8 TEMPERATURE(TAVG)= 455 C;
236 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;

```

237 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

NOTE: THE PROCEDURE PLOT USED 1.72 SECONDS AND 136K AND PRINTED PAGE 8.

238 PROC PLOT NOLEND;
 239 PLOT PH2*RASH=SSRCMD/ CONTOUR=10;
 240 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 241 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
 242 TITLE3 SSRCMD, SRC BOTTOMS (R50+)F;
 243 TITLE4 (WEIGHT X BASED ON INLET MAF COAL CONCENTRATION);
 244 TITLE5 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA);
 245 TITLE6 AND RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED);
 246 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 247 TITLE8 TEMPERATURE(TAVG)= 455 C;
 248 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 249 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

NOTE: THE PROCEDURE PLOT USED 1.72 SECONDS AND 136K AND PRINTED PAGE 9.

250 DATA DS4;
 251 MSBY=3.72339; MSC1C4=11.5896; MSBY=4.08854; MSBW=7.5061; MSNAP=8.89556;
 252 MSMD=9.65792; MSMD=11.091; MSSRC=44.6567; MS10M=6.07843; MTAVG=453.058;
 253 MPH2=12.4387; MSRT=0.812101; MCIN=33.9253; MRASH=4.04038; MGASRT=46.6828; DUM=1;
 254 MV=1.65584;
 255 TAVGB=455.; PH2B=.91+13.79; GASRTB=56.04; CINB=30.; SRTB=1.; RASHB=10.17;
 256 VB=1.65584;
 257 TAVGMX=465.; TAVGMN=412.80;
 258 PH2MX=17.650; PH2MN=6.890;
 259 SRTMX=1.590; SRTMN=0.130;
 260 CINMX=50.00; CINMN=23.40;
 261 RASHMX=12.70; RASHMN=0.00;
 262 GASRTMX=97.970; GASRTMN= 12.880;
 263 VMX=6.05484; VMN=0.42680;
 264 DTAVG=(TAVGMX-TAVGMN)/50.; DPH2=(PH2MX-PH2MN)/50.;
 265 DSRT=(SRTMX-SRTMN)/50.; DCIN=(CINMX-CINMN)/50.;
 266 DRASH=(RASHMX-RASHMN)/50.; DGASRT=(GASRTMX-GASRTMN)/50.;
 267 DV=(VMX-VMN)/50.;
 268 PH2=PH2MN-DPH2;
 269 TAVG=TAVGB;
 270 GASRT=GASRTB;
 271 SRT=SRTB;
 272 RASH=RASHB;
 273 V=VB;
 274 A: PH2+DPH2;
 275 CIN=CINMN-DCIN;
 276 B: CIN+DCIN;
 277 VPH2=PH2-MPH2; VPH22=VPH2**2;
 278 VCIN=CIN-MCIN; VCIN2=VCIN**2;
 279 VTAVG=TAVGB-MTAVG; VTAVG2=VTAVG**2;
 280 VSRT=SRTB-MSRT; VSRT2=VSRT**2;
 281 VGASRT=GASRTB-MGASRT; VGASRT2=VGASRT**2;
 282 VRASH=RASHB-MRASH; VRASH2=VRASH**2;
 283 VV=VB-MV;
 284 VCR=VCIN+VRASH; VCG=VCIN+VGASRT; VRG=VRASH+VGASRT;
 285 VSC=VSRT+VCIN; VSR=VSRT+VRASH; VSG=VSRT+VGASRT;
 286 VPC=VPH2+VCIN; VPR=VPH2+VRASH; VPG=VPH2+VGASRT;

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207 VTR=VTAVG*VRASH; VTG=VTAVG*VGASRT; VPS=VPH2*VSRT;
288 VTP=VTAVG*VPH2; VTS=VTAVG*VSRT; VTC=VTAVG*VCIN;
209 SHDMD=10.59855+4.80085*VSRT-0.29811*VCIN+1.03129*VV+0.01097*VTAVG2
290 -0.05592*VTC+0.05855*VPC-0.19568*VPR;
291 SHDMD=12.67509+1.62409*VRASH-1.66366*VV-0.01217*VTAVG2+0.05043*VTC-2.06902*VSRT
292 SSRCMD=45.19364-0.91708*VTAVG-15.94040*VSRT+0.39049*VCIN-2.09200*VRASH
293 +0.95063*VV-0.00678*VTAVG2-0.02706*VCIN2-1.11290*VTS+3.21994*VSR;
294 OUTPUT;
295 IF CIN < CINMX THEN GO TO B;
296 IF PH2 < PH2MX THEN GO TO A;

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NOTE: DATA SET WORK.DS4 HAS 2652 OBSERVATIONS AND 83 VARIABLES. 28 OBS/TRK.
 NOTE: THE DATA STATEMENT USED 1.74 SECONDS AND 100K.

```

297 PROC PLOT NOLEGEND;
298 PLOT PH2*CIN=SHDMD/ CONTOUR=10;
299 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
300 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
301 TITLE3 SHDMD, MIDDLE DISTILLATE (380-550)F;
302 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
303 TITLE5 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA);
304 TITLE6 AND CIN, INLET COAL CONCENTRATION(G COAL /100 G SLURRY FEED);
305 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
306 TITLE8 TEMPERATURE(TAVG)= 455 C;
307 TITLE9 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;
308 TITLE10 SLURRY RESIDENCE TIME= ONE HOUR;

```

232 NOTE: THE PROCEDURE PLOT USED 1.69 SECONDS AND 136K AND PRINTED PAGE 10.

```

309 PROC PLOT NOLEGEND;
310 PLOT PH2*CIN=SHDMD/ CONTOUR=10;
311 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
312 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
313 TITLE3 SHDMD, HEAVY DISTILLATE (550-850)F;
314 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
315 TITLE5 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA);
316 TITLE6 AND CIN, INLET COAL CONCENTRATION(G COAL /100 G SLURRY FEED);
317 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
318 TITLE8 TEMPERATURE(TAVG)= 455 C;
319 TITLE9 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;
320 TITLE10 SLURRY RESIDENCE TIME= ONE HOUR;

```

NOTE: THE PROCEDURE PLOT USED 1.74 SECONDS AND 136K AND PRINTED PAGE 11.

```

321 PROC PLOT NOLEGEND;
322 PLOT PH2*CIN=SSRCMD/ CONTOUR=10;
323 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
324 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
325 TITLE3 SSRCMD, SRC BOTTOMS (850+)F;
326 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
327 TITLE5 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA);
328 TITLE6 AND CIN, INLET COAL CONCENTRATION(G COAL /100 G SLURRY FEED);
329 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
330 TITLE8 TEMPERATURE(TAVG)= 455 C;
331 TITLE9 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;
332 TITLE10 SLURRY RESIDENCE TIME= ONE HOUR;

```


NOTE: THE PROCEDURE PLOT USED 1.72 SECONDS AND 136K AND PRINTED PAGE 12.

```

333 DATA D55;
334 MSNV=3.72339; MSC1C4=11.5896; MSBY=4.08854; MSHW=7.5061; MSNAP=8.89556;
335 MSMD=9.65792; MSHD=11.091; MSSHC=44.6567; MS10M=6.07843; MTAVG=453.058;
336 MPH2=12.4387; MSRT=0.812101; MCIN=33.9253; MRASH=4.04038; MGASRT=46.6828; DUM=1;
337 MV=1.65584;
338 TAVGB=455.; PH2B=.91*13.79; GASRTB=56.04; CINB=30.; SRTB=1.; RASHB=10.17;
339 VB=1.65584;
340 TAVGMX=465.; TAVGMN=412.80;
341 PH2MX=17.650; PH2MN=6.890;
342 SRTMX=1.590; SRTMN=0.130;
343 CINMX=50.00; CINMN=23.40;
344 RASHMX=12.70; RASHMN=0.00;
345 GASRTMX=97.970; GASRTMN= 12.880;
346 VMX=6.05484; VMN=0.42680;
347 DTAVG=(TAVGMX-TAVGMN)/50.; DPH2=(PH2MX-PH2MN)/50.;
348 DSRT=(SRTMX-SRTMN)/50.; DCIN=(CINMX-CINMN)/50.;
349 DRASH=(RASHMX-RASHMN)/50.; DGASRT=(GASRTMX-GASRTMN)/50.;
350 DV=(VMX-VMN)/50.;
351 TAVG=TAVGMN-DTAVG;
352 SRT=SRTB;
353 CIN=CINB;
354 GASRT=GASRTB;
355 RASH=RASHB;
356 V=VB;
357 A: TAVG+DTAVG;
358 PH2=PH2MN-DPH2;
359 B: PH2+DPH2;
360 VTAVG=TAVG-MTAVG; VTAVG2= VTAVG**2;
361 VPH2=PH2-MPH2; VPH22=VPH2**2;
362 VCIN=CINB-MCIN; VCIN2=VCIN**2;
363 VSRT=SRTB-MSRT; VSRT2=VSRT**2;
364 VGASRT=GASRTB-MGASRT; VGASRT2=VGASRT**2;
365 VRASH=RASHB-MRASH; VRASH2=VRASH**2;
366 VV=VB-MV;
367 VTP=VTAVG*VPH2; VTS=VTAVG*VSRT; VTC=VTAVG*VCIN;
368 VTR=VTAVG*VRASH; VTG=VTAVG*VGASRT; VPS=VPH2*VSRT;
369 VPC=VPH2*VCIN; VPR=VPH2*VRASH; VPG=VPH2*VGASRT;
370 VSC=VSRT*VCIN; VSR=VSRT*VRASH; VSG=VSRT*VGASRT;
371 VCR=VCIN*VRASH; VCG=VCIN*VGASRT; VRG=VRASH*VGASRT;
372 SMDMD=10.59855+4.80085*VSRT-0.29811*VCIN+1.03129*VV+0.01097*VTAVG2
373 -0.05592*VTC+0.05855*VPC-0.19563*VPR;
374 SMDMD=12.67509+1.62409*VRASH-1.86366*VV-0.01217*VTAVG2+0.05043*VTC-2.06902*VSR;
375 SSRCMD=45.19364-0.91708*VTAVG-15.94040*VSRT+0.39049*VCIN-2.09200*VRASH
376 +0.95063*VV-0.00678*VTAVG2-0.02706*VCIN2-1.11290*VTS+3.21994*VSR;
377 OUTPUT;
378 IF PH2 < PH2MX THEN GO TO B;
379 IF IAVG < TAVGMX THEN GO TO A;

```

NOTE: DATA SET WORK.D55 HAS 2704 OBSERVATIONS AND 83 VARIABLES. 28 OBS/TRK.
 NOTE: THE DATA STATEMENT USED 1.81 SECONDS AND 108K.

```

380 PROC PLOT NOLEGEND;
381 PLOT TAVG*PH2=SMDMD/ CONTOUR=10;

```

9.

A T T A L N A T O S I E

K I A T C C

382 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 383 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
 384 TITLE3 SHMD, MIDDLE DISTILLATE (340-550)F;
 385 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 386 TITLES VS. TAVG, AVERAGE REACTOR TEMPERATURE(C);
 387 TITLE6 AND PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA);
 388 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 389 TITLE8 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 390 TITLE9 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;
 391 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

NOTE: THE PROCEDURE PLOT USED 1.75 SECONDS AND 136K AND PRINTED PAGE 13.

392 PROC PLOT NOLENDI
 393 PLOT TAVG*PH2=SHMD/ CONTOUR=10;
 394 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 395 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
 396 TITLE3 SHMD, HEAVY DISTILLATE (550-850)F;
 397 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 398 TITLES VS. TAVG, AVERAGE REACTOR TEMPERATURE(C);
 399 TITLE6 AND PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA);
 400 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 401 TITLE8 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 402 TITLE9 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;
 403 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

NOTE: THE PROCEDURE PLOT USED 1.75 SECONDS AND 136K AND PRINTED PAGE 14.

234 404 PROC PLOT NOLENDI
 405 PLOT TAVG*PH2=SSRCMD/ CONTOUR=10;
 406 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 407 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
 408 TITLE3 SSRCMD, SRC BOTTOMS (850+)F;
 409 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 410 TITLES VS. TAVG, AVERAGE REACTOR TEMPERATURE(C);
 411 TITLE6 AND PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA);
 412 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 413 TITLE8 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 414 TITLE9 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;
 415 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

NOTE: THE PROCEDURE PLOT USED 1.74 SECONDS AND 136K AND PRINTED PAGE 15.

416 DATA D56;
 417 MSBY=3.72339; MSC1C4=11.5896; MSRY=4.08854; MSHW=7.5061; MSNAP=8.89556;
 418 MSND=9.65792; MSHD=11.091; MSSRC=44.6567; MS10M=6.07443; MTAVG=453.058;
 419 MPH2=12.4387; MSRT=0.812101; MCIN=33.9253; MRASH=4.04038; MGASRT=46.6828; DUM=1;
 420 MV=1.65584;
 421 TAVGB=455.; PH2B=.91+13.79; GASRTB=56.04; CINB=30.; SRTB=1.; RASMB=10.17;
 422 VB=1.65584;
 423 TAVGMX=465.; TAVGMN=412.80;
 424 PH2MX=17.650; PH2MN=6.890;
 425 SRTMX=1.590; SRTMN=0.130;
 426 CINMX=50.00; CINMN=23.40;
 427 RASHMX=12.70; RASHMN=0.00;
 428 GASRTMX=97.970; GASRTMN= 12.680;

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429 VMX=6.05484; VMN=0.42680;
430 DTAVG=(TAVGMX-TAVGMN)/50.; DPH2=(PH2MX-PH2MN)/50.;
431 DSRT=(SRTMX-SRTMN)/50.; DCIN=(CINMX-CINMN)/50.;
432 DRASH=(RASHMX-RASHMN)/50.; DGASRT=(GASRTMX-GASRTMN)/50.;
433 DV=(VMX-VMN)/50.;
434 TAVG=TAVGMN-DTAVG;
435 CIN=CINB;
436 SRT=SRTB;
437 PH2=PH2B;
438 GASRT=GASRTB;
439 V=VB;
440 A: TAVG+DTAVG;
441 RASH=RASHMN-DRASH;
442 B: RASH+DRASH;
443 VTAVG=TAVG-MTAVG; VTAVG2= VTAVG**2;
444 VRASH=RASH-MRASH; VRASH2=VRASH**2;
445 VCIN=CINB-MCIN; VCIN2=VCIN**2;
446 VSRT=SRTB-MSRT; VSRT2=VSRT**2;
447 VPH2=PH2B-MPH2; VPH22=VPH2**2;
448 VGASRT=GASRTB-MGASRT; VGASRT2=VGASRT**2;
449 VV=VB-MV;
450 VTP=VTAVG*VPH2; VTS=VTAVG*VSRT; VTC=VTAVG*VCIN;
451 VTR=VTAVG*VRASH; VTG=VTAVG*VGASRT; VPS=VPH2*VSRT;
452 VPC=VPH2*VCIN; VPR=VPH2*VRASH; VPG=VPH2*VGASRT;
453 VSC=VSRT*VCIN; VSR=VSRT*VRASH; VSG=VSRT*VGASRT;
454 VCR=VCIN*VRASH; VCG=VCIN*VGASRT; VRG=VRASH*VGASRT;
455 SMDND=10.59855+4.80085*VSRT-0.29811*VCIN+1.03129*VV+0.01097*VTAVG2
456 -0.05592*VTC+0.05855*VPC-0.19568*VPR;
457 SHMDND=12.67509+1.62409*VRASH-1.66366*VV-0.01217*VTAVG2+0.05043*VTC-2.06902*VSR;
458 SSRCDND=45.19364-0.91708*VTAVG-15.94040*VSRT+0.39049*VCIN-2.09200*VRASH
459 +0.95063*VV-0.00678*VTAVG2-0.02706*VCIN2-1.11290*VTS+3.21994*VSR;
460 OUTPUT;
461 IF RASH < RASHMX THEN GO TO B;
462 IF TAVG < TAVGMX THEN GO TO A;

```

NOTE: DATA SET WORK.DS6 HAS 2704 OBSERVATIONS AND 83 VARIABLES. 28 OBS/TRK.
 NOTE: THE DATA STATEMENT USED 1.80 SECONDS AND 108K.

```

463 PROC PLOT NOLEND;
464 PLOT TAVG*RASH=SMDND/ CONTOUR=10;
465 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
466 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
467 TITLE3 SMDND, MIDDLE DISTILLATE (380-550)F;
468 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
469 TITLE5 VS. TAVG, AVERAGE REACTOR TEMPERATURE (C);
470 TITLE6 AND RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED);
471 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
472 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA;
473 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
474 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

```

NOTE: THE PROCEDURE PLOT USED 1.81 SECONDS AND 136K AND PRINTED PAGE 16.

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475 PROC PLOT NOLEND;
476 PLOT TAVG*RASH=SHMDND/ CONTOUR=10;
477 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;

```

478 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
 479 TITLE3 SHOWD, HEAVY DISTILLATE (550-850)F;
 480 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 481 TITLE5 VS. TAVG, AVERAGE REACTOR TEMPERATURE(C);
 482 TITLE6 AND RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED);
 483 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 484 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA;
 485 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 486 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

NOTE: THE PROCEDURE PLOT USED 1.77 SECONDS AND 136K AND PRINTED PAGE 17.

487 PROC PLOT NOLEND;
 488 PLOT TAVG+RASH=SSRCMD/ CONTOUR=10;
 489 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 490 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
 491 TITLE3 SSRCMD, SHC BOTTOMS (850+)F;
 492 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 493 TITLE5 VS. TAVG, AVERAGE REACTOR TEMPERATURE(C);
 494 TITLE6 AND RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED);
 495 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 496 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA;
 497 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
 498 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

NOTE: THE PROCEDURE PLOT USED 1.80 SECONDS AND 136K AND PRINTED PAGE 18.

236

499 DATA DS7;
 500 MSBY=3.72339; MSC1C4=11.5896; MSBY=4.08854; MSBW=7.5061; MSNAP=8.89556;
 501 MSMD=9.65792; MSMD=11.091; MSSRC=44.6567; MSIDM=6.07843; MTAVG=453.058;
 502 MPH2=12.4387; MSRT=0.812101; MCIN=33.9253; MRASH=4.04038; MGASRT=46.6828; DUM=1;
 503 MV=1.65584;
 504 TAVGR=455.; PH2B=.91*13.79; GASRTB=56.04; CINB=30.; SRTB=1.; RASHB=10.17;
 505 VB=1.65584;
 506 TAVGMN=465.; TAVGMN=412.80;
 507 PH2MX=17.650; PH2MN=6.890;
 508 SRTMX=1.590; SRTMN=0.130;
 509 CINMX=50.00; CINMN=23.40;
 510 RASHMX=12.70; RASHMN=0.00;
 511 GASRTMX=97.470; GASRTMN= 12.880;
 512 VMX=6.05484; VMN=0.42680;
 513 DTAVG=(TAVGMX-TAVGMN)/50.; DPH2=(PH2MX-PH2MN)/50.;
 514 DSRT=(SRTMX-SRTMN)/50.; DCIN=(CINMX-CINMN)/50.;
 515 DRASH=(RASHMX-RASHMN)/50.; DGASRT=(GASRTMX-GASRTMN)/50.;
 516 DV=(VMX-VMN)/50.;
 517 PH2=PH2MN-DPH2;
 518 TAVG=TAVGR; GASRT=GASRTB; RASH=RASHB; CIN=CINB;
 519 A: PH2+DPH2;
 520 SRT=SRTMN-DSRT;
 521 B: SRT+DSRT;
 522 VPH2=PH2-MPH2; VPH22=VPH2**2;
 523 VSRT=SRT-MSRT; VSRT2=VSRT**2;
 524 VTAVG=TAVGR-MTAVG; VTAVG2=VTAVG**2;
 525 VGASRT=GASRTB-MGASRT; VGASRT2=VGASRT**2;
 526 VRASH=RASHB-MRASH; VRASH2=VRASH**2;
 527 VCIN=CINB-MCIN; VCIN2=VCIN**2;

```

528 VV=VB-MV;
529 VTP=VTAVG*VPH2; VTS=VTAVG*VSRT; VTC=VTAVG*VCIN;
530 VTR=VTAVG*VRASH; VTG=VTAVG*VGASRT; VPS=VPH2*VSRT;
531 VSC=VSRT*VCIN; VSR=VSRT*VRASH; VSG=VSRT*VGASRT;
532 VCR=VCIN*VRASH; VCG=VCIN*VGASRT; VRG=VRASH*VGASRT;
533 VPC=VPH2*VCIN; VPR=VPH2*VRASH; VPG=VPH2*VGASRT;
534 SMDMD=10.59855+4.80085*VSRT-0.29311*VCIN+1.03129*VV+0.01097*VTAVG2
535 -0.05592*VTC+0.05855*VPC-0.19568*VPR;
536 SHDMD=12.67509+1.62409*VRASH-1.65366*VV-0.01217*VTAVG2+0.05043*VTC-2.06902*VSR;
537 SSRDMD=45.19364-0.91708*VTAVG-15.94040*VSRT+0.39049*VCIN-2.09200*VRASH
538 +0.95063*VV-0.00678*VTAVG2-0.02706*VCIN2-1.11290*VTS+3.21994*VSR;
539 OUTPUT;
540 IF SRT < SRTMX THEN GO TO B;
541 IF PH2 < PH2MX THEN GO TO A;

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NOTE: DATA SET WORK.DS7 HAS 2704 OBSERVATIONS AND 82 VARIABLES. 28 OBS/TRK.
 NOTE: THE DATA STATEMENT USED 1.82 SECONDS AND 108K.

```

542 PROC PLOT NOLEGEND;
543 PLOT PH2*SRT=SMDMD/ CONTOUR=10;
544 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
545 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
546 TITLE3 SMDMD, MIDDLE DISTILLATE (380-550)F;
547 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
548 TITLE5 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA);
549 TITLE6 AND SRT, NOMINAL SLURRY RESIDENCE TIME(HRS);
550 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
551 TITLE8 TEMPERATURE(TAVG)= 455 C;
552 TITLE9 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;
553 TITLE10 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;

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NOTE: THE PROCEDURE PLOT USED 1.81 SECONDS AND 136K AND PRINTED PAGE 19.

```

554 PROC PLOT NOLEGEND;
555 PLOT PH2*SRT=SHDMD/ CONTOUR=10;
556 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
557 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
558 TITLE3 SHDMD, HEAVY DISTILLATE (550-850)F;
559 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
560 TITLE5 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA);
561 TITLE6 AND SRT, NOMINAL SLURRY RESIDENCE TIME(HRS);
562 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
563 TITLE8 TEMPERATURE(TAVG)= 455 C;
564 TITLE9 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;
565 TITLE10 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;

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NOTE: THE PROCEDURE PLOT USED 1.75 SECONDS AND 136K AND PRINTED PAGE 20.

```

566 PROC PLOT NOLEGEND;
567 PLOT PH2*SRT=SSRDMD/ CONTOUR=10;
568 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
569 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
570 TITLE3 SSRDMD, SRC BOTTOMS (850+)F;
571 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
572 TITLE5 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA);
573 TITLE6 AND SRT, NOMINAL SLURRY RESIDENCE TIME(HRS);

```

874 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 875 TITLE8 TEMPERATURE(TAVG)= 455 C;
 876 TITLE9 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;
 877 TITLE10 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 1.73 SECONDS AND 136K AND PRINTED PAGE 21.

878 DATA DS8;
 879 NSHW=3.72339; MSC1C4=11.58961; MSRY=4.08854; NSHW=7.5061; MSNAP=8.89556;
 880 MSND=9.65792; MSND=11.091; MSSRC=44.6567; MS10M=6.07843; MTAVG=453.058;
 881 MPH2=12.4387; MSRT=0.812101; MCIN=33.9253; MRASH=4.04038; MGASRT=46.6828; DUM=1;
 882 MV=1.65584;
 883 TAVGB=455.; PH2B=.91*13.79; GASRTB=56.04; CINB=30.; SRTB=1.; RASHB=10.17;
 884 VB=1.65584;
 885 TAVGMX=465.; TAVGMN=412.80;
 886 PH2MX=17.650; PH2MN=6.890;
 887 SRTMX=1.590; SRTMN=0.130;
 888 CINMX=50.00; CINMN=23.40;
 889 RASHMX=12.70; RASHMN=0.00;
 890 GASRTMX=97.970; GASRTMN=12.880;
 891 VMX=6.05484; VMN=0.42680;
 892 DTAVG=(TAVGMX-TAVGMN)/50.; DPH2=(PH2MX-PH2MN)/50.;
 893 DSRT=(SRTMX-SRTMN)/50.; DCIN=(CINMX-CINMN)/50.;
 894 DRASH=(RASHMX-RASHMN)/50.; DGASRT=(GASRTMX-GASRTMN)/50.;
 895 DV=(VMX-VMN)/50.;
 896 SRT=SRTMN-DSRT;
 897 TAVG=TAVGB; PH2=PH2B; GASRT=GASRTB; RASH=RASHB;
 898 V=VB;
 899 A: SRT+DSRT;
 900 CIN=CINMN-DCIN;
 901 B: CIN+DCIN;
 902 VSRT=SRT-MSRT; VSRT2=VSRT**2;
 903 VCIN=CIN-MCIN; VCIN2=VCIN**2;
 904 VTAVG=TAVGB-MTAVG; VTAVG2=VTAVG**2;
 905 VPH2=PH2B-MPH2; VPH22=VPH2**2;
 906 VGASRT=GASRTB-MGASRT; VGASRT2=VGASRT**2;
 907 VRASH=RASHB-MRASH; VRASH2=VRASH**2;
 908 VV=VB-MV;
 909 VTP=VTAVG+VPH2; VTS=VTAVG+VSRT; VTC=VTAVG+VCIN;
 910 VTR=VTAVG+VRASH; VTG=VTAVG+VGASRT; VPS=VPH2+VSRT;
 911 VSC=VSRT+VCIN; VSR=VSRT+VRASH; VSG=VSRT+VGASRT;
 912 VCR=VCIN+VRASH; VCG=VCIN+VGASRT; VRG=VRASH+VGASRT;
 913 VPC=VPH2+VCIN; VPR=VPH2+VRASH; VPG=VPH2+VGASRT;
 914 SHDND=10.59855+4.80085*VSRT-0.29811*VCIN+1.03129*VV+0.01097*VTAVG2
 915 -0.05592*VTC+0.05855*VPC-0.19568*VPR;
 916 SHDND=12.67509+1.62409*VRASH-1.66366*VV-0.01217*VTAVG2+0.05043*VTC-2.06902*VSR;
 917 SSRCD=45.19364-0.91708*VTAVG-15.94040*VSRT+0.39049*VCIN-2.09200*VRASH
 918 +0.95063*VV-0.00678*VTAVG2-0.02706*VCIN2-1.11290*VTS+3.21994*VSR;
 919 OUTPUT;
 920 IF CIN < CINMX THEN GO TO B;
 921 IF SRT < SRTMX THEN GO TO A;

NOTE: DATA SET WORK.DS8 HAS 2652 OBSERVATIONS AND 83 VARIABLES. 28 OBS/TRK.

NOTE: THE DATA STATEMENT USED 1.76 SECONDS AND 108K.

622 PROC PLOT NOLEND;

```

623 PLOT SRT+CIN=SMOCD/ CONTOUR=10;
624 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
625 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
626 TITLE3 SMOCD, MIDDLE DISTILLATE (380-550)F;
627 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
628 TITLE5 VS. CIN, INLET COAL CONCENTRATION
629 TITLE6 AND SRT, NOMINAL SLURRY RESIDENCE TIME(HRS);
630 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
631 TITLE8 TEMPERATURE(TAVG)= 455 C;
632 TITLE9 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA;
633 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

```

NOTE: THE PROCEDURE PLOT USED 1.74 SECONDS AND 136K AND PRINTED PAGE 22.

```

634 PROC PLOT NOLEGEND;
635 PLOT SRT+CIN=SHOCD/ CONTOUR=10;
636 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
637 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
638 TITLE3 SHOCD, HEAVY DISTILLATE (550-850)F;
639 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
640 TITLE5 VS. CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED);
641 TITLE6 AND SRT, NOMINAL SLURRY RESIDENCE TIME(HRS);
642 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
643 TITLE8 TEMPERATURE(TAVG)= 455 C;
644 TITLE9 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA;
645 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

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NOTE: THE PROCEDURE PLOT USED 1.70 SECONDS AND 136K AND PRINTED PAGE 23.

```

646 PROC PLOT NOLEGEND;
647 PLOT SRT+CIN=SSRCMD/ CONTOUR=10;
648 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
649 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
650 TITLE3 SSRCMD, SRC BOTTOMS (850+)F;
651 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
652 TITLE5 VS. CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED);
653 TITLE6 AND SRT, NOMINAL SLURRY RESIDENCE TIME(HRS);
654 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
655 TITLE8 TEMPERATURE(TAVG)= 455 C;
656 TITLE9 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA;
657 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

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NOTE: THE PROCEDURE PLOT USED 1.74 SECONDS AND 136K AND PRINTED PAGE 24.

```

658 DATA DS9;
659 MSBY=3.72339; MSC1C4=11.5896; MSBY=4.08854; MSHW=7.5061; MSNAP=8.89556;
660 MSMD=9.65792; MSMD=11.091; MSSRC=44.6567; MS10M=6.07843; MTAVG=453.058;
661 MPH2=12.4387; MSRT=0.812101; MCIN=33.9253; MRASH=4.04038; MGASRT=46.6828; DUM=1;
662 MV=1.65584;
663 TAVGB=455.; PH2B=.91*13.79; GASRTB=56.04; CINB=30.; SRTB=1.; RASHB=10.17;
664 VB=1.65584;
665 TAVGMX=465.; TAVGMN=412.80;
666 PH2MX=17.650; PH2MN=6.890;
667 SRTMX=1.590; SRTMN=0.130;
668 CINMX=50.00; CINMN=23.40;
669 RASHMX=12.70; RASHMN=0.00;

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570 GASRTMX=97.970; GASRTMN= 12.880;
571 VMX=6.05484; VMN=0.42680;
572 DTAVG=(TAVGMX-TAVGMN)/50.; DPH2=(PH2MX-PH2MN)/50.;
573 DSRT=(SRTMX-SRTMN)/50.; DCIN=(CINMX-CINMN)/50.;
574 DRASH=(RASHMX-RASHMN)/50.; DGASRT=(GASRTMX-GASRTMN)/50.;
575 DV=(VMX-VMN)/50.;
576 SRT=SRTMN-DSRT;
577 TAVG=TAVGB; PH2=PH2B; GASRT=GASRTB; CIN=CINB;
578 V=VB;
579 A: SRT+DSRT;
580 RASH=RASHMN-DRASH;
581 B: RASH+DRASH;
582 VSRT=SRT-MSRT; VSRT2=VSRT**2;
583 VRASH=RASH-MRASH; VRASH2=VRASH**2;
584 VTAVG=TAVGB-MTAVG; VTAVG2=VTAVG**2;
585 VPH2=PH2B-MPH2; VPH22=VPH2**2;
586 VGASRT=GASRTB-MGASRT; VGASRT2=VGASRT**2;
587 VCIN=CINB-MCIN; VCIN2=VCIN**2;
588 VV=VB-MV;
589 VTP=VTAVG+VPH2; VTS=VTAVG+VSRT; VTC=VTAVG+VCIN;
590 VTR=VTAVG+VRASH; VTG=VTAVG+VGASRT; VPS=VPH2+VSRT;
591 VPC=VPH2+VCIN; VPR=VPH2+VRASH; VPG=VPH2+VGASRT;
592 VSC=VSRT+VCIN; VSR=VSRT+VRASH; VSG=VSRT+VGASRT;
593 VCR=VCIN+VRASH; VCG=VCIN+VGASRT; VRG=VRASH+VGASRT;
594 SMDMD=10.59855+4.80085*VSRT-0.29811*VCIN+1.03129*VV+0.01097*VTAVG2
595 -0.05592*VTC+0.05855*VPC-0.19568*VPR;
596 SHDMD=12.67509+1.62409*VRASH-1.66366*VV-0.01217*VTAVG2+0.05043*VTC-2.06902*VSR;
597 SSRDMD=45.19364-0.91708*VTAVG-15.94040*VSRT+0.39049*VCIN-2.09200*VRASH
598 +0.95063*VV-0.00678*VTAVG2-0.02706*VCIN2-1.11290*VTS+3.21994*VSR;
599 OUTPUT;
700 IF RASH < RASHMX THEN GO TO B;
701 IF SRT < SRTMX THEN GO TO A;

```

NOTE: DATA SET WORK.DS9 HAS 2704 OBSERVATIONS AND 63 VARIABLES, 28 OBS/TRK.
 NOTE: THE DATA STATEMENT USED 1.80 SECONDS AND 102K.

```

702 PROC PLOT NOLEGEND;
703 PLOT SRT+RASH=SMDMD/ CONTOUR=10;
704 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
705 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
706 TITLE3 SMDMD, MIDDLE DISTILLATE (380-550)F;
707 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
708 TITLE5 VS. SRT, NOMINAL SLURRY RESIDENCE TIME(HRS);
709 TITLE6 AND RASH, RECYCLE ASH CONCENTRATION(IG ASH/100 G SLURRY FEED);
710 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
711 TITLE8 TEMPERATURE(TAVG)= 455 C;
712 TITLE9 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA;
713 TITLE10 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;

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NOTE: THE PROCEDURE PLOT USED 1.77 SECONDS AND 136K AND PRINTED PAGE 25.

```

714 PROC PLOT NOLEGEND;
715 PLOT SRT+RASH=SHDMD/ CONTOUR=10;
716 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
717 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
718 TITLE3 SHDMD, HEAVY DISTILLATE (550-850)F;

```


719 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 720 TITLES VS. SRT, NOMINAL SLURRY RESIDENCE TIME(HRS);
 721 TITLE6 AND RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED);
 722 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 723 TITLE8 TEMPERATURE(TAVG)= 455 C;
 724 TITLE9 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA;
 725 TITLE10 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 1.79 SECONDS AND 136K AND PRINTED PAGE 26.

726 PROC PLOT NOLEGEND;
 727 PLOT SRT#RASH=SSRCMD/ CONTOUR=10;
 728 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 729 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
 730 TITLE3 SSRCMD, SRC BOTTOMS (850+)F;
 731 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 732 TITLES VS. SRT, NOMINAL SLURRY RESIDENCE TIME(HRS);
 733 TITLE6 AND RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED);
 734 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 735 TITLE8 TEMPERATURE(TAVG)= 455 C;
 736 TITLE9 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA;
 737 TITLE10 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 1.81 SECONDS AND 136K AND PRINTED PAGE 27.

738 DATA DS101;
 739 MSHY=3.72339; MSC1C4=11.5896; MSBY=4.08884; MSHW=7.5061; MSNAP=8.89556;
 740 MSMD=9.65792; MSMD=11.091; MSSRC=44.6567; MS10M=6.07843; MTAVG=453.058;
 741 MPH2=12.4387; MSRT=0.812101; MCIN=33.9253; MRASH=4.04038; MGASRT=46.6828; DUM=1;
 742 MV=1.65584;
 743 TAVGB=455.; PH2B=.91*13.79; GASRTB=56.04; CINB=30.; SRTB=1.; RASHB=10.17;
 744 VB=1.65584;
 745 TAVGMX=465.; TAVGMN=412.80;
 746 PH2MX=17.650; PH2MN=6.890;
 747 SRTMX=1.590; SRTMN=0.130;
 748 CINMX=50.00; CINMN=23.40;
 749 RASHMX=12.70; RASHMN=0.00;
 750 GASRTMX=97.970; GASRTMN= 12.880;
 751 VMX=6.05484; VMN=0.42680;
 752 DTAVG=(TAVGMX-TAVGMN)/50.; DPH2=(PH2MX-PH2MN)/50.;
 753 DSRT=(SRTMX-SRTMN)/50.; DCIN=(CINMX-CINMN)/50.;
 754 DRASH=(RASHMX-RASHMN)/50.; DGASRT=(GASRTMX-GASRTMN)/50.;
 755 DV=(VMX-VMN)/50.;
 756 CIN=CINMN-DCIN;
 757 TAVG=TAVGB; PH2=PH2B; GASRT=GASRTB; SRT=SRTB;
 758 V=VB;
 759 A= CIN+DCIN;
 760 RASH=RASHMN-DRASH;
 761 B= RASH+DRASH;
 762 VC1N=CIN-MCIN; VCIN2=VCIN**2;
 763 VRASH=RASH-MRASH; VRASH2=VRASH**2;
 764 VTAVG=TAVGB-MTAVG; VTAVG2=VTAVG**2;
 765 VPH2=PH2B-MPH2; VPH22=VPH2**2; VGASRT= GASRTB-MGASRT; VGASRT2=VGASRT**2;
 766 VSRT=SRTB-MSRT; VSRT2=VSRT**2;
 767 VV=VB-MV;
 768 VTP=VTAVG+VPH2; VTS=VTAVG+VSRT; VTC=VTAVG+VCIN;

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769 VTR=VTAVG*VRASH; VTG=VTAVG*VGASRT; VPS=VPH2*VSRT;
770 VSC=VSRT*VCIN; VSR=VSRT*VRASH; VSG=VSRT*VGASRT;
771 VCR=VCIN*VRASH; VCG=VCIN*VGASRT; VRG=VRASH*VGASRT;
772 VPC=VPH2*VCIN; VPR=VPH2*VRASH; VPG=VPH2*VGASRT;
773 SHDMD=10.59855+4.80085*VSRT-0.29811*VCIN+1.03129*VV+0.01097*VTAVG2
774 -0.05592*VTC+0.05855*VPC-0.19568*VPR;
775 SHDMD=12.67509+1.62409*VRASH-1.66366*VV-0.01217*VTAVG2+0.05043*VTC-2.06902*VSR;
776 SSRDMD=45.19364-0.91708*VTAVG-15.94040*VSRT+0.39049*VCIN-2.09200*VRASH
777 +0.95063*VV-0.00678*VTAVG2-0.02706*VCIN2-1.11290*VT5+3.21994*VSR;
778 OUTPUT;
779 IF RASH < RASHMX THEN GO TO B;
780 IF CIN < CINMX THEN GO TO A;

```

NOTE: DATA SET WORK.DS10 HAS 2652 OBSERVATIONS AND 83 VARIABLES. 28 OBS/TRK.
NOTE: THE DATA STATEMENT USED 1.82 SECONDS AND 10RK.

```

781 PROC PLOT NOLEGEND;
782 PLOT CIN*ASH=SHDMD/ CONTOUR=10;
783 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
784 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
785 TITLE3 SHDMD, MIDDLE DISTILLATE (380-550)F;
786 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
787 TITLE5 VS. CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED);
788 TITLE6 AND RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED);
789 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
790 TITLE8 TEMPERATURE(TAVG)= 455 C;
791 TITLE9 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA;
792 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

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NOTE: THE PROCEDURE PLOT USED 1.79 SECONDS AND 136K AND PRINTED PAGE 28.

```

793 PROC PLOT NOLEGEND;
794 PLOT CIN*ASH=SHDMD/ CONTOUR=10;
795 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
796 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
797 TITLE3 SHDMD, HEAVY DISTILLATE (550-850)F;
798 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
799 TITLE5 VS. CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED);
800 TITLE6 AND RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED);
801 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
802 TITLE8 TEMPERATURE(TAVG)= 455 C;
803 TITLE9 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA;
804 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

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NOTE: THE PROCEDURE PLOT USED 1.80 SECONDS AND 136K AND PRINTED PAGE 29.

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805 PROC PLOT NOLEGEND;
806 PLOT CIN*ASH=SSRDMD/ CONTOUR=10;
807 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
808 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
809 TITLE3 SSRDMD, SRC BOTTOMS (850+)F;
810 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
811 TITLE5 VS. CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED);
812 TITLE6 AND RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED);
813 TITLE7 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
814 TITLE8 TEMPERATURE(TAVG)= 455 C;

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18

STATISTICAL ANALYSIS SYSTEM

8:52 TUESDAY, MAY 22, 1979

815 TITLE9 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA;
816 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

NOTE: THE PROCEDURE PLOT USED 1.76 SECONDS AND 136K AND PRINTED PAGE 30.

NOTE: SAS USED 136K MEMORY.

NOTE: BARR, GOODNIGHT, SALL AND HELWIG
SAS INSTITUTE INC.
P.O. BOX 10066
RALEIGH, N.C. 27605

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SMOOD, MIDDLE DISTILLATE (380-550)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE (C)
 AND SRT, NOMINAL SLURRY RESIDENCE TIME (HRS.)
 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

RT52 TUESDAY, MAY 22, 1979

NOTE: 1248 OBS HIDDEN

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHDMD, HEAVY DISTILLATE (550-850)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE(C)
 AND SRT, NOMINAL SLURRY RESIDENCE TIME(HRS)
 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SYMBOL	SHDMD	SYMBOL	SHDMD	SYMBOL	SHDMD
.....	0.6394559 - 2.3864318	000000	12.8682871 - 16.3622389	000000	26.8440943 - 30.3380461
.....	2.3864318 - 5.8803836	+++++	16.3622389 - 19.8561907	000000	30.3380461 - 32.0850220
-----	5.8803836 - 9.3743354	XXXXXX	19.8561907 - 23.3501425		
=====	9.3743354 - 12.8682871	000000	23.3501425 - 26.8440943		

NOTE: 1248 OBS HIDDEN

LINEs INDICATE CONSTANT LEVELS OF NET YIELD OF

SSRCMD, SRC BOTTOMS (R50+)

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. TAVG. AVERAGE REACTOR TEMPERATURE (C)

AND SRT, SLURRY RESIDENCE TIME (HRS)

BASIS VALUES: GAS LINEAR VELOCITY (V) = 1.65584 CM/SEC

PRESSURE (PM2) = 13.79 AT A GAS PURITY OF 91% = 12.55 MPa

COAL CONCENTRATION (CIN) = 30 G/100 G SLURRY FEED

RECYCLE ASH CONCENTRATION (RASH) = 10.17 G/100 G SLURRY FEED

SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD
.....	8.768138 - 13.590851	000000	42.527124 - 52.172549	000000	81.108823 - 90.754247
.....	13.590851 - 23.236275	+++++	52.172549 - 61.817974	000000	90.754247 - 95.576960
-----	23.236275 - 32.881700	xxxxxx	61.817974 - 71.463398		
=====	32.881700 - 42.527124	000000	71.463398 - 81.108823		

NOTE: 1248 OBS HIDDEN

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SMDMD, MIDDLE DISTILLATE (380-650)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE (C)
 AND CIN, INLET COAL CONCENTRATION (G COAL/100 G SLURRY FEED)
 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SYMBOL	SMDMD	SYMBOL	SMDMD	SYMBOL	SMDMD
.....	-3.1430056 - 0.4038886	000000	21.6642539 - 28.7520423	#####	50.0154075 - 57.1031959
.....	0.4008886 - 7.4896770	+++++	28.7520423 - 35.8398307	#####	57.1031959 - 60.6470902
-----	7.4896770 - 14.5764655	XXXXXX	35.8398307 - 42.9276191		
=====	14.5764655 - 21.6642539	888888	42.9276191 - 50.0154075		

NOTE: 1224 OBS HIDDEN

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHDMD, HEAVY DISTILLATE (550-850)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE(C)
 AND CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED)
 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G /100 G SLURRY FEED

SYMBOL	SHDMD	SYMBOL	SHDMD	SYMBOL	SHDMD
.....	-32.111679 - -28.732224	000000	-8.454293 - -1.694983	000000	18.582948 - 25.342258
.....	-28.732224 - -21.972914	+++++	-1.694983 - 5.064327	000000	25.342258 - 28.721913
-----	-21.972914 - -15.213603	XXXXXX	5.064327 - 11.823637		
=====	-15.213603 - -8.454293	000000	11.823637 - 18.582948		

NOTE: 1224 OBS HIDDEN

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SSR CMD, SRC BOTTOMS (R50+)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE(C)
 AND CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED)
 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.95MPA
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

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SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD
.....	10.20798 - 13.46540	=====	26.49508 - 33.00992	XXXXXX	46.03961 - 52.55445	#####	65.58413 - 68.84156
.....	13.46540 - 19.98024	000000	33.00992 - 39.52477	000000	52.55445 - 59.06929		
-----	19.98024 - 26.49508	+++++	39.52477 - 46.03961	000000	59.06929 - 65.58413		

NOTE: 1224 OBS HIDDEN

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
SMDMD, MIDDLE DISTILLATE (380-550)F
(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)
AND RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED)
BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
TEMPERATURE(TAVG)= 455 C
COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
SLURRY RESIDENCE TIME(SRT)= ONE HOUR

SYMBOL	SMDMD	SYMBOL	SMDMD	SYMBOL	SMDMD
.....	2.426295 - 3.629936	000000	10.851776 - 13.259056	888888	20.480897 - 22.888177
.....	3.629936 - 6.037216	+++++	13.259056 - 15.666337	888888	22.888177 - 24.091817
-----	6.037216 - 8.444496	XXXXXX	15.666337 - 18.073617		
EEEEEE	8.444496 - 10.851776	888888	18.073617 - 20.480897		

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHDMD, HEAVY DISTILLATE (550-850)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)
 AND RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED)
 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR

				RASH								
SYMBOL		SHDMD		SYMBOL		SHDMD		SYMBOL		SHDMD		
.....		7.253593	-	8.142614	000000	13.476739	-	15.254781	000000	20.588907	-	22.366949
.....		8.142614	-	9.920656	+++++	15.254781	-	17.032823	000000	22.366949	-	23.255970
-----		9.920656	-	11.698698	XXXXXX	17.032823	-	18.810865				
=====		11.698698	-	13.476739	000000	18.810865	-	20.588907				

NOTE: 1196 OBS HIDDEN

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SSRCMD. SRC BOTTOMS (850+)%
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PH2. AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
 AND RASH. RECYCLE ASH CONCENTRATION (G ASH/100 G SLURRY FEED)
 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR

SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD
.....	24.78174 - 25.85187	=====	30.13238 - 32.27264	XXXXXX	36.55315 - 38.69340	000000	42.97391 - 44.84404
.....	25.85187 - 27.99213	000000	32.27264 - 34.41289	000000	38.69340 - 40.83366		
-----	27.99213 - 30.13238	+++++	34.41289 - 36.55315	000000	40.83366 - 42.97391		

NOTE: 1196 OBS HIDDEN

CI P UNK RAI 21 LII REA FOR
 LINES INDICATE CO NT S T OF
 SMDMD, MIDDLE DISTILLATE (380-550)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)
 AND CIN, INLET COAL CONCENTRATION(G COAL /100 G SLURRY FEED)
 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME= ONE HOUR

SYMBOL	SMDMD	SYMBOL	SMDMD	SYMBOL	SMDMD
.....	3.602805 - 4.841399	000000	12.272958 - 14.750144	888888	22.181703 - 24.658890
.....	4.841399 - 7.318585	+++++	14.750144 - 17.227330	888888	24.658890 - 25.897483
-----	7.318585 - 9.795771	xxxxxx	17.227330 - 19.704517		
=====	9.795771 - 12.272958	888888	19.704517 - 22.181703		

NOTE: 1173.085 HIDDEN

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHODD. HEAVY DISTILLATE (550-R50)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)
 AND CIN, INLET COAL CONCENTRATION(G COAL /100 G SLURRY FEED)
 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME= ONE HOUR

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CIN

SYMBOL	SHODD	SYMBOL	SHODD	SYMBOL	SHODD	SYMBOL	SHODD
.....	19.17046 - 19.31518	=====	19.89409 - 20.18354	XXXXXX	20.76245 - 21.05190	000000	21.63080 - 21.77553
.....	19.31518 - 19.60464	000000	20.18354 - 20.47299	000000	21.05190 - 21.34135		
-----	19.60464 - 19.89409	+++++	20.47299 - 20.76245	000000	21.34135 - 21.63080		

NOTE: 1173 OBS HIDDEN

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SSKCMD, SRC BOTTOMS (850+)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)
 AND CIN, INLET COAL CONCENTRATION(G COAL /100 G SLURRY FEED)
 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME= ONE HOUR

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CIN

SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD
.....	23.76343 - 24.23652	=====	26.12888 - 27.07506	XXXXXX	28.96742 - 29.91359	000000	31.80595 - 32.27904
.....	24.23652 - 25.18270	000000	27.07506 - 28.02124	000000	29.91359 - 30.85977		
-----	25.18270 - 26.12888	+++++	28.02124 - 28.96742	000000	30.85977 - 31.80595		

NOTE: 1173 OBS HIDDEN

END
 78

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SNOWD, MIDDLE DISTILLATE (380-550)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE (C)
 AND PH2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME (SRT)= ONE HOUR

SYMBOL	SNOWD	SYMBOL	SNOWD	SYMBOL	SNOWD
.....	3.816838 - 5.246114	000000	13.821767 - 16.680317	000000	25.255970 - 28.114521
.....	5.246114 - 8.104665	+++++	16.680317 - 19.538868	000000	28.114521 - 29.543797
-----	8.104665 - 10.963216	XXXXXX	19.538868 - 22.397419		
=====	10.963216 - 13.821767	000000	22.397419 - 25.255970		

NOTE: 1248 OBS HIDDEN

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHDMD, HEAVY DISTILLATE (550-850)F
 (WEIGHT % BASED ON INLET MAF (COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE(C)
 AND PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)
 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR

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SYMBOL	SHDMD	SYMBOL	SHDMD	SYMBOL	SHDMD
.....	8.492340 - 9.190066	000000	13.376425 - 14.771878	000000	18.958236 - 20.353689
.....	9.190066 - 10.585519	+++++	14.771878 - 16.167331	000000	20.353689 - 21.051415
-----	10.585519 - 11.980972	XXXXXX	16.167331 - 17.562783		
=====	11.980972 - 13.376425	000000	17.562783 - 18.958236		

NOTE: 1248 OBS HIDDEN

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS IN NET YIELD OF
 SSRCMD, THE BOTTOMS (0504)F
 (WEIGHT % BASED ON INLET HAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE (C)
 AND PH2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.655M4 CM/SEC
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 RECYCLE AND CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME(STR)= ONE HOUR

R:52 TUESDAY, MAY 22, 1979 15

YMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD
.....	15.36603 - 18.14036	=====	29.28769 - 34.85625	XXXXXX	45.99368 - 51.56234	BBBBBB	62.69967 - 65.48400
.....	18.15036 - 23.71903	UUUUUU	34.85625 - 40.42502	HHHHHH	51.56234 - 57.13101		
-----	23.71903 - 29.28769	++++++	40.42502 - 45.99368	NNNNNN	57.13101 - 62.69967		

OTE: 1248 OBS. HIDDEN

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SMDMD, MIDDLE DISTILLATE (380-550)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE(C)
 AND RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED)
 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR

SYMBOL	SMDMD	SYMBOL	SMDMD	SYMBOL	SMDMD	SYMBOL	SMDMD
.....	11.35523 - 11.92855	=====	14.22184 - 15.36848	XXXXXX	17.66176 - 18.80840	BBBBBB	21.10168 - 21.67500
.....	11.92855 - 13.07520	000000	15.36848 - 16.51512	000000	18.80840 - 19.95504		
-----	13.07520 - 14.22184	+++++	16.51512 - 17.66176	000000	19.95504 - 21.10168		

NOTE: 1248 OBS HIDDEN

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHDMD, HEAVY DISTILLATE (550-850)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE (C)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/100 G SLURRY FEED)
 BASIS VALUES: GAS LINEAR VELOCITY (V) = 1.65504 CM/SEC
 PRESSURE (PM2) = 13.79 AT A GAS PURITY OF 91% = 12.55MPA
 COAL CONCENTRATION (CIN) = 30 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME (SRT) = ONE HOUR

8:55 ESD MAY 19 7

SYMBOL	SHDMD	SYMBOL	SHDMD	SYMBOL	SHDMD
.....	-4.070897 -	000000	7.036334 -	#####	19.730313 -
.....	-2.484150 -	+++++	10.209829 -	#####	22.903808 -
-----	0.689345 -	xxxxxx	13.383324 -		24.490555
=====	3.862840 -	#####	16.556819 -		
	7.036334		19.730313		

NOTE: 1248 OBS HIDDEN

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SSRCMD, SRC BOTTOMS (850+)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE (C)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/100 G SLURRY FEED)
 BASIS VALUES: GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
 PRESSURE (PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA
 COAL CONCENTRATION (CIN)= 30 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME (SRT)= ONE HOUR

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SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD
.....	11.22629 - 15.08075	=====	30.49858 - 38.20750	XXXXXX	53.62534 - 61.33426	#####	76.75209 - 80.60655
100000	15.08075 - 22.78967	000000	38.20750 - 45.91642	000000	61.33426 - 69.04318		
-----	22.78967 - 30.49858	++++++	45.91642 - 53.62534	000000	69.04318 - 76.75209		

NOTE: 1248 OBS HIDDEN

LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SMDMD, MIDDLE DISTILLATE (380-550)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)
 AND SRT, NOMINAL SLURRY RESIDENCE TIME(HRS)
 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

R:52 TUESDAY, MAY 22, 1979 19

SYMBOL	SMDMD	SYMBOL	SMDMD	SYMBOL	SMDMD
.....	1.205767 - 2.474431	000000	10.086416 - 12.623744	000000	20.235729 - 22.773057
+++++	2.474431 - 5.011760	+++++	12.623744 - 15.161072	000000	22.773057 - 24.041721
-----	5.011760 - 7.549088	XXXXXX	15.161072 - 17.698401		
=====	7.549088 - 10.086416	000000	17.698401 - 20.235729		

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT, SHOWN ARE
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHDMD, HEAVY DISTILLATE (550-850)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)
 N/ND SRT, NOMINAL SLURRY RESIDENCE TIME(HRS)
 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED
 COAL CONCENTRATION(CTN)= 30 G/100 G SLURRY FEED

SYMBOL	SHDMD	SYMBOL	SHDMD	SYMBOL	SHDMD	SYMBOL	SHDMD
.....	11.96395 - 13.01320	=====	17.21019 - 19.30869	xxxxxx	23.50569 - 25.60419	#####	29.80119 - 30.85044
.....	13.01320 - 15.11169	000000	19.30869 - 21.40719	000000	25.60419 - 27.70269		
-----	15.11169 - 17.21019	+++++	21.40719 - 23.50569	000000	27.70269 - 29.80119		

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL

8:52 TUESDAY, MAY 22, 1979 21

LINE INDICATE CONSTANT LEVELS OF NET YIELD OF

SSRCMD, SRC BOTTOMS (R50+)%

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)

AND SRT, NOMINAL SLURRY RESIDENCE TIME(MRS)

BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

TEMPERATURE(TAVG)= 455 C

RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD
=====	27.49873 - 27.63403	=====	28.17522 - 28.44582	XXXXXX	28.98701 - 29.25761	=====	29.79880 - 29.93410
=====	27.63403 - 27.90462	=====	28.44582 - 28.71641	=====	29.25761 - 29.52820	=====	
=====	27.90462 - 28.17522	=====	28.71641 - 28.98701	=====	29.52820 - 29.79880	=====	

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT: UNCONSTRAINED 2: TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SMDMD, MIDDLE DISTILLATE (380-550)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

8:52 TUESDAY, MAY 22, 1979 22

VS. CIN, INLET COAL CONCENTRATION

TITLE6 AND SRT, NOMINAL SLURRY RESIDENCE TIME(HRS)

BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SYMBOL	SMDMD	SYMBOL	SMDMD	SYMBOL	SMDMD
.....	0.7991087 - 1.7877861	000000	7.7198506 - 9.6972055	000000	15.6292700 - 17.6066249
.....	1.7877861 - 3.7651409	+++++	9.6972055 - 11.6745603	000000	17.6066249 - 18.5953023
-----	3.7651409 - 5.7424958	XXXXXX	11.6745603 - 13.6519152		
=====	5.7424958 - 7.7198506	000000	13.6519152 - 15.6292700		

NOTE: 1122 OBS HIDDEN

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHOND, HEAVY DISTILLATE (550-850)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. CIN, INLET COAL CONCENTRATION (G COAL/100 G SLURRY FEED)
 AND SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)
 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.85MPA
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

8:52 TUESDAY, MAY 22, 1979 23

SYMBOL	SHOND	SYMBOL	SHOND	SYMBOL	SHOND	SYMBOL	SHOND
#####	11.31757 - 12.51155	#####	17.26745 - 19.67540	XXXXXX	24.45131 - 26.83926	#####	31.61516 - 32.80914
#####	12.51155 - 14.89950	(#####)	19.67540 - 22.06336	#####	26.83926 - 29.22721		
-----	14.89950 - 17.26745	+++++	22.06336 - 24.45131	#####	29.22721 - 31.61516		

NOTE: 1122 OBS HIDDEN

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SSRCMD, SRC BOTTOMS (H50+)
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. CIN, INLET COAL CONCENTRATION (G COAL/100 G SLURRY FEED)
 AND SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)
 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

R:52 TUESDAY, MAY 22, 1979 24

SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD
.....	22.34067 - 22.94906	=====	25.38261 - 26.59939	xxxxxx	29.03294 - 30.24971	#####	32.68327 - 33.29165
.....	22.94906 - 24.16584	000000	26.59939 - 27.81616	000000	30.24971 - 31.46649		
-----	24.16584 - 25.38261	+++++	27.81616 - 29.03294	000000	31.46649 - 32.68327		

NOTE: 1122 OBS HIDDEN

CI PLI MLI AIN I II III IV V VI VII VIII IX X
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SMDMD, MIDDLE DISTILLATE (380-550)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. SRT, NOMINAL SLURRY RESIDENCE TIME(HRS)
 AND RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED)
 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

SYMBOL	SMDMD	SYMBOL	SMDMD	SYMBOL	SMDMD
.....	8.744163 - 9.156872	000000	11.633127 - 12.456546	888888	14.934801 - 15.760219
.....	9.156872 - 9.982291	+++++	12.456546 - 13.283964	888888	15.760219 - 16.172928
-----	9.982291 - 10.807709	XXXXXX	13.283964 - 14.109382		
888888	10.807709 - 11.633127	888888	14.109382 - 14.934801		

NOTE: 1144 OBS HIDDEN

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHDMD, HEAVY DISTILLATE (550-850)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. SRT, NOMINAL SLURRY RESIDENCE TIME(HRS)
 AND RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED)
 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

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SYMBOL	SHDMD	SYMBOL	SHDMD	SYMBOL	SHDMD
.....	-0.0192827 - 2.1651723	000000	15.2719026 - 19.6408127	000000	32.7475430 - 37.1164531
.....	2.1651723 - 6.5340824	+++++	19.6408127 - 24.0097228	000000	37.1164531 - 39.3009082
-----	6.5340824 - 10.9029925	xxxxxx	24.0097228 - 28.3786329		
=====	10.9029925 - 15.2719026	000000	28.3786329 - 32.7475430		

NOTE: 1144 OBS HIDDEN

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SSRCMD, SRC BOTTOMS (R50+)F
 (WEIGHT % BASED ON INLET MAP COAL CONCENTRATION)
 VS. SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/100 G SLURRY FEED)
 BASIS VALUES: GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
 TEMPERATURE (TAVG)= 455 C
 PRESSURE (PH2)= 13.79 AT A GAS PURITY OF 91% = 12.85MPA
 COAL CONCENTRATION (CIN)= 30 G/100 G SLURRY FEED

SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD
.....	15.56003 - 18.64620	=====	30.99085 - 37.16318	XXXXXX	49.50784 - 55.68016	000000	68.02482 - 71.11098
.....	18.64620 - 24.81852	000000	37.16318 - 43.33551	000000	55.68016 - 61.85249		
-----	24.81852 - 30.99085	+++++	43.33551 - 49.50784	000000	61.85249 - 68.02482		

NOTE: 1144 ORS HIDDEN

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SMDMD, MIDDLE DISTILLATE (380-550)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED)
 AND RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED)
 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR

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SYMBOL	SMDMD	SYMBOL	SMDMD	SYMBOL	SMDMD
.....	4.915814 - 5.522820	000000	9.164856 - 10.378868	000000	14.020903 - 15.234915
.....	5.522820 - 6.736832	+++++	10.378868 - 11.592880	000000	15.234915 - 15.841921
-----	6.736832 - 7.950844	XXXXXX	11.592880 - 12.806891		
=====	7.950844 - 9.164856	000000	12.806891 - 14.020903		

NOTE: 1196 OBS HIDDEN

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHDND, HEAVY DISTILLATE (550-850°F)

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. CIN, INLET COAL CONCENTRATION (G COAL/100 G SLURRY FEED)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/100 G SLURRY FEED)

BASIS VALUES: GAS LINEAR VELOCITY (V) = 1.65584 CM/SEC

TEMPERATURE (TAVG) = 455 C

PRESSURE (PH2) = 13.79 AT A GAS PURITY OF 91% = 12.85 MPa

SLURRY RESIDENCE TIME (SRT) = ONE HOUR

SYMBOL	SHDND	SYMBOL	SHDND	SYMBOL	SHDND
.....	6.607221 - 7.640969	000000	13.843452 - 15.910946	000000	22.113429 - 24.180924
.....	7.640969 - 9.708463	+++++	15.910946 - 17.978441	000000	24.180924 - 25.214671
-----	9.708463 - 11.775957	xxxxxx	17.978441 - 20.045935		
=====	11.775957 - 13.843452	000000	20.045935 - 22.113429		

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SSRCMD, SRC BOTTOMS (850+)F

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(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED)
 AND RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED)
 BASIS VALUES: GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR

SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD
.....	19.62369 - 21.16691	=====	27.33977 - 30.42621	XXXXXX	36.59907 - 39.68551	=====	45.05837 - 47.40159
.....	21.16691 - 24.25334	000000	30.42621 - 33.51264	000000	39.68551 - 42.77194		
-----	24.25334 - 27.33977	+++++	33.51264 - 36.59907	000000	42.77194 - 45.85837		

NOTE: 1196 OBS HIDDEN

NOTE: THE JOB SHARES HAS BEEN RUN UNDER RELEASE 76.0C OF SAS AT GULF OIL CORPORATION.

NOTE: SASNEWS SASNEWS SASNEWS SASNEWS SASNEWS SASNEWS

A TEST RELEASE OF SAS79.1 IS NOW AVAILABLE.
TO EXECUTE SAS79 USE // FREE SAS79

FOR A BRIEF DESCRIPTION OF THE NEW FEATURES OF
SAS79, USE --> PHIC DOC DATA=DOC.SAS79;

```

1 DATA DS1;
2 MSHV=3.72339; MSCIC4=11.5896; MSBY=4.08854; MSHW=7.5061; MSNAP=8.69556;
3 MSND=9.65792; MSND=11.091; MSRC=44.6567; MSIN=6.07043; MTAVG=453.050;
4 MPH2=12.4387; MSRT=0.812101; MCIN=33.9253; MHASH=4.04038; MGASRT=46.6428; DUM=1;
5 MV=1.65584;
6 TAVG=455.; PH2B=.91*13.79; GASRTB=56.04; CINB=30.; SRTB=1.; RASHB=10.17;
7 VB=1.65584;
8 TAVGMX=465.; TAVGMN=412.80;
9 PH2MX=17.650; PH2MN=6.890;
10 SRTMX=1.590; SRTMN=0.130;
11 CINMX=50.00; CINMN=23.40;
12 RASHMX=12.70; RASHMN=0.00;
13 GASRTMX=97.970; GASRTMN=12.880;
14 VMX=6.05484; VMN=0.42680;
15 DTAVG=(TAVGMX-TAVGMN)/50.; DPH2=(PH2MX-PH2MN)/50.;
16 DSRT=(SRTMX-SRTMN)/50.; DCIN=(CINMX-CINMN)/50.;
17 DRASH=(RASHMX-RASHMN)/50.; DGASRT=(GASRTMX-GASRTMN)/50.;
18 DV=(VMX-VMN)/50.;
19 CIN=DCIN;
20 TAVG=TAVGB;
21 PH2=PH2B;
22 GASRT=GASRTB;
23 SRT=SRTB;
24 RASH=RASHB;
25 V=VB;
26 E=CIN+DCIN;
27 VCIN=CIN-MCIN; VCIN2=VCIN**2;
28 VTAVG=TAVGB-MTAVG; VTAVG2=VTAVG**2;
29 VPH2=PH2B-MPH2; VPH22=VPH2**2;
30 VGASRT=GASRTB-MGASRT; VGASRT2=VGASRT**2;
31 VSRT=SRTB-MSRT; VSRT2=VSRT**2;
32 VRASH=RASHB-MHASH; VRASH2=VRASH**2;
33 VV=VB-MV;
34 VTP=VTAVG+VPH2; VTS=VTAVG+VSRT; VTC=VTAVG+VCIN;
35 VTR=VTAVG+VRASH; VTG=VTAVG+VGASRT; VPS=VPH2+VSRT;
36 VSC=VSRT+VCIN; VSR=VSRT+VRASH; VSG=VSRT+VGASRT;
37 VCR=VCIN+VRASH; VCG=VCIN+VGASRT; VRG=VRASH+VGASRT;
38 VPC=VPH2+VCIN; VPR=VPH2+VRASH; VPG=VPH2+VGASRT;
39 SHYMD=3.6119*2.3203*VSRT+0.13540*VRASH+0.00136*VTAVG2+0.0334*VPH22
40 -0.00810*VTC;
41 SCIC4MD=4.58494+0.53345*VTAVG+0.6974*VSRT-0.11946*VCIN+0.0041*VTAVG2
42 +0.03203*VRASH2-0.4196*VTS+0.03637*VTR;
43 SBYMD=4.02712+0.04141*VTAVG+0.16621*VRASH+0.23306*VV+0.00616*VCIN2+0.05816*VTS
44 -0.01662*VPH-0.09672*VSC-0.26448*VSR;
45 SHYMD=7.24562+0.10348*VTAVG+1.79551*VSRT+0.12134*VCIN-0.34153*VV-0.01464*VCIN2

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46 +0.04847*VRASH2+0.26228*VSC;
47 SNAPMD=4.44774+0.14484*VTAVG+3.44105*VSRT-4.82967*VSRT2;
48 SHDMO=10.59855+4.40085*VSRT-0.24811*VCIN+1.03129*VV+0.01097*VTAVG2
49 -0.05592*VTC+0.05455*VPC-0.19568*VPR;
50 SHDMO=12.67504+1.62409*VRASH-1.66366*VV-0.01217*VTAVG2+0.05043*VTC-2.06902*VSR;
51 SSRMD=45.19364-0.41708*VTAVG-15.44040*VSRT+0.39049*VCIN-2.09200*VRASH
52 +0.95063*VV-0.00678*VTAVG2-0.02706*VCIN2-1.11290*VTS+3.21994*VSR;
53 SIOMMO=5.77606+0.10021*VTAVG-0.45104*VPH2+0.00300*VTAVG2-0.01155*VTP-0.63717*VPS
54 +0.35222*VSR;
55 OUTPUT;
56 IF CIN < CINMX THEN GO TO E;

```

NOTE: DATA SET WORK.DS1 HAS 51 OBSERVATIONS AND 89 VARIABLES. 26 OBS/TRK.
 NOTE: THE DATA STATEMENT USED 0.52 SECONDS AND 108K.

```

57 PROC PLOT NOLEND;
58 PLOT SHYMD+CIN;
59 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
60 TITLE2 NET HYDROGEN CONSUMPTION;
61 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
62 TITLE4 VS. CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED);
63 TITLE5 BASIS VALUES;;
64 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
65 TITLE7 TEMPERATURE(TAVG)= 455 C;
66 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
67 TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
68 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

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275 NOTE: THE PROCEDURE PLOT USED 0.45 SECONDS AND 136K AND PRINTED PAGE 1.

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69 PROC PLOT NOLEND;
70 PLOT SCIC4MD+CIN;
71 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
72 TITLE2 NET YIELD OF C1-C4;
73 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
74 TITLE4 VS. CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED);
75 TITLE5 BASIS VALUES;;
76 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
77 TITLE7 TEMPERATURE(TAVG)= 455 C;
78 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
79 TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
80 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

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NOTE: THE PROCEDURE PLOT USED 0.44 SECONDS AND 136K AND PRINTED PAGE 2.

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81 PROC PLOT NOLEND;
82 PLOT SBYMD+CIN;
83 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
84 TITLE2 NET YIELD OF BYPRODUCTS(NH3,H2S,CO,CO2);
85 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
86 TITLE4 VS. CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED);
87 TITLE5 BASIS VALUES;;
88 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
89 TITLE7 TEMPERATURE(TAVG)= 455 C;
90 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
91 TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

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92 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.43 SECONDS AND 136K AND PRINTED PAGE 3.

93 PROC PLOT NOLEGEND;
 94 PLOT SHMMD*CM;
 95 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 96 TITLE2 NET YIELD OF WATER;
 97 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 98 TITLE4 VS. CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED);
 99 TITLE5 BASIS VALUES;;
 100 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 101 TITLE7 TEMPERATURE(TAVG)= 455 C;
 102 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 103 TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
 104 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.44 SECONDS AND 136K AND PRINTED PAGE 4.

105 PROC PLOT NOLEGEND;
 106 PLOT SNAPMD*CM;
 107 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 108 TITLE2 NET YIELD OF NAPHTHA(C5-3ROF);
 109 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 110 TITLE4 VS. CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED);
 111 TITLE5 BASIS VALUES;;
 112 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 113 TITLE7 TEMPERATURE(TAVG)= 455 C;
 114 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 115 TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
 116 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.43 SECONDS AND 136K AND PRINTED PAGE 5.

117 PROC PLOT NOLEGEND;
 118 PLOT SHMD*CM;
 119 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 120 TITLE2 NET YIELD OF MIDDLE DISTILLATE(380-550F);
 121 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 122 TITLE4 VS. CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED);
 123 TITLE5 BASIS VALUES;;
 124 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
 125 TITLE7 TEMPERATURE(TAVG)= 455 C;
 126 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
 127 TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
 128 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.45 SECONDS AND 136K AND PRINTED PAGE 6.

129 PROC PLOT NOLEGEND;
 130 PLOT SHMD*CM;
 131 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
 132 TITLE2 NET YIELD OF HEAVY DISTILLATE(550-850F);
 133 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
 134 TITLE4 VS. CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED);
 135 TITLE5 BASIS VALUES;;

136 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
137 TITLE7 TEMPERATURE(TAVG)= 455 C;
138 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
139 TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
140 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.46 SECONDS AND 136K AND PRINTED PAGE 7.

141 PROC PLOT NOLEND;
142 PLOT SSROND+CIN;
143 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
144 TITLE2 NET YIELD OF SRC BUTTOMS(R50+)%;
145 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
146 TITLE4 VS. CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED);
147 TITLE5 BASIS VALUES;
148 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
149 TITLE7 TEMPERATURE(TAVG)= 455 C;
150 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
151 TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
152 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.45 SECONDS AND 136K AND PRINTED PAGE 8.

153 PROC PLOT NOLEND;
154 PLOT S10MND+CIN;
155 TITLE1 SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
156 TITLE2 NET YIELD OF INSOLUBLE ORGANIC MATTER;
157 TITLE3 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
158 TITLE4 VS. CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED);
159 TITLE5 BASIS VALUES;
160 TITLE6 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC;
161 TITLE7 TEMPERATURE(TAVG)= 455 C;
162 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
163 TITLE9 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
164 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

NOTE: THE PROCEDURE PLOT USED 0.43 SECONDS AND 136K AND PRINTED PAGE 9.

NOTE: SAS USED 136K MEMORY.

NOTE: BARR, GOODNIGHT, SALL AND HELWIG
SAS INSTITUTE INC.
P.O. BOX 10066
RALEIGH, N.C. 27605

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
NET HYDROGEN CONSUMPTION.

1
10:42 TUESDAY, MAY 22, 1979

(WEIGHT % BASED ON INLET MAX COAL CONCENTRATION)
VS. CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED)

BASIS VALUES:

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

TEMPERATURE(TAVG)= 455 C.

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

SLURRY RESIDENCE TIME(SRT)= ONE HOUR

RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET YIELD OF C1-C4
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. CIN, INLET COAL CONCENTRATION (G COAL/100 G SLURRY FEED)

2
 10:42 TUESDAY, MAY 22, 1979

BASIS VALUES:
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL

NET YIELD OF HYPRODUCTS(NH₃,H₂S,CU,CO₂)

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED)

BASIS VALUES:

GAS LINEAR VELOCITY(V)= 1.655H₄ CM/SEC

TEMPERATURE(TAVG)= 455 C

PRESSURE(PH₂)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

SLURRY RESIDENCE TIME(SHT)= ONE HOUR

RECYCLE ASH CONCENTRATION(ASHI)= 10.17 G/100 G SLURRY FEED

3
10:42 TUESDAY, MAY 22, 1979

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET YIELD OF WATER
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED)

10:42 TUESDAY, MAY 22, 1979

BASIS VALUES:
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL

NET YIELD OF NAPHTHA(C5-380F)

(WEIGHT % BASED ON INLET NAFC COAL CONCENTRATION)

VS. CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED)

BASIS VALUES:

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

TEMPERATURE(TAVG)= 455 C

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

SLURRY RESIDENCE TIME(SRT)= ONE HOUR

RECYCLE ASH CONCENTRATION(WASH)= 10.17 G/100 G SLURRY FEED

10:42 TUESDAY, MAY 22, 1979

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282

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET YIELD OF MIDDLE DISTILLATE(380-550F)
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED)

6
 10:42 TUESDAY, MAY 22, 1979

BASIS VALUES:
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 PHRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 NET YIELD OF HEAVY DISTILLATE(550-850F)
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED)

10:42 TUESDAY, MAY 22, 1979

BASE VALUES:
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SINGLE VARIABLE PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL

NET YIELD OF SRC BOTTOMS(850+)F
(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
VS. CIN, INLET COAL CONCENTRATION(G COAL/100 G SLURRY FEED)

8
10:42 TUESDAY, MAY 22, 1979

HASIS VALUES:
GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
TEMPERATURE(TAVG)= 455 C
PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
SLURRY RESIDENCE TIME(SRT)= ONE HOUR
RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

10:42 TUESDAY, MAY 22, 1979

S IOMMD

286

6.322301

23.400 25.528 27.656 29.784 31.912 34.040 36.168 38.296 40.424 42.552 44.680 46.808 48.936

CIN

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL

11:35 TUESDAY, MAY 22, 1979 1

LINE INDICATE CONSTANT LEVELS OF NET YIELD OF

SMDMD, MIDDLE DISTILLATE (380-550°F)

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. TAVG, AVERAGE REACTOR TEMPERATURE (°C)

AND V, LINEAR GAS VELOCITY (CM/SEC)

BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME (SRT) = ONE HOUR

PRESSURE (PH2) = 13.79 AT A GAS PURITY OF 91% = 12.55 MPa

COAL CONCENTRATION (CIN) = 30 G/100 G SLURRY FEED

RECYCLE ASH CONCENTRATION (RASH) = 10.17 G/100 G SLURRY FEED

SYMBOL	SMDMD	SYMBOL	SMDMD	SYMBOL	SMDMD	SYMBOL	SMDMD
#####	10.14777 - 11.03447	=====	14.58129 - 16.35469	xxxxxx	19.90150 - 21.67491	#####	25.22172 - 26.10843
oooooo	11.03447 - 12.80788	oooooooo	16.35469 - 18.12810	#####	21.67491 - 23.44832		
-----	12.80788 - 14.58129	++++++	18.12810 - 19.90150	#####	23.44832 - 25.22172		

NOTE: 1248 OBS HIDDEN

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHDMD, HEAVY DISTILLATE (550-850)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE(C)
 AND V, LINEAR GAS VELOCITY(CM/SEC)

14:35 TUESDAY, MAY 22, 1979 2

BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 MECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SYMBOL		SHDMD	SYMBOL		SHDMD	SYMBOL		SHDMD
.....	0.9866367 -	2.2149414	000000	9.5847692 -	12.0413784	000000	19.4112062 -	21.8678155
.....	2.2149414 -	4.6715506	+++++	12.0413784 -	14.4979877	000000	21.8678155 -	23.0961202
-----	4.6715506 -	7.1281599	XXXXXX	14.4979877 -	16.9545970			
=====	7.1281599 -	9.5847692	000000	16.9545970 -	19.4112062			

NOTE: 1248 OBS HIDDEN

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SSRCMD, SRC BOTTOMS (R50+)%
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE(C)
 AND V, LINEAR GAS VELOCITY(CM/SEC)
 BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.65MPA
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

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SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD
.....	14.19767 - 17.28518	-----	29.63521 - 35.81023	XXXXXX	48.16027 - 54.33528	#####	66.68532 - 69.77283
.....	17.28518 - 23.46019	000000	35.81023 - 41.98525	000000	54.33528 - 60.51030		
-----	23.46019 - 29.63521	+++++	41.98525 - 48.16027	000000	60.51030 - 66.68532		

NOTE: 1248 OBS HIDDEN

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL

14:35 TUESDAY, MAY 22, 1979

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LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
SMDMD, MIDDLE DISTILLATE (380-550)F
(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)
AND V, LINEAR GAS VELOCITY(CM/SEC)

BASIS VALUES: RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED
TEMPERATURE(TAVG)= 455 C
COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
SLURRY RESIDENCE TIME(SRT)= ONE HOUR

SYMBOL	SMDMD	SYMBOL	SMDMD	SYMBOL	SMDMD
.....	4.115010 - 5.315385	000000	12.517636 - 14.918386	000000	22.120637 - 24.521387
.....	5.315385 - 7.716135	+++++	14.918386 - 17.319136	000000	24.521387 - 25.721762
-----	7.716135 - 10.116886	XXXXXX	17.319136 - 19.719887		
-----	10.116886 - 12.517636	000000	19.719887 - 22.120637		

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHMD, HEAVY DISTILLATE (550-850)F
 (WEIGHT % BASED ON INLET WAF COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)
 AND V, LINEAR GAS VELOCITY(CM/SEC)

14:35 TUESDAY, MAY 22, 1979 5

BASIS VALUES: RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED
 TEMPERATURE(TAVG)= 455 C
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR

V

SYMBOL	SHMD	SYMBOL	SHMD	SYMBOL	SHMD	SYMBOL	SHMD
.....	12.31113 - 12.84170	+++++	14.96402 - 16.02517	XXXXXX	18.14749 - 19.20864	BBBBBB	21.33096 - 21.86183
.....	12.84170 - 13.90286	000000	16.02517 - 17.08633	888888	19.20864 - 20.26980		
-----	13.90286 - 14.96402	+++++	17.08633 - 18.14749	888888	20.26980 - 21.33096		

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL

14:35 TUESDAY, MAY 22, 1979 6

LINE INDICATE CONSTANT LEVELS OF NET YIELD OF

SSRCMD, SRC BOTTOMS (850+)F

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. PM2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)

AND V, LINEAR GAS VELOCITY(CM/SEC)

BASIS VALUES: RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

TEMPERATURE(TAVG)= 455 C

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

SLURRY RESIDENCE TIME(SRT)= ONE HOUR

SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD
.....	27.75313 - 28.05630	=====	29.26901 - 29.87536	XXXXXX	31.08807 - 31.69443	#####	32.90714 - 33.21031
.....	28.05630 - 28.66266	000000	29.87536 - 30.48172	000000	31.69443 - 32.30078		
-----	28.66266 - 29.26901	+++++	30.48172 - 31.08807	000000	32.30078 - 32.90714		

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SMDMD, MIDDLE DISTILLATE (380-550)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)
 AND V, GAS LINEAR VELOCITY (CM/SEC)
 BASIS VALUES: TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 RECYCLE ASH CONCENTRATION(RASH)= .10.17 G/100 G SLURRY FEED

14:35 TUESDAY, MAY 22, 1979 7

SYMBOL		SMDMD	SYMBOL		SMDMD	SYMBOL		SMDMD
.....	7.536701 -	8.262792	000000	12.619342 -	14.071526	000000	18.428076 -	19.880259
.....	8.262792 -	9.714976	+++++	14.071526 -	15.523709	000000	19.880259 -	20.606351
-----	9.714976 -	11.167159	XXXXXX	15.523709 -	16.975892			
000000	11.167159 -	12.619342	000000	16.975892 -	18.428076			

NOTE: 1144 DRS HIDDEN

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL

14:35 TUESDAY, MAY 22, 1979 8

LINE INDICATE CONSTANT LEVELS OF NET YIELD OF

SHDMD, HEAVY DISTILLATE (550-850)F

(WEIGHT % BASED ON INLET HAF COAL CONCENTRATION)

VS. SRT, NOMINAL SLURRY RESIDENCE TIME(HRS)

AND V, GAS LINEAR VELOCITY(CM/SEC)

BASIS VALUES: TEMPERATURE(TAVG)= 455 C

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

RECYCLE ASH CONCENTRATION(RASH)= 10.17 G /100 G SLURRY FEED

SYMBOL	SHDMD	SYMBOL	SHDMD	SYMBOL	SHDMD
.....	4.458243 - 6.038070	000000	15.517036 - 18.676692	000000	28.155658 - 31.315313
.....	6.038070 - 9.197726	+++++	18.676692 - 21.836347	000000	31.315313 - 32.895141
-----	9.197726 - 12.357381	xxxxxx	21.836347 - 24.996003		
=====	12.357381 - 15.517036	000000	24.996003 - 28.155658		

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SSRCMD, SRC BOTTOMS (R50+1F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. SRT, NOMINAL SLURRY RESIDENCE TIME(HRS)
 AND V, GAS LINEAR VELOCITY(CM/SEC)
 BASIS VALUES: TEMPERATURE(TAVG)= 455 C
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.85MPA
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

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SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD
000000	26.33036 - 26.76884	XXXXXX	28.52274 - 29.39969	000000	31.15360 - 32.03055	000000	33.78445 - 34.22293
000000	26.76884 - 27.64579	000000	29.39969 - 30.27664	000000	32.03055 - 32.90750		
000000	27.64579 - 28.52274	000000	30.27664 - 31.15360	000000	32.90750 - 33.78445		

NOTE: 1144 OBS HIDDEN

LINE INDICATE CONSTANT LEVELS OF NET YIELD OF

SMDMD, MIDDLE DISTILLATE (380-550)F

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. V, GAS LINEAR VELOCITY (CM/SEC)

AND CIN, INLET COAL CONCENTRATION (G COAL /100 G SLURRY FEED)

BASIS VALUES: PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

TEMPERATURE(TAVG)= 455 C

RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SLURRY RESIDENCE TIME= ONE HOUR

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL

14:35 TUESDAY, MAY 22, 1979 11

LINE INDICATE CONSTANT LEVELS OF NET YIELD OF
SHMD, HEAVY DISTILLATE (550-850)F

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
VS. V, GAS LINEAR VELOCITY (CM/SEC)

AND CIN, INLET COAL CONCENTRATION (G COAL /100 G SLURRY FEED)

BASIS VALUES: PRESSURE (PM2) = 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

TEMPERATURE (TAVG) = 455 C

RECYCLE ASH CONCENTRATION (RASH) = 10.17 G/100 G SLURRY FEED

SLURRY RESIDENCE TIME = ONE HOUR

SYMBOL	SHMD	SYMBOL	SHMD	SYMBOL	SHMD	SYMBOL	SHMD
.....	11.66476 - 12.34006	=====	15.04128 - 16.39189	XXXXXX	19.09310 - 20.44371	#####	23.14493 - 23.82024
.....	12.34006 - 13.69067	000000	16.39189 - 17.74250	000000	20.44371 - 21.79432		
-----	13.69067 - 15.04128	+++++	17.74250 - 19.09310	000000	21.79432 - 23.14493		

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF

14:35 TUESDAY, MAY 22, 1979 12

SSRCMD, SRC BOTTOMS (H50+1F)
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. V. GAS LINEAR VELOCITY (CM/SEC)
 AND CIN, INLET COAL CONCENTRATION (G COAL /100 G SLURRY FEED)
 BASIS VALUES: PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 TEMPERATURE(TAVG)= 455 C
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME= ONE HOUR

SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD
.....	22.59507 - 23.37134	=====	26.47640 - 28.02894	XXXXXX	31.13400 - 32.68653	#####	35.79160 - 36.56786
.....	23.37134 - 24.92387	000000	28.02894 - 29.58147	000000	32.68653 - 34.23907		
-----	24.92387 - 26.47640	+++++	29.58147 - 31.13400	000000	34.23907 - 35.79160		

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHDMD, MIDDLE DISTILLATE (380-550°F)
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. RASH, RECYCLE ASH CONCENTRATION (G ASH/100 G SLURRY FEED)
 AND V, GAS LINEAR VELOCITY (CM/SEC)
 BASIS VALUES: TEMPERATURE (TAVG) = 455 C
 COAL CONCENTRATION (CIN) = 30 G/100 G SLURRY FEED
 PRESSURE (PH2) = 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 SLURRY RESIDENCE TIME (SRT) = ONE HOUR

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V

SYMBOL	SHDMD	SYMBOL	SHDMD	SYMBOL	SHDMD	SYMBOL	SHDMD
.....	11.65341 - 11.99783		13.37551 - 14.06435	XXXXXX	15.44203 - 16.13087		17.50855 - 17.85297
.....	11.99783 - 12.68667	000000	14.06435 - 14.75319	888888	16.13087 - 16.81971		
-----	12.68667 - 13.37551	+++++	14.75319 - 15.44203	888888	16.81971 - 17.50855		

NOTE: 1300 OBS HIDDEN

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHDMD, HEAVY DISTILLATE (550-850)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED)
 AND V, GAS LINEAR VELOCITY (CM/SEC)
 BASIS VALUES: TEMPERATURE(TAVG)= 455 C
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 SLURRY RESIDENCE TIME(SRT)= ONE HOUR

14:35 TUESDAY, MAY 22, 1979 14

SYMBOL	SHDMD	SYMBOL	SHDMD	SYMBOL	SHDMD
.....	-0.252110 - 1.167489	000000	9.685084 - 12.524282	000000	21.041877 - 23.881075
.....	1.167489 - 4.006687	+++++	12.524282 - 15.363480	000000	23.881075 - 25.300674
-----	4.006687 - 6.845885	XXXXXX	15.363480 - 18.202679		
=====	6.845885 - 9.685084	000000	18.202679 - 21.041877		

NOTE: 1300 OBS HIDDEN

CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SSRCMD, SRC BOTTOMS (R50+)%
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. RASH, RECYCLE ASH CONCENTRATION (G ASH/100 G SLURRY FEED)
 AND V, GAS LINEAR VELOCITY (CM/SEC)
 BASIS VALUES: TEMPERATURE (TAVG) = 455 C
 COAL CONCENTRATION (CIN) = 30 G/100 G SLURRY FEED
 PRESSURE (PH2) = 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 SLURRY RESIDENCE TIME (SRT) = ONE HOUR

14:35 TUESDAY, MAY 22, 1979 15

SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD
.....	23.61330 - 24.98669	=====	30.47990 - 33.22651	xxxxxxx	38.71973 - 41.46634	#####	46.95956 - 48.33206
.....	24.98669 - 27.73330	000000	33.22651 - 35.97312	000000	41.46634 - 44.21295		
-----	27.73330 - 30.47990	+++++	35.97312 - 38.71973	000000	44.21295 - 46.95956		

NOTE: 1300 OBS HIDDEN

1

S T A T I S T I C A L A N A L Y S I S S Y S T E M

14:35 TUESDAY, MAY 22, 1979

NOTE: THE JOB SFHARES HAS BEEN RUN UNDER RELEASE 76.6C OF SAS AT GULF OIL CORPORATION.

NOTE: SASNEWS SASNEWS SASNEWS SASNEWS SASNEWS SASNEWS

A TEST RELEASE OF SAS79.1 IS NOW AVAILABLE.
TO EXECUTE SAS79 USE // EXEC SAS79

FOR A BRIEF DESCRIPTION OF THE NEW FEATURES OF
SAS79, USE --> PROC DOC DATA=DOC.SAS79;

```

1  DATA DS1;
2  NSHV=3.72338; NSCIC4=11.5006; NSBY=4.08854; NSHW=7.5061; NSNAP=8.09556;
3  NSND=9.65792; NSHD=11.091; NSSRC=44.6567; NSIDM=6.07843; NTAVG=453.058;
4  NPH2=12.4381; NSRT=0.812101; MCIN=33.9253; MRASH=4.04038; NGASRT=46.6828; DUM=1;
5  NV=1.65584;
6  TAVGB=455.1; PH2B=.9113.79; GASRTB=56.04; CINB=30.; SRTB=1.; RASHB=10.17;
7  VB=1.65584;
8  TAVGMX=465.1; TAVGMN=12.80;
9  PH2MX=17.650; PH2MN=6.890;
10 SRTMX=1.690; SRTMN=0.130;
11 CINMX=50.00; CINMN=23.40;
12 RASHMX=12.70; RASHMN=0.80;
13 GASRTMX=97.970; GASRTMN=12.880;
14 VMX=6.05484; VMN=0.42688;
15 DTAVG=(TAVGMX-TAVGMN)/50.; DPH2=(PH2MX-PH2MN)/50.;
16 DSRT=(SRTMX-SRTMN)/50.; DCIN=(CINMX-CINMN)/50.;
17 DRASH=(RASHMX-RASHMN)/50.; DGASRT=(GASRTMX-GASRTMN)/50.;
18 DV=(VMX-VMN)/50.;
19 TAVG=TAVGMN-DTAVG;
20 PH2=PH2B; SRT=SRTB; CIN=CINB; RASH=RASHB;
21 GASRT=GASRTB;
22 A: TAVG+DTAVG;
23 V=VMN-DV;
24 B: V+DV;
25 VTAVG=TAVG-MTAVG; VTAVG2=VTAVG**2;
26 VV=V-NV;
27 VPH2=PH2B-MPH2; VPH22=VPH2**2;
28 VGASRT=GASRTB-MGASRT; VGASRT2=VGASRT**2;
29 VCIN=CINB-MCIN; VCIN2=VCIN**2;
30 VRASH=RASHB-MRASH; VRASH2=VRASH**2;
31 VSRT=SRTB-MSRT; VSRT2=VSRT**2;
32 VTP=VTAVG+VPH2; VTS=VTAVG+VSRT; VTC=VTAVG+VCIN;
33 VTR=VTAVG+VRASH; VTG=VTAVG+VGASRT; VPS=VPH2+VSRT;
34 VPC=VPH2+VCIN; VPR=VPH2+VRASH; VPG=VPH2+VGASRT;
35 VSC=VSRT+VCIN; VSR=VSRT+VRASH; VSG=VSRT+VGASRT;
36 VCR=VCIN+VRASH; VCG=VCIN+VGASRT; VRG=VRASH+VGASRT;
37 SMDMD=10.59855+4.80085*VSRT-0.29811*VCIN+1.03129*VV+0.01097*VTAVG2
38 -0.05592*VTC+0.05855*VPC-0.19568*VPR;
39 SHDMD=12.67509+1.62409*VRASH-1.66366*VV-0.01217*VTAVG2+0.05043*VTC-2.06902*VSR;
40 SSRDMD=45.19364-0.91708*VTAVG-15.94040*VSRT+0.39049*VCIN-2.09700*VRASH
41 +0.95063*VV-0.00678*VTAVG2-0.02706*VCIN2-1.11290*VTS+3.21994*VSR;
42 OUTPUT;
43 IF V < VMX THEN GO TO B;
44 IF TAVG < TAVGMX THEN GO TO A;

```

NOTE: DATA SET WORK.DS1 HAS 2704 OBSERVATIONS AND 83 VARIABLES. 28 OBS/TRK.
NOTE: THE DATA STATEMENT USED 1.96 SECONDS AND 108K.

```
45      PROC PLOT NOLEGEND;
46      PLOT TAVG*V=SHDMD/ CONTOUR=10;
47      TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
48      TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
49      TITLE3 SHDMD, MIDDLE DISTILLATE (380-550)F;
50      TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
51      TITLE5 VS. TAVG, AVERAGE REACTOR TEMPERATURE(C);
52      TITLE6 AND V, LINEAR GAS VELOCITY(CM/SEC);
53      TITLE7 BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
54      TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA;
55      TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
56      TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;
```

NOTE: THE PROCEDURE PLOT USED 1.87 SECONDS AND 136K AND PRINTED PAGE 1.

```
57      PROC PLOT NOLEGEND;
58      PLOT TAVG*V=SHDMD/ CONTOUR=10;
59      TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
60      TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
61      TITLE3 SHDMD, HEAVY DISTILLATE (550-850)F;
62      TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
63      TITLE5 VS. TAVG, AVERAGE REACTOR TEMPERATURE(C);
64      TITLE6 AND V, LINEAR GAS VELOCITY(CM/SEC);
65      TITLE7 BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
66      TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA;
67      TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
68      TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;
```

NOTE: THE PROCEDURE PLOT USED 1.84 SECONDS AND 136K AND PRINTED PAGE 2.

```
69      PROC PLOT NOLEGEND;
70      PLOT TAVG*V=SSRCMD/ CONTOUR=10;
71      TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
72      TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
73      TITLE3 SSRCMD, SRC BOTTOMS (850+)F;
74      TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
75      TITLE5 VS. TAVG, AVERAGE REACTOR TEMPERATURE(C);
76      TITLE6 AND V, LINEAR GAS VELOCITY(CM/SEC);
77      TITLE7 BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR;
78      TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA;
79      TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
80      TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;
```

NOTE: THE PROCEDURE PLOT USED 1.81 SECONDS AND 136K AND PRINTED PAGE 3.

```
81      DATA DS2;
82      MSHY=3.72339; MSC1C4=11.5896; MSHY=4.08854; MSHW=7.5061; MSNAP=8.89556;
83      MSMD=9.65792; MSMD=11.091; MSSRC=44.6567; MS10M=6.07843; MTAVG=453.058;
84      MPH2=12.4387; MSRT=0.812101; MCIN=33.9253; MRASH=4.04038; MGASRT=46.6828; DUM=1;
85      MV=1.65584;
86      TAVGB=455.; PH2B=.91*13.79; GASHTB=56.04; CINB=30.; SRTB=1.; RASHB=10.17;
87      VB=1.65584;
88      TAVGMX=465.; TAVGMN=412.80;
```

```

89 PH2MX=17.650; PH2MN=6.890;
90 SRTMX=1.590; SRTMN=0.130;
91 CINMX=50.00; CINMN=23.40;
92 RASHMX=12.70; RASHMN=0.00;
93 GASRTMX=97.970; GASRTMN=12.880;
94 VMX=6.05484; VMN=0.42680;
95 DTAVG=(TAVGMX-TAVGMN)/50.; DPH2=(PH2MX-PH2MN)/50.;
96 DSRT=(SRTMX-SRTMN)/50.; DCIN=(CINMX-CINMN)/50.;
97 DRASH=(RASHMX-RASHMN)/50.; DGASRT=(GASRTMX-GASRTMN)/50.;
98 DV=(VMX-VMN)/50.;
99 PH2=PH2MN-DPH2;
100 TAVG=TAVGB; SRT=SRTB; CIN=CINB; RASH=RASHB;
101 GASRT=GASRTB;
102 A: PH2+DPH2;
103 V=VMN-DV;
104 B: V+DV;
105 VPH2=PH2-MPH2; VPH22=VPH2**2;
106 VV=V-MV;
107 VTAVG=TAVGB-MTAVG; VTAVG2=VTAVG**2;
108 VSRT=SRTB-MSRT; VSRT2=VSRT**2;
109 VGASRT=GASRTB-MGASRT; VGASRT2=VGASRT**2;
110 VCIN=CINB-MCIN; VCIN2=VCIN**2;
111 VRASH=RASHB-MRASH; VRASH2=VRASH**2;
112 VTP=VTAVG+VPH2; VTS=VTAVG+VSRT; VTC=VTAVG+VCIN;
113 VTR=VTAVG+VRASH; VTG=VTAVG+VGASRT; VPS=VPH2+VSRT;
114 VPC=VPH2+VCIN; VPR=VPH2+VRASH; VPG=VPH2+VGASRT;
115 VSC=VSRT+VCIN; VSR=VSRT+VRASH; VSG=VSRT+VGASRT;
116 VCR=VCIN+VRASH; VCG=VCIN+VGASRT; VRG=VRASH+VGASRT;
117 SMDND=10.59856+4.80085*VSRT-0.29811*VCIN+1.03129*VV+0.01097*VTAVG2
118 -0.05592*VTC+0.05855*VPC-0.19568*VPR;
119 SHDND=12.67509+1.62409*VRASH-1.66366*VV-0.01217*VTAVG2+0.05043*VTC-2.06902*VSR;
120 SSRDND=45.19364-0.91708*VTAVG-15.94040*VSRT+0.39049*VCIN-2.09200*VRASH
121 +0.95063*VV-0.00678*VTAVG2-0.02706*VCIN2-1.11290*VTS+3.21994*VSR;
122 OUTPUT;
123 IF V < VMX THEN GO TO B;
124 IF PH2 < PH2MX THEN GO TO A;

```

NOTE: DATA SET WORK.DS2 HAS 2704 OBSERVATIONS AND 83 VARIABLES. 28 OBS/TRK.

NOTE: THE DATA STATEMENT USED 1.81 SECONDS AND 108K.

```

125 PROC PLOT NOLEND;
126 PLOT PH2+V=SMDND/ CONTOUR=10;
127 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
128 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
129 TITLE3 SMDND, MIDDLE DISTILLATE (380-550)F;
130 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
131 TITLE5 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA);
132 TITLE6 AND V, LINEAR GAS VELOCITY(CM/SEC);
133 TITLE7 BASIS VALUES: RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;
134 TITLE8 TEMPERATURE(TAVG)= 455 C;
135 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
136 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

```

NOTE: THE PROCEDURE PLOT USED 1.79 SECONDS AND 136K AND PRINTED PAGE 4.

```

137 PROC PLOT NOLEND;

```



```

138 PLOT PH2*V=SHDND/ CONTOUR=10;
139 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
140 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
141 TITLE3 SHDND, HEAVY DISTILLATE (550-850)F;
142 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
143 TITLES VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA);
144 TITLE6 AND V, LINEAR GAS VELOCITY(CM/SEC);
145 TITLE7 BASIS VALUES: RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;
146 TITLE8 TEMPERATURE(TAVG)= 455 C;
147 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
148 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

```

NOTE: THE PROCEDURE PLOT USED 1.81 SECONDS AND 136K AND PRINTED PAGE 5.

```

149 PROC PLOT NOLEGEND;
150 PLOT PH2*V=SSRCMD/ CONTOUR=10;
151 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
152 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
153 TITLE3 SSRCMD, SRC BOTTOMS (850+)F;
154 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
155 TITLES VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA);
156 TITLE6 AND V, LINEAR GAS VELOCITY(CM/SEC);
157 TITLE7 BASIS VALUES: RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;
158 TITLE8 TEMPERATURE(TAVG)= 455 C;
159 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
160 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

```

NOTE: THE PROCEDURE PLOT USED 1.81 SECONDS AND 136K AND PRINTED PAGE 6.

```

161 DATA 053;
162 MSBY=3.72339; MSC1C4=11.5896; MSBY=4.08854; MSBW=7.5061; MSNAP=8.89556;
163 MSMD=9.65792; MSMD=11.091; MSSRC=44.6567; MSIDM=6.07843; MTAVG=453.058;
164 MPH2=12.4387; MSRT=0.812101; MCIN=33.9253; MRASH=4.04038; MGASRT=46.6028; DUM=1;
165 MV=1.65584;
166 TAVGB=455.; PH2B=.91*13.79; GASRTB=56.04; CINB=30.; SRTB=1.; RASHB=10.17;
167 VB=1.65584;
168 TAVGMX=465.; TAVGMN=412.80;
169 PH2MX=17.650; PH2MN=6.890;
170 SRTMX=1.590; SRTMN=0.130;
171 CINMX=50.00; CINMN=23.40;
172 RASHMX=12.70; RASHMN=0.00;
173 GASRTMX=97.970; GASRTMN= 12.880;
174 VMX=6.05484; VMN=0.42680;
175 DTAVG=(TAVGMX-TAVGMN)/50.; DPH2=(PH2MX-PH2MN)/50.;
176 DSRT=(SRTMX-SRTMN)/50.; DCIN=(CINMX-CINMN)/50.;
177 DRASH=(RASHMX-RASHMN)/50.; DGASRT=(GASRTMX-GASRTMN)/50.;
178 DV=(VMX-VMN)/50.;
179 SRT=SRTMN-DSRT;
180 TAVG=TAVGB; PH2=PH2B; CIN=CINB; RASH=RASHB;
181 GASRT=GASRTB;
182 A= SRT+DSRT;
183 V=VMN-DV;
184 B= V+DV;
185 VSRT=SRT-MSRT; VSRT2=VSRT**2;
186 VV=V-MV;
187 VPH2=PH2B-MPH2; VPH22=VPH2**2;

```

```

188  VGASRT=GASRTB-MGASRT; VGASRT2=VGASRT**2;
189  VRASH=RASHB-MRASH; VRASH2=VRASH**2;
190  VTAVG=TAVGB-MTAVG; VTAVG2=VTAVG**2;
191  VCIN=CINB-MCIN; VCIN2=VCIN**2;
192  VTP=VTAVG*VPH2; VTS=VTAVG*VSRT; VTC=VTAVG*VCIN;
193  VTR=VTAVG*VRASH; VTG=VTAVG*VGASRT; VPS=VPH2*VSRT;
194  VPC=VPH2*VCIN; VPR=VPH2*VRASH; VPG=VPH2*VGASRT;
195  VSC=VSRT*VCIN; VSR=VSRT*VRASH; VSG=VSRT*VGASRT;
196  VCR=VCIN*VRASH; VCG=VCIN*VGASRT; VRG=VRASH*VGASRT;
197  SHDND=10.59855+4.80085*VSRT-0.29811*VCIN+1.03129*VV+0.01097*VTAVG2
198  -0.05592*VTC+0.05855*VPC-0.19568*VPR;
199  SHDND=12.67509+1.62409*VRASH-1.66366*VV-D.01217*VTAVG2+0.05043*VTC-2.06902*VSR;
200  SSRDND=45.19364-0.91708*VTAVG-15.94040*VSRT+0.39449*VCIN-2.09200*VRASH
201  +0.95063*VV-0.00678*VTAVG2-0.02706*VCIN2-1.11290*VTS+3.21994*VSR;
202  OUTPUT;
203  IF V < VMK THEN GO TO B;
204  IF SRT < SRTMX THEN GO TO A;

```

NOTE: DATA SET WORK.DS3 HAS 2704 OBSERVATIONS AND 83 VARIABLES. 28 OBS/TRK.
 NOTE: THE DATA STATEMENT USED 1.83 SECONDS AND 108K.

```

205  PROC PLOT NOLEND;
206  PLOT SRT*V=SHDND/ CONTOUR=10;
207  TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
208  TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
209  TITLE3 SHDND, MIDDLE DISTILLATE (380-550)F;
210  TITLE4 (WEIGHT % BASED ON INLET MAP COAL CONCENTRATION);
211  TITLE5 VS. SRT, NOMINAL SLURRY RESIDENCE TIME(HRS);
212  TITLE6 AND V, GAS LINEAR VELOCITY(CM/SEC);
213  TITLE7 BASIS VALUES: TEMPERATURE(TAVG)= 455 C;
214  TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA;
215  TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
216  TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

```

NOTE: THE PROCEDURE PLOT USED 1.84 SECONDS AND 136K AND PRINTED PAGE 7.

```

217  PROC PLOT NOLEND;
218  PLOT SRT*V=SHDND/ CONTOUR=10;
219  TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
220  TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
221  TITLE3 SHDND, HEAVY DISTILLATE (550-850)F;
222  TITLE4 (WEIGHT % BASED ON INLET MAP COAL CONCENTRATION);
223  TITLE5 VS. SRT, NOMINAL SLURRY RESIDENCE TIME(HRS);
224  TITLE6 AND V, GAS LINEAR VELOCITY(CM/SEC);
225  TITLE7 BASIS VALUES: TEMPERATURE(TAVG)= 455 C;
226  TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA;
227  TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
228  TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G /100 G SLURRY FEED;

```

NOTE: THE PROCEDURE PLOT USED 1.85 SECONDS AND 136K AND PRINTED PAGE 8.

```

229  PROC PLOT NOLEND;
230  PLOT SRT*V=SSRDND/ CONTOUR=10;
231  TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
232  TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
233  TITLE3 SSRDND, SHC BOTTOMS (850+)F;

```

```

234 TITLE4 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION);
235 TITLE5 VS. SRT, NOMINAL SLURRY RESIDENCE TIME(HRS);
236 TITLE6 AND V, GAS LINEAR VELOCITY(CM/SEC);
237 TITLE7 BASIS VALUES: TEMPERATURE(TAVG)= 455 C;
238 TITLE8 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA;
239 TITLE9 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
240 TITLE10 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;

```

NOTE: THE PROCEDURE PLOT USED 1.82 SECONDS AND 136K AND PRINTED PAGE 9.

```

241 DATA D54;
242 MSNV=3.72339; MSC1C4=11.5896; MSBV=4.08854; MSNV=7.5061; MSNAP=8.89556;
243 MSND=9.65792; MSMD=11.091; MSSRC=44.6567; MS10M=6.07843; MTAVG=453.058;
244 MPH2=12.4387; MSRT=0.812101; MCIN=33.9253; MRASH=4.04038; MGASRT=46.6828; DUM=1;
245 NV=1.65584;
246 TAVGB=455.; PH2B=.91+13.79; GASRTB=56.04; CINB=30.; SRTB=1.; RASHB=10.17;
247 VB=1.65584;
248 TAVGMX=465.; TAVGMN=412.00;
249 PH2MX=17.650; PH2MN=6.890;
250 SRTMX=1.500; SRTMN=0.130;
251 CINMX=50.00; CINMN=23.40;
252 RASHMX=12.70; RASHMN=0.00;
253 GASRTMX=97.970; GASRTMN= 12.880;
254 VMX=6.05484; VMN=0.42680;
255 DTAVG=(TAVGMX-TAVGMN)/50.; DPH2=(PH2MX-PH2MN)/50.;
256 DSRT=(SRTMX-SRTMN)/50.; DCIN=(CINMX-CINMN)/50.;
257 DRASH=(RASHMX-RASHMN)/50.; DGASRT=(GASRTMX-GASRTMN)/50.;
258 DV=(VMX-VMN)/50.;
259 CIN=CINMN-DCIN;
260 GASRT=GASRTB;
261 TAVG=TAVGB; PH2=PH2B; SRT=SRTB; RASH=RASHB;
262 A: CIN+DCIN;
263 V=VMN-DV;
264 B: V+DV;
265 VCIN=CIN-MCIN; VCIN2=VCIN**2;
266 VV=V-NV;
267 VTAVG=TAVGB-MTAVG; VTAVG2=VTAVG**2;
268 VPH2=PH2B-MPH2; VPH22=VPH2**2;
269 VSRT=SRTB-MSRT; VSRT2=VSRT**2;
270 VGASRT=GASRTB-MGASRT; VGASRT2=VGASRT**2;
271 VRASH=RASHB-MRASH; VRASH2=VRASH**2;
272 VCR=VCIN+VRASH; VCG=VCIN+VGASRT; VRG=VRASH+VGASRT;
273 VSC=VSRT+VCR; VSR=VSRT+VRASH; VSG=VSRT+VGASRT;
274 VPC=VPH2+VCIN; VPR=VPH2+VRASH; VPG=VPH2+VGASRT;
275 VTR=VTAVG+VRASH; VTG=VTAVG+VGASRT; VPS=VPH2+VSRT;
276 VTP=VTAVG+VPH2; VTS=VTAVG+VSRT; VTC=VTAVG+VCIN;
277 SHCMD=10.59856+4.80085*VSRT-0.29811*VCIN+1.03129*VV+0.01097*VTAVG2
278 -0.05592*VTC+0.05855*VPC-0.19568*VPR;
279 SHCMD=12.67509+1.62409*VRASH-1.66366*VV-0.01217*VTAVG2+0.05043*VTC-2.06902*VSR;
280 SSRCMD=45.19364-0.91708*VTAVG-15.94040*VSRT+0.39049*VCIN-2.09200*VRASH
281 +0.95063*VV-0.00678*VTAVG2-0.02706*VCIN2-1.11290*VTS+3.21994*VSR;
282 OUTPUT;
283 IF V < VMX THEN GO TO B;
284 IF CIN < CINMX THEN GO TO A;

```

NOTE: DATA SET WORK.D54 HAS 2652 OBSERVATIONS AND 83 VARIABLES. 28 OBS/TRK.

NOTE: THE DATA STATEMENT USED 1.86 SECONDS AND 108K.

```

285 PROC PLOT NOLEGEND;
286 PLOT CINOV=SHMD/ CONTOUR=10;
287 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
288 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
289 TITLE3 SHMD, MIDDLE DISTILLATE (380-550)F;
290 TITLE4 (WEIGHT % BASED ON INLET MAP COAL CONCENTRATION);
291 TITLE5 VS. V. GAS LINEAR VELOCITY (CM/SEC);
292 TITLE6 AND CM, INLET COAL CONCENTRATION(G COAL /100 G SLURRY FEED);
293 TITLE7 BASIS VALUES: PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
294 TITLE8 TEMPERATURE(TAVG)= 455 C;
295 TITLE9 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;
296 TITLE10 SLURRY RESIDENCE TIME= ONE HOUR;

```

NOTE: THE PROCEDURE PLOT USED 1.74 SECONDS AND 136K AND PRINTED PAGE 10.

```

297 PROC PLOT NOLEGEND;
298 PLOT CINOV=SHMD/ CONTOUR=10;
299 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
300 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
301 TITLE3 SHMD, HEAVY DISTILLATE (580-850)F;
302 TITLE4 (WEIGHT % BASED ON INLET MAP COAL CONCENTRATION);
303 TITLE5 VS. V. GAS LINEAR VELOCITY (CM/SEC);
304 TITLE6 AND CM, INLET COAL CONCENTRATION(G COAL /100 G SLURRY FEED);
305 TITLE7 BASIS VALUES: PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
306 TITLE8 TEMPERATURE(TAVG)= 455 C;
307 TITLE9 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;
308 TITLE10 SLURRY RESIDENCE TIME= ONE HOUR;

```

NOTE: THE PROCEDURE PLOT USED 1.76 SECONDS AND 136K AND PRINTED PAGE 11.

```

309 PROC PLOT NOLEGEND;
310 PLOT CINOV=SSRCMD/ CONTOUR=10;
311 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
312 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
313 TITLE3 SSRCMD, SRC BOTTOMS (850+)F;
314 TITLE4 (WEIGHT % BASED ON INLET MAP COAL CONCENTRATION);
315 TITLE5 VS. V. GAS LINEAR VELOCITY (CM/SEC);
316 TITLE6 AND CM, INLET COAL CONCENTRATION(G COAL /100 G SLURRY FEED);
317 TITLE7 BASIS VALUES: PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
318 TITLE8 TEMPERATURE(TAVG)= 455 C;
319 TITLE9 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED;
320 TITLE10 SLURRY RESIDENCE TIME= ONE HOUR;

```

NOTE: THE PROCEDURE PLOT USED 1.78 SECONDS AND 136K AND PRINTED PAGE 12.

```

321 DATA D55;
322 MSNV=3.72339; MSC1C4=11.5696; MSBY=4.08954; MSHW=7.5061; MSNAP=8.89556;
323 MSMD=9.65792; MSMD=11.091; MSSRC=44.6567; MSJOM=6.07443; MTAVG=453.058;
324 MPH2=12.4387; MSRT=0.812101; MCIN=33.9253; MRASH=4.04038; MGASRT=46.6828; DUM=1;
325 NV=1.65584;
326 TAVGB=455.; PH2B=.91*13.79; GASRTB=56.04; CINB=30.; SWTB=1.; RASHB=10.17;
327 VB=1.65584;
328 TAVGMX=465.; TAVGMN=411.80;
329 PH2MX=17.650; PH2MN=6.840;

```

```

330 SRTMX=1.590; SRTMN=0.130;
331 CINMX=50.00; CINMN=23.40;
332 RASHMX=12.70; RASHMN=0.00;
333 GASRTMX=97.970; GASRTMN=12.880;
334 VMX=6.05484; VMN=0.42680;
335 DTAVG=(TAVGMX-TAVGMN)/50.; DPH2=(PH2MX-PH2MN)/50.;
336 DSRT=(SRTMX-SRTMN)/50.; DCIN=(CINMX-CINMN)/50.;
337 DRASH=(RASHMX-RASHMN)/50.; DGASRT=(GASRTMX-GASRTMN)/50.;
338 DV=(VMX-VMN)/50.;
339 RASH=RASHMN-DRASH;
340 TAVG=TAVGB; PH2=PH2B; SRT=SRTB; CIN=CINB;
341 GASRT=GASRTB;
342 A: RASH+DRASH;
343 V=VMN-DV;
344 B: V+DV;
345 VRASH=RASH-MRASH; VRASH2=VRASH**2;
346 VV=V-MV;
347 VCIN=CINB-MCIN; VCIN2=VCIN**2;
348 VSRT=SRTB-MSRT; VSRT2=VSRT**2;
349 VGASRT=GASRTB-MGASRT; VGASRT2=VGASRT**2;
350 VTAVG=TAVGB-MTAVG; VTAVG2=VTAVG**2;
351 VPH2=PH2B-MPH2; VPH22=VPH2**2;
352 VTP=VTAVG*VPH2; VTS=VTAVG*VSRT; VTC=VTAVG*VCIN;
353 VTR=VTAVG*VRASH; VTG=VTAVG*VGASRT; VPS=VPH2*VSRT;
354 VPC=VPH2*VCIN; VPR=VPH2*VRASH; VPG=VPH2*VGASRT;
355 VSC=VSRT*VCIN; VSR=VSRT*VRASH; VSG=VSRT*VGASRT;
356 VCR=VCIN*VRASH; VCG=VCIN*VGASRT; VRG=VRASH*VGASRT;
357 SMDND=10.59855+4.80085*VSRT-0.29811*VCIN+1.03129*VV+0.01097*VTAVG2
358 -0.05592*VTC+0.05855*VPC-0.19568*VPR;
359 SHDND=12.67509+1.62409*VRASH-1.66366*VV-0.01217*VTAVG2+0.05043*VTC-2.06902*VSR;
360 SSRCHD=45.19364-0.91708*VTAVG-15.94040*VSRT+0.39049*VCIN-2.09200*VRASH
361 +0.95063*VV-0.00678*VTAVG2-0.02706*VCIN2-1.11290*VTS+3.21994*VSR;
362 OUTPUT;
363 IF V < VMX THEN GO TO B;
364 IF RASH < RASHMX THEN GO TO A;

```

NOTE: DATA SET WORK.DS5 HAS 2704 OBSERVATIONS AND 83 VARIABLES. 28 OBS/TRK.
 NOTE: THE DATA STATEMENT USED 1.91 SECONDS AND 108K.

```

365 PROC PLOT NOLEGEND;
366 PLOT RASH*V=SMDND/ CONTOUR=10;
367 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
368 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
369 TITLE3 SMDND, MIDDLE DISTILLATE (380-550)F;
370 TITLE4 (WEIGHT % BASED ON INLET WAF COAL CONCENTRATION);
371 TITLE5 VS. RASH, RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED);
372 TITLE6 AND V, GAS LINEAR VELOCITY (CM/SEC);
373 TITLE7 BASIS VALUES: TEMPERATURE(TAVG)= 455 C;
374 TITLE8 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
375 TITLE9 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
376 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

```

NOTE: THE PROCEDURE PLOT USED 1.83 SECONDS AND 136K AND PRINTED PAGE 13.

```

377 PROC PLOT NOLEGEND;
378 PLOT RASH*V=SMDND/ CONTOUR=10;

```

```

379 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
380 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
381 TITLE3 SHOND. HEAVY DISTILLATE (550-850)F;
382 TITLE4 (WEIGHT % BASED ON INLET MAP COAL CONCENTRATION);
383 TITLE5 VS. RASH. RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED);
384 TITLE6 AND V. GAS LINEAR VELOCITY (CM/SEC);
385 TITLE7 BASIS VALUES: TEMPERATURE(TAVG)= 455 C;
386 TITLE8 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
387 TITLE9 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
388 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

```

NOTE: THE PROCEDURE PLOT USED 1.90 SECONDS AND 136K AND PRINTED PAGE 14.

```

389 PROC PLOT NOLEND;
390 PLOT RASH+V=SSRCMD/ CONTOUR=10;
391 TITLE1 CONTOUR PLOT, UNCONSTRAINED 21 TERM LINEAR REGRESSION MODEL;
392 TITLE2 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF ;
393 TITLE3 SSRCMD. SRC BOTTOMS (850+)F;
394 TITLE4 (WEIGHT % BASED ON INLET MAP COAL CONCENTRATION);
395 TITLE5 VS. RASH. RECYCLE ASH CONCENTRATION(G ASH/100 G SLURRY FEED);
396 TITLE6 AND V. GAS LINEAR VELOCITY (CM/SEC);
397 TITLE7 BASIS VALUES: TEMPERATURE(TAVG)= 455 C;
398 TITLE8 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED;
399 TITLE9 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA;
400 TITLE10 SLURRY RESIDENCE TIME(SRT)= ONE HOUR;

```

NOTE: THE PROCEDURE PLOT USED 1.81 SECONDS AND 136K AND PRINTED PAGE 15.

NOTE: SAS USED 136K MEMORY.

NOTE: BARR. GOODNIGHT, SALL AND HELMIG
 SAS INSTITUTE INC.
 P.O. BOX 10066
 RALEIGH, N.C. 27605

APPENDIX 2

GULF RESEARCH & DEVELOPMENT COMPANY

Pittsburgh, PA 15230

A SEQUEL REPORT: SECOND-ORDER MODELS
FOR THE SRC YIELDS FROM KENTUCKY COAL

by

N.L. Carr
G.L. Jones
M. McMahon

Report No. 627RK002
Project No. 238-8515-260
File No. FT07-30-30
June 18, 1979

APPROVED: Harold Denton

DATE: June 18, 1979

SUMMARY

This report contains further details of the full second-order model for SRC yields referred to in the previous main report*. The main conclusions drawn from an analyses of this model are the same as those from the first report which were determined by an analyses of the "stepwise regression model". The intent of this report is to present all the contour plots for selected pairs of variables generated by the full second-order model of each of the SRC (process) yields.

The behavior and the characteristics of the full second-order model are believed to be improved over linear, first-order models. However, there is no significant improvement over the stepwise, second-order model, except for one model, that of the SRC yield. These models which allow non-linear behavior of the responses should be better predictors than the linear models.

Another significant conclusion drawn from this analysis is that both pressure and SRT may be reduced in the SRC-II process with Kentucky coal: if the recycle ash level is maintained about 10%, or somewhat higher, if the temperature is held about 455°C, and if the feed slurry contains about 30% coal.

^A Report No. 627RK001, "Second Order Models for the SRC Yields from Kentucky Coals", by N.L. Carr, G.L. Jones and M. McMahon, dated June 18, 1979, File FT07-30-30.

INTRODUCTION

This report is intended as an addendum to the results of the main report (Second-Order Models for the SRC Yields from Kentucky Coal). This report contains contour plots illustrating the effects of variable pairs (except gas velocity) on SRC yields as predicted by the full second-order model in five dimensions. The algebraic form and the statistics associated with the full second-order model are contained in the previous report. In all respects the data base and notation used to obtain the contour plots for the full second-order model are the same as those used in the main report which discussed the predictions of the "stepwise regression model". The behavior of the full second-order model in five dimensions is examined and reported. This provides a basis for comparison with other models which contain fewer variables.

The normal coal liquefaction yields from the reaction section are described as functions of temperature, inlet hydrogen partial pressure, nominal slurry residence time, % coal in the feed slurry, and the % recycle ash in the feed slurry. The models allow for possible curvature in this space. Also, the gas velocity (superficial) is a forced variable (linear) included in each model.

Contour plots are provided for all yields and combinations of the five variables whereas the previous report included plots for the distillates and SRC.

SUMMARY OF THE RESULTS

Although the effects of certain pairs of variables on some yields may differ between the two models, these differences are not normally significant. Furthermore, a comparison of the yields predicted by each model for each of the 79 runs in the data base show very little difference.

The effects of individual variables are summarized in Tables I through IV. Table I summarizes the effects of each individual variable which lead to increases in the responses (yields). Those trends which differ from those of the main report are so indicated. Table II contains a more detailed summary of the directional effects of variable pairs on middle and heavy distillate and SRC yields. Table III summarizes the values of the coefficients of the full second-order models for each of the yields. Not shown is the intercept term which is given in the main report and represents the approximate mean value of each yield predicted by the model. Table IV is generated from Table III by multiplying the coefficients by the mean values of the variables and regrouping these modified coefficients in order to quantify the relative effects of each primary variable on each yield.

The effects of each of the variables on SRC yields are discussed below.

A. Average Reactor Temperature (TAVG)

Table I shows that increasing temperature favors the formation of middle distillate, light gases (C1-C4) and the consumption of hydrogen, while SRC, heavy distillate and naphtha yields tend to decrease with temperature. These trends are born out in Tables II through IV which show that the effect of temperature alone is small, but that temperature-pressure, temperature-squared and temperature-coal (CIN) interactions are really the dominant effects particularly on the yields of middle and heavy distillate and SRC.

B. Inlet Hydrogen Partial Pressure (PH2)

Table I shows that the effect of pressure is rather small for the middle and heavy distillate and SRC yields, and actually decrease somewhat the yields of naphtha and light gases. These trends are clarified by referring to the relatively small values of the modified coefficients in Table IV for the pressure terms compared to the temperature terms. Also the effect of pressure bares out the conclusions of the main report that a decrease in pressure may be possible without sacrificing yields, under certain other conditions.

C. Nominal Slurry Residence Time (SRT)

In the region near the proposed SRC-II design, the effect of SRT is quite weak on all the liquid and solid yields, but increasing SRT does favor the production of light gases and leads to increased consumption of

hydrogen. These trends are illustrated further in Tables II through IV which show that the modified coefficient values for the SRT variables (Table IV) are all relatively small compared to those of temperature or pressure.

D. Inlet Coal Concentration (CIN)

Referring again to Table I, increasing CIN favors the yield of SRC and reduces the yield of all other products. The effect of coal often overrides the effect of a second variable. This can be seen by studying the contour plots and the trends shown in Table II. Table IV shows that all the coal effects are strongly negative indicating the decrease in all yields except SRC with increasing coal concentration. These trends are projected from the normal process design points as described before.

E. Recycle Ash Concentration (RASH)

As discussed in the main report, recycle ash selectively decreases SRC and increases the yield of middle plus heavy distillate. Although middle distillate decreases slightly with increasing ash, the loss is more than compensated by a substantial increase in the yield of heavy distillate. Similarly, yields of naphtha and light gases are also increased and more hydrogen is consumed.

The interaction of ash with other variables such as coal, SRT and temperature shown in Table II clearly illustrate the beneficial effect of ash in interacting with coal slurry in the preheater (CIN·RASH) and with the soup in the reactor (TAVG·RASH, SRT·RASH). A comparison of the modified coefficients in Table IV with the contour plots points up the beneficial effects of ash at greater than 10% levels, even when other variables such as temperature, SRT, pressure and coal are below their mean values.

Table I

SUMMARY OF EFFECTS OF VARIABLES PREDICTED
FROM THE FULL SECOND ORDER MODEL

(Directions are for increases in variables)

<u>Response</u>	AVG	NOM.	Recycle	Hydrogen	Inlet	Linear Gas
	Temperature	SRT	ASH CONC.	Inlet Part.	Coal Conc.	Velocity
	TAVG	SRT	RASH	PH2	CIN	V
SRC	dec.	nil	dec.	nil	inc.	inc.
HD	dec.	nil*	inc.	nil	dec.*	dec.
MD	inc.	nil*	dec.*	nil*	dec.	inc.
NAP	dec.*	dec.*	inc.*	dec.*	dec.*	nil
Cl-C4	inc.	inc.	inc.	dec.*	dec.	nil
HY	inc.	inc.	inc.	nil	dec.	nil

* Indicate qualitative differences in effect between step-wise model predictions and full second order model predictions when compared near the design point.

Table II

SUMMARY TRENDS FOR SRC YIELDS FROM CONTOUR PLOTS

X-Y	Directions of Increasing		
	MD	HD	SRC
T-SRT (OPTIMUM T)	→ (448)	← (448)	↘ ?
T-CIN	↖ ↗	↘	↘
PH2-RASH	↗ *	→	↖
PH2-CIN	↗ *	← *	↘ *
T-PH2	↑ *	↘ *	↓
T-RASH (OPTIMUM T)	↖ (445) *	↗ (445) ↑	↘
PH2-SRT	↘	↖	↖ *
SRT-CIN	↖ ↗	↘ *	↘ *
SRT-RASH	↑	↘	↘ +
CIN-RASH	↖	↘	↗

X

Y

Coordinates for contour plots,
and illustrations above.

? means SRC model behavior is questionable above approximately 9% RASH.

* These trends differ from those of the step-wise regression model.

+ Region less than 9% RASH.

SUMMARY

XX
 THE FOLLOWING REPORT IS COMPOSED OF SIX SECTIONS
 XX
 XX
 SECTION ONE IS A COMPLETE LISTING OF THE DATA BASE CONTAINING INDEPENDENT
 VARIABLES AND YIELDS WHICH ARE DESCRIBED BELOW.
 XX
 SECTION TWO CONTAINS THE RESULTS OF A LINEAR REGRESSION ON THE YIELDS IN THE
 DATA BASE ASSUMING A LINEAR REGRESSION MODEL IN 21 TERMS IN
 WHICH ALL TERMS ARE CONSIDERED SIGNIFICANT. THE COEFFICIENTS AND THE F STA-
 TISTICS ARE HIGHLIGHTED FOR EACH REGRESSION MODEL. AN ALGEBRAIC EXPRESSION
 FOR EACH OF THE REGRESSION MODELS IS ALSO INCLUDED.
 XX
 SECTION THREE CONTAINS PARITY OR SCATTER PLOTS IN WHICH THE YIELD PREDICTIONS
 OF THE MODELS DERIVED IN SECTION TWO ARE PLOTTED AGAINST THE ACTUAL DATA YIELDS.
 XX
 SECTION FOUR CONTAINS THE RESULTS OF A LINEAR REGRESSION ON THE YIELDS OF THE
 DATA BASE ASSUMING A LINEAR REGRESSION MODEL IN 21 TERMS
 IN WHICH ONLY THE TERMS WHICH ARE SIGNIFICANT AT A 95% CONFIDENCE INTERVAL
 ARE RETAINED IN THE MODEL. AS IN SECTION TWO, THE COEFFICIENTS AND F STATISTICS
 ARE HIGHLIGHTED, AND AN ALGEBRAIC EXPRESSION FOR EACH MODEL IS PROVIDED.
 XX
 SECTION FIVE CONTAINS A NUMBER OF PLOTS ILLUSTRATING PREDICTED YIELDS OBTAINED
 FROM THE MODELS IN SECTION FOUR VERSUS EACH OF THE SIX INDEPENDENT VARIABLES
 XX
 SECTION SIX IS COMPRISED OF CONTOUR PLOTS SHOWING CONTOURS OF EACH YIELD FOR
 SELECTED PAIRS OF INDEPENDENT VARIABLES. AGAIN THE YIELDS ARE THOSE PREDICTED
 BY THE MODELS IN SECTION FOUR.
 XX
 XX

TERMS

XX

CODE DESIGNATES ONE OF THE FOUR SRC PILOT PLANTS

.....THOSE BEGINNING WITH FTL ARE FT. LEWIS RUNS

.....THOSE BEGINNING WITH MER ARE MERRIAM RUNS

.....THOSE BEGINNING WITH HRI ARE HYDROCARBON RESEARCH INSTITUTE RUNS

.....THOSE BEGINNING WITH PNN ARE P-99 RUNS

RUN.....A SPECIFIC RUN FOR EACH OF THE PILOT PLANTS

COAL.....KENTUCKY COAL ONLY

MODE.....SRC-I OR SRC-II

TAVG.....AVERAGE REACTOR TEMPERATURE, DEG C

TPRMT.....PREHEATER TEMPERATURE, DEG C

PTOT.....TOTAL AVERAGE REACTOR PRESSURE IN MPA

GASRT.....GAS RATE PER COAL RATE IN MSCF/TON OF COAL

PUR.....GAS PURITY (HYDROGEN CONCENTRATION) IN PER CENT

DIA.....REACTOR DIAMETER IN CM

LEN.....REACTOR LENGTH IN CM

SRT.....NOMINAL SLURRY RESIDENCE TIME (HRS)

CIN.....INLET COAL CONCENTRATION (G COAL/100 G SLURRY FEED)

RMD.....RECYCLE MIDDLE DISTILLATE

RHD.....RECYCLE HEAVY DISTILLATE

RSRC.....RECYCLE SRC

RASH.....RECYCLE ASH

RIOM.....RECYCLE IOM

TOTSOL.....TOTAL SOLIDS IN THE SLURRY FEED

DHY.....NET HYDROGEN CONSUMPTION BASED ON 1 G OF MOISTURE FREE COAL

DC1C4.....NET YIELD OF C1-C4 BASED ON 1 G OF MOISTURE FREE COAL

DBY.....NET YIELD OF BYPRODUCTS BASED ON 1 G OF MOISTURE FREE COAL

DHW.....NET YIELD OF WATER BASED ON 1 G OF MOISTURE FREE COAL

DNAP.....NET YIELD OF NAPHTHA BASED ON 1 G OF MOISTURE FREE COAL

NAPHTHA.....C5-380F

DMD.....NET YIELD OF MIDDLE DISTILLATE BASED ON 1 G OF MOISTURE FREE COAL

MIDDLE DISTILLATE.....380-550F

DHD.....NET YIELD OF HEAVY DISTILLATE BASED ON 1 G OF MOISTURE FREE COAL

HEAVY DISTILLATE.....550-850F

DSRC.....NET YIELD OF SRC BASED ON 1 G OF MOISTURE FREE COAL

DIOM.....NET YIELD OF IOM BASED ON 1 G OF MOISTURE FREE COAL

IOM.....INSOLUBLE ORGANIC MATTER

DASH.....NET YIELD OF ASH BASED ON 1 G OF MOISTURE FREE COAL

PH2.....INLET HYDROGEN PARTIAL PRESSURE IN THE REACTOR (MPA)

V.....GAS LINEAR VELOCITY (CM/SEC)

SHY.....NET HYDROGEN CONSUMPTION PER 100 G OF MAF COAL

SC1C4.....NET YIELD OF C1-C4 PER 100 G OF MAF COAL

SBY.....NET YIELDS

SBY.....NET YIELD OF BYPRODUCTS PER 100 G OF MAF COAL

SHW.....NET YIELD OF WATER PER 100 G OF MAF COAL

SNAP.....NET YIELD OF NAPHTHA PER 100 G OF MAF COAL

SMD.....NET YIELD OF MIDDLE DISTILLATE PER 100 G OF MAF COAL

SHD.....NET YIELD OF HEAVY DISTILLATE PER 100 G OF MAF COAL

SSRC.....NET YIELD OF SRC PER 100 G OF MAF COAL

SIOM.....NET YIELD OF IOM PER 100 G OF MAF COAL

SUMIN.....TOTAL MASS OF COAL AND HYDROGEN IN

SUMOUT.....SUM OF THE NET YIELDS

MTAVG.....MEAN VALUE FOR TEMPERATURE

MPH2.....MEAN VALUE FOR THE AVERAGE HYDROGEN PARTIAL PRESSURE

GLOSSARY

9:35 FRIDAY, JUNE 15, 1979 3

TERMS

MGASRT.....MEAN VALUE FOR THE GAS RATE
MSRT.....MEAN VALUE FOR THE NOMINAL SLURRY RESIDENCE TIME
MCIN.....MEAN VALUE FOR THE INLET COAL CONCENTRATION
MRASH.....MEAN VALUE FOR THE RECYCLE ASH CONCENTRATION
MV.....MEAN VALUE FOR THE GAS LINEAR VELOCITY
VTAVG.....DEVIATION OF THE TEMPERATURE FROM ITS MEAN VALUE
VPH2.....DEVIATION OF THE H2 PARTIAL PRESSURE FROM ITS MEAN VALUE
VGASRT.....DEVIATION OF THE GAS RATE FROM ITS MEAN VALUE
VSRT.....DEVIATION OF THE SLURRY RESIDENCE TIME FROM ITS MEAN VALUE
VRASH.....DEVIATION OF THE RECYCLE ASH FROM ITS MEAN VALUE
VV.....DEVIATION OF THE GAS LINEAR VELOCITY FROM ITS MEAN VALUE
VTP.....CROSS PRODUCT OF VTAVG AND VPH2
VTS.....CROSS PRODUCT OF VTAVG AND VSRT
VTC.....CROSS PRODUCT OF VTAVG AND VCIN
VTR.....CROSS PRODUCT OF VTAVG AND VRASH
VPS.....CROSS PRODUCT OF VPH2 AND VSRT
VPC.....CROSS PRODUCT OF VPH2 AND VCIN
VPR.....CROSS PRODUCT OF VPH2 AND VRASH
VSC.....CROSS PRODUCT OF VSRT AND VCIN
VSR.....CROSS PRODUCT OF VSRT AND VRASH
VCR.....CROSS PRODUCT OF VCIN AND VRASH
XX
XX
OBSERVATIONS CORRESPOND TO RUNS IN THE DATA BASE
XX

LINE INDICATE CONSTANT LEVELS OF NET YIELD OF
SHYMD, HYDROGEN CONSUMPTION

(WEIGHT % BASED ON INLET MAE COAL CONCENTRATION)

VS. TAVG, AVERAGE REACTOR TEMPERATURE (DIG C)

AND PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)

BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SYMBOL	SHYMD	SYMBOL	SHYMD	SYMBOL	SHYMD	SYMBOL	SHYMD
.....	2.576272 - 2.907770	=====	4.233763 - 4.896759	XXXXXX	6.222752 - 6.885748	#####	8.211741 - 8.543239
.....	2.907770 - 3.570766	OOOOOO	4.896759 - 5.559756	#####	6.885748 - 7.548745		
-----	3.570766 - 4.233763	+++++	5.559756 - 6.222752	#####	7.548745 - 8.211741		

NOTE: 1248 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SC1C4ND, C1-C4

17324 FRIDAY, JUNE 8, 1979 2

(WEIGHT % BASED ON INLET WAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE (DEG C)
 AND PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)
 BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 RECYCLE ASH CONCENTRATION(HASH)= 10.17 G/100 G SLURRY FEED

SYMBOL	SC1C4ND	SYMBOL	SC1C4ND	SYMBOL	SC1C4ND
.....	-9.5709083 -	000000	5.2241722 -	000000	22.1326356 -
.....	-7.4573254 -	+++++	9.4513381 -	000000	26.3600015 -
-----	-3.2301595 -	XXXXXX	13.6785039 -		26.4735844
=====	0.4970064 -	000000	17.9056698 -		
	5.2241722		22.1326356		

NOTE: 1248 OBS HIDDEN

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SYMD, BYPRODUCTS (NH₃, H₂S, CO, CO₂)
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE (DEG C)
 AND PH2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
 BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME (SRT)= ONE HOUR
 GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
 COAL CONCENTRATION (CIN)= 30 G/100 G SLURRY FEED
 RECYCLE ASH CONCENTRATION (RASH)= 10.17 G/100 G SLURRY FEED

SYMBOL	SYMD	SYMBOL	SYMD	SYMBOL	SYMD	SYMBOL	SYMD
.....	3.468320 - 3.748124	=====	4.867340 - 5.426947	XXXXXX	6.546163 - 7.105770	#####	8.224986 - 8.504790
.....	3.748124 - 4.307732	UUUUUU	5.426947 - 5.986555	HHHHHH	7.105770 - 7.665378		
-----	4.307732 - 4.867340	+++++	5.986555 - 6.546163	#####	7.665378 - 8.224986		

NOTE: 1248 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHWMD, WATER

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(WEIGHT % BASED ON INLET MAF (COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTION TEMPERATURE (DEG C)
 AND PM2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)

BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SYMBOL	SHWMD	SYMBOL	SHWMD	SYMBOL	SHWMD
.....	7.882962 - 8.623819	000000	13.068960 - 14.550673	000000	18.995814 - 20.477527
.....	8.623819 - 10.105533	+++++	14.550673 - 16.032387	000000	20.477527 - 21.218384
-----	10.105533 - 11.567246	xxxxxx	16.032387 - 17.514100		
=====	11.567246 - 13.068960	000000	17.514100 - 18.995814		

LINE INDICATE CONSTANT LEVELS OF NET YIELD OF
SNAPMD, NAPHTHA (CS-380F)

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. TAVG, AVERAGE REACTION TEMPERATURE (DEG C)

AND PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)

BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SYMBOL		SNAPMD		SYMBOL		SNAPMD		SYMBOL		SNAPMD	
.....	-2.363779 -	-1.018454		000000	7.053494 -	9.744143		000000	17.616091 -	20.506741	
.....	-1.018454 -	1.672195		+++++	9.744143 -	12.434793		000000	20.506741 -	21.852065	
-----	1.672195 -	4.362845		XXXXXX	12.434793 -	15.125442					
=====	4.362845 -	7.053494		000000	15.125442 -	17.616091					

NOTE: 1248 ORS HIDDEN

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHMD, MIDDLE DISTILLATE (380-550)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE (DEG C)
 AND PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)
 BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SYMBOL	SHMD	SYMBOL	SHMD	SYMBOL	SHMD
.....	-21.700429 -	000000	-4.921995 -	000000	14.253357 -
.....	-19.303510 -	+++++	-0.128157 -	000000	19.047195 -
-----	-14.509672 -	xxxxxx	4.665681 -	000000	21.444114
=====	-9.715833 -	888888	9.459519 -		
			14.253357		

NOTE: 1248 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHMD, HEAVY DISTILLATE (550-850)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE (DEG C)
 AND PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)
 BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

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SYMBOL	SHMD	SYMBOL	SHMD	SYMBOL	SHMD	SYMBOL	SHMD
.....	11.28774 - 12.62072	=====	17.96261 - 20.61855	XXXXXX	25.95044 - 28.61638	#####	33.94827 - 35.28124
.....	12.62072 - 15.28666	OOOIXIU	20.61855 - 23.28449	HHHHHH	28.61638 - 31.28233		
-----	15.28666 - 17.95261	+++++	23.28449 - 25.95044	#####	31.28233 - 33.94827		

NOTE : 1248 OBS HIDDEN

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SSRCMD, SRC BOTTOMS (850+)F
 (WEIGHT % BASED ON INLET WAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTION TEMPERATURE (DEG C)
 AND PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)
 BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD
....	12.21686 - 15.47826	=====	28.52389 - 35.04670	XXXXXX	48.09232 - 54.61513	#####	67.66076 - 70.92217
.....	15.47826 - 22.00107	ORXXXX	35.04670 - 41.56951	888888	54.61513 - 61.13795		
-----	22.00107 - 26.52389	+++++	41.56951 - 48.09232	888888	61.13795 - 67.66076		

NOTE: 1248 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL

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LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 S10MMD, INSOLUBLE ORGANIC MATTER
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTION TEMPERATURE (DEG C)
 AND PH2, AVERAGE HYDROGEN PARTIAL PRESSURE(MPA)

BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SYMBOL		S10MMD	SYMBOL		S10MMD	SYMBOL		S10MMD
.....	-4.845591	-3.648610	000000	3.533277	5.927239	000000	13.109126	15.503089
.....	-3.648610	-1.254647	+++++	5.927239	8.321202	000000	15.503089	16.700070
-----	-1.254647	1.139315	XXXXXX	8.321202	10.715164			
=====	1.139315	3.533277	000000	10.715164	13.109126			

NOTE: 1248 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL

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LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
SHYMD, HYDROGEN CONSUMPTION

(WEIGHT % BASED ON INLET MAE COAL CONCENTRATION)

VS. TAVG, AVERAGE REACTOR TEMPERATURE (DEG C)

AND SRT, NOMINAL SLURRY RESIDENCE TIME

BASIS VALUES: RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

INLET COAL CONCENTRATION(CIN)= 30 G/ 100 G SLURRY FEED

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

SYMBOL	SHYMD	SYMBOL	SHYMD	SYMBOL	SHYMD	SYMBOL	SHYMD
=====	2.585277 - 2.835908	=====	3.838431 - 4.339693	XXXXXX	5.342215 - 5.843477	=====	6.846000 - 7.096630
=====	2.835908 - 3.337170	UUUUUU	4.339693 - 4.840954	HHHHHH	5.843477 - 6.344738		
-----	3.337170 - 3.838431	+++++	4.840954 - 5.342215	HHHHHH	6.344738 - 6.846000		

NOTE: 1248 OBS HIDDEN

CUNTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SC1C4MD, C1-C4

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(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. TAVG, AVERAGE REACTOR TEMPERATURE (DIG C)

AND SRT, NOMINAL SLURRY RESIDENCE TIME

BASIS VALUES: RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

INLET COAL CONCENTRATION(CIN)= 30 G/ 100 G SLURRY FEED

PRESSURE(PW2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

LINE INDICATE CONSTANT LEVELS OF NET YIELD OF

SBYMD, BYPRODUCTS (NH₃, H₂S, CO, CO₂)

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. TAVG, AVERAGE REACTOR TEMPERATURE (DEG C)

AND SRT, NOMINAL SLURRY RESIDENCE TIME

BASIS VALUES: RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

INLET COAL CONCENTRATION(ICIN)= 30 G/ 100 G SLURRY FEED

PNRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

SRT

SYMBOL	SBYMD	SYMBOL	SBYMD	SYMBOL	SBYMD	SYMBOL	SBYMD
.....	3.711044 - 3.928830	=====	4.799978 - 5.235552	xxxxxx	6.106700 - 6.542274	#####	7.413421 - 7.631208
.....	3.928830 - 4.364404	000000	5.235552 - 5.671126	000000	6.542274 - 6.977847		
-----	4.364404 - 4.799978	+++++	5.671126 - 6.106700	000000	6.977847 - 7.413421		

NOTE: 1248 OBS HIDDEN

SHMD, WATER

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. TAVG. AVERAGE REACTOR TEMPERATURE (DEG C)

AND SRT, NOMINAL SLURRY RESIDENCE TIME

BASIS VALUES: RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

INLET COAL CONCENTRATION(ICIN)= 30 G/ 100 G SLURRY FEED

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

SYMBOL	SHMD	SYMBOL	SHMD	SYMBOL	SHMD
.....	5.240044 - 6.970973	000000	17.356552 - 20.818412	000000	31.203991 - 34.665851
.....	6.970973 - 10.432833	+++++	20.818412 - 24.260272	000000	34.665851 - 36.396780
-----	10.432833 - 13.894693	XXXXXX	24.260272 - 27.742131		
=====	13.894693 - 17.356552	000000	27.742131 - 31.203991		

NOTE: 1248 ORS HIDDEN

LINE INDICATE CONSTANT LEVELS OF NET YIELD OF
SNAPMD, NAPHTHA (C5-380F)

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. TAVG, AVERAGE REACTOR TEMPERATURE (DEG C)

AND SRT, NOMINAL SLURRY RESIDENCE TIME

BASIS VALUES: RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

INLET COAL CONCENTRATION(CIN)= 30 G/ 100 G SLURRY FEED

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

SYMBOL	SNAPMD	SYMBOL	SNAPMD	SYMBOL	SNAPMD
.....	2.375253 -	000000	7.569444 -	000000	13.505662 -
.....	3.117280 -	+++++	9.653498 -	000000	14.989716 -
-----	4.601335 -	xxxxxx	10.537553 -		15.731744
=====	6.085389 -	000000	12.021607 -		
	7.569444		13.505662		

NOTE: 1248 OBS HIDDEN

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SMDMD, MIDDLE DISTILLATE (380-550)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE (DEG C)
 AND SRT, NOMINAL SLURRY RESIDENCE TIME

BASIS VALUES: RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 INLET COAL CONCENTRATION(ICIN)= 30 G/ 100 G SLURRY FEED
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

SYMBOL		SMDMD	SYMBOL		SMDMD	SYMBOL		SMDMD
.....	-29.363220 -	-25.937729	000000	-5.384783 -	1.466199	000000	22.019146 -	28.870128
.....	-25.937729 -	-19.086747	+++++	1.466199 -	8.317181	000000	28.870128 -	32.295619
-----	-19.086747 -	-12.235765	xxxxxx	8.317181 -	15.168164			
=====	-12.235765 -	-5.384783	000000	15.168164 -	22.019146			

NOTE: 1248 OBS MIDDLE N

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL

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LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHDMD, HEAVY DISTILLATE (550-850)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE (DEG C)
 AND SRT, NOMINAL SLURRY RESIDENCE TIME

BASIS VALUES: RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 INLET COAL CONCENTRATION(ICIN)= 30 G/ 100 G SLURRY FEED
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

SYMBOL	SHDMD	SYMBOL	SHDMD	SYMBOL	SHDMD
.....	4.313971 - 6.462878	000000	19.356323 - 23.654138	000000	36.547583 - 40.845398
+++++	6.462878 - 10.760693	+++++	23.654138 - 27.951953	000000	40.845398 - 42.994306
-----	10.760693 - 15.058508	xxxxxx	27.951953 - 32.249768		
=====	15.058508 - 19.356323	000000	32.249768 - 36.547583		

NOTE: 1248 OBS HIDDEN

SSRCMD, SRC BOTTOMS (850+)F
 (WEIGHT % BASED ON INLET MAF (COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE (DEG C)
 AND SRT, NOMINAL SLURRY RESIDENCE TIME

BASIS VALUES: RECYCLE ASH CONCENTRATION(WASH)= 10.17 G/100 G SLURRY FEED
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 INLET COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD
.....	7.173257 - 11.875045	000000	40.085767 - 44.484341	000000	77.700064 - 87.103638
.....	11.875045 - 21.278619	+++++	44.484341 - 58.892915	000000	87.103638 - 91.805425
-----	21.278619 - 30.682193	XXXXXX	58.892915 - 68.296490		
=====	30.682193 - 40.085767	HHHHHH	68.296490 - 77.700064		

NOTE: 1248 DMS HIDDEN

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
STOMMD, INSOLUBLE ORGANIC MATTER
(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
VS. TAVG, AVERAGE REACTOR TEMPERATURE (DEG C)
AND SRT, NOMINAL SLURRY RESIDENCE TIME

BASIS VALUES: RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED
GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
INLET COAL CONCENTRATION(CIN)= 30 G/ 100 G SLURRY FEED
PRESSURE(PM2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

SYMBOL		STOMMD	SYMBOL		STOMMD	SYMBOL		STOMMD
.....	-1.2702969 -	-0.6368978	oooo	3.1634967 -	4.4302948	oooo	8.2306893 -	9.4974875
++++	-0.6368978 -	0.6299003	++++	4.4302948 -	5.6970930	oooo	9.4974875 -	10.1308866
-----	0.6299003 -	1.8966985	xxxxxx	5.6970930 -	6.9636912			
=====	1.8966985 -	3.1634967	oooo	6.9636912 -	8.2306893			

NOTE: 1248 OBS HIDDEN

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
SHYMD, HYDROGEN CONSUMPTION
(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
VS. TAVG, AVERAGE REACTOR TEMPERATURE (DEG C)
AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL / 100 G SLURRY FEED)
BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME (SRT) = ONE HOUR
PRESSURE (PH2) = 13.79 AT A GAS PURITY OF 91% = 12.55MPA
GAS LINEAR VELOCITY (V) = 1.65504 CM/SEC
RECYCLE ASH CONCENTRATION (RASH) = 10.17 G / 100 G SLURRY FEED

SYMBOL	HYMD	SYMBOL	SHYMD	SYMBOL	SHYMD	SYMBOL	SHYMD
.....	1.450574 - 1.749609	=====	2.913748 - 3.495818	XXXXXX	4.659958 - 5.242028	BBBBBB	6.406168 - 6.697203
.....	1.749609 - 2.331679	OOOUUU	3.495818 - 4.077888	HHHHHH	5.242028 - 5.824098		
-----	2.331679 - 2.913748	+++++	4.077888 - 4.659958	BBBBBB	5.824098 - 6.406168		

NOTE: 1224 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SCIC4MD, C1-C4

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(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE (DEG C)
 AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)
 BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.65MPA
 GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/ 100 G SLURRY FEED

SYMBOL	SCIC4MD	SYMBOL	SCIC4MD	SYMBOL	SCIC4MD
.....	-3.909769 -	000000	8.649648 -	000000	23.003269 -
.....	-2.115567 -	+++++	12.238053 -	000000	26.591674 -
-----	1.472838 -	xxxxxx	15.826458 -		26.591674 -
=====	5.061243 -	000000	19.414864 -		26.591674 -
			23.003269		

NOTE: 1224 OBS HIDDEN

Lines indicate constant levels of net yield of
SBYND, BYPRODUCTS (NH₃, H₂S, CO, CO₂)

(WEIGHT % BASED ON INLET MAE COAL CONCENTRATION)

VS. TAVG, AVERAGE REACTOR TEMPERATURE (DEG C)

AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)

BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME (SRT) = ONE HOUR

PRESSURE (PH₂) = 13.79 AT A GAS PURITY OF 91% = 12.55 MPa

GAS LINEAR VELOCITY (V) = 1.65584 CM/SEC

RECYCLE ASH CONCENTRATION (RASH) = .10, 17 G/ 100 G SLURRY FEED

SYMBOL	S AD		SYMBOL	SBYND		SYMBOL	SBYND		SYMBOL	SBYND					
ooooo	4.382642	-	4.558351	=====	5.261184	-	5.612601	xxxxxx	6.315434	-	6.666850	BBBBBB	7.369684	-	7.645392
ooooo	4.558351	-	4.909767	nnnnnn	5.612601	-	5.964017	nnnnnn	6.666850	-	7.018267				
-----	4.909767	-	5.261184	+++++	5.964017	-	6.315434	BBBBBB	7.018267	-	7.369684				

NOTE: 1224 OBS HIDDEN

LINE INDICATE CONSTANT LEVELS OF NET YIELD OF
SHWMD, WATER

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. TAVG, AVERAGE REACTOR TEMPERATURE (DEG C)

AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)

BASE VALUES: NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA

GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC

RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/ 100 G SLURRY FEED

SYMBOL	SHWMD	SYMBOL	SHWMD	SYMBOL	SHWMD
.....	5.954428 - 6.727007	000000	11.362485 - 12.907644	#####	17.543122 - 19.088282
.....	6.727007 - 8.272167	++++++	12.907644 - 14.452804	#####	19.088282 - 19.860861
-----	8.272167 - 9.817326	xxxxxx	14.452804 - 15.997963		
=====	9.817326 - 11.362485	000000	15.997963 - 17.543122		

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SNAPMD, NAIPHTHA (C5-380F)
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE (DEG C)
 AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)
 BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.85MPA
 GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/ 100 G SLURRY FEED

SYMBOL		SNAPMD	SYMBOL		SNAPMD	SYMBOL		SNAPMD
.....	1.705407 -	2.527460	000000	7.460276 -	9.104382	000000	14.036698 -	15.680803
.....	2.527960 -	4.172065	+++++	9.104382 -	10.748487	000000	15.680803 -	16.502656
-----	4.172065 -	5.816171	xxxxxx	10.748487 -	12.392592			
=====	5.816171 -	7.460276	000000	12.392592 -	14.036698			

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
SMDMD, MIDDLE DISTILLATE (380-550)F
(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
VS. TAVG, AVERAGE REACTOR TEMPERATURE (DEG C)
AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)
BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME (SRT)= ONE HOUR
PRESSURE (PH2)= 13.79 AT A GAS PURITY OF 91% = 12.85MPA
GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
RECYCLE ASH CONCENTRATION (RASH)= 10.17 G/ 100 G SLURRY FEED

SYMBOL		SMDMD	SYMBOL		SMDMD	SYMBOL		SMDMD
.....	-24.369839 -	-21.391378	000000	-3.520609 -	2.436314	888888	20.307082 -	26.264005
.....	-21.391378 -	-15.434455	+++++	2.436314 -	8.393236	888888	26.264005 -	29.242466
-----	-15.434455 -	-9.477532	xxxxxx	8.393236 -	14.350159			
=====	-9.477532 -	-3.520609	888888	14.350159 -	20.307082			

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
SHMD. HEAVY DISTILLATE (550-H50)F
(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
VS. TAVG, AVERAGE REACTOR TEMPERATURE (DEG C)
AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)
BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR
PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA
GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/ 100 G SLURRY FEED

SYMBOL	SHMD	SYMBOL	SHMD	SYMBOL	SHMD
.....	-26.319689 -	000000	-2.574475 -	000000	24.562912 -
.....	-22.927516 -	+++++	4.209872 -	000000	31.347259 -
-----	-16.143169 -	xxxxxx	10.994219 -		34.739433
-----	-9.358822 -	000000	17.778565 -		
-----	-2.574475 -				

NOTE: 1224 UHS HIDDEN

LINE INDICATE CONSTANT LEVELS OF NET YIELD OF

SSRCMD, SAC BUTTOMS (850+)F

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. TAVG, AVERAGE REACTOR TEMPERATURE (DEG C)

AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)

BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.35MPA

GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC

RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/ 100 G SLURRY FEED

SSRCMD	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD
9.09637 - 13.79163	32.57267 - 41.96319	XXXXXX	60.74423 - 70.13475	88.91579 - 93.61105			
13.79163 - 23.18215	41.96319 - 51.35371	000000	70.13475 - 79.52527				
23.18215 - 32.57267	51.35371 - 60.74423	+++++	79.52527 - 88.91579				

NOTE: 1224 OBS HIDDEN

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
S10MND, INSOLUBLE ORGANIC MATTER

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. TAVG, AVERAGE REACTOR TEMPERATURE (DEG C)

AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)

BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55MPA

GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC

RECYCLE ASH CONCENTRATION(HASH)= 10.17 G/ 100 G SLURRY FEED

SYMBOL	S10MND	SYMBOL	S10MND	SYMBOL	S10MND
.....	-5.5736195 -	000000	0.8908552 -	000000	8.2788263 -
.....	-4.6501231 -	+++++	2.7378480 -	000000	10.1258191 -
-----	-2.8031303 -	xxxxxx	4.5848408 -	000000	11.0493155
-----	-0.9561376 -	000000	6.4318336 -		
	0.8908552		8.2788263		

NOTE: 1224 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHYMD, HYDROGEN CONSUMPTION
 (WEIGHT % BASED ON INLET NAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE (DEG C)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME= ONE HOUR

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SYMBOL	SHYMD	SYMBOL	SHYMD	SYMBOL	SHYMD	SYMBOL	SHYMD
.....	2.663969 - 2.633372	=====	3.510984 - 3.849790	XXXXXX	4.527402 - 4.866208	#####	5.543820 - 5.713223
.....	2.633372 - 3.172178	000000	3.849790 - 4.184596	000000	4.866208 - 5.205014		
-----	3.172178 - 3.510984	+++++	4.184596 - 4.527402	000000	5.205014 - 5.543820		

NOTE: 1248 OBS HIDDEN

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF

SCIC4MD, C1-C4

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. TAVG. AVERAGE REACTOR TEMPERATURE (DEG C)

AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)

BASIS VALUES: PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

SLURRY RESIDENCE TIME= ONE HOUR

SYMBOL	SCIC4MD	SYMBOL	SCIC4MD	SYMBOL	SCIC4MD
.....	-4.2615402 -	000000	7.0257454 -	000000	19.9255003 -
.....	-2.6490708 -	+++++	10.2506841 -	000000	23.1504390 -
-----	0.5758679 -	xxxxxx	13.4756228 -		
=====	3.8008067 -	000000	16.7005616 -		
	7.0257454		19.9255003		

NOTE: 1248 OBS HIDDEN

END

LINEs INDICATE CONSTANT LEVELS OF NET YIELD OF

SBYND, BYPRODUCTS (NH₃, H₂S, CO, CO₂)

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. TAVG, AVERAGE REACTOR TEMPERATURE (DEG C)

AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)

BASIS VALUES: PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

SLURRY RESIDENCE TIME= ONE HOUR

SYMBOL	SBYND	SYMBOL	SBYND	SYMBOL	SBYND	SYMBOL	SBYND
+++++	1.647475 - 1.934297	=====	3.081583 - 3.655227	xxxxxx	4.802513 - 5.376156	#####	6.523443 - 6.810264
ooooo	1.934297 - 2.507940	oooooooo	3.655227 - 4.228870	ooooooo	5.376156 - 5.949800		
-----	2.507940 - 3.081583	+++++	4.228870 - 4.802513	#####	5.949800 - 6.523443		

NOTE: 1248 OBS HIDDEN

LINE INDICATE CONSTANT LEVELS OF NET YIELD OF

SHWMD, WATER

(WEIGHT % BASED ON INLET MAF (COAL CONCENTRATION)

VS. TAVG, AVERAGE REACTOR TEMPERATURE (DEG C)

AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)

BASIS VALUES: PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

SLURRY RESIDENCE TIME= ONE HOUR

SYMBOL		SHWMD		SYMBOL		SHWMD		SYMBOL		SHWMD	
.....	2.040368 -	3.277487		000000	10.700205 -	13.174444		000000	20.597161 -	23.071400	
.....	3.277487 -	5.751726		+++++	13.174444 -	15.648683		000000	23.071400 -	24.308520	
-----	5.751726 -	8.225965		xxxxxx	15.648683 -	18.122922					
EEEEEE	8.225965 -	10.700205		000000	18.122922 -	20.597161					

NOTE: 1248 OBS HIDDEN

LINE INDICATE CONSTANT LEVELS OF NET YIELD OF

SNAPMD, NAPHTHA (C5-380F)

1WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. TAVG, AVERAGE REACTION TEMPERATURE (DEG C)

AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)

BASIS VALUES: PRESSURE(PM2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

SLURRY RESIDENCE TIME= ONE HOUR

SYMBOL		SNAPMD	SYMBOL		SNAPMD	SYMBOL		SNAPMD
.....	5.674911 -	6.236444	000000	9.605638 -	10.728702	000000	14.097896 -	15.220961
.....	6.236444 -	7.359508	+++++	10.728702 -	11.851767	000000	15.220961 -	15.782493
-----	7.359508 -	8.482573	xxxxxx	11.851767 -	12.974831			
=====	8.482573 -	9.605638	000000	12.974831 -	14.097896			

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL 17:24 FRIDAY, JUNE 8, 1979 33
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SMDMD, MIDDLE DISTILLATE (360-550)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTION TEMPERATURE (DEG C)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME= ONE HOUR

SYMBOL	SMDMD	SYMBOL	SMDMD	SYMBOL	SMDMD
.....	-29.669216 - -26.783403	000000	-9.468523 - -3.696897	000000	13.617983 - 19.389610
.....	-26.783403 - -21.011776	+++++	-3.696897 - 2.074730	000000	19.389610 - 22.275423
-----	-21.011776 - -15.240150	XXXXXX	2.074730 - 7.846357		
=====	-15.240150 - -9.468523	000000	7.846357 - 13.617983		

NOTE: 1248 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHDMD, HEAVY DISTILLATE (550-850)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE (DEG C)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME= ONE HOUR

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SYMBOL	SHDMD	SYMBOL	SHDMD	SYMBOL	SHDMD
.....	-8.640543 -	000000	5.783681 -	000000	22.268508 -
.....	-6.579940 -	+++++	9.904888 -	000000	26.389715 -
-----	-2.458733 -	xxxxxx	14.026095 -		28.450318
=====	1.662474 -	000000	18.147301 -		
	5.783681		22.268508		

NOTE: 1248 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SSRCMD, SRC BOTTOMS (850+1F)
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTOR TEMPERATURE (DEG C)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME= ONE HOUR

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SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD
.....	14.08524 - 17.52293	=====	31.27369 - 38.14907	XXXXXX	51.89983 - 58.77520	#####	72.52596 - 75.96365
.....	17.52293 - 24.39831	UUUUUU	38.14907 - 45.02445	RRRRRR	58.77520 - 65.65058		
-----	24.39831 - 31.27369	+++++	45.02445 - 51.89983	#####	65.65058 - 72.52596		

NOTE: 1248 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 STOMMD, INSOLUBLE ORGANIC MATTER
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. TAVG, AVERAGE REACTION TEMPERATURE (DEG C)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 SLURRY RESIDENCE TIME= ONE HOUR

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SYMBOL			STOMMD			SYMBOL			STOMMD			SYMBOL			STOMMD		
.....			-2.414423	-	-1.709993	000000			2.516583	-	3.925441	000000			8.152017	-	9.560876
.....			-1.709993	-	-0.301135	+++++			3.925441	-	5.334300	000000			9.560876	-	10.265305
-----			-0.301135	-	1.107724	xxxxxx			5.334300	-	6.743158						
=====			1.107724	-	2.516583	000000			6.743158	-	8.152017						

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHYMD, HYDROGEN CONSUMPTION
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
 AND SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)

BASIS VALUES: TEMPERATURE (TAVG) = 455 C
 COAL CONCENTRATION (M(CIN)) = 30 G/100 G SLURRY FEED
 GAS LINEAR VELOCITY (V) = 1.65584 CM/SEC
 RECYCLE ASH CONCENTRATION (RASH) = 10.17 G/100 G SLURRY FEED

SYMBOL	SHYMD	SYMBOL	SHYMD	SYMBOL	SHYMD	SYMBOL	SHYMD
.....	3.256843 - 3.606301	=====	5.004133 - 5.703048	XXXXXX	7.100880 - 7.794796	#####	9.197628 - 9.547065
.....	3.606301 - 4.305217	UUUUUU	5.703048 - 6.401964	UUUUUU	7.794796 - 8.498712		
-----	4.305217 - 5.004133	+++++	6.401964 - 7.100880	#####	8.498712 - 9.197628		

NOTE: 1196 OBS HIDDEN

LINES INDICATE CONSTANT LEVELS OF NLT YIELD OF
 SC1C4MD, C1-C4
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
 AND SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)
 BASIS VALUES: TEMPERATURE(TAVG)= 455 C
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
 RECYCLE ASM CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SYMBOL	SC1C4MD	SYMBOL	SC1C4MD	SYMBOL	SC1C4MD
.....	5.659529 - 6.844160	000000	13.951945 - 16.321207	000000	23.428492 - 25.798254
.....	6.844160 - 9.213422	+++++	16.321207 - 18.690469	000000	25.798254 - 26.982885
-----	9.213422 - 11.582683	XXXXX	18.690469 - 21.059731		
=====	11.582683 - 13.951945	000000	21.059731 - 23.428492		

NOTE: 1196 DMS HIDDEN

Lines indicate constant levels of net yield of
SBYMD, BYPRODUCTS (NH₃, H₂S, CO, CO₂)

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. PM2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)

AND SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)

BASIS VALUES: TEMPERATURE(TAVG)= 455 C

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC

RECYCLE ASH CONCENTRATION(RASH)= 10.17 G /100 G SLURRY FEED

SYMBOL	SBYMD	SYMBOL	SBYMD	SYMBOL	SBYMD	SYMBOL	SBYMD
.....	2.834837 - 3.079622	=====	4.058764 - 4.548335	xxxxxxx	5.527477 - 6.017048	#####	6.996189 - 7.240975
.....	3.079622 - 3.569193	000000	4.548335 - 5.037906	#####	6.017048 - 6.506618		
-----	3.569193 - 4.058764	+++++	5.037905 - 5.527477	#####	6.506618 - 6.996189		

NOTE: 1196 OBS HIDDEN

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
SHWMD, WATER

(WEIGHT % BASED ON INLET HAF COAL CONCENTRATION)
VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)

AND SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)

BASIS VALUES: TEMPERATURE(TAVG)= 455 C

COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED

GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC

RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SYMBOL	SHWMD	SYMBOL	SHWMD	SYMBOL	SHWMD
.....	3.947330 - 5.174648	000000	12.538557 - 14.993193	#####	22.357101 - 24.811737
.....	5.174648 - 7.629264	+++++	14.993193 - 17.447829	#####	24.811737 - 26.039055
-----	7.629264 - 10.083921	xxxxxx	17.447829 - 19.902465		
=====	10.083921 - 12.538557	000000	19.902465 - 22.357101		

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SNAPMD, NAPHTHA (C5-360F)
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
 AND SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)
 BASIS VALUES: TEMPERATURE (TAVG) = 455 C
 COAL CONCENTRATION (CIN) = 30 G/100 G SLURRY FEED
 GAS LINEAR VELOCITY (V) = 1.65584 CM/SEC
 RECYCLE ASH CONCENTRATION (RASH) = 10.17 G/100 G SLURRY FEED

SYMBOL		SNAPMD	SYMBOL		SNAPMD	SYMBOL		SNAPMD
.....	-10.276874 -	-8.858475	000000	-0.348084 -	2.486713	000000	10.999105 -	13.835902
.....	-8.858475 -	-6.021678	000000	2.486713 -	5.325510	000000	13.835902 -	15.254300
-----	-6.021678 -	-3.184881	XXXXXX	5.325510 -	8.162307			
=====	-3.184881 -	-0.348084	000000	8.162307 -	10.999105			

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SMDMD, MIDDLE DISTILLATE (380-550)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPa)
 AND SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)
 BASIS VALUES: TEMPERATURE (TAVG) = 455 C
 COAL CONCENTRATION (CIN) = 30 G/100 G SLURRY FEED
 GAS LINEAR VELOCITY (V) = 1.65584 CM/SEC
 RECYCLE ASM CONCENTRATION (RASH) = 10.17 G/100 G SLURRY FEED

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SYMBOL	SMDMD	SYMBOL	SMDMD	SYMBOL	SMDMD
.....	-9.406196 -	000000	2.654453 -	000000	17.009481 -
.....	-8.111817 -	+++++	6.243210 -	000000	20.598238 -
-----	-4.523060 -	xxxxxx	9.831967 -		22.392617
=====	-0.434303 -	000000	13.420724 -		
			17.009481		

NOTE: 1196 HRS HIDDEN

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
SHDMO, HEAVY DISTILLATE (550-H50)F
(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
AND SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)

BASIS VALUES: TEMPERATURE(TAVG)= 455 C
COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SYMBOL	SHDMO	SYMBOL	SHDMO	SYMBOL	SHDMO
.....	8.250564 - 10.050928	000000	20.853114 - 24.453843	#####	35.256029 - 38.856758
+++++	10.050928 - 13.651657	+++++	24.453843 - 28.054571	#####	38.856758 - 40.657122
-----	13.651657 - 17.252385	xxxxxx	28.054571 - 31.655300		
=====	17.252385 - 20.853114	000000	31.655300 - 35.256029		

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SSRCMD, SRC BOTTOMS (850+1)F
 (WEIGHT % BASED ON INLET MAP COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
 AND SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)
 BASIS VALUES: TEMPERATURE(TAVG)= 455 C
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

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SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD
.....	19.29658 - 20.12836	== == ==	23.45546 - 25.11901	XXXXXX	28.44612 - 30.10967	#####	33.43677 - 34.26854
.....	20.12836 - 21.79191	000000	25.11901 - 26.78256	000000	30.10967 - 31.77322		
-----	21.79191 - 23.45546	+++++	26.78256 - 28.44612	000000	31.77322 - 33.43677		

NOTE: 1196 UBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL 17:24 FRIDAY, JUNE 8, 1979 46
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 STOMNO, INSOLUBLE ORGANIC MATTER
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
 AND SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)
 BASIS VALUES: TEMPERATURE(TAVG)= 455 C
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SYMBOL		SIGNMD		SYMBOL		SIGNMD		SYMBOL		SIGNMD		
.....		0.2737132	-	1.1206954	000000	6.2025886	-	7.8965530	000000	12.9784461	-	14.6724105
.....		1.1206954	-	2.8146598	+++++	7.8965530	-	9.5905174	000000	14.6724105	-	15.5193927
-----		2.8146598	-	4.5086242	XXXXXX	9.5905174	-	11.2844818				
=====		4.5086242	-	6.2025886	000000	11.2844818	-	12.9784461				

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHYMD, HYDROGEN CONSUMPTION
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
 AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)
 BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 TEMPERATURE (TAVG)= 455 C
 GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
 RECYCLE ASH CONCENTRATION(WASH)= 10.17 G/ 100 G SLURRY FEED

1
 15:59 MONDAY, JUNE 11, 1979

SYMBOL	SHYMD	SYMBOL	SHYMD	SYMBOL	SHYMD	SYMBOL	SHYMD
.....	1.188869 - 1.594433	=====	3.216688 - 4.027815	XXXXXX	5.650070 - 6.461198	#####	8.083452 - 8.489016
.....	1.594433 - 2.405561	UUUUUU	4.027815 - 4.838943	HHHHHH	6.461198 - 7.272325		
-----	2.405561 - 3.216688	+++++	4.838943 - 5.650070	#####	7.272325 - 8.083452		

NOTE: 1173 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SC1C4MD, C1-C4

2
 15:59 MONDAY, JUNE 11, 1979

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. IPH2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
 AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)
 BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 TEMPERATURE (TAVG)= 455 C
 GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/ 100 G SLURRY FEED

SYMBOL	SC1C4MD	SYMBOL	SC1C4MD	SYMBOL	SC1C4MD	SYMBOL	SC1C4MD
.....	10.60878 - 11.32368	=====	14.18329 - 15.61309	xxxxxx	18.47270 - 19.90251	#####	22.76212 - 23.47702
.....	11.32368 - 12.75349	000000	15.61309 - 17.04290	000000	19.90251 - 21.33231		
-----	12.75349 - 14.18329	+++++	17.04290 - 18.47270	000000	21.33231 - 22.76212		

NOTE: 1173 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SBYMD, BYPRODUCTS (NH₃, H₂S, CO, CO₂)
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PH₂, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
 AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)
 BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME (SRT)= ONE HOUR
 TEMPERATURE (TAVG)= 455 C
 GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
 RECYCLE ASH CONCENTRATION (RASH)= 10.17 G/ 100 G SLURRY FEED

3
 15:59 MONDAY, JUNE 11, 1979

SYMBOL	SBYMD	SYMBOL	SBYMD	SYMBOL	SBYMD	SYMBOL	SBYMD
.....	2.074025 - 2.375703	=====	3.582413 - 4.185768	XXXXXX	5.392478 - 5.995834	#####	7.202544 - 7.504222
.....	2.375703 - 2.979058	000000	4.185768 - 4.789123	000000	5.995834 - 6.599189		
-----	2.979058 - 3.582413	+++++	4.789123 - 5.392478	000000	6.599189 - 7.202544		

NOTE: 1173 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL

LINE INDICATE CONSTANT LEVELS OF NET YIELD OF
SHWMD, WATER

15:59 MONDAY, JUNE 11, 1979

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)
BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR

TEMPERATURE(TAVG)= 455 C
GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/ 100 G SLURRY FEED

SYMBOL	SHWMD	SYMBOL	SHWMD	SYMBOL	SHWMD
.....	6.793700 - 7.093208	000000	8.890251 - 9.489266	000000	11.286310 - 11.885325
.....	7.093208 - 7.692222	+++++	9.489266 - 10.088281	000000	11.885325 - 12.184832
-----	7.692222 - 8.291237	xxxxxx	10.088281 - 10.687295		
xxxxxx	8.291237 - 8.890251	000000	10.687295 - 11.286310		

NOTE: 1173 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SNAPMD, NAPHTHA (C5-380F)
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
 AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)
 BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME (SRT)= ONE HOUR
 TEMPERATURE (TAVG)= 455 C
 GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
 RECYCLE ASH CONCENTRATION (RASH)= 10.17 G/ 100 G SLURRY FEED

5
 15:59 MONDAY, JUNE 11, 1979

SYMBOL		SNAPMD		SYMBOL		SNAPMD		SYMBOL		SNAPMD		
.....		-7.615229	-	-8.179536	000000	2.434624	-	5.306010	000000	13.920170	-	16.791557
.....		-6.179536	-	-3.308150	+++++	5.306010	-	8.177397	000000	16.791557	-	18.227250
-----		-3.308150	-	-0.436763	xxxxxx	8.177397	-	11.048783				
=====		-0.436763	-	2.434624	000000	11.048783	-	13.920170				

NOTE: 1173 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL

15:59 MONDAY, JUNE 11, 1979

LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SMDND, MIDDLE DISTILLATE (380-550)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PM2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
 AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)
 BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 TEMPERATURE(TAVG)= 455 C
 GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/ 100 G SLURRY FEED

SYMBOL	SMDND	SYMBOL	SMDND	SYMBOL	SMDND
.....	-9.1649331 -	000000	0.6734961 -	000000	11.9174151 -
.....	-7.7594432 -	+++++	3.4844758 -	000000	14.7283949 -
-----	-4.9484634 -	xxxxxx	6.2954556 -		
=====	-2.1374837 -	000000	9.1064354 -		

NOTE: 1173 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHDMD, HEAVY DISTILLATE (550-850)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
 AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)
 BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 TEMPERATURE(TAVG)= 455 C
 GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/ 100 G SLURRY FEED

7
 15:59 MONDAY, JUNE 11, 1979

SYMBOL	SHDMD	SYMBOL	SHDMD	SYMBOL	SHDMD	SYMBOL	SHDMD
-----	14.80248 - 15.24891	=====	17.03466 - 17.92754	xxxxxxx	19.71328 - 20.60616	#####	22.39190 - 22.83834
ooooo	15.24891 - 16.14179	oooooooo	17.92754 - 18.82041	oooooooo	20.60616 - 21.49903		
-----	16.14179 - 17.03466	+++++	18.82041 - 19.71328	#####	21.49903 - 22.39190		

NOTE: 1173 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SSRCMD, SRC BOTTOMS (850+1F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
 AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)
 BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 TEMPERATURE(TAVG)= 455 C
 GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/ 100 G SLURRY FEED

8
 15:59 MONDAY, JUNE 11, 1979

SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD
.....	20.42778 - 22.57729	=====	31.17535 - 35.47438	xxxxxx	44.07243 - 48.37146	#####	56.96952 - 59.11903
.....	22.57729 - 26.87632	000000	35.47438 - 39.77341	888888	48.37146 - 52.67049		
-----	26.87632 - 31.17535	+++++	39.77341 - 44.07243	888888	52.67049 - 56.96952		

NOTE: 1173 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL

Lines indicate constant levels of net yield of

S10MMD, INSOLUBLE ORGANIC MATTER

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. PM2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)

AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)

BASIS VALUES: NOMINAL SLURRY RESIDENCE TIME (SRT) = ONE HOUR

TEMPERATURE (TAVG) = 455 C

GAS LINEAR VELOCITY (V) = 1.65584 CM/SEC

RECYCLE ASH CONCENTRATION (RASH) = 10.17 G/ 100 G SLURRY FEED

15:59 MONDAY, JUNE 11, 1979

SYMBOL		S10MMD	SYMBOL		S10MMD	SYMBOL		S10MMD
.....	-0.542983 -	0.294770	000000	5.321291 -	6.996798	#####	12.023319 -	13.698826
.....	0.264770 -	1.970277	+++++	6.996798 -	8.672305	#####	13.698826 -	14.536579
-----	1.970277 -	3.645784	xxxxxx	8.672305 -	10.347812			
#####	3.645784 -	5.321291	#####	10.347812 -	12.023319			

NOTE: 1173 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHYMD, HYDROGEN CONSUMPTION
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: TEMPERATURE(TAVG)= 455 C
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
 NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR

10
 15:59 MONDAY, JUNE 11, 1979

SYMBOL	SHYMD	SYMBOL	SHYMD	SYMBOL	SHYMD	SYMBOL	SHYMD
.....	3.313766 - 3.564677	=====	4.568317 - 5.070137	XXXXXX	6.073777 - 6.575597	#####	7.579237 - 7.830147
.....	3.564677 - 4.066497	000000	5.070137 - 5.571957	000000	6.575597 - 7.077417		
-----	4.066497 - 4.568317	+++++	5.571957 - 6.073777	000000	7.077417 - 7.579237		

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR-REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SC1C4MD, C1-C4
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: TEMPERATURE(TAVG)= 455 C
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
 NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR

11
 15:59 MONDAY, JUNE 11, 1979

SYMBOL	SC1C4MD	SYMBOL	SC1C4MD	SYMBOL	SC1C4MD	SYMBOL	SC1C4MD
.....	10.69895 - 11.32295	=====	13.81898 - 15.06700	XXXXXX	17.56302 - 18.81104	#####	21.30707 - 21.93107
.....	11.32295 - 12.57097	OUOUOU	15.06700 - 16.31501	UUUUUU	18.81104 - 20.05905		
-----	12.57097 - 13.81898	+++++	16.31501 - 17.56302	UUUUUU	20.05905 - 21.30707		

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SBYND, BYPRODUCTS (NH₃, H₂S, CO, CO₂)
 (WEIGHT % BASED ON INLET MAFCOAL CONCENTRATION)
 VS. PH₂, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: TEMPERATURE (TAVG) = 455 C
 COAL CONCENTRATION (CIN) = 30 G/100 G SLURRY FEED
 GAS LINEAR VELOCITY (V) = 1.65584 CM/SEC
 NOMINAL SLURRY RESIDENCE TIME (SRT) = ONE HOUR

12
 15:59 MONDAY, JUNE 11, 1979

FL	SBYND	SYMBOL	SBYND	SYMBOL	SBYND	SYMBOL	SBYND
0.000	2.711345 - 2.952211	=====	3.915675 - 4.397407	XXXXXX	5.360871 - 5.842603	BBBBBB	6.806066 - 7.046932
1.016	2.952211 - 3.433943	000000	4.397407 - 4.879139	BBBBBB	5.842603 - 6.324335		
2.032	3.433943 - 3.915675	+++++	4.879139 - 5.360871	BBBBBB	6.324335 - 6.806066		

TE: 1196 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHAND, WATER
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: TEMPERATURE(TAVG)= 455 C
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
 NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR

13
 15:59 MONDAY, JUNE 11, 1979

SYMBOL	SHAND	SYMBOL	SHAND	SYMBOL	SHAND
.....	6.693848 - 7.053504	000000	9.211442 - 9.930754	000000	12.088692 - 12.808005
.....	7.053504 - 7.772817	+++++	9.930754 - 10.650067	000000	12.808005 - 13.167661
-----	7.772817 - 8.492129	XXXXXX	10.650067 - 11.369380		
000000	8.492129 - 9.211442	000000	11.369380 - 12.088692		

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SNAPMD, NAPHTHA (C5-380F)
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PM2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: TEMPERATURE(TAVG)= 455 C
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
 NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR

14
 15:59 MONDAY, JUNE 11, 1979

SYMBOL			SNAPMD			SYMBOL			SNAPMD			SYMBOL			SNAPMD		
.....	-5.6979036	-	-4.4510162	000000	3.0303080	-	5.5240827	000000	13.0054069	-	15.4991817	000000	15.4991817	-	16.7460690		
.....	-4.4510162	-	-1.9572415	+++++	5.5240827	-	8.0178575	000000	15.4991817	-	16.7460690						
-----	-1.9572415	-	0.5365332	xxxxxx	8.0178575	-	10.5116322										
=====	0.5365332	-	3.0303080	000000	10.5116322	-	13.0054069										

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SMDMD, MIDDLE DISTILLATE (380-550°F)
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: TEMPERATURE(TAVG)= 455 C
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
 NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR

15
 18:59 MONDAY, JUNE 11, 1979

SYMBOL	SMDMD	SYMBOL	SMDMD	SYMBOL	SMDMD
.....	6.274780 - 6.704401	000000	9.262130 - 10.141373	000000	12.719102 - 13.578345
.....	6.704401 - 7.563644	+++++	10.141373 - 11.000616	000000	13.578345 - 14.007966
-----	7.563644 - 8.422887	XXXXXX	11.000616 - 11.859859		
000000	8.422887 - 9.282130	000000	11.859859 - 12.719102		

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHDMD, HEAVY DISTILLATE (550-850)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: TEMPERATURE(TAVG)= 455 C
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
 NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR

16
 15:59 MONDAY, JUNE 11, 1979

SYMBOL	SHDMD	SYMBOL	SHDMD	SYMBOL	SHDMD
.....	-1.923607 - -0.401446	000000	8.731519 - 11.775841	000000	20.908806 - 23.953128
.....	-0.401446 - 2.642875	+++++	11.775841 - 14.820162	000000	23.953128 - 26.475288
-----	2.642875 - 5.687197	XXXXXX	14.820162 - 17.864484		
-----	5.687197 - 8.731519	000000	17.864484 - 20.908806		

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SSRCMD, SHC BOTTOMS (850+)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: TEMPERATURE(TAVG)= 455 C
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
 NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR

17
 15:50 MONDAY, JUNE 11, 1979

SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD
.....	24.94014 - 26.42354	=====	32.35710 - 35.32388	xxxxxx	41.25745 - 44.22423	#####	50.15779 - 51.64118
.....	26.42354 - 29.39032	000000	35.32388 - 38.29066	000000	44.22423 - 47.19101		
-----	29.39032 - 32.35710	++ ++	38.29066 - 41.25745	000000	47.19101 - 50.15779		

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 STOMMD, INSOLUBLE ORGANIC MATTER
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. PH2, AVERAGE HYDROGEN PARTIAL PRESSURE (MPA)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: TEMPERATURE(TAVG)= 455 C
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 GAS LINEAR VELOCITY (V)= 1.65584 CM/SEC
 NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR

18
 15:59 MONDAY, JUNE 11, 1979

SYMBOL	STOMMD	SYMBOL	STOMMD	SYMBOL	STOMMD
.....	0.3313028 - 1.1492968	000000	6.0572602 - 7.6932480	000000	12.6012115 - 14.2371993
.....	1.1492968 - 2.7852846	+++++	7.6932480 - 9.3292359	000000	14.2371993 - 15.0551932
-----	2.7852846 - 4.4212724	XXXXXX	9.3292359 - 10.9652237		
XXXXXX	4.4212724 - 6.0572602	000000	10.9652237 - 12.6012115		

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHYMD, HYDROGEN CONSUMPTION
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)
 AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)
 BASIS VALUES: TEMPERATURE(TAVG)= 455 C
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

19
 15:59 MONDAY, JUNE 11, 1979

SYMBOL	SHYMD	SYMBOL	SHYMD	SYMBOL	SHYMD
.....	-0.9700458 - -0.5595863	000000	1.9031710 - 2.7240901	888888	5.1868474 - 6.0077665
+++++	-0.5595863 - 0.2613328	+++++	2.7240901 - 3.5450092	888888	6.0077665 - 6.4182260
-----	0.2613328 - 1.0822519	XXXXXX	3.5450092 - 4.3659283		
000000	1.0822519 - 1.9031710	000000	4.3659283 - 5.1868474		

NOTE: 1122 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SC1C4MD, C1-C4

20
 15:59 MONDAY, JUNE 11, 1979

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)
 AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)
 BASIS VALUES: TEMPERATURE(TAVG)= 455 C
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.65 MPA
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SYMBOL	SC1C4MD	SYMBOL	SC1C4MD	SYMBOL	SC1C4MD
.....	6.243585 - 7.283395	000000	13.522259 - 15.601881	000000	21.840745 - 23.920366
.....	7.283395 - 9.363017	+++++	15.601881 - 17.681502	000000	23.920366 - 24.960177
-----	9.363017 - 11.442638	xxxxxx	17.681502 - 19.761124		
000000	11.442638 - 13.522259	000000	19.761124 - 21.840745		

NOTE: 1122 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL

LINE INDICATE CONSTANT LEVELS OF NET YIELD OF

SBYMD, BYPRODUCTS (NH₃, H₂S, CO, CO₂)

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)

AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)

BASIS VALUES: TEMPERATURE(TAVG)= 455 C

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPa

RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

21
15:59 MONDAY, JUNE 11, 1979

SYMBOL	SBYMD	SYMBOL	SBYMD	SYMBOL	SBYMD	SYMBOL	SBYMD
.....	3.219063 - 3.405287	=====	4.150185 - 4.522634	XXXXXX	5.267532 - 5.639981	#####	6.384878 - 6.571103
.....	3.405287 - 3.777736	UUUUUU	4.522634 - 4.895083	BBBBBB	5.639981 - 6.012429		
-----	3.777736 - 4.150185	+++++	4.895083 - 5.267532	#####	6.012429 - 6.384878		

NOTE: 1122 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHWMD, WATER

22
 15:59 MONDAY, JUNE 11, 1979

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)
 AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)
 BASIS VALUES: TEMPERATURE(TAVG)= 455 C
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

SYMBOL		SHWMD	SYMBOL		SHWMD	SYMBOL		SHWMD
.....	2.545885 -	3.458848	000000	8.936626 -	10.762552	#####	16.240330 -	18.066255
.....	3.458848 -	5.284774	+++++	10.762552 -	12.588478	#####	18.066255 -	10.979218
-----	5.284774 -	7.110700	XXXXXX	12.588478 -	14.414404			
=====	7.110700 -	8.936626	888888	14.414404 -	16.240330			

NOTE: 1122 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL

LINE INDICATE CONSTANT LEVELS OF NET YIELD OF

SNAPMD, NAPHTHA (C5-380F)

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)

AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)

BASIS VALUES: TEMPERATURE(TAVG)= 455 C

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.58 MPA

RECYCLE ASM CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

23
15:59 MONDAY, JUNE 11, 1979

SYMBOL	SNAPMD	SYMBOL	SNAPMD	SYMBOL	SNAPMD
.....	-6.218519 -	000000	1.399343 -		10.105471 -
.....	-5.130253 -	+++++	3.575875 -		12.282003 -
-----	-2.453721 -	XXXXXX	5.752407 -		13.370269
=====	-0.777189 -	000000	7.928939 -		
	1.399343		10.105471		

NOTE: 1122 OBS HIDDEN

CONTOUR PLOT: FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SMDMD, MIDDLE DISTILLATE (380-550°F)
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)
 AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)
 BASIS VALUES: TEMPERATURE(TAVG)= 455 C
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPa
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

24
 15:59 MONDAY, JUNE 11, 1970

NOTE: 1122 085 HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHDMD, HEAVY DISTILLATE (550-850)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)
 AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)
 BASIS VALUES: TEMPERATURE(TAVG)= 455 C
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

25
 15:59 MONDAY, JUNE 11, 1979

SYMBOL	SHDMD	SYMBOL	SHDMD	SYMBOL	SHDMD
.....	8.955007 - 10.323151	000000	18.532016 - 21.268304	#####	29.477168 - 32.213456
.....	10.323151 - 13.059439	+++++	21.268304 - 24.004592	#####	32.213456 - 33.581600
-----	13.059439 - 15.795727	xxxxxx	24.004592 - 26.740880		
=====	15.795727 - 18.532016	000000	26.740880 - 29.477168		

NOTE: 1122 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL

LINE INDICATE CONSTANT LEVELS OF NET YIELD OF

SSRCMD, SRC BOTTOMS (850+)F

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)

AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)

BASIS VALUES: TEMPERATURE(TAVG)= 455 C

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

RECYCLE ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

26
15:59 MONDAY, JUNE 11, 1979

SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD
.....	18.64996 - 20.53325	=====	28.06637 - 31.83293	XXXXXX	39.36605 - 43.13262	BBBBBB	50.66574 - 52.54902
.....	20.53325 - 24.29981	OOOOOO	31.83293 - 35.59949	HHHHHH	43.13262 - 46.89918		
-----	24.29981 - 28.06637	+++++	35.59949 - 39.36605	BBBBBB	46.89918 - 50.66574		

NOTE: 1122 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL

Lines indicate constant levels of net yield of

SIOMND, INSOLUBLE ORGANIC MATTER

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)

AND CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)

BASIS VALUES: TEMPERATURE(TAVG)= 455 C

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.65 MPA

RECYCLL ASH CONCENTRATION(RASH)= 10.17 G/100 G SLURRY FEED

27
15:59 MONDAY, JUNE 11, 1979

SYMBOL	SIOMND	SYMBOL	SIOMND	SYMBOL	SIOMND	SYMBOL	SIOMND
.....	4.232519 - 4.483792	=====	5.488884 - 5.991430	XXXXXX	6.496522 - 7.499068	#####	8.504160 - 8.755433
.....	4.483792 - 4.986338	000000	5.991430 - 6.493976	#####	7.499068 - 8.001614		
-----	4.986338 - 5.488884	+++++	6.493976 - 6.996522	#####	8.001614 - 8.504160		

NOTE: 1122 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHYMD, HYDROGEN CONSUMPTION
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 TEMPERATURE(TAVG)= 465 C

28
 15:59 MONDAY, JUNE 11, 1979

SYMBOL	SHYMD	SYMBOL	SHYMD	SYMBOL	SHYMD	SYMBOL	SHYMD
-----	1.576616 - 1.818848	=====	2.787778 - 3.272242	XXXXXX	4.241172 - 4.725636	#####	5.694566 - 5.936798
.....	1.818848 - 2.303313	000000	3.272242 - 3.756707	000000	4.725636 - 5.210101		
-----	2.303313 - 2.787778	+++++	3.756707 - 4.241172	000000	5.210101 - 5.694566		

NOTE: 1144 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SC1C4MD, C1-C4
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.65 MPA
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 TEMPERATURE(TAVG)= 455 C

29
 15:59 MONDAY, JUNE 11, 1979

SYMBOL	SC1C4MD	SYMBOL	SC1C4MD	SYMBOL	SC1C4MD
.....	3.178399 - 4.228100	000000	10.526305 - 12.625706	000000	18.923911 - 21.023313
.....	4.228100 - 6.327501	+++++	12.625706 - 14.725108	000000	21.023313 - 22.073013
-----	6.327501 - 8.426903	XXXXXX	14.725108 - 16.824509		
=====	8.426903 - 10.526305	000000	16.824509 - 18.923911		

NOTE: 1144 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SBYMD, BYPRODUCTS (NH₃, H₂S, CO, CO₂)
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: PRESSURE(PH2) = 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 GAS LINEAR VELOCITY(V) = 1.65584 CM/SEC
 COAL CONCENTRATION(CIN) = 30 G/100 G SLURRY FEED
 TEMPERATURE(TAVG) = 455 C

30
 15:59 MONDAY, JUNE 11, 1979

SYMBOL	SBYMD	SYMBOL	SBYMD	SYMBOL	SBYMD	SYMBOL	SBYMD
.....	2.417903 - 2.588976		3.273268 - 3.615415	XXXXXX	4.299707 - 4.641853		5.326146 - 5.407219
.....	2.588976 - 2.931122	000000	3.615415 - 3.957561	000000	4.641853 - 4.984000		
-----	2.931122 - 3.273268	+++++	3.957561 - 4.299707	000000	4.984000 - 5.326146		

NOTE: 1144 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHWND, WATER
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 TEMPERATURE(TAVG)= 455 C

31
 15:59 MONDAY, JUNE 11, 1979

SYMBOL	SHWND	SYMBOL	SHWND	SYMBOL	SHWND
.....	4.523638 - 5.599217	000000	12.052693 - 14.203852	000000	20.657328 - 22.808486
.....	5.599217 - 7.750376	+++++	14.203852 - 16.355010	000000	22.808486 - 23.884066
-----	7.750376 - 9.901535	xxxxxx	16.355010 - 18.506169		
000000	9.901535 - 12.052693	000000	18.506169 - 20.657328		

NOTE: 1144 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SNAPMD, NAPHTHA (C5-380F)
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 TEMPERATURE(TAVG)= 455 C

32
 15:59 MONDAY, JUNE 11, 1979

SYMBOL	SNAPMD	SYMBOL	SNAPMD	SYMBOL	SNAPMD
.....	1.629000 - 2.175486	000000	5.454403 - 6.547375	888888	9.826291 - 10.919263
.....	2.175486 - 3.268458	+++++	6.547375 - 7.640347	888888	10.919263 - 11.465749
-----	3.268458 - 4.361430	xxxxxx	7.640347 - 8.733319		
xxxxxx	4.361430 - 5.454403	888888	8.733319 - 9.826291		

NOTE: 1144 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SNOWD, MIDDLE DISTILLATE (380-550)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 TEMPERATURE(TAVG)= 455 C

33
 15:59 MONDAY, JUNE 11, 1979

SYMBOL	SNOWD	SYMBOL	SNOWD	SYMBOL	SNOWD
.....	-3.9246377 - -2.5120358	000000	5.9647754 - 8.7903792	000000	17.2671905 - 20.0927943
.....	-2.5120358 - 0.3135679	+++++	8.7903792 - 11.6159830	000000	20.0927943 - 21.5055951
-----	0.3135679 - 3.1391717	XXXXXX	11.6159830 - 14.4415867		
000000	3.1391717 - 5.9647754	000000	14.4415867 - 17.2671905		

NOTE: 1144 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHMD. HEAVY DISTILLATE (550-850)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. SRT. NOMINAL SLURRY RESIDENCE TIME (HRS)
 AND RASH. RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 TEMPERATURE(TAVG)= 455 C

SYMBOL		SHDMD		SYMBOL		SHDMD		SYMBOL		SHDMD	
.....	0.3598514 -	2.3936918	000000	14.5967343 -	18.6644151	000000	30.8674575 -	34.9351383			
.....	2.3936918 -	6.4613727	+++++	18.6644151 -	22.7320959	000000	34.9351383 -	36.9689787			
-----	6.4613727 -	10.5290535	XXXXXX	22.7320959 -	26.7997767						
-----	10.5290535 -	14.5967343	000000	26.7997767 -	30.8674575						

NOTE: 1144 OBS HIDDEN

15:59 MONDAY, JUNE 11, 1979

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SSRCMD, SRC BOTTOMS (850+)*
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.65 MPa
 GAS LINEAR VELOCITY(V)= 1.65504 CM/SEC
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 TEMPERATURE(TAVG)= 455 C

SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD
.....	25.02390 - 27.56426	=====	37.72570 - 42.80642	XXXXXX	52.96787 - 58.04659	#####	68.21003 - 70.78039
.....	27.56426 - 32.64498	000000	42.80642 - 47.88714	888888	58.04659 - 63.12931		
-----	32.64498 - 37.72570	+++++	47.88714 - 52.96787	888888	63.12931 - 68.21003		

NOTE: 1144 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 STOMMD, INSOLUBLE ORGANIC MATTER
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. SRT, NOMINAL SLURRY RESIDENCE TIME (HRS)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 COAL CONCENTRATION(CIN)= 30 G/100 G SLURRY FEED
 TEMPERATURE(TAVG)= 455 C

36
 15:59 MONDAY, JUNE 11, 1970

SYMBOL	STOMMD	SYMBOL	STOMMD	SYMBOL	STOMMD	SYMBOL	STOMMD
-----	3.443269 - 3.714336	=====	4.798602 - 5.340735	XXXXXX	6.425001 - 6.967134	#####	8.051401 - 8.322467
.....	3.714336 - 4.256469	UUUUUU	5.340735 - 5.882868	BBBBBB	6.967134 - 7.509268		
-----	4.256469 - 4.798602	+++++	5.882868 - 6.425001	#####	7.509268 - 8.051401		

NOTE: 1144 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL

LINEs INDICATE CONSTANT LEVELS OF NET YIELD OF

SHYMD, HYDROGEN CONSUMPTION

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)

AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)

BASIS VALUES: TEMPERATURE(TAVG)= 455 C

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.66 MPa

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15:59 MONDAY, JUNE 11, 1979

SYMBOL	SHYMD	SYMBOL	SHYMD	SYMBOL	SHYMD
.....	0.6459667 - 0.9244450	000000	2.5953145 - 3.1522711	#####	4.8231407 - 5.3800972
.....	0.9244450 - 1.4814015	+++++	3.1522711 - 3.7092276	#####	5.3800972 - 5.6585754
-----	1.4814015 - 2.0383580	xxxxxx	3.7092276 - 4.2661841		
#####	2.0383580 - 2.5953145	000000	4.2661841 - 4.8231407		

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SC1C4MD, C1-C4
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: TEMPERATURE(TAVG)= 455 C
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

38
 15:59 MONDAY, JUNE 11, 1979

SYMBOL	SC1C4MD	SYMBOL	SC1C4MD	SYMBOL	SC1C4MD	SYMBOL	SC1C4MD
oooooo	10.49040 - 10.95998	=====	12.83830 - 13.77747	xxxxxxx	15.65579 - 16.59496	oooooooo	18.47328 - 18.94286
oooooo	10.95998 - 11.89914	000000	13.77747 - 14.71663	ooooooo	16.59496 - 17.53412		
-----	11.89914 - 12.83830	++++++	14.71663 - 15.65579	ooooooo	17.53412 - 18.47328		

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT. FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SBYMD, BYPRODUCTS (NH₃, H₂S, CO, CO₂)
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: TEMPERATURE(TAVG)= 455 C
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 PRESSURE(P12)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPa

39
 15:59 MONDAY, JUNE 11, 1979

SYMBOL	SBYMD	SYMBOL	SBYMD	SYMBOL	SBYMD	SYMBOL	SBYMD
.....	3.432823 - 3.595798	-----	4.247696 - 4.573646	XXXXXX	5.225544 - 5.551493	888888	6.203342 - 6.366366
.....	3.595798 - 3.921747	000000	4.573646 - 4.899595	000000	5.551493 - 5.877443		
-----	3.921747 - 4.247696	+++++	4.899595 - 5.225544	888888	5.877443 - 6.203392		

NOTE 1 1196 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHWMD, WATER

40
 15:59 MONDAY, JUNE 11, 1979

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: TEMPERATURE(TAVG)= 455 C
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

SYMBOL		SHWMD	SYMBOL		SHWMD	SYMBOL		SHWMD
.....	4.810694 -	5.173662	000000	7.351471 -	8.077407	000000	10.255215 -	10.981152
.....	5.173662 -	5.899598	+++++	8.077407 -	8.803343	000000	10.981152 -	11.344120
.....	5.899598 -	6.625535	xxxxxx	8.803343 -	9.529279			
=====	6.625535 -	7.351471	000000	9.529279 -	10.255215			

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SNAPMD, NAPHTHA (C5-380F)

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 15:59 MONDAY, JUNE 11, 1979

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: TEMPERATURE(TAVG)= 455 C
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

SYMBOL		SNAPMD	SYMBOL		SNAPMD	SYMBOL		SNAPMD
.....	-0.00906978 -	0.70658704	000000	5.00052801 -	6.43184166	888888	10.72578262 -	12.15709627
.....	0.70658704 -	2.13790070	+++++	6.43184166 -	7.86315531	888888	12.15709627 -	12.87275318
-----	2.13790070 -	3.56921435	XXXXXX	7.86315531 -	9.29446897			
=====	3.56921435 -	5.00052801	888888	9.29446897 -	10.72578262			

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SMDMD, MIDDLE DISTILLATE (380-550)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: TEMPERATURE(TAVG)= 455 C
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.55 MPA

42
 15:59 MONDAY, JUNE 11, 1979

SYMBOL		SMDMD	SYMBOL		SMDMD	SYMBOL		SMDMD
.....	-2.6098374 -	-1.4863283	000000	5.2547259 -	7.5017440	000000	14.2427983 -	16.4898164
.....	-1.4863283 -	0.7606898	+++++	7.5017440 -	9.7487621	000000	16.4898164 -	17.6133254
-----	0.7606898 -	3.0077079	xxxxxx	9.7487621 -	11.9957802			
=====	3.0077079 -	5.2547259	000000	11.9957802 -	14.2427983			

OTE: 11% OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL
 LINES INDICATE CONSTANT LEVELS OF NET YIELD OF
 SHMD. HEAVY DISTILLATE (550-850)F
 (WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)
 VS. CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)
 AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)
 BASIS VALUES: TEMPERATURE(TAVG)= 455 C
 GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC
 NOMINAL SLURRY RESIDENCE TIME(SAT)= ONE HOUR
 PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.66 MPA

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 15:59 MONDAY, JUNE 11, 1979

SYMBOL	SHMD	SYMBOL	SHMD	SYMBOL	SHMD
.....	0.4989684 - 1.6365376	000000	8.8119527 - 11.1870910	000000	18.3125061 - 20.6876445
.....	1.6365376 - 4.0616759	+++++	11.1870910 - 13.5622294	000000	20.6876445 - 21.8752137
-----	4.0616759 - 6.4368143	XXXXXX	13.5622294 - 15.9373678		
=====	6.4368143 - 8.8119527	000000	15.9373678 - 18.3125061		

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL

LINE INDICATE CONSTANT LEVELS OF NET YIELD OF

SSRCMD, SRC BOTTOMS (R50+)F

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)

AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)

BASIS VALUES: TEMPERATURE(TAVG)= 455 C

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR

PRESSURE(PH2)= 13.79 AT A GAS PURITY OF 91% = 12.58 MPa

15:59 MONDAY, JUNE 11, 1979

SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD	SYMBOL	SSRCMD
.....	18.59132 - 20.51824	=====	28.22590 - 32.07973	xxxxxx	39.78739 - 43.64122	#####	51.34888 - 53.27579
.....	20.51824 - 24.37207		32.07973 - 35.93356	#####	43.64122 - 47.49505		
-----	24.37207 - 28.22590	+++++	35.93356 - 39.78739	#####	47.49505 - 51.34888		

NOTE: 1196 OBS HIDDEN

CONTOUR PLOT, FULLY CONSTRAINED 21 TERM LINEAR REGRESSION MODEL

LINE INDICATE CONSTANT LEVELS OF NET YIELD OF

SIDMMD, INSOLUBLE ORGANIC MATTER

(WEIGHT % BASED ON INLET MAF COAL CONCENTRATION)

VS. CIN, AVERAGE INLET COAL CONCENTRATION (G COAL/ 100 G SLURRY FEED)

AND RASH, RECYCLE ASH CONCENTRATION (G ASH/ 100 G SLURRY FEED)

BASIS VALUES: TEMPERATURE(TAVG)= 455 C

GAS LINEAR VELOCITY(V)= 1.65584 CM/SEC

NOMINAL SLURRY RESIDENCE TIME(SRT)= ONE HOUR

PRESSURE(PHR)= 13.79 AT A GAS PURITY OF 91% = 12.66 MPa

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15:59 MONDAY, JUNE 11, 1979

SYMBOL	SIDMMD	SYMBOL	SIDMMD	SYMBOL	SIDMMD	SYMBOL	SIDMMD
.....	3.619947 - 3.869893	-----	4.869674 - 5.369564	XXXXXX	6.369346 - 6.869236	#####	7.869017 - 8.110963
.....	3.869893 - 4.369783	000000	5.369564 - 5.869455	000000	6.869236 - 7.369127		
-----	4.369783 - 4.869674	+++++	5.869455 - 6.369346	000000	7.369127 - 7.869017		

NOTE: 1196 OBS HIDDEN