A COMPUTER MODEL OF THE RECTISOL PROCESS USING THE ASPEN SIMULATOR

by

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ABSTRACT

A computer model of the Rectisol process for acid gas absorption has been developed with the ASPEN process simulator. The model uses a modified version of the Redlich-Kwong-Soave equation-of-state to represent the phase equilibria for the methanol-water-aromatics-acid gas system. This report describes the development of the physical properties model and the flowsheet simulation. The work is based on the CONOCO design for a commercial scale coal gasification facility. The computer modelling effort was carried out under contract to the Morgantown Energy Technical Center, U. S. Department of Energy.

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I would like to express my appreciation to all the ASPEN staff who gave me help and support on this project, especially to Herb Britt and Chau-Chyun Chen for assisting me in almost every aspect, to Joe Boston and Paul Mathias for their help with modelling the physical properties, and to Willie Chan and Fred Ziegler for their debugging efforts. I would also like to thank my advisor, Professor L. B. Evans, for his guidance and optimism throughout.

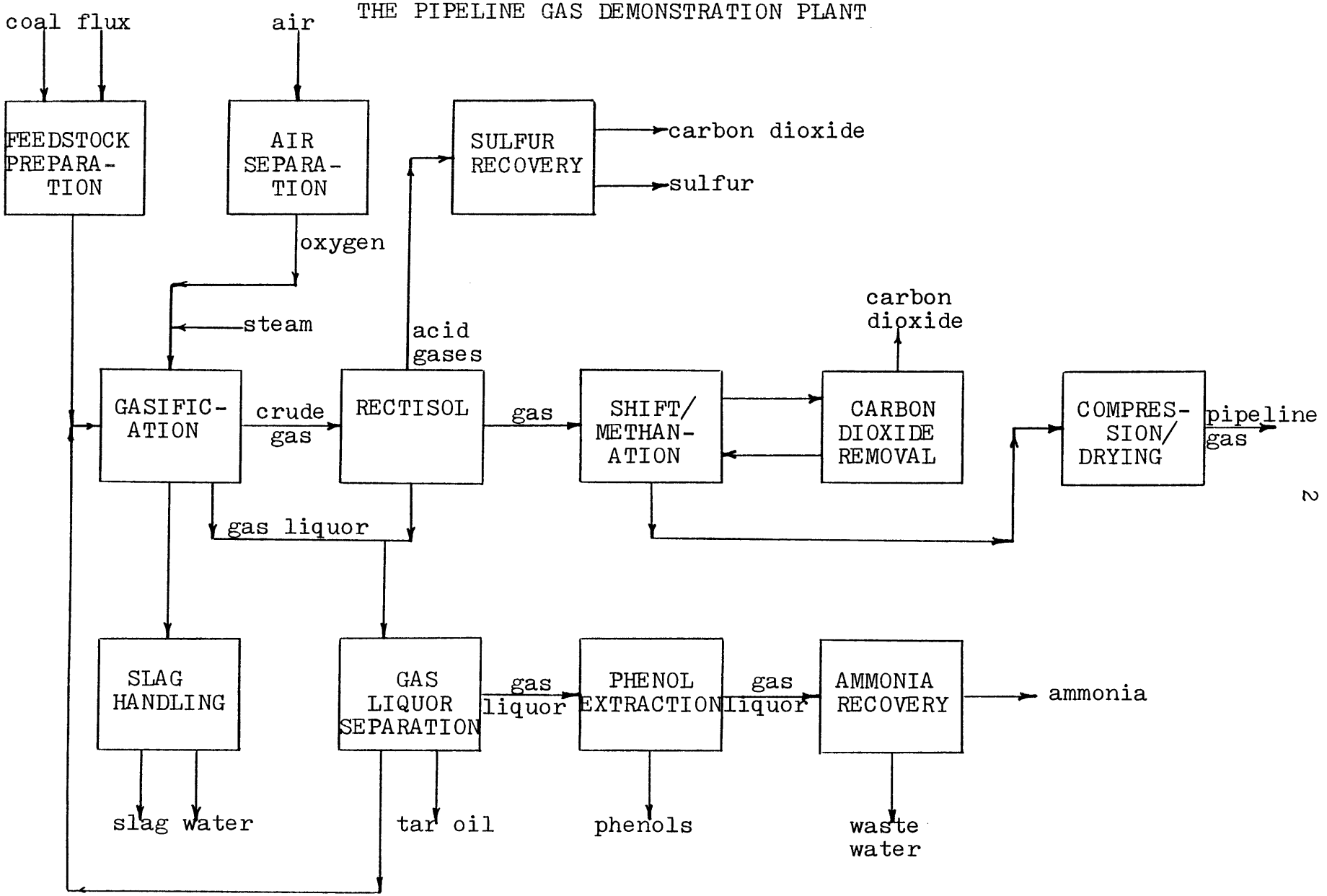
I. INTRODUCTION

The objective of this work was to develop a computer model of the Rectisol process (Hochgesand, 1970; Scholz, 1969) using the ASPEN process simulator. This simulation was prepared as part of a program to transfer ASPEN technology to the Morgantown Energy Technology Center (METC) of the United States Department of Energy. The overall program involved development of computer models for the major process units in the CONOCO Slagging Lurgi Coal Gasification process.

The computer modelling effort took CONOCO's design for a commercial scale coal gasification facility as the basis (CONOCO, 1980). This facility, shown schematically in Figure 1, is designed to generate pipeline quality substitute natural gas from coal. Briefly, the process gasifies coal with steam and oxygen, generated by cryogenic air separation. The gasification takes place at high pressure in a moving bed slagging gasifier using Lurgi technology. Crude synthesis gas is recovered from the top of the gasifier, while the ash is withdrawn in a molten slag form from the bottom. The synthesis gas is subsequently directed to the Rectisol unit for purification. Here, light oils and sulfur compounds are removed from the gas and recovered. Following purification, the gases are allowed to undergo water-gas shift and methanation reactions simultaneously. Carbon dioxide produced in the shift reaction must then be washed out with hot carbonate solution to improve the BTU quality of the substitute natural gas. The final gas treatment involves compression and drying.

Figure 1

THE PIPELINE GAS DEMONSTRATION PLANT



Reference: CONOCO, 1980a

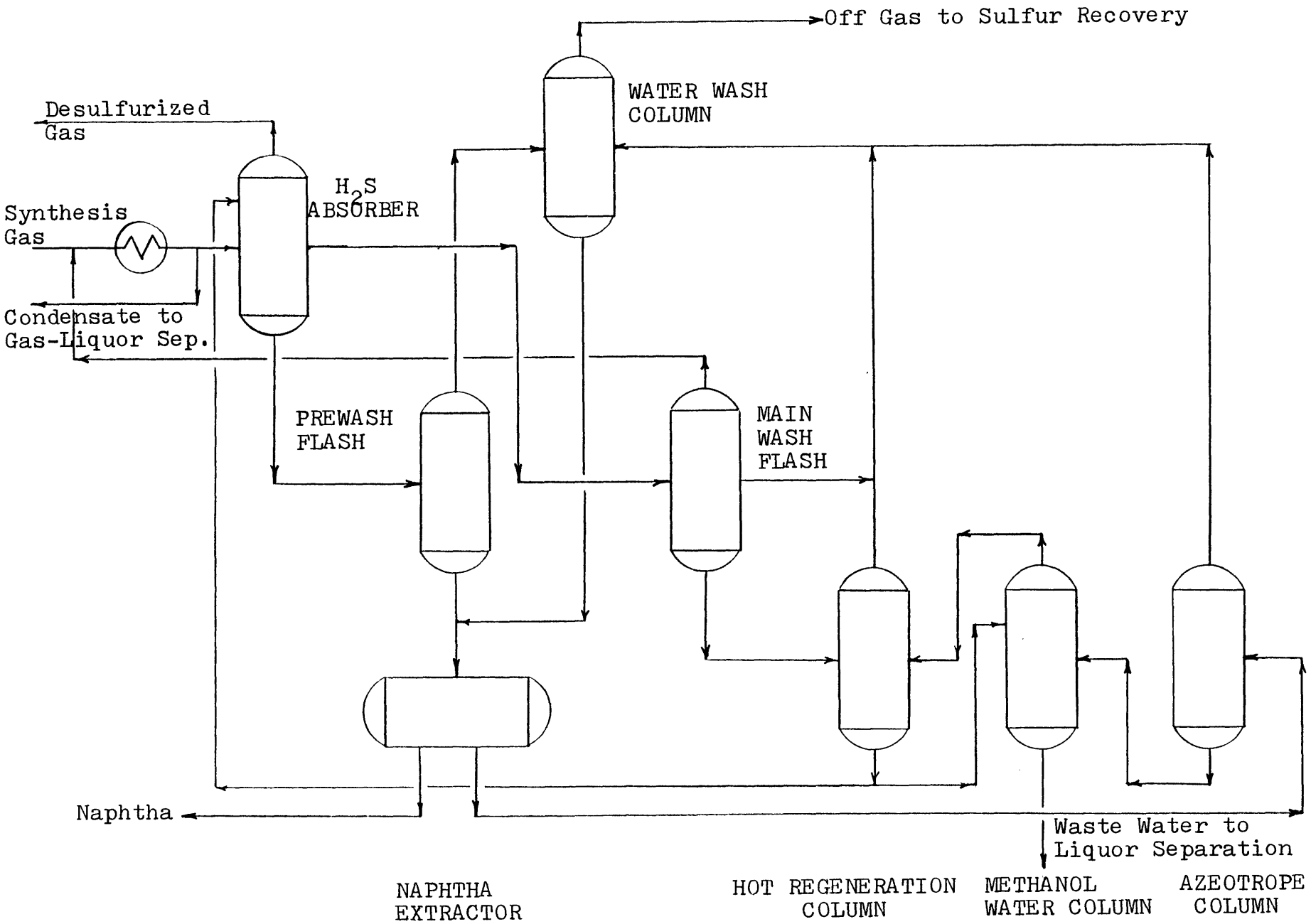
The Rectisol process itself features refrigerated methanol as the solvent into which the acid gases in the synthesis gas are absorbed. The process is comprised of an absorption section followed by a series of regeneration processes in which the rich solvent is purified and the absorbed compounds recovered. The diagram in Figure 2 illustrates the particular Rectisol design proposed for the CONOCO coal gasification facility.

The Rectisol computer model described in this report provides a stream-by-stream heat and material balance for the process. In addition, the model predicts the composition of the outlet streams for a given set of operating conditions. Therefore, the model can be used to assess the effect of various process variables on the composition of the desulfurized gas and acid gas products. The model also predicts the purity of the regenerated methanol solvent for specific regeneration operating conditions. Separate models of the absorbers and distillation columns yield a rigorous tray-to-tray analysis of each column. Overall, the Rectisol simulation represents a flexible tool which may be applied in future design and sensitivity studies and in trouble-shooting after process start-up.

The input to the simulation is based on the process flowsheet and feed streams from the CONOCO commercial design. Since Rectisol is a proprietary process licensed by Lurgi Mineralöltechnik GmbH, the CONOCO design did not provide any information on the actual process operating conditions. For this reason, development of the computer model entailed a

Figure 2

THE RECTISOL PROCESS



fair amount of design work to establish reasonable process operating conditions.

The following chapters describe the development of the Rectisol model. The work initially involved a literature search to locate published process data regarding Rectisol. Subsequently, considerable effort was devoted to developing a good thermodynamic model of the system to provide adequate physical properties predictions. The actual computer modelling work required testing of several ASPEN models which were still in the development stage. Further, it was necessary to perform sensitivity studies on the design variables in order to establish suitable operating conditions. It was originally intended to use the final Rectisol model to examine the sensitivity of the process to various design variables. However, lack of computer funds curtailed the project once the model was developed.

II. ACID GAS ABSORPTION PROCESSES

This section discusses the general features of acid gas absorption processes in order to provide some background for the detailed description of the Rectisol process. In addition, the discussion serves to present the basic design variables which must be considered in designing a process to remove acid gases.

General Features of Acid Gas Absorption Processes

Removal of acid gases, primarily carbon dioxide and hydrogen sulfide, is important for many industrial plants producing a gaseous intermediate or final product. In the production of substitute natural gas by coal gasification, hydrogen is generated together with a substantial quantity of carbon dioxide. Since carbon dioxide has no heating value, it must be separated out of the final pipeline gas to raise the overall BTU value. The separation may occur at several points in the process. Removal prior to shift conversion of the carbon monoxide and water to hydrogen and carbon dioxide favors the equilibrium hydrogen concentration. However, since carbon dioxide is produced in this reaction, further treating to remove carbon dioxide may be required. All sulfur bearing compounds, on the other hand, must be removed before methanation to avoid poisoning the methanation catalyst.

Rectisol is just one example of the many acid gas absorption processes. In general, these processes feature an absorption section in which the acid gases are absorbed into a liquid solvent, and a regeneration section where the acid gases

are recovered to yield a lean solvent of sufficient purity for recycle. In addition, the processes usually include a final wash to recover solvent carried over with the acid gas stream. The details of each section are discussed below, highlighting the major factors affecting each section.

Absorption

Acid gases are removed from the sour gas by absorption into a liquid solvent. The gas stream is contacted with the solvent in an absorber column where it flows counter-current to the downflowing liquid. The column itself may contain packing or trays, as dictated by the economics of the specific design. Plate columns generally operate at lower efficiency. Thus, a packed column design, which requires less height, may be preferable when a large concentration of acid gas is to be absorbed (Kohl and Riesenfeld, 1979).

Most absorbers operate at low temperature where equilibrium favors absorption. However, the fact that the absorption rate increases with an increase in temperature justifies operating some absorption processes at elevated temperature.

Regeneration

The solvent regeneration section serves two functions: namely, to recover the absorbed acid gases from the solvent, and to reduce the gas concentration in the solvent to a low level prior to its recycle to the absorber. A recycled solvent of higher purity will absorb a greater quantity of gas per pass, thereby reducing the solvent recirculation rate. The tradeoff must therefore be considered between regeneration costs and the costs associated with a higher recycle rate, such

as larger equipment and higher pumping requirements. Further, the purity of the treated gas is limited by the degree of regeneration. The gas will approach equilibrium with the freshly regenerated solvent which it contacts in the final stage of the absorber (Hochgesand, 1970).

There are three primary methods of regeneration. The choice is determined by the nature of the solvent and the desired purity. Flash desorption represents the cheapest method where the pressure of the solvent is let down in several stages. The final stage is usually atmospheric. However, a vacuum flash may be employed to remove the dissolved gases further. If flash desorption is not adequate, the gases may be stripped from the solvent following a single flash. Heat must be supplied to the stripper to provide the heat of desorption and to vaporize the stripping medium (often steam). This heat is frequently supplied in the form of steam through the stripper reboiler. As such, the regeneration step can be a significant energy consumer.

Hot regeneration provides the most complete regeneration and consequently leads to the highest purity for the feed gas. Gas solubility tends to decrease with increased temperature. This effect is augmented by heating the solvent to its boiling point so that solvent vapors provide some stripping action. In this case, heat is required to raise the system to the solvent boiling point, to supply the heat of desorption and further to supply the heat of vaporization for the solvent vapors. Although some of this heat may be obtained through heat exchange of the hot overhead gases and hot regenerated solvent

with the incoming solvent, heat exchanger losses make external heating necessary (Hochgesand, 1970).

Solvent Selection

A variety of solvents are employed to absorb acid gases. Despite the varied chemical nature of these solvents, all should exhibit certain characteristics to render them suitable as solvents. Foremost, the solvent must have a high solvency for the acid gas constituents at reasonable operating conditions. In addition, the absorption process must be reversible so that the solvent will release the gas components with relative ease to yield both gas and solvent of high purity. It is highly undesirable for the solvent to form an irreversible compound with any of the feed gas constituents since this may lead to appreciable solvent losses. The solvent should also have low volatility to prevent excessive solvent losses in the gas stream by vaporization. Other desirable characteristics include low viscosity for minimal pumping costs, good heat transfer properties and low heat capacity to minimize heating requirements, stability, and low corrosivity. Finally, low cost and availability are obviously desirable (Nonhebel, 1972).

The acid gas components may be absorbed into the solvent by physically dissolving or by reacting chemically with an active solvent component. The absorption process involves transfer of the acid gases from the gas phase, through the gas-liquid interface, into the liquid phase. In the case of a chemical solvent, the absorbed gases then react reversibly to form compounds. Chemical and physical solvents have

several distinguishing characteristics which account for the different absorption mechanisms. As the diagram in Figure 3 shows, the equilibrium loading of a physical solvent increases in direct proportion to partial pressure, provided Henry's Law applies. In contrast, the loading of a chemical solvent rises rapidly at low gas partial pressure, but then reaches a point of saturation beyond which little absorption occurs. This distinction makes chemical solvents the best choice for purifying gas streams at low gas partial pressures, and physical solvents the choice for purifying high pressure concentrated streams. The same behaviour dictates the method of regeneration. Physical solvents are easily regenerated by flash desorption, although stripping or hot regeneration may be used for greater purity. However, a saturated chemical solvent subjected to a pressure reduction will release only a fraction of the total absorbed gas. Some form of reboiling is required to effect adequate regeneration (Hochgesand, 1970).

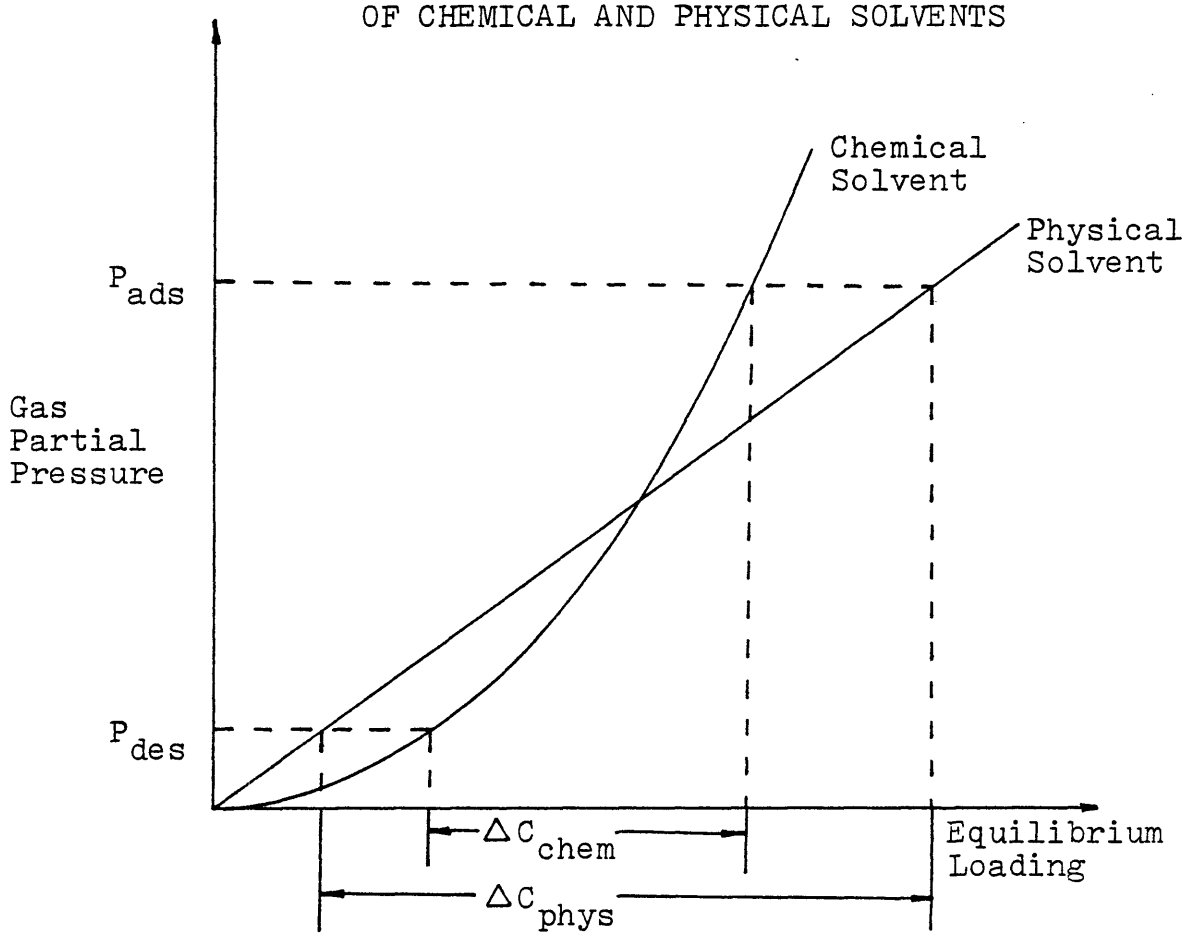
In a chemical absorption system, chemical reactions increase the liquid film coefficient, thereby raising the overall absorption rate (Kohl, Riesenfeld, 1970). Since chemical absorption is more rapid than physical absorption, chemical systems require fewer trays and thus smaller towers.

Heat Integration

Solvent regeneration usually takes place at higher temperature than absorption. As a result, most acid gas absorption processes are highly heat integrated. Often the rich solvent may be preheated and the lean solvent cooled by heat exchange. The absorption process is exothermic so that the solvent

Figure 3

COMPARISON OF EQUILIBRIUM LOADING
OF CHEMICAL AND PHYSICAL SOLVENTS



Reference: Hochgesand, 1970

temperature is raised within the absorber. This means that additional cooling beyond heat exchange is necessary.

Solvent Recovery

To minimize the solvent losses from the system, the gas streams may be washed with water or other suitable wash solutions to recover the vaporized solvent leaving the absorption or regeneration sections.

Advantages of the Rectisol Process

The Rectisol process employs refrigerated methanol as a physical solvent to absorb both hydrogen sulfide and carbon dioxide. According to the literature, the absorption process is carried out at low temperatures, generally between $0^{o}F$ and $-75^{o}F$. At this temperature level, both hydrogen sulfide and carbon dioxide are highly soluble in the methanol, although the solubility of hydrogen sulfide exceeds that of carbon dioxide by a factor of 5-6 (Hochgesand, 1970). Methanol has a high vapor pressure compared to most solvents. Thus, the low temperature is also desirable to reduce the methanol losses due to vaporization.

Rectisol has several attractions supporting its application in the CONOCO design. Firstly, Rectisol is ideal for high pressure processes since the equilibrium loading of a physical solvent is directly proportional to pressure. In the CONOCO design, the synthesis gas comes directly from the gasifier and is therefore at high pressure. Further, since Rectisol favors absorption of hydrogen sulfide over carbon dioxide, the hydrogen sulfide may be totally removed with only a fraction of the carbon dioxide. Such selective removal is important

for two reasons. Firstly, if the sulfur compounds are recovered with a low concentration of carbon dioxide, the gas stream may be handled directly in a sulfur recovery unit, such as a Claus Plant, without overloading the sulfur plant or without recourse to further separation. Secondly, since carbon dioxide removal prior to shift conversion and methanation is not necessary, utilities would be needlessly consumed in removing a high proportion of the carbon dioxide at this stage (Hochgesand, 1970). However, as mentioned earlier, it may be attractive to remove a fraction of the carbon dioxide on account of the equilibrium considerations associated with the subsequent water-gas shift reaction.

Rectisol Process Description

This section discusses the specific design of the Rectisol process developed as part of the CONOCO Slagging Lurgi Coal Gasification commercial design. Figure 4 shows a simplified block flow diagram of the process, indicating the major process sections. A copy of the Rectisol process flowsheet, taken from the CONOCO commercial design report, is displayed in Figures 5 and 6. The details of each section are outlined briefly below.

In the Rectisol unit, the synthesis gas produced in the gasification section is treated to remove the undesirable sulfur compounds and to recover any light oils in the gas. Purified gas is then directed to the joint shift/methanation section. The removed sulfur compounds proceed to the sulfur recovery unit.

Figure 4

BLOCK FLOW DIAGRAM OF THE RECTISOL PROCESS

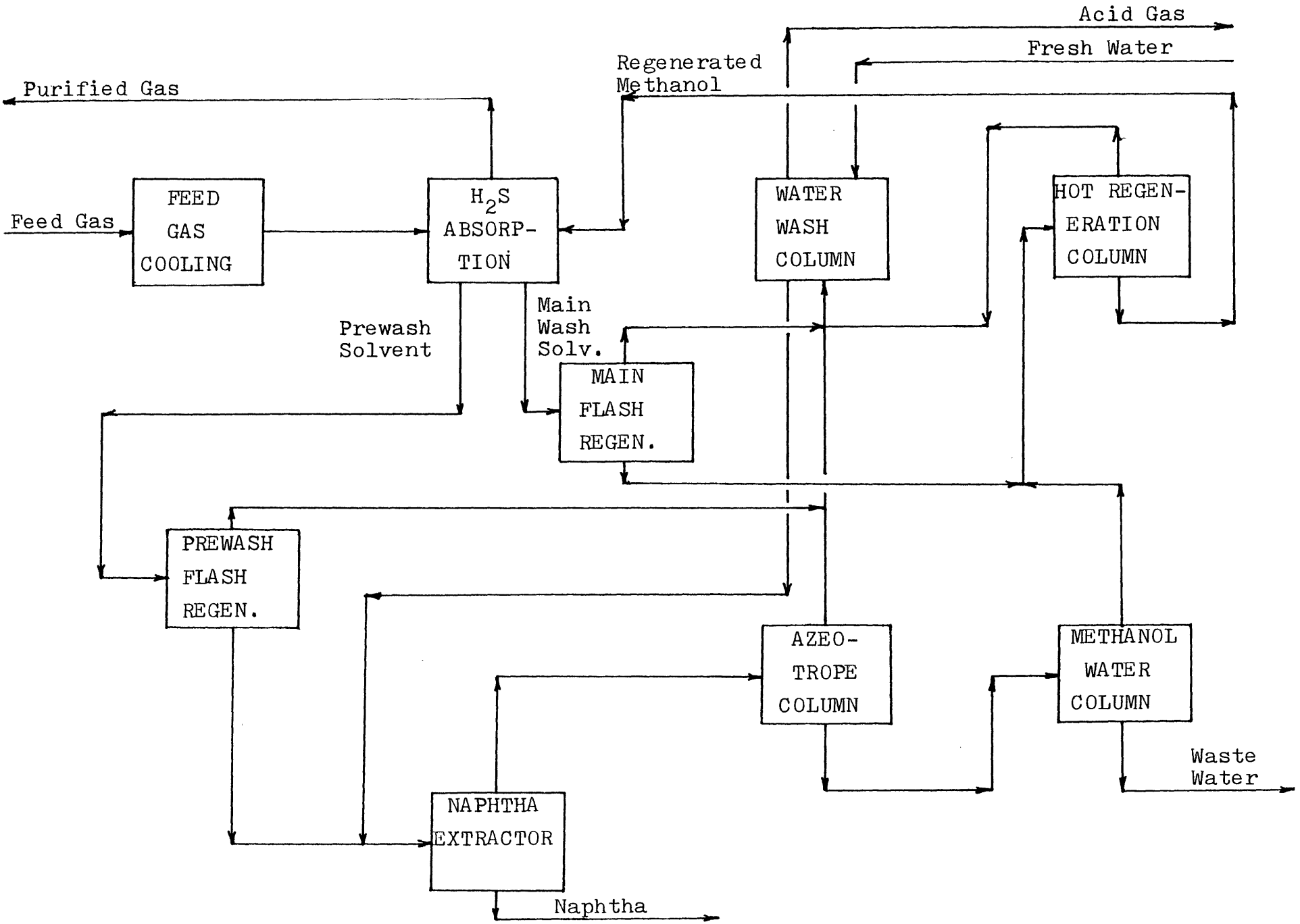
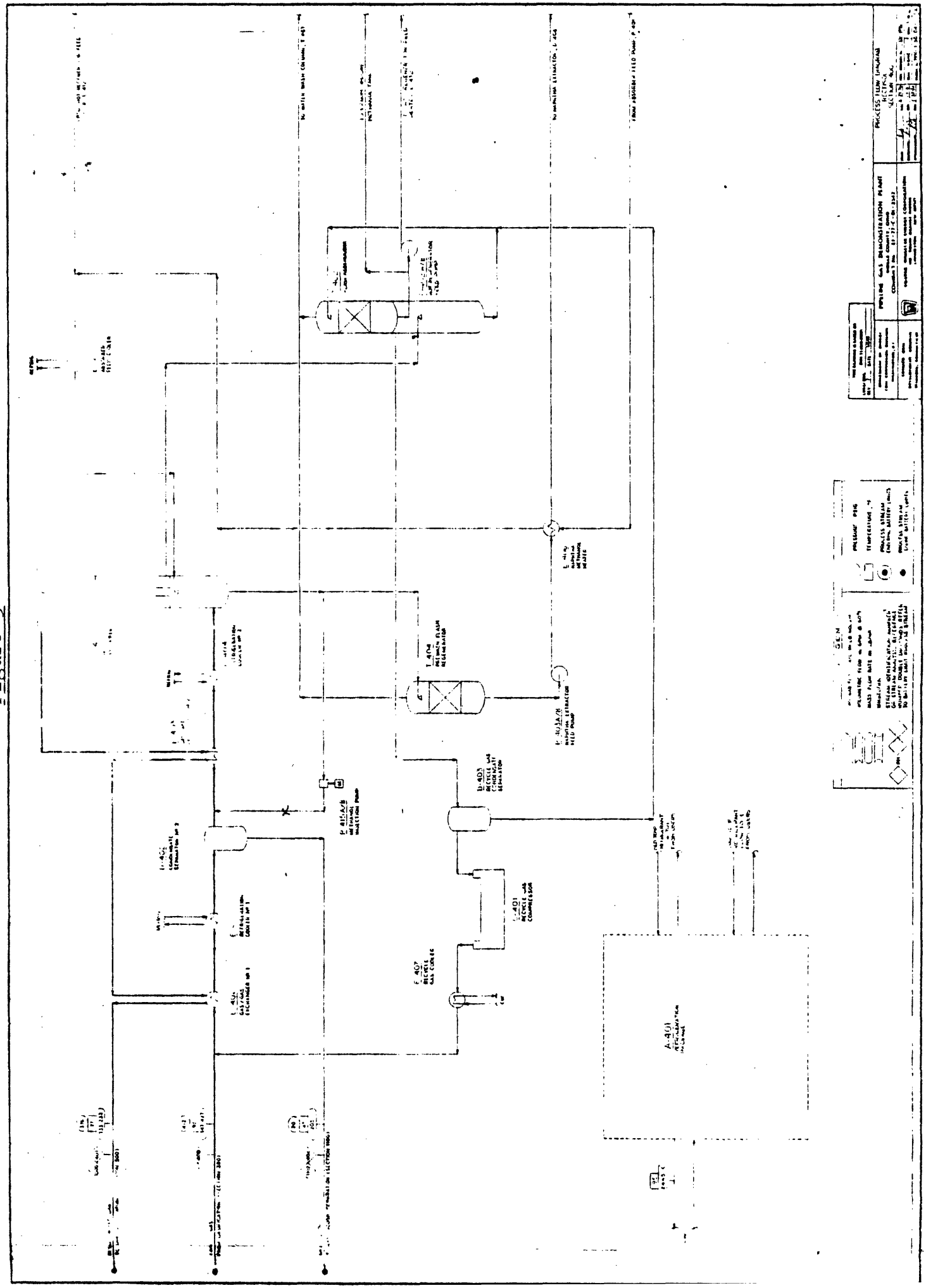


Figure 5



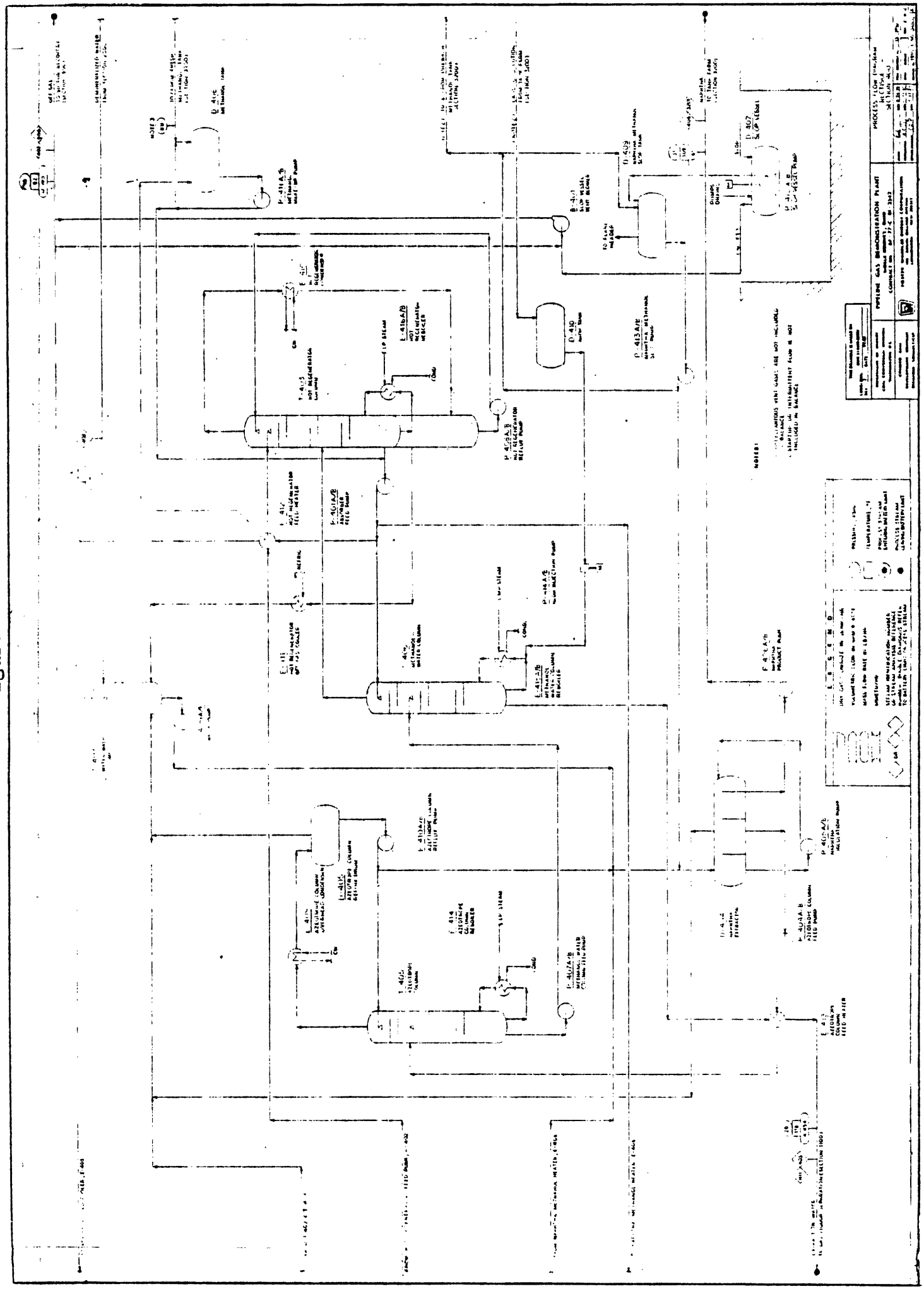


Figure 6

The feed gas is first cooled to absorption conditions by heat exchange with the purified gas and by supplemental refrigeration. The cooled gas then proceeds to the absorption section where the sulfur compounds, naphtha, hydrogen cyanide and water are physically absorbed with refrigerated methanol. The absorption process occurs at high pressure and low temperature in two stages; in the prewash section, all the naphtha, water and hydrogen cyanide are removed with some of the acid gas, while in the main wash section, the remaining sulfur compounds and a portion of the carbon dioxide are absorbed.

The ensuing process steps are devoted to solvent regeneration in which acid gases are recovered from the methanol to yield a lean solvent of sufficient purity for recirculation. In the first step, the rich solvent streams from the prewash and main wash absoprtion sections are separately flash regenerated. The pressure of the solvent is reduced causing a fraction of the acid gases to desorb.

The liquid from the prewash flash regenerator is sent to the naphtha extractor to recover the absorbed naphtha. Here a liquid-liquid separation is attained on adding the water rich bottoms from the water wash column. The high purity naphtha layer is decanted and sent to storage. The remaining methanol-water-naphtha liquid is fed to the azeotrope column. This column produces an overhead composed of naphtha, carbon dioxide, hydrogen sulfide and methanol. A mixture of methanol and water is recovered in the bottoms which is subsequently separated in the methanol-water column.

The hot regenerator serves to strip the main wash solvent of the gases that were not desorbed during flash regeneration. The methanol overhead from the methanol-water column is also fed to this unit where the methanol vapors, in conjunction with those generated in the reboiler, act as the stripping medium. The acid gases are recovered in the overhead and combined with the gases from flash regeneration, the azeotrope column and the naphtha extractor. This total gas stream is finally water washed to recover any vaporized methanol prior to being sent to the sulfur plant.

A portion of the regenerated methanol from the hot regeneration column bottoms is used as reflux for the methanol-water column. The remaining methanol is cooled by heat exchange with the naphtha extractor feed and the hot regeneration column feed. After further refrigeration, the regenerated methanol is recirculated to the absorption section.

III. DEVELOPMENT OF PHYSICAL PROPERTIES MODEL

Accurate representation of the phase equilibria was essential to the simulation work in view of the lack of process data. Moreover, the physical properties estimation was especially important since the hydrogen sulfide-carbon dioxide-nitrogen-hydrogen-methanol-water-aromatics system is highly non-ideal. The presence of methanol and water, which are significantly polar, and hydrogen, nitrogen, carbon monoxide and methane, which are supercritical, render this system hard to describe. Therefore, considerable effort was devoted to developing a good thermodynamic model.

In order to simplify the system, all the sulfur compounds are treated as hydrogen sulfide, and the C_2, C_3, C_4 compounds are lumped into the methane component throughout this work. The naphtha in the feed is represented as benzene since coal-derived liquids are generally aromatic. These simplifications reduce the system to the following nine components: H_2, CO, N_2, CO_2, CH_4, H_2S, H_2O, C_6H_6, and CH_3OH.

Selection of the Thermodynamic Model

There are two approaches to modelling the phase behaviour of a mixture. The conventional method invokes a liquid activity coefficient model to represent the liquid and an equation-of-state for the vapor. Thus, the system is described according to:

$$\hat{\Phi}_i y_i P_T = \gamma_i x_i f_i^{ol}$$

where $\hat{\Phi}_i$ = vapor fugacity coefficient

P_T = total pressure

γ_i = liquid activity coefficient

f_i^{ol} = liquid reference fugacity

y_i, x_i = vapor, liquid mole fractions

The alternative approach uses a single equation-of-state to describe both the vapor and liquid phases. Noncondensable components in the mixture present a problem with regard to establishing the reference fugacity for the activity coefficient approach. Generally, the standard state fugacity is that of the pure liquid at the system temperature and pressure. It is meaningless, however, to consider a pure liquid state for a supercritical component and, thus, it is necessary to follow the unsymmetric convention. In this case, the activity coefficient is normalized to 1.0 at infinite dilution and the Henry's Law constant becomes the standard state fugacity. As O'Connell (1977) points out, there are difficulties associated with referencing to the Henry's Law constant for multicomponent solvents since the constant is dependent on solvent composition. As such, the composition dependence of the standard state fugacity should be built into the thermodynamic model.

On the other hand, equation-of-state models have generally proved to be inadequate for predicting the non-idealities of mixtures containing polar substances (Mathias, 1981). However, ASPEN has recently adapted the Redlich-Kwong-Soave (RKS) equation-of-state to improve its ability to represent systems containing highly polar compounds. Mathias (1981) has demonstrated that this model is effective in describing the coexisting vapor and liquid phases for systems such as methanol-water. An alternative model applicable to polar

systems is the Perturbed Hard Chain equation-of-state (Gmehling et al., 1979). In this case, the model handles polar components by assuming that they dimerize. Thus, the model must evaluate the chemical equilibrium for the dimerization process. Such treatment proves to be a major drawback for this equation-of-state since it augments the computational effort substantially. In addition, as Mathias (1981) notes, dimers are rarely observed experimentally, so that the equation rests on a weak theoretical foundation.

Consideration of the difficulties and inaccuracies associated with the activity coefficient model approach led to the selection of an equation-of-state to correlate the Rectisol system for this work. The particular equation-of-state that was chosen was the modified version of the Redlich-Kwong-Soave model which is described in the next section.

Modified Redlich-Kwong-Soave Equation-of-State

The basic Redlich-Kwong-Soave equation is given by

$$P = \frac{RT}{V - b} - \frac{a}{V(V + b)}$$

where 'a' and 'b' are functions of critical temperature and pressure as follows

$$a = \alpha(T)a_c$$

$$a_c = 0.42748 \frac{R^2 T_{ci}^2}{P_{ci}}$$

$$b = 0.08664 \frac{RT_{ci}}{P_{ci}}$$

To some extent, the 'a' parameter may be regarded as an attractive parameter, accounting for the intermolecular attractive

forces. On the other hand, the 'b' parameter is a repulsive term, representing the finite volume occupied by the component. $\alpha(T)$ is used to correlate pure component vapor pressure data and has been modified by ASPEN to the following form

$$\alpha^{0.5} = 1 + m(1 - T_r^{0.5}) - p(1 - T_r)(0.7 - T_r)$$

T_r = reduced temperature

m = function of acentric factor

p = polar parameter

The correlation for m, taken from the work of Graboski and Daubert (1978), is

$$m = 0.48508 - 1.55191\omega - 0.15613\omega^2$$

where ω = acentric factor.

The ASPEN work has introduced the polar parameter, p, in the expression for α to improve the vapor pressure predictions. This parameter is empirical and must be determined by fitting experimental pure component vapor pressure data.

For supercritical components, Boston and Mathias (1980) recommend a different expression for α to extrapolate into the supercritical region

$$\alpha^{0.5} = \exp(c\ (1 - T_r^d))$$

with $c = 1 + 0.5m + 0.3p$

$$d = \frac{c - 1}{c}$$

Mixtures are represented by the above equations using the one-fluid theory. This means that the parameters 'a' and 'b' become quadratic mole fraction averages with the following form

$$a = \sum_i \sum_j x_i x_j a_{ij}$$

$$b = \sum_i \sum_j x_i x_j b_{ij}$$

where

$$a_{ij} = (a_i a_j)^{0.5}\left(1 - K^0_{a_{ij}} - K^1_{a_{ij}} \frac{T}{1000}\right)$$

$$b_{ij} = \left(\frac{b_i + b_j}{2}\right)\left(1 - K^0_{b_{ij}} - K^1_{b_{ij}} \frac{T}{1000}\right)$$

As these equations show, the binary interaction parameters, $K_{a_{ij}}$ and $K_{b_{ij}}$, are expressed as linear functions of the absolute temperature in Kelvin. These parameters account for the deviation of the behaviour of a binary pair from that predicted according to the basic mixing rules. Any combination of these four parameters, K^0_a, K^1_a, K^0_b, K^1_b, may be used to fit binary vapor-liquid equilibrium (VLE) data to the modified RKS equation-of-state.

Experimental Phase Equilibrium Data

The physical properties model requires only binary interaction parameters in order to describe a multicomponent system. In the absence of multicomponent vapor-liquid equilibrium data, values for these parameters may be established by fitting binary phase equilibrium data alone. Prausnitz (1980) indicates that his experience has been good in employing only binary experimental data to predict multicomponent equilibria, provided that the system is well removed from the critical for each component. He cautions that, in cases where the critical conditions are exceeded, multicomponent predictions may be unreliable even if the binaries are fit well. Unfortunately, published multicomponent data are not available for the specific Rectisol system. This deficiency made it necessary to rely on experimental binary equilbrium data to a great extent. As the work proceeded towards determining the parameters for

the modified RKS model, the results of a recent study at North Carolina State University became available, presenting quaternary data for the hydrogen sulfide-carbon dioxide-nitrogen-methanol system (Rousseau et al., 1981). These data initially served as a comparison for the multicomponent equilibria predicted by the preliminary physical properties model. Subsequently, the quaternary data were used to improve the binary parameter estimates, leading ultimately to an improvement in the model predictions.

In order to maintain the data fitting effort at a manageable level, it was initially decided to ignore the interactions between two gas components. Justification for this simplification lay in the fact that the non-idealities of the liquid phase were expected to dominate over the vapor phase non-idealities, as Prausnitz notes (1980). This decision reduced the data fitting to the 21 possible interactions of the gas components with methanol, benzene and water and the interactions between methanol, benzene and water themselves.

The temperatures in the Rectisol process span a broad range, varying from -75°F in the absorption section to as high as 250°F during solvent regeneration. To minimize the degree of extrapolation, the parameter estimation work called for data covering as wide a temperature range as possible. A literature search revealed experimental phase equilibria for each of the binary pairs. Although this information did not provide complete temperature coverage, the data adequately spanned the temperatures where a given interaction was most relevant. For instance, gas-liquid non-idealities are most

important at the lower end of the temperature range where absorption takes place. On the other hand, the high temperature processes mostly involve the separation of benzene, methanol and water.

In cases where more than one data set were located for a binary pair, only the most recent was selected for the model development unless these data appeared to be generally inconsistent with previous data.

Development of Modified Redlich-Kwong-Soave Model Parameters

Fitting the modified RKS model to binary experimental data involved adjustment of a combination of the four interaction parameters, K_a^0, K_a^1, K_b^0, K_b^1, as discussed previously. The best estimates for the combination of parameters were generated for each set of binary data using the ASPEN Data Regression System (DRS). DRS employs the maximum-likelihood principle in reducing experimental data. This analysis recognizes that experimental data contain random measurement errors which it takes into consideration, assuming that the errors are randomly distributed about zero with a normal distribution. The standard deviation associated with a particular measurement is supplied by the user. The system creates an objective function comprised of sum-of-squares terms for each observed variable, for example:

$$\sum_{i=1}^{N} \left[\frac{(P_i^o - P_i^e)^2}{\sigma_{P_i}^2} + \frac{(T_i^o - T_i^e)^2}{\sigma_{T_i}^2} + \frac{(x_{1i}^o - x_{1i}^e)^2}{\sigma_{x_i}^2} + \frac{(y_{1i}^o - y_{1i}^e)^2}{\sigma_{y_1}^2} \right]$$

in which the superscript 'o' stands for the value adjusted according to the thermodynamic model, while 'e' refers to the

experimental value. The terms are summed over all data points. In DRS, the Britt-Luecke (1973) generalized least-squares algorithm computes estimates for the model parameters such that the objective function is minimized. At the same time, the parameters must satisfy the equilibrium constraint that the fugacities of all equilibrium phases are equal.

Prausnitz (1980) presents an informative discussion of the methods of estimating parameters. Many of his recommendations were adopted for this work. For instance, the following values were used for the standard deviation of the measured variables, as Prausnitz suggests: temperature - 0.05°C, pressure - 1 mmHg, liquid mole fraction - 0.001, vapor mole fraction - 0.003.

The data regression work demonstrated that, in most cases, two parameters adequately correlate the equilibrium data. However, in the final set of interaction parameters, additional parameters are included for some pairs if these improve the fit significantly. One notable example is the benzene-water system for which all four parameters are essential to modelling the observed liquid immiscibility. It should be noted that, in order for the 'a' and 'b' parameters in the fundamental RKS equation to retain their theoretical significance, the term $(1 - K^0_{a_{ij}} - K^1_{a_{ij}} \frac{T}{1000})$ and the analogous term for the 'b' parameter must have a positive value. Unfortunately, in the case of benzene and water, large parameter values are necessary to represent the equilibrium, rendering the above terms negative. While this anomaly causes no computational difficulty, it does mean that the model must be considered to be purely empirical

as far as benzene and water are concerned. As such, there may be some concern about using the equation-of state to extrapolate information. However, the benzene-water experimental data adequately cover the temperature range of importance in the Rectisol process. Further, a comparison with experimental data demonstrates that the model provides a good prediction of the liquid-liquid equilibrium for the methanol-benzene-water system. This comparison is illustrated in the following chapter.

It has been suggested that highly non-ideal mixtures, such as the benzene-water mixture, may be better represented using the recently proposed mixing rules based on the local-composition concept (Boston, 1981; Whiting, Prausnitz, 1981). Further work in this area lay beyond the scope of this project.

In general, good agreement was obtained between the experimental binary data and the thermodynamic model predictions. The maximum error in the liquid composition for a set of binary data was, on the whole, less than 6 percent. For a given binary pair, the binary parameters exhibit a high degree of correlation which indicates that the parameters are not uniquely determined. In other words, the experimental data may be represented by several alternate parameter combinations with little loss of accuracy.

Evaluation of the Preliminary Thermodynamic Model

The preliminary thermodynamic model of the Rectisol system was comprised of the modified RKS equation-of-state with interaction parameters generated by regression of binary

data, as just described. This model neglected any gas-gas interactions, considering them to obey the simple mixing rules without correction. To assess the validity of the model, the predicted equilibria for the hydrogen sulfide-carbon dioxide-nitrogen-methanol subsystem were checked against the data presented by the North Carolina State University team (Rousseau et al., 1981). Bubble point calculations using the experimental liquid composition and temperature permitted a comparison of the predicted bubble point pressure and vapor composition with the actual data. Unfortunately, the model did not prove to represent the data adequately, overpredicting the bubble point pressure by as much as 30 percent and overestimating the nitrogen in the vapor at the expense of the carbon dioxide. In an effort to ameliorate the situation, parameters modelling the gas-gas interactions (carbon dioxide-nitrogen, hydrogen sulfide-carbon dioxide, hydrogen sulfide-nitrogen) were regressed from binary data and included in the model. The resulting improvement in the model predictions was not considered sufficient. Further, the predicted Henry's Law constants for nitrogen in mixed methanol-carbon dioxide and methanol-hydrogen sulfide solvents exhibited unexpected behaviour. The experimental data appeared to be consistent with the approximate relationship that

$$\ln H_{N_2,mix} = \sum_i x_i' \ln H_{N_2,i} \qquad \text{(Prausnitz, 1980)}$$

with x_i' = solvent mole fraction on solute free basis

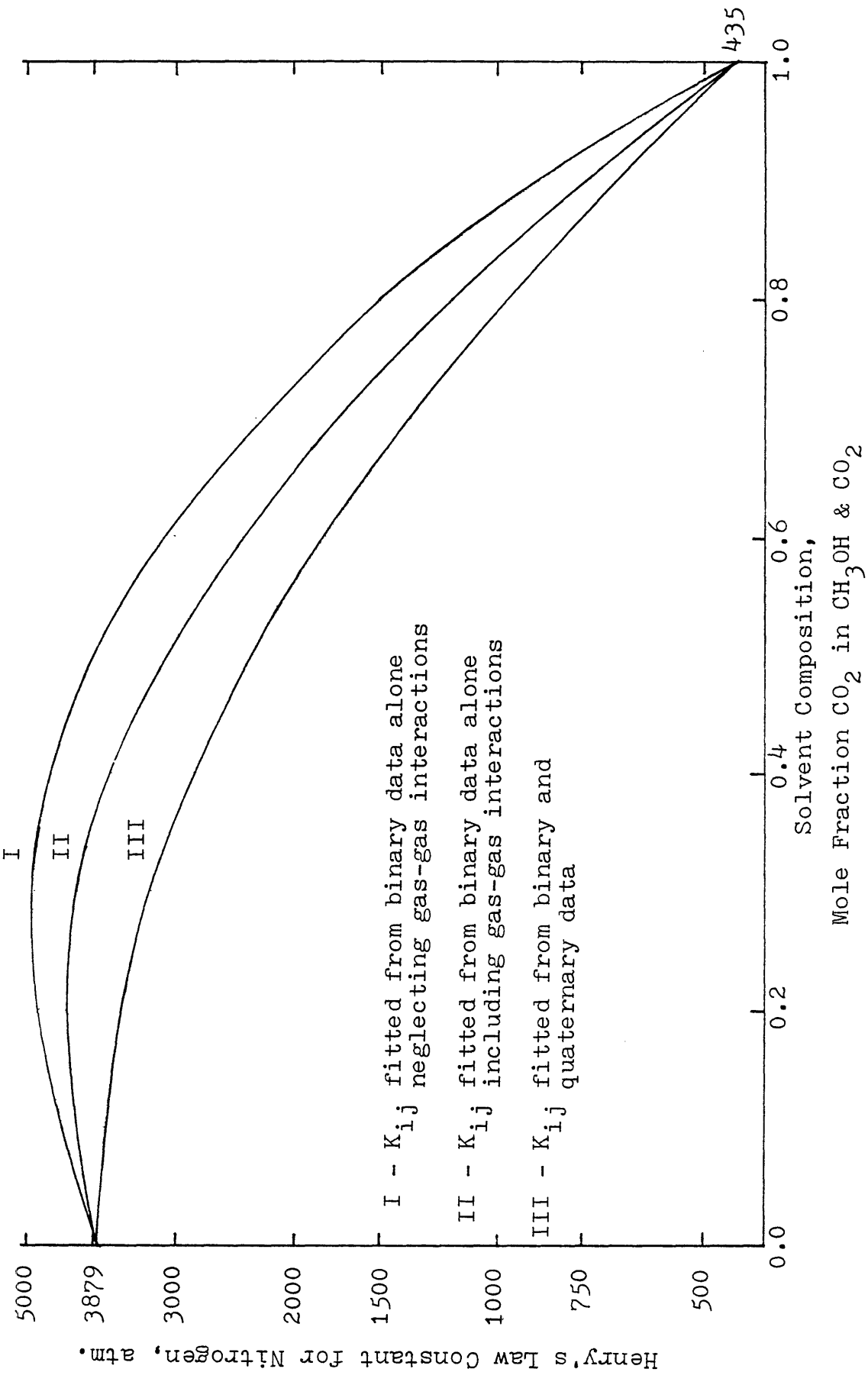
However, rather than displaying linearity on a logarithmic basis according to the above expression, the predicted Henry's Law constants increased initially with a small increase in the

amount of dissolved carbon dioxide or hydrogen sulfide. The constants appeared to reach a maximum before decreasing to the Henry's Law constant for nitrogen in pure carbon dioxide or hydrogen sulfide. Figure 7 illustrates the variation of the Henry's Law constant with solvent composition. The plot includes three curves. The upper two demonstrate the improvement in the behaviour of the constant on inclusion of the gas-gas interactions. The lower results from utilizing the quaternary data in estimating the parameters for the physical properties model, which is discussed in detail in the following section. The abnormal solubility behaviour is in part responsible for the deviations between the predicted and experimental compositions. In the model, a small amount of dissolved gas in the methanol results in an unexpectedly high Henry's constant and consequently a lower solubility for nitrogen. Therefore, the vapor mole fraction of nitrogen is overpredicted.

From an analysis of the experimental data and the model predictions, it was concluded that the vapor interactions between carbon dioxide and nitrogen are strong and conceal any non-idealities in the liquid. This fact makes the system hard to analyze. It did not appear possible to isolate the vapor and liquid behaviour from binary data using a single equation-of-state. The apparant success of Rousseau et al. (1981) in modelling the quaternary system may be attributed to the fact that they adopted the activity coefficient approach. This means that they employed a separate equation for each phase. In their model, the vapor is represented by the RKS equation-of-state with interaction coefficients set

Figure 7

HENRY'S LAW CONSTANT FOR NITROGEN
IN A METHANOL AND CARBON DIOXIDE MIXTURE



to the standard vapor values available from separate vapor phase studies. Having established the vapor behaviour in this manner, the liquid behaviour could be considered independently.

In working with the modified RKS equation, it appeared that the 'a' parameter, the attractive term in the basic equation, could be treated as the vapor term, while the repulsive 'b' term could be considered as representing the liquid. This observation suggested that the vapor interactions could be isolated from those in the liquid by fixing the interaction parameter for the 'a' term to the standard RKS vapor value reported in the literature. The remaining non-idealities due to the liquid phase could then be reflected in the 'b' parameter. It should be noted that this approach is only suitable for subcritical components since the modified RKS equation only reduces to the original RKS equation at conditions below the critical.

For the final model. it was decided to use the quaternary experimental data in the data regression runs to generate improved parameter estimates for the interactions between carbon dioxide, hydrogen sulfide and nitrogen. So that the DRS runs would converge, several parameters were fixed before the final DRS run rather than fitting all the gas-gas interactions with the quaternary data. Hydrogen sulfide-nitrogen gas interactions appeared less significant, so the original parameters developed from binary data were used. The effect of the vapor interactions for the hydrogen sulfide-carbon dioxide pair, which are both subcritical, was modelled with the

standard RKS value for K_a^0 (Graboski and Daubert, 1978). Data regression of the quaternary data then established parameter estimates for K_a^0 and K_b^0 for carbon dioxide-nitrogen and the liquid K_b^0 for hydrogen sulfide-carbon dioxide. The resultant model predictions agree substantially better with the experimental data as the comparison in Table 1 shows. The bubble point pressure predictions still appear to deviate from the data, especially at the higher pressure levels, however.

Table 2 displays the final parameter estimates, indicating the literature source of the data. This table shows that the final set includes values for several additional gas pairs which were readily available from previous work (Mathias, 1981). The parameter set is stored in a user library under RKAKIJ, to be called directly by the simulation program.

Enthalpy Calculations

In order to guarentee reliable enthalpy predictions from the modified RKS model, enthalpy data should be included in the data regression runs to determine interactions parameters. However, such data were not available for the Rectisol system. Under these circumstances, the Lee-Kesler equation-of-state was favored over the modified RKS equation-of-state for enthalpy calculations. The former correlation has a good reputation for predicting reasonable mixture enthalpies based on the pure component properties.

Table 1

COMPARISON OF MODIFIED RKS MODEL PREDICTIONS WITH EXPERIMENTAL DATA FOR CH_3OH-H_2S-CO_2-N_2

Temp. °C	Pressure atm		$x^{ex}_{N_2}$	$x^{m}_{N_2}$	$x^{ex}_{H_2S}$	$x^{m}_{H_2S}$	$x^{ex}_{CO_2}$	$x^{m}_{CO_2}$	$y^{ex}_{N_2}$	$y^{m}_{N_2}$	$y^{ex}_{H_2S}$	$y^{m}_{H_2S}$	$y^{ex}_{CO_2}$	$y^{m}_{CO_2}$
-25.0	9.3	8.6	0.003	0.0010	0.015	0.0178	0.074	0.074	0.403	0.403	0.052	0.036	0.544	0.543
-25.0	20.8	21.2	0.003	0.0029	0.019	0.0188	0.210	0.210	0.365	0.365	0.024	0.027	0.611	0.608
-25.0	29.6	32.4	0.005	0.0066	0.021	0.0208	0.331	0.331	0.400	0.400	0.010	0.028	0.589	0.592
-25.0	40.1	35.3	0.008	0.0074	0.016	0.0162	0.235	0.235	0.542	0.540	0.000	0.017	0.458	0.452
0.0	9.2	10.3	0.002	0.0008	0.013	0.0124	0.085	0.085	0.284	0.282	0.031	0.035	0.685	0.682
0.0	21.2	24.4	0.002	0.0016	0.021	0.0206	0.234	0.234	0.165	0.163	0.035	0.039	0.801	0.798
0.0	29.0	30.7	0.003	0.0028	0.018	0.0176	0.283	0.283	0.204	0.203	0.022	0.031	0.774	0.765
0.0	39.8	45.0	0.007	0.0076	0.020	0.0209	0.285	0.285	0.376	0.376	0.039	0.028	0.585	0.589

Table 2

BINARY INTERACTION PARAMETERS FOR THE MODIFIED REDLICH-KWONG-SOAVE EQUATION-OF-STATE

Component Pair		K_a^0	K_a^1	K_b^0	K_b^1	Data Source
CH_3OH	C_6H_6	-0.1346	4.3946	-0.2099	4.7570	Dechema, 1977
CH_3OH	H_2O	-0.2217	0.5730	-0.0580	0.3399	Dechema, 1977
CH_3OH	H_2S	0.4963	-1.4481	0.5124	-1.7128	Yorizane et al., 1969
CH_3OH	CO_2	-0.1085	0.7305	-0.0825	0.4699	Yorizane et al., 1969
CH_3OH	N_2	0.0	0.0	0.0786	0.0124	Kretschmer et al., 1946
CH_3OH	CO	0.0	0.0	0.0722	0.0765	Scholz, 1969
CH_3OH	CH_4	0.0	0.0	0.0402	-0.0495	Scholz, 1969
CH_3OH	H_2	0.0	0.0	0.1613	-0.1763	Yorizane et al., 1969
H_2O	C_6H_6	3.0853	-5.4828	2.5536	-4.5121	Stephen, Stephen, 1963
H_2O	H_2S	-1.2867	-1.5662	-0.5548	-2.0000	Clarke, Glew, 1971
H_2O	CO_2	0.4099	0.0	0.5832	-0.9041	Houghton et al., 1957
H_2O	N_2	0.0	0.0	0.5497	-1.1118	Int. Crit. Tables, 1933
H_2O	CO	0.0	0.0	0.5031	-0.9076	Seidell, 1952
H_2O	CH_4	0.0	0.0	0.4921	-1.1556	Seidell, 1952
H_2O	H_2	0.0	0.0	0.5188	-0.8740	Wiebe, Gaddy, 1934
C_6H_6	H_2S	0.0	0.0	0.2816	-0.3628	Gerrard, 1972
C_6H_6	CO_2	0.0	0.0	0.1275	-0.6731	Seidell, 1952
C_6H_6	CO	0.0	0.0	-0.3526	1.2061	Seidell, 1952
C_6H_6	N_2	0.0	0.0	-0.3328	1.0390	Seidell, 1952
C_6H_6	CH_4	0.0	0.0	-0.3389	1.0884	Evans, Battino, 1971
C_6H_6	H_2	0.0	0.0	-0.1904	0.6512	Cook et al., 1957

Table 2 (continued)

BINARY INTERACTION PARAMETERS FOR THE MODIFIED REDLICH-KWONG-SOAVE EQUATION-OF-STATE

Component Pair		K_a^0	K_a^1	K_b^0	K_b^1	Data Source
CO_2	N_2	-0.1856	0.0	0.1133	0.0	Yorizane et al., 1970
CO_2	H_2S	0.1020	0.0	-0.2462	0.0	Graboski, Daubert, 1978
H_2S	N_2	0.0	0.0	-0.2915	0.8497	Sobocinski, Kurata, 1959
CO	CH_4	0.0	0.0	-0.4623	0.1989	Toyama, 1961
H_2	CH_4	0.0	0.0	0.0335	0.0	Kirk, Ziegler, 1965
H_2	CO_2	-0.9346	0.0	0.4954	-2.9481	Spano et al., 1968
CO_2	CH_4	0.0598	0.1808	0.0	0.0	Donnelly, Katz, 1954

IV. SIMULATION OF THE RECTISOL PROCESS

Basis for the Process Simulation

The proprietary nature of the Rectisol process restricts the amount of process data disclosed in the literature. The information presented in the CONOCO Commercial Design Report consists solely of the feed and product compositions and a process flowsheet. While the process flowsheet shows detail of the sequence of operations and the destination of all intermediate streams, no specifics are provided for the process operating conditions. On account of the lack of actual operating conditions, it was impossible to develop a simulation that would match the CONOCO design. Therefore, this work adopted the approach of developing a viable Rectisol design based on the CONOCO design flowsheet and feed composition. The feed gas composition, pressure and temperature displayed in Table 3 were taken for the process model.

The literature search located typical absorption temperature and pressure ranges only. Detailed simulation of the other process units using ASPEN established the remaining operating conditions necessary to achieve the desired separation.

To minimize the computer time and cost associated with simulating a complex cyclic process such as Rectisol, a simplified process model was assembled. In this simulation, a series of simple unit operations such as mixers, splitters, flashes, heaters and pumps represent the Rectisol process. Rigorous simulation of the staged separation units is performed

Table 3

COMPOSITION OF FEED GAS TO RECTISOL PROCESS

Component	lbmol/hr
Hydrogen	1909.7
Carbon Monoxide	4052.9
Carbon Dioxide	299.1
Methane	471.1
Ethane	18.9
Ethylene	2.2
Propane	4.7
Propylene	2.2
Butane	1.8
Butylene	1.6
Nitrogen	41.7
Hydrogen Sulfide	131.0
Carbonyl Sulfide	8.0
Carbon Disulfide	0.1
Thiophene	0.4
Hydrogen Cyanide	trace
Naphtha	23.1
Water	13.8
Total	6982.3
Temperature, ^{o}F	95
Pressure, psia	427

on a stand-alone basis, external to the overall flowsheet. The results of such rigorous simulations established the splits to be used in the simplified model, where the units are modelled by separator blocks. A block flow diagram of the overall flowsheet simulation is shown in Figure 8, indicating the correspondence between the model and the actual design flowsheet. Appendix A contains the computer input and output for the simplified Rectisol model.

The development and design philosophy employed in each of the major process sections is discussed in detail below.

Absorption Section

The hydrogen sulfide absorber consists of two separate sections; a prewash section, which removes all the water and naphtha from the synthesis gas, and a main wash section, where the bulk of the hydrogen sulfide absorption occurs. Each section was simulated independently using RADFRAC, which is ASPEN's rigorous model for multistage vapor-liquid fractionation. The results of these simulations were used to set the degree of absorption in the overall flowsheet simulation in which two mixers and two separators (PREWASH1, PREWASH2, H2SABS1, H2SABS2) model the absorption section.

In designing the absorbers, the designer must establish the number of trays, the temperature of the entering gases and solvent, and the operating pressure. For a given degree of absorption, these parameters then dictate the required solvent rate. Hochgesand (1970) indicates that for the Rectisol process the methanol circulation rate greatly affects the process economics, since it influences the size of all process

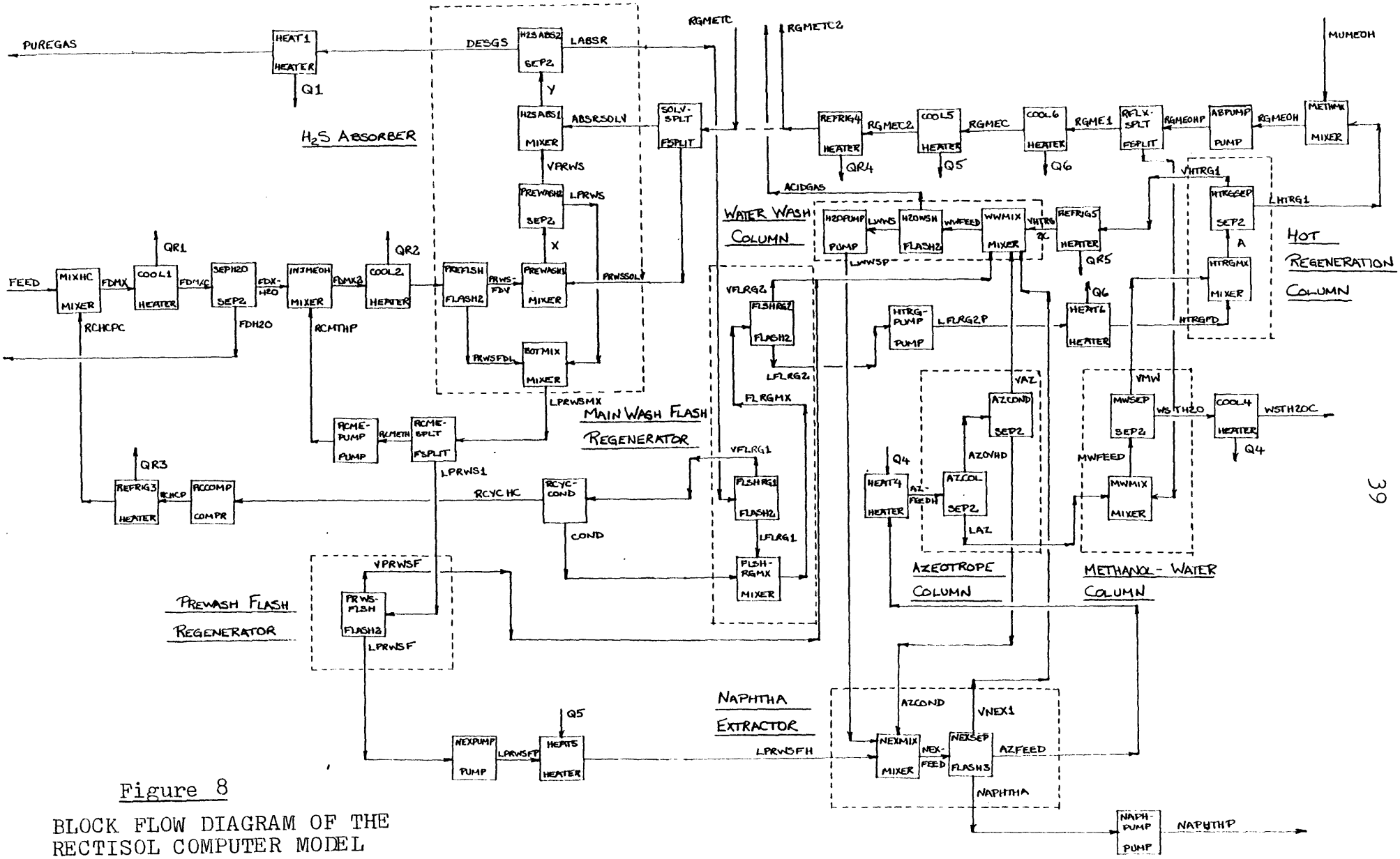


Figure 8

BLOCK FLOW DIAGRAM OF THE RECTISOL COMPUTER MODEL

equipment, pumping costs, regeneration costs etc.. The design of the absorption section, therefore, sought to minimize the methanol solvent rate. Since high pressure favors physical absorption, the absorbers are designed to operate at the maximum pressure compatible with the other units. This pressure of 421 psia is the pressure of the gasifier overhead less an allowance of 6 psi for the pressure drop through the heat exchange train. According to Hochgesand (1970), economics rarely justify compressing the feed gas further. With the same consideration in mind, the absorbers are designed to operate at low temperature with the recirculating methanol cooled to -75°F and the feed gas cooled to -30°F. Sasol report such temperature levels for their Rectisol operation, which appear to be typical (Hoogendoorn, 1957). Further, although this study did not examine the detailed heat exchange between the feed and desulfurized gas, a heat balance shows that the feed may be cooled by heat exchange to -30°F without supplemental refrigeration.

Absorption columns may contain packing or trays, although there is some evidence in the literature to suggest that trayed columns are more common for Rectisol (Maddox, 1977; Herbert, 1956). In the current design, the absorbers are designed as trayed columns. The pressure drop through the column is based on the rule-of-thumb of 0.15 psi pressure drop per stage (Treybal, 1968).

The design for the prewash absorber features six theoretical trays and a solvent rate set at 25 percent greater than the theoretical rate required to absorb all the naphtha. This

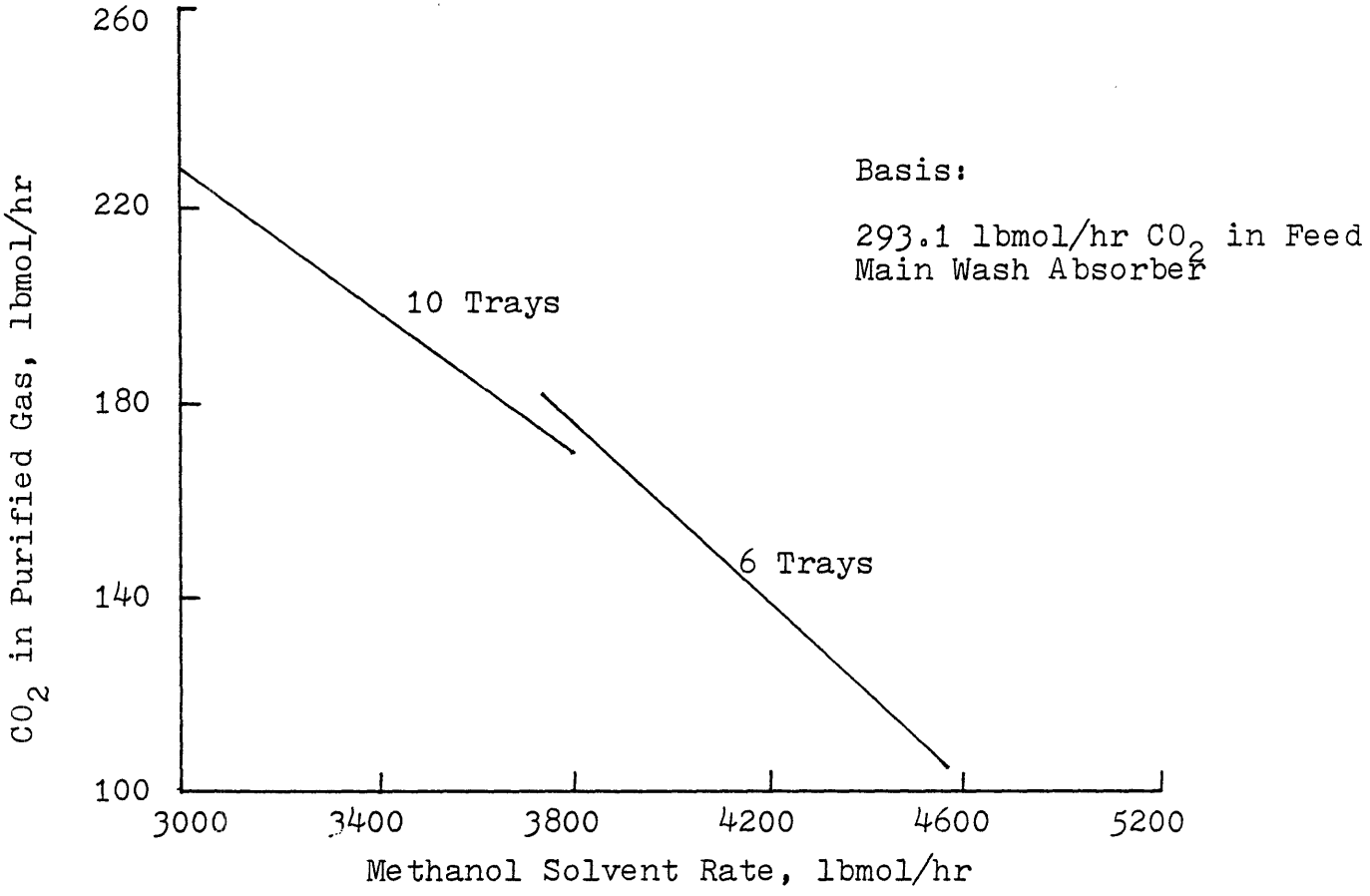
follows the recommendation of Kohl and Riesenfeld (1979). Given the objective of the prewash absorber to recover the naphtha with as little hydrogen sulfide as possible, the methanol rate is restricted to the minimum that ensures complete naphtha absorption. In order to improve the performance of the RADFRAC model for the prewash absorber, the feed is preflashed so that any liquid may bypass the absorber. This preflash simulates what would actually occur in the bottom of the absorber.

The gas from the prewash absorber proceeds to the main wash section where all the hydrogen sulfide and part of the carbon dioxide are removed. The methanol solvent rate to the main wash section was determined so that the degree of carbon dioxide removal agreed with the information presented in the CONOCO Commercial Design Report, while achieving complete removal of hydrogen sulfide. However, the basis for the absorber feed composition did not account for the small amount of recycled hydrocarbon gas. This means that the predicted carbon dioxide gas removal in the overall simulation is not in complete agreement with the CONOCO commercial design.

It is unusual for an absorber to contain less than six or more than ten theoretical trays (Perry and Chilton, 1973). A sensitivity study to the number of trays in the main wash absorber indicated that an increase from six to ten trays results in a reductions of only 2 percent in the required methanol rate. Figure 9 shows a plot of carbon dioxide in the outlet gas versus solvent rate and number of trays. The relative insensitivity of the required amount of solvent to the

Figure 9

EFFECT OF SOLVENT RATE AND NUMBER
OF TRAYS ON CARBON DIOXIDE ABSORPTION



tower size justified designing the main wash absorber with six trays.

The output from simulating both the prewash and main wash absorbers rigorously is included in Appendix B. In the final simulation, the main wash and prewash absorbers operate with 3100 lbmol/hr and 330 lbmol/hr of circulating methanol respectively.

Flash Regeneration Section

In the flash regeneration section, a fraction of the absorbed gases are recovered from the rich solvent by a reduction in pressure. The pressure of downstream processes dictate the final flash pressure. In this simulation, the prewash flash regenerator flashes the prewash solvent to 30 psia, allowing sufficient pressure head to feed the water wash column without further compression. Similarly, the main flash regenerator is designed to flash the main wash solvent to 30 psia in two stages, with an intermediate pressure of 75 psia. Since the vapor from the first flash is recycled to the absorption section, the intermediate pressure must minimize the amount of hydrogen sulfide and carbon dioxide desorbed while recovering as much of the desired hydrocarbon gases as possible. An intermediate pressure of 75 psia represents an appropriate compromise. The three flashes are simulated as two-phase adiabatic flashes (PRWSFLSH, FLSHRG1, FLSHRG2).

Naphtha Extractor

In the naphtha extractor, the methanol-water-naphtha-gas stream is allowed to separate into two liquid phases to permit removal of the naphtha-rich phase from the system. The feed

consists primarily of the bottoms from the prewash flash regenerator to which a water-rich stream is added to effect the liquid-liquid separation. The water source is the bottoms from the water wash column. In order to ensure that the naphtha extractor operates without any of the water icing, the prewash flash bottoms is preheated to 50°F. The design pressure is 30 psia, 5 psi higher than the water wash column to which any vapors are directed. At these conditions, the physical properties model predicts a phase separation into two liquid phases which are in reasonable agreement with liquid-liquid experimental data for the methanol-benzene-water ternary. The plot in Figure 10 illustrates the comparison between the predicted separation at 38°F and experimental data at 77°F. Unfortunately, published data were not located at the actual separation temperature.

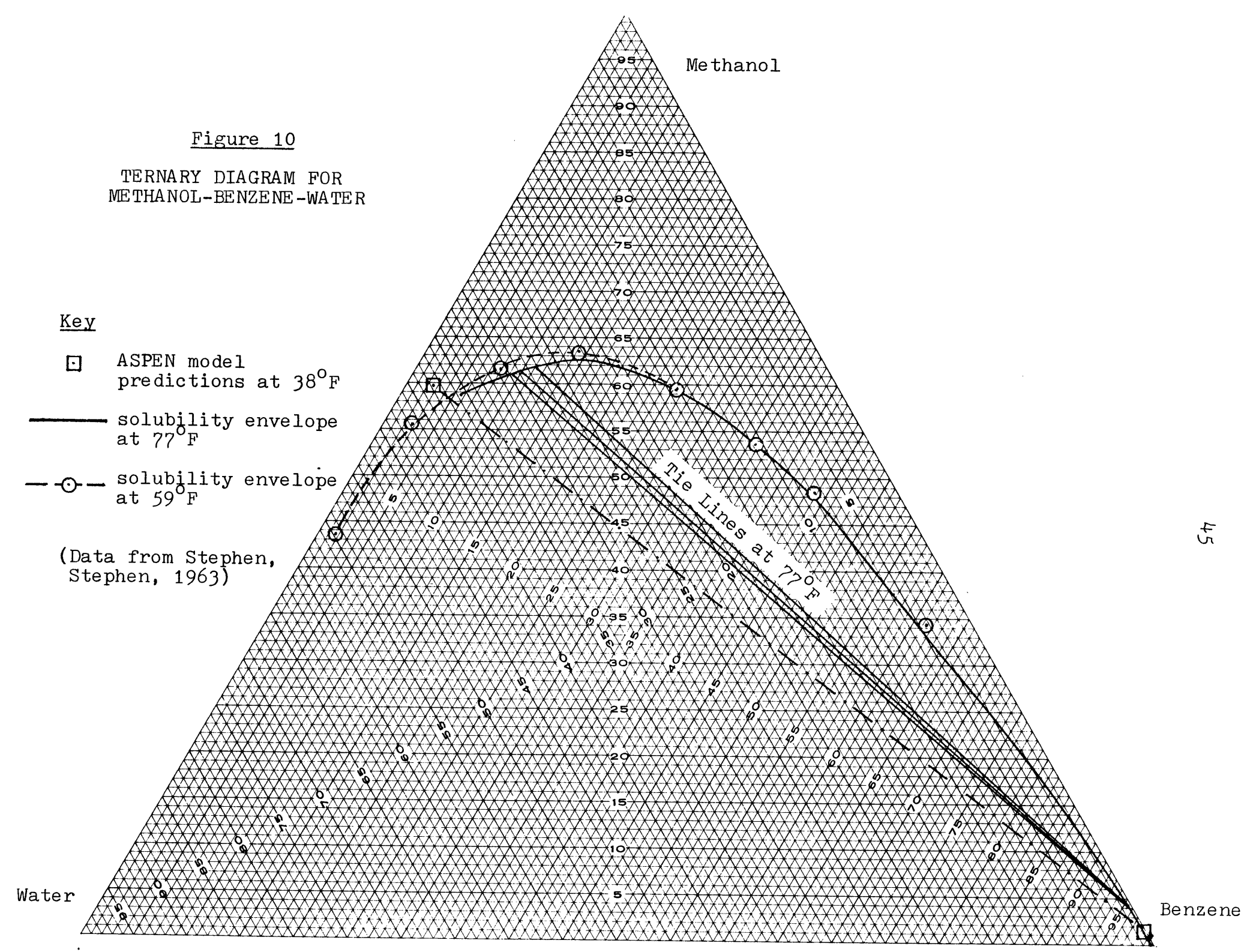
In the overall model, the naphtha extractor is represented by a feed mixer (NEXMIX) followed by a three-phase adiabatic flash at 30 psia (NEXSEP).

Azeotrope Column

The objective of the azeotrope column lies in removing the residual naphtha and dissolved gases from the methanol-water mixture. Preliminary simulation of the column using RADFRAC suggested that a good separation is possible in this column, yielding an uncontaminated methanol-water stream. This simulation indicated that all the gas components and naphtha are distilled in the overhead along with a small portion of the methanol, while all the water and remaining methanol are recovered in the bottoms. As the name of the

Figure 10

TERNARY DIAGRAM FOR
METHANOL-BENZENE-WATER



column suggests, the overhead may be expected to contain benzene and methanol in their azeotropic compositions (61.4 mole % methanol at 128.8°F). Further simulation of the column with RADFRAC demonstrated that in the overhead methanol and benzene may indeed reach their azeotropic composition on a methanol plus benzene basis.

Development of a feasible design for the azeotrope column involved setting the distillate rate, the reflux ratio, the number of theoretical trays, and the feed entry point. Seeing that the split between the overhead and the bottoms was well defined in the preliminary study, the distillate rate could be established purely by material balance considerations. The behaviour of the column proved to be highly sensitive to the reflux ratio. The amount of material in the rectifying section of the column depends directly on the reflux ratio. Since such a large percentage of the feed (94 mole percent) ultimately appears in the bottoms product, a high reflux ratio is necessary to ensure adequate vapor flow throughout the column. In the final design, a reflux ratio of 2.0 leads to satisfactory operation. While this ratio appears to be substantially higher than the minimum reflux ratio, difficulties were encountered in obtaining a converged RADFRAC solution at lower reflux ratios.

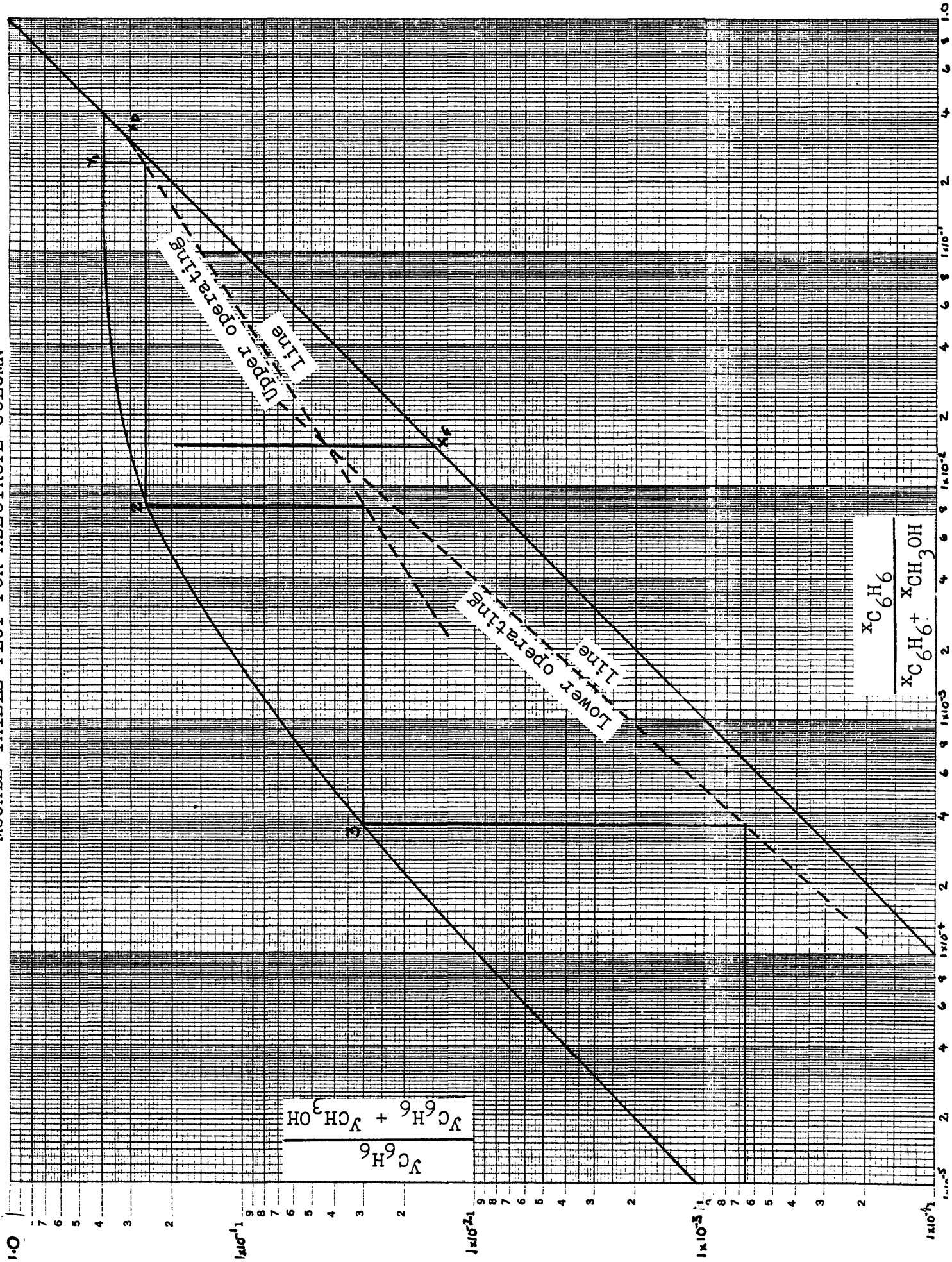
A revealing method of interpreting tray-to-tray output uses the idealized McCabe-Thiele techniques (Russell, 1981). This tool provides valuable insights despite the non-ideality of the particular system. If methanol and benzene are identified as the two components which require separation, and

all the compositions are normalized on a methanol plus benzene basis, a McCabe-Thiele x-y diagram may be prepared. Figure 11 displays such a diagram for the upper portion of the azeotrope column, where compositions are plotted on a logarithmic scale for clarity. The equilibrium compositions were taken directly from the RADFRAC output. This type of plot identified pinch points, the minimum reflux ratio, and indicated the optimum feed location during the column design. In the final design, the feed enters at the third stage. Figure 11 suggests that a slight improvement in the column efficiency may be realized with the feed located at the second stage. The diagram also shows that the physical properties model predicts an azeotrope composition close to that reported. Since the overhead lies at this composition, it can be seen that increasing the number of trays would not improve the separation.

The feed quality plays a significant role in the column design, as well. Given the fixed distillate rate of 45 lbmol/hr a simplified material balance analysis, assuming constant molar overflow, predicts the maximum percentage of vapor permitted in the feed for the column to operate as desired. For instance, with a reflux ratio of 2.0, the feed must be greater than 82 percent liquid in order to meet the desired distillate rate. Higher degree of vaporization results in insufficient vapor in the stripping section. In the actual process flowsheet, the azeotrope column feed is preheated by heat exchange with the waste water from the methanol-water column. The final temperature of the waste water was taken to be $118^{\circ}F$, as

Figure 11

McCABE-THIELE PLOT FOR AZEOTROPE COLUMN



indicated on the CONOCO flowsheet, for this simulation. This heat exchange results in an all liquid azeotrope column feed at a temperature of 96°F.

The rigorous simulation of the azeotrope column is shown in Appendix C. This simulation required 40 outside loop iterations to achieve a converged solution. The difficulty in converging is a consequence of the non-ideality of the system in which the outside loop variables for RADFRAC, namely K-values and enthalpy, are highly composition dependent.

Methanol-Water Column

The methanol-water stream from the azeotrope column bottoms is separated in the methanol-water column. In this simulation, the column is designed to yield a 99 percent pure methanol distillate. A RADFRAC model was used to develop the column design, and to examine the sensitivity to various design parameters. In addition, a McCabe-Thiele diagram provided initial estimates of the number of stages required to effect the desired separation at a given reflux ratio. This same diagram showed that the minimum reflux ratio occurs at a value of approximately 0.9.

Perry (1973) indicates that setting the reflux ratio 30 percent higher than the minimum reflux ratio generally minimizes the combined operating and fixed costs. This general rule was followed in chosing a reflux ratio of 1.2 for the column design. At such a reflux ratio, the desired methanol-water separation requires 25 theoretical trays. The final design introduces the feed on the nineteenth stage from the top which is the optimal stage according to the McCabe-Thiele technique.

In the RADFRAC model of the column, a total condenser is included on the overhead. In the actual flowsheet, however, the overhead vapors proceed directly to the hot regeneration column to act as reflux. Since the methanol overhead and the hot regeneration column bottoms differ very little in composition, the hot regeneration column is, in essence, acting as the total condenser.

Detailed output from the RADFRAC simulation is located in Appendix D. In the overall flowsheet, the column is represented by a mixer and separator block (MWMIX, MWSEP) with the reflux rate calculated by the Fortran paragraph REFLUX.

Hot Regeneration Column

The purpose of the hot regeneration column is to strip the main wash solvent completely of the acid gases remaining after flash desorption. Methanol from the methanol-water column is also fed to this column. The methanol vapors, combined with those generated in the reboiler, strip the acid gases from the solvent.

The column is designed with 10 theoretical stages with the main wash solvent and methanol distillate feeds located on the third and sixth stages from the top, respectively. The column was simulated with RADFRAC at reflux ratios ranging from 0.5 to 2.0. These simulations indicated that it is possible to strip essentially all the acid gases from the methanol at reflux ratios of 1.0 or greater. At the same time, the overhead vapor contains less than 0.07 mole percent methanol vapor. Increasing the reflux ratio from 1.0 to 2.0 does not

improve the separation significantly. However, at a reflux ratio of 0.5, the separation is inadequate, resulting in approximately 13 mole percent methanol in the overhead. The overhead column temperature varies greatly with the reflux ratio. At ratios exceeding 1.0, the overhead contains practically no methanol and must be cooled to -40°F or less in order to condense sufficient material for reflux. The temperature is low enough so that the acid gases require no further refrigeration prior to the water wash column. On the other hand, at low reflux ratios, the overhead may contain a significant percentage of methanol vapor and, therefore, the column can be refluxed by condensing the methanol. For instance, at a 0.5 reflux ratio, methanol accounts for 98 percent of the condensate which is condensed at 97°F. Under these circumstances, a significant amount of the methanol is lost with the acid gases. Some of this may be subsequently recovered in the water wash column. Thus, the design of the hot regeneration column must consider the trade-off between a high condenser duty requiring refrigeration on one hand, and increased methanol losses on the other. Such a trade-off lay beyond the scope of this work. For the purpose of this simulation, a reflux ratio of 1.0 was selected where the methanol losses are negligible.

The detailed RADFRAC simulation of this column established the splits for the separator (HTRGSEP) representing the column in the overall flowsheet. The RADFRAC model is included in Appendix E.

Water Wash Column

Methanol vapor is recovered from the combined acid gas streams in the water wash column. The water-rich stream from this unit is sent to the naphtha extractor to effect the liquid-liquid separation. The rate of water addition was determined from experimental data so that the subsequent liquid-liquid separation in the naphtha extractor would yield a methanol-water phase containing less than 1 mole percent benzene. The results from simulating this column as a four stage absorber with RADFRAC (see Appendix F) demonstrate that such a water rate is sufficient to ensure no methanol carryover with the acid gas. In the simplified flowsheet, the water wash column is modelled with a separator block (H2OWSH) which separates the feed according to the distribution predicted by the rigorous model.

Heat Exchangers

The naphtha extractor feed/regenerated methanol, azeotrope feed/waste water, and hot regenerator feed/regenerated methanol heat exchangers are each modelled using two heaters. The heat duty calculated in one heater is passed to the second heater, which represents the other side of the exchanger, as an input stream. The split in duty between the two regenerated methanol coolers is determined so that the naphtha extractor feed (pre-wash flash bottoms) is preheated to 50°F to ensure operation of the naphtha extractor without any icing.

The absorber feed gas cooling train is handled by a series of heaters. The simulation does not model the detailed heat exchange with the purified gas. An enthalpy balance, however,

indicates that the heat removed from the feed gas in cooling the gas to -30°F is sufficient to heat the purified gas to 67°F. The CONOCO Design Basis shows that the purified gas is heated to 77°F after heat exchange. Thus, the absorber feed temperature may be achieved through heat exchange with the purified gas without any supplemental refrigeration.

Methanol Make-up

A methanol make-up stream contributes to steady operation of the hydrogen sulfide absorbers by maintaining the methanol circulation at the design rate. The make-up stream replaces any methanol lost from the recycle stream. In the simulation, a Fortran paragraph (MAKEUP) calculates the required make-up rate.

Flowsheet Convergence

To facilitate the convergence of the overall flowsheet which contains several recycle loops, the regenerated methanol recycle stream is broken. More specifically, the methanol solvent to the absorption section (RGMETC) is treated as a feed stream, while the regenerated methanol from the hot regeneration column (RGMETC2) is considered as a product stream. This simplification is possible since the stream composition is well defined and the stream rate is maintained at the design rate by the methanol make-up stream. Such treatment permits the flowsheet to be divided into two subsystems which can be converged separately.

The flowsheet is converged with an ASPEN generated tear stream set using the Wegstein convergence method. Three

material streams and two heat streams must be converged to converge the entire flowsheet.

V. RECTISOL PROCESS SIMULATION RESULTS

The process simulation provides a stream-by-stream heat and material balance which is shown in the simulation output in Appendix A.

The predicted composition of the desulfurized gas is compared with the composition from the CONOCO Design Basis in Table 4. The comparison shows that the ASPEN model predicts a higher yield of each gas constituent. This discrepancy stems from the fact that the methanol circulation rate was established based on the fresh feed gas composition which neglected the recycled hydrocarbon gas, as was mentioned earlier. Therefore, the degree of absorption predicted by the ASPEN model is lower than that accomplished by the CONOCO design. To improve the agreement between the simulation and the design, the methanol circulation rate in the simulation could be increased.

The acid gas and the desulfurized gas are related by material balance since virtually all the gases are recovered in these two streams. Therefore, the lower degree of absorption shown by the ASPEN model leads to a lower acid gas recovery as compared to the CONOCO design. Table 5 presents the acid gas composition for both the design and the simulation.

The composition of the regenerated methanol calculated by the rigorous simulation of the hot regeneration column is shown in Table 6. The model predicts that it is possible to regenerate the methanol to 99.8 percent purity, contaminated only by 0.2 percent water and 2 ppm hydrogen sulfide.

Table 4

DESULFURIZED GAS COMPOSITION

Component	ASPEN Model lbmol/hr	CONOCO Design lbmol/hr
Hydrogen	1909.4	1907.7
Carbon Monoxide	4048.7	4037.4
Carbon Dioxide	173.4	159.2
Methane - Butane	499.6	485.9
Hydrogen Sulfide	0.0	0.0
Nitrogen	41.6	41.6
Water	0.0	0.0
Naphtha	0.0	0.0
Methanol	0.1	0.0

Table 5

ACID GAS COMPOSITION

Component	ASPEN Model lbmol/hr	CONOCO Design lbmol/hr
Hydrogen	0.3	2.0
Carbon Monoxide	4.2	15.5
Carbon Dioxide	125.6	139.9
Methane - Butane	2.9	16.6
Nitrogen	0.0	0.1
Hydrogen Sulfide & Carbonyl Sulfide	134.9	138.7
Water	8.0	5.6
Naphtha	1.8	0.0
Methanol	0.0	0.0

Table 6

REGENERATED METHANOL

Component	ASPEN Model lbmol/hr
Hydrogen Sulfide	0.13
Water	8.84
Methanol	3817.90

Table 7 shows the heating and cooling duties calculated by the process simulation. The heat balance predicts that the refrigeration duty to cool the recirculating methanol is 10.86 MMBtu/hr. The total predicted cooling duty, including both refrigeration and cooling water duty, is 16.80 MMBtu/hr. This is lower than the duty quoted for the CONOCO design. The deviation may be attributed to the differences in the design basis for the simulation and the actual CONOCO design. In order for the simulation to match the degree of carbon dioxide absorption in the CONOCO design, a higher methanol circulation rate or a lower absorption feed gas temperature is required. Both of these design changes would raise the refrigeration duty. As Table 7 demonstrates, the calculated heating duty is significantly higher than that for the CONOCO design. The heating duty represents the steam heat required to reboil the azeotrope column, the methanol-water column and the hot regeneration column. As such, the heating duty is highly sensitive to the specific column design.

Table 7

COOLING AND HEATING DUTIES
FOR THE RECTISOL PROCESS

	ASPEN Model MMBtu/hr	CONOCO Design MMBtu/hr
Refrigeration and Cooling Water Duty		
Solvent Refrigeration	10.86	-
Hot Regeneration Column Condenser	4.31	-
Azeotrope Column Condenser	1.63	-
	16.80	18.76
Steam Heating Duty		
Azeotrope Column Reboiler	4.22	-
Methanol-Water Column Reboiler	10.75	-
Hot Regeneration Column Reboiler	10.10	-
	25.07	11.96

VI. CONCLUSION

The process model described in this report represents a viable Rectisol process, based on the CONOCO design. The model demonstrates that the synthesis gas may be desulfurized and the methanol solvent may be regenerated with reasonable operating conditions.

It is difficult to assess the validity of the computer model in view of the lack of published process data. One point of comparison lies in the predicted compositions for the desulfurized gas and acid gas. The current basis for the methanol circulation rate, which is not consistent with the CONOCO basis, renders this comparison meaningless. Unfortunately, this project was concluded, due to lack of computer funds, before a valid comparison could be made at an increased methanol circulation rate. However, a minor adjustment of the main wash solvent rate to approximately 3400 lbmol/hr from the current 3100 lbmol/hr is expected to bring the model predictions in line with the design basis.

The Rectisol computer model was developed as a flexible tool which may be applied in future design work or sensitivity studies. The effect of a design modification to one of the major process units may be examined using the rigorous stand-alone model. The results of this simulation may then be transferred to the overall simulation to assess the impact of the change on the process as a whole. In addition, the model may be employed to consider the trade-offs between such variables as the absorption temperature, the degree of regeneration, and the methanol circulation rate. An enhancement of the

Rectisol model by linking it to the ASPEN Cost Estimation Subsystem and Economic Evaluation Subsystem would permit these design changes to be evaluated from an economic standpoint.

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APPENDIX A

Overall Rectisol Model

```
TITLE 'RECTISOL GAS DESULFURIZATION
       METC COAL GASIFICATION PLANT'
DESCRIPTION 'GAS COOLING, H2S ABSORPTION, FLASH REGENERATION
             NAPHTHA EXTRACTION, AZEOTROPE DISTILLATION, METHANOL
             WATER SEPARATION, HOT REGENERATION'
IN-UNITS ENG
HISTORY
     MSG-LEVEL PROPERTIES=2
RUN-CONTROL  MAX-TIME=300.
COMPONENTS H2 H2/CO CO/CO2 CO2/CH4 CH4/N2 N2/H2S H2S/H2O H2O/
           C6H6 C6H6/CH3OH CH4O
PROPERTIES OPSETA GLOBAL/SYSOP14
PROP-OPTIONS OPSETA SYSOP14 HVMX HVMX13/HLMX HLMX13
INSERT * RKAKIJ
;
;     ********************
;
;     FEED GAS COOLING
;
;     ********************
;
FLOWSHEET GASCOOL
     BLOCK MIXHC     IN= FEED RCHCPC      OUT=FDMX
     BLOCK COOL1     IN=FDMX              OUT=FDMXC Q1
     BLOCK SEPH2O    IN= FDMXC            OUT=FDH2O FDXH2O
     BLOCK INJMEOH   IN= FDXH2O RCMTHP    OUT=FDMX2
     BLOCK COOL2     IN= FDMX2            OUT=PRWSFD Q2
;
;     ************************************
;
;     PREWASH ABSORBER & MAIN WASH ABSORBER
;
;     ************************************
;
FLOWSHEET H2SABSBR
     BLOCK PREFLSH  IN= PRWSFD           OUT= PRWSFDV PRWSFDL
     BLOCK PREWASH1 IN= PRWSFDV PRWSSOLV OUT=X
     BLOCK PREWASH2 IN= X                OUT=VPRWS LPRWS
     BLOCK H2SABS1  IN=VPRWS ABSRSOLV    OUT=Y
     BLOCK H2SABS2  IN= Y                OUT=DESGS LABSR
     BLOCK HEAT1    IN= DESGS            OUT=PUREGAS QH1
     BLOCK SOLVSPLT IN= RGMETC           OUT=PRWSSOLV ABSRSOLV
     BLOCK BOTMIX   IN= LPRWS PRWSFDL    OUT= LPRWSMX
     BLOCK RCMESPLT IN= LPRWSMX          OUT=RCMETH  LPRWS1
     BLOCK RCMEPUMP IN= RCMETH           OUT=RCMTHP
;
;     *************************
;
;     FLASH REGENERATION SECTION
;
;     *************************
;
FLOWSHEET FLASHREGEN
     BLOCK PRWSFLSH IN= LPRWS1           OUT=VPRWSF LPRWSF
     BLOCK NEXPUMP  IN= LPRWSF           OUT=LPRWSFP
     BLOCK HEAT5    IN= LPRWSFP          OUT=LPRWSFH Q5
     BLOCK FLSHRG1  IN= LABSR            OUT=VFLRG1 LFLRG1
     BLOCK FLSHRGMX IN= LFLRG1 COND      OUT=FLRGMX
     BLOCK FLSHRG2  IN= FLRGMX           OUT=VFLRG2 LFLRG2
     BLOCK HTRGPUMP IN= LFLRG2           OUT=LFLRG2P
     BLOCK RCYCCOND IN= VFLRG1           OUT=RCYCHC COND
     BLOCK RCCOMP   IN= RCYCHC           OUT=RCHCP
```

```
     BLOCK REFRIG3  IN= RCHCP            OUT=RCHCPC QR3
;
;      **************
;
;     NAPHTHA EXTRACTOR
;
;     *****************
;
FLOWSHEET NAPHEXTR
     BLOCK NEXMIX  IN= LPRWSFH AZCOND LWWSP OUT=NEXFEED
     BLOCK NEXSEP IN=NEXFEED        OUT=VNEX AZFEED NAPHTHA
     BLOCK NAPHPUMP IN=NAPHTHA          OUT=NAPHTHP
      BLOCK HEAT4   IN=AZFEED  Q4       OUT=AZFEEDH
;
;     ***************
;
;     AZEOTROPE TOWER
;
;     ***************
;
FLOWSHEET AZEOCOL
     BLOCK AZCOL   IN= AZFEEDH          OUT= AZOVHD LAZ
     BLOCK AZCOND  IN= AZOVHD           OUT= VAZ AZCOND
;
;     **********************
;
;     METHANOL-WATER COLUMN
;
;     **********************
;
FLOWSHEET METHCOL
     BLOCK MWMIX IN= LAZ    MEOHRFLX    OUT= MWFEED
     BLOCK MWSEP IN= MWFEED             OUT= WSTH2O VMW
     BLOCK COOL4 IN= WSTH2O             OUT= WSTH2OC Q4
;
;     ***********************
;
;     HOT REGENERATOR COLUMN
;
;     ***********************
;
FLOWSHEET HOTREGEN
     BLOCK HEAT6    IN= LFLRG2P Q6      OUT= HTRGFD
     BLOCK HTRGMX   IN= HTRGFD VMW      OUT= A
     BLOCK HTRGSEP  IN= A               OUT= VHTRG1 LHTRG1
     BLOCK METHMX   IN= LHTRG1 MUMEOH   OUT= RGMEOH
     BLOCK ABPUMP   IN= RGMEOH          OUT= RGMEOHP
     BLOCK RFLXSPLT IN= RGMEOHP         OUT= MEOHRFLX RGME1
;
;     ****************************
;
;     REGENERATED METHANOL RECYCLE
;
;     ****************************
;
FLOWSHEET RECYCLE
     BLOCK COOL6   IN= RGME1            OUT= RGMEC Q6
     BLOCK COOL5   IN= RGMEC Q5         OUT= RGMEC2
     BLOCK REFRIG4 IN= RGMEC2           OUT= RGMETC2 QR4
;
;     *****************
;
;     WATER WASH COLUMN
;
;     *****************
;
```

```
FLOWSHEET H2OWASH
     BLOCK WWMIX   IN= VPRWSF VFLRG2 VAZ VNEX VHTRG1 ADDH2O &
                                         OUT= WWFEED
     BLOCK H2OWSH  IN= WWFEED            OUT= ACIDGAS LWWS
     BLOCK H2OPUMP IN= LWWS              OUT= LWWSP
;
;     *****************
;
;     STREAM DEFINITION
;
;     *****************
;
DEF-STREAMS HEAT Q1 Q2  Q4 Q5 Q6  QR3 QR4  QH1
;
;     ************************
;
;     INPUT STREAM DEFINITION
;
;     ************************
;
STREAM FEED TEMP=95. PRES=427.
     MOLE-FLOW H2 1909.7/CO 4052.9/CO2 299.1/CH4 502.5/N2 41.7/
               H2S 139.5/H2O 13.8/C6H6 23.1
;
STREAM MUMEOH TEMP=60. PRES=15.
     MOLE-FLOW CH3OH 2.
;
STREAM ADDH2O TEMP=100. PRES=40.
     MOLE-FLOW H2O 385.
;
STREAM LHTRG1 TEMP=130. PRES=15.
     MOLE-FLOW CH3OH 3100.
;
STREAM RGMETC TEMP=-75. PRES=420.
     MOLE-FLOW CH3OH 3430.
;
STREAM MEOHRFLX TEMP=130. PRES=15.
     MOLE-FLOW CH3OH 770.
;
;     *****************
;
;     BLOCK INFORMATION
;
;     *****************
;
;     ***********
;
;     GAS COOLING
;
;     ***********
;
BLOCK MIXHC MIXER
     PARAM PRES=427. NPK=1 KPH=1
;
BLOCK COOL1 HEATER
     PARAM  PRES=-3.  TEMP=40.
;
BLOCK SEPH2O SEP2
     FLASH-SPECS FDH2O NPK=1 KPH=2 /
                 FDXH2O NPK=1 KPH=1
      MASS SUBS=MIXED STRM=FDH2O COMP=H2O FLOW=205.
;
BLOCK INJMEOH MIXER
;
BLOCK COOL2 HEATER
     PARAM PRES=-3. TEMP=-30.
```

```
;
;      ********
;
;      H2S ABSORBER
;
;      ************
;
BLOCK PREFLSH FLASH2
     PARAM TEMP=-30. PRES=423.
;
BLOCK PREWASH1 MIXER
;
BLOCK PREWASH2 SEP2
     FLASH-SPECS VPRWS TEMP=-27.8 PRES=422.1 NPK=1 KPH=1/
                 LPRWS  TEMP=-22.3 PRES=423. NPK=1 KPH=2
     FRAC SUBS=MIXED STRM=VPRWS COMP=H2 CO CO2 CH4 N2 H2S H2O C6H6 CH3OH &
     FRAC= 0.999882 0.999580 0.975942 0.998711 0.999718 0.815149 0.0 &
           0.0 0.002532
;
BLOCK H2SABS1 MIXER
;
BLOCK H2SABS2 SEP2
     FLASH-SPECS DESGS TEMP=-73. PRES=421.2 NPK=1 KPH=1/
                 LABSR TEMP=-27.3 PRES=422.1 NPK=1 KPH=2
     FRAC SUBS=MIXED STRM=DESGS COMP=H2 CO CO2 CH4 N2 H2S H2O C6H6 CH3OH &
     FRAC= 0.998882 0.995618 0.572902 0.986591 0.996822 0.00029 0.0 &
           0.0 0.00004
;
BLOCK HEAT1 HEATER
     PARAM TEMP=77. PRES=-4.
;
BLOCK SOLVSPLT FSPLIT
     FRAC ABSRSOLV 0.9038
;
BLOCK BOTMIX MIXER
     PARAM NPK=2
;
BLOCK RCMESPLT FSPLIT
     FRAC RCMETH 0.05
;
BLOCK RCMEPUMP PUMP
     PARAM POUT= 427.
;
;      ******************
;
;      FLASH REGENERATION
;
;      ******************
;
BLOCK PRWSFLSH FLASH2
     PARAM PRES=30. DUTY=0.
;
BLOCK NEXPUMP PUMP
     PARAM POUT=40.
;
BLOCK HEAT5 HEATER
     PARAM PRES=-5. TEMP=50.
;
BLOCK FLSHRG1 FLASH2
     PARAM PRES=75. DUTY=0.
;
BLOCK FLSHRGMX MIXER
;
BLOCK FLSHRG2 FLASH2
     PARAM PRES=30.
;
```

```
BLOCK HTRGPUMP PUMP
     PA   4 POUT=40.
;
BLOCK RCYCCOND FLASH2
     PARAM PRES=65. DUTY=0.
;
BLOCK RCCOMP COMPR
     PARAM 2 PRES=427.
;
BLOCK REFRIG3 HEATER
     PARAM PRES=-2. TEMP=95.
;
;      *****************
;
;      NAPHTHA EXTRACTOR
;
;      *****************
;
BLOCK NEXMIX MIXER
;
BLOCK NEXSEP FLASH3
     PARAM DUTY=0. PRES=30. KEY=H20 L-KODE=1
;
BLOCK NAPHPUMP PUMP
     PARAM POUT=50.
;
BLOCK HEAT4 HEATER
     PARAM PRES=50.
;
;      ****************
;
;      AZEOTROPE COLUMN
;
;      ****************
;
BLOCK AZCOL SEP2
     FLASH-SPECS AZOVHD TEMP=130. PRES=48. NPK=1 KPH=1/
                 LAZ    TEMP=228. PRES=50. NPK=1 KPH=2
     FRAC SUBS=MIXED STRM=AZOVHD COMP=H2 CO CO2 CH4 N2 H2S C6H6 H20  &
                                 FRAC=1. 1. 1.  1.  1. 1.  1.  0.
     MOLE-FLOW SUBS=MIXED STRM=AZOVHD COMP=CH3OH &
                                 FLOW=20.
;
BLOCK AZCOND SEP2
     FLASH-SPECS VAZ TEMP=130. PRES=48. NPK=1 KPH=1/
                 AZCOND TEMP=130. PRES=48. NPK=1 KPH=2
     FRAC SUBS=MIXED STRM=VAZ COMP= H2 CO CO2 CH4 N2 H2S C6H6 H20 CH3OH &
               FRAC= 1.0 1.0 0.985 1.0 1.0 0.928 0.75 0.0 0.75
;
;      *********************
;
;      METHANOL-WATER COLUMN
;
;      *********************
;
BLOCK MWMIX MIXER
;
BLOCK MWSEP SEP2
     FLASH-SPECS WSTH20 TEMP=250. PRES=40. NPK=1 KPH=2/
                 VMW    TEMP=160. PRES=25. NPK=1 KPH=1
     FRAC SUBS=MIXED STRM= WSTH20 COMP= H2 CO CO2 CH4 N2 H2S H20 C6H6 CH3OH &
                           FRAC = 0.  0. 0. 0. 0. 0. .989 0. 0.002
     MOLE-FLOW SUBS=MIXED STRM=VMW COMP=CH3OH FLOW=1100.
;
BLOCK COOL4 HEATER
     PARAM PRES=35. TEMP=118.
```

```
;
;      **********************
;
;      HOT REGENERATION SECTION
;
;      **********************
;
BLOCK HEAT6 HEATER
     PARAM PRES=-5.
;
BLOCK  HTRGMX MIXER
;
BLOCK HTRGSEP SEP2
     FLASH-SPECS VHTRG1 TEMP=-39.77 PRES=33.5 NPK=1 KPH=1/
                 LHTRG1 TEMP=190.9 PRES=35. NPK=1 KPH=2
     FRAC SUBS=MIXED STRM=LHTRG1 COMP= H2 CO CO2 CH4 N2 H2S H2O C6H6 CH3OH &
                    FRAC=              0. 0. 0. 0. 0. 0.0 1. 0. 0.999963
;
;
BLOCK METHMX MIXER
;
BLOCK ABPUMP HEATER
     PARAM PRES=420. Q=0.
;
BLOCK RFLXSPLT FSPLIT
     MOLE-FLOW MEOHRFLX 770. 1
     DEF-KEY ID=1 SUBS=MIXED COMP=CH3OH
;
      ***************
;
      RECYCLE METHANOL
;
      ***************
;
BLOCK COOL6 HEATER
     PARAM PRES=-5. TEMP=40.
;
BLOCK COOL5 HEATER
     PARAM PRES=-5.
;
BLOCK REFRIG4 HEATER
     PARAM PRES=-5. TEMP=-75.
;
      ****************
;
      WATER WASH COLUMN
;
      ****************
;
BLOCK WWMIX MIXER
;
BLOCK H2OWSH SEP2
     FLASH-SPECS ACIDGAS TEMP=89. PRES=25. NPK=1 KPH=1/
                 LWWS    TEMP=40.9 PRES=26. NPK=1 KPH=2
     FRAC SUBS=MIXED STRM=ACIDGAS COMP=H2 CO CO2 CH4 N2 H2S H2O C6H6 CH3OH &
                     FRAC= 1.0 1.0 0.9994 1.0 1.0 0.9951 0.0207 0.4091 0.0
;
BLOCK H2OPUMP PUMP
     PARAM POUT=50.
;
      *************************
;
      AZEOTROPE COLUMN SPLITS
;
      *************************
;
```

```
FORTRAN AZEO
     DE   NE BENZ MOLE-FLOW STREAM=AZFEED COMPONENT=C6H6
     DE. .NE FMETH MOLE-FLOW  STREAM=AZFEED COMPONENT=CH3OH
     DEFINE WAT  MOLE-FLOW STREAM=AZFEED COMPONENT=H2O
     DEFINE X1 BLOCK-VAR BLOCK=AZCOL SENTENCE=MOLE-FLOW VARIABLE=FLOW&
              ELEMENT=1 ID1=MIXED ID2=AZOVHD
F     X1=(.614/.386)*BENZ
F     IF(X1.GT.FMETH) X1=FMETH
     EXECUTE BEFORE AZCOL
;
;     ***************************
;
;      MAKEUP METHANOL CALCULATION
;
;     ***************************
;
FORTRAN MAKEUP
     DEFINE RECIRC MOLE-FLOW STREAM=LHTRG1 COMPONENT=CH3OH
     DEFINE FLOWMU MOLE-FLOW STREAM=MUMEOH COMPONENT=CH3OH
     DEFINE RFLX MOLE-FLOW STREAM=MEOHRFLX COMPONENT=CH3OH
F     FLOWMU=3430.-(RECIRC-RFLX)
F     IF(FLOWMU.LE.ODO) FLOWMU=ODO
     EXECUTE BEFORE METHMX
;
;     ***********************************
;
;      METHANOL-WATER COLUMN REFLUX
;
;     ***********************************
;
FORTRAN REFLUX
     DEFINE FDMW MOLE-FLOW STREAM=LAZ COMPONENT=CH3OH
     DEFINE WAT MOLE-FLOW STREAM=LAZ COMPONENT=H2O
     DEFINE RFSPLT BLOCK-VAR BLOCK=RFLXSPLT SENTENCE=MOLE-FLOW VARIABLE=FLOW&
                 ID1=MEOHRFLX
F     OVHDMW= (FDMW*0.99)+(WAT*0.01)
F     RFSPLT=1.2*OVHDMW
     EXECUTE BEFORE RFLXSPLT
;
```

RECTISOL GAS DESULFURIZATION

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RECTISOL GAS DESULFURIZATION
FLOWSHEET SECTION

FLOWSHEET CONNECTIVITY BY STREAMS

FLOWSHEET SECTION GASCOOL

STREAM	SOURCE	DEST	STREAM	SOURCE	DEST
FDMX	MIXHC	COOL1	FDMXC	COOL1	SEPH2O
Q1	COOL1	----	FDH2O	SEPH2O	----
FDXH2O	SEPH2O	INJMEOH	FDMX2	INJMEOH	COOL2
PRWSFD	COOL2	PREFLSH	Q2	COOL2	----
FEED	----	MIXHC			

FLOWSHEET SECTION H2SABSBR

STREAM	SOURCE	DEST	STREAM	SOURCE	DEST
PRWSFDV	PREFLSH	PREWASH1	PRWSFDL	PREFLSH	BOTMIX
X	PREWASH1	PREWASH2	VPRWS	PREWASH2	H2SABS1
LPRWS	PREWASH2	BOTMIX	Y	H2SABS1	H2SABS2
DESGS	H2SABS2	HEAT1	LABSR	H2SABS2	FLSHRG1
PUREGAS	HEAT1	----	QH1	HEAT1	----
PRWSSOLV	SOLVSPLT	PREWASH1	ABSRSOLV	SOLVSPLT	H2SABS1
LPRWSMX	BOTMIX	RCMESPLT	RCMETH	RCMESPLT	RCMEPUMP
LPRWS1	RCMESPLT	PRWSFLSH	RCMTHP	RCMEPUMP	INJMEOH
RGMETC	----	SOLVSPLT			

FLOWSHEET SECTION FLASHREG

STREAM	SOURCE	DEST	STREAM	SOURCE	DEST
VPRWSF	PRWSFLSH	WWMIX	LPRWSF	PRWSFLSH	NEXPUMP
LPRWSFP	NEXPUMP	HEAT5	LPRWSFH	HEAT5	NEXMIX
Q5	HEAT5	COOL5	VFLRG1	FLSHRG1	RCYCCOND
LFLRG1	FLSHRG1	FLSHRGMX	FLRGMX	FLSHRGMX	FLSHRG2
VFLRG2	FLSHRG2	WWMIX	LFLRG2	FLSHRG2	HTRGPUMP
LFLRG2P	HTRGPUMP	HEAT6	RCYCHC	RCYCCOND	RCCOMP
COND	RCYCCOND	FLSHRGMX	RCHCP	RCCOMP	REFRIG3
RCHCPC	REFRIG3	MIXHC	QR3	REFRIG3	----

FLOWSHEET SECTION NAPHEXTR

STREAM	SOURCE	DEST	STREAM	SOURCE	DEST
NEXFEED	NEXMIX	NEXSEP	VNEX	NEXSEP	WWMIX
AZFEED	NEXSEP	HEAT4	NAPHTHA	NEXSEP	NAPHPUMP
NAPHTHP	NAPHPUMP	----	AZFEEDH	HEAT4	AZCOL

FLOWSHEET SECTION AZEOCOL

STREAM	SOURCE	DEST	STREAM	SOURCE	DEST
AZOVHD	AZCOL	AZCOND	LAZ	AZCOL	MWMIX
VAZ	AZCOND	WWMIX	AZCOND	AZCOND	NEXMIX

FLOWSHEET SECTION METHCOL

STREAM	SOURCE	DEST	STREAM	SOURCE	DEST
MWFEED	MWMIX	MWSEP	WSTH2O	MWSEP	COOL4
VMW	MWSEP	HTRGMX	WSTH2OC	COOL4	----
Q4	COOL4	HEAT4			

FLOWSHEET SECTION HOTREGEN

STREAM	SOURCE	DEST	STREAM	SOURCE	DEST
HTRGFD	HEAT6	HTRGMX	A	HTRGMX	HTRGSEP
VHTRG1	HTRGSEP	WWMIX	LHTRG1	HTRGSEP	METHMX
RGMEOH	METHMX	ABPUMP	RGMEOHP	ABPUMP	RFLXSPLT

FLOWSHEET CONNECTIVITY BY STREAMS (CONTINUED)

MEOHRFLX	RFLXSPLT	MWMIX	RGME1	RFLXSPLT	COOL6
MUMEOH	----	METHMX			

FLOWSHEET SECTION RECYCLE

STREAM	SOURCE	DEST	STREAM	SOURCE	DEST
RGMEC	COOL6	COOL5	Q6	COOL6	HEAT6
RGMEC2	COOL5	REFRIG4	RGMETC2	REFRIG4	----
QR4	REFRIG4	----			

FLOWSHEET SECTION H2OWASH

STREAM	SOURCE	DEST	STREAM	SOURCE	DEST
WWFEED	WWMIX	H2OWSH	ACIDGAS	H2OWSH	----
LWWS	H2OWSH	H2OPUMP	LWWSP	H2OPUMP	NEXMIX
ADDH2O	----	WWMIX			

FLOWSHEET CONNECTIVITY BY BLOCKS

FLOWSHEET SECTION GASCOOL

BLOCK	INLETS	OUTLETS
MIXHC	FEED RCHCPC	FDMX
COOL1	FDMX	FDMXC Q1
SEPH2O	FDMXC	FDH2O FDXH2O
INJMEOH	FDXH2O RCMTHP	FDMX2
COOL2	FDMX2	PRWSFD Q2

FLOWSHEET SECTION H2SABSBR

BLOCK	INLETS	OUTLETS
PREFLSH	PRWSFD	PRWSFDV PRWSFDL
PREWASH1	PRWSFDV PRWSSOLV	X
PREWASH2	X	VPRWS LPRWS
H2SABS1	VPRWS ABSRSOLV	Y
H2SABS2	Y	DESGS LABSR
HEAT1	DESGS	PUREGAS QH1
SOLVSPLT	RGMETC	PRWSSOLV ABSRSOLV
BOTMIX	LPRWS PRWSFDL	LPRWSMX
RCMESPLT	LPRWSMX	RCMETH LPRWS1
RCMEPUMP	RCMETH	RCMTHP

FLOWSHEET SECTION FLASHREG

BLOCK	INLETS	OUTLETS
PRWSFLSH	LPRWS1	VPRWSF LPRWSF
NEXPUMP	LPRWSF	LPRWSFP
HEAT5	LPRWSFP	LPRWSFH Q5
FLSHRG1	LABSR	VFLRG1 LFLRG1
FLSHRGMX	LFLRG1 COND	FLRGMX
FLSHRG2	FLRGMX	VFLRG2 LFLRG2
HTRGPUMP	LFLRG2	LFLRG2P
RCYCCOND	VFLRG1	RCYCHC COND
RCCOMP	RCYCHC	RCHCP
REFRIG3	RCHCP	RCHCPC QR3

FLOWSHEET SECTION NAPHEXTR

BLOCK	INLETS	OUTLETS
NEXMIX	LPRWSFH AZCOND LWWSP	NEXFEED

FLOWSHEET CONNECTIVITY BY BLOCKS (CONTINUED)

NEXSEP	NEXFEED	VNEX AZFEED NAPHTHA
NAPHPUMP	NAPHTHA	NAPHTHP
HEAT4	AZFEED Q4	AZFEEDH

FLOWSHEET SECTION AZEOCOL

BLOCK	INLETS	OUTLETS
AZCOL	AZFEEDH	AZOVHD LAZ
AZCOND	AZOVHD	VAZ AZCOND

FLOWSHEET SECTION METHCOL

BLOCK	INLETS	OUTLETS
MWMIX	LAZ MEOHRFLX	MWFEED
MWSEP	MWFEED	WSTH2O VMW
COOL4	WSTH2O	WSTH2OC Q4

FLOWSHEET SECTION HOTREGEN

BLOCK	INLETS	OUTLETS
HEAT6	LFLRG2P Q6	HTRGFD
HTRGMX	HTRGFD VMW	A
HTRGSEP	A	VHTRG1 LHTRG1
METHMX	LHTRG1 MUMEOH	RGMEOH
ABPUMP	RGMEOH	RGMEOHP
RFLXSPLT	RGMEOHP	MEOHRFLX RGME1

FLOWSHEET SECTION RECYCLE

BLOCK	INLETS	OUTLETS
COOL6	RGME1	RGMEC Q6
COOL5	RGMEC Q5	RGMEC2
REFRIG4	RGMEC2	RGMETC2 QR4

FLOWSHEET SECTION H2OWASH

BLOCK	INLETS	OUTLETS
WWMIX	VPRWSF VFLRG2 VAZ VNEX VHTRG1 ADDH2O	WWFEED
H2OWSH	WWFEED	ACIDGAS LWWS
H2OPUMP	LWWS	LWWSP

CONVERGENCE BLOCK: $OLVERO1
TEAR STREAMS: PRWSFD
MAXIT= 30 WAIT 1 ITERATIONS BEFORE ACCELLERATING
ACCELLERATE EVERY 0 ITERS. QMAX= 0.0 QMIN= -5.000
$OLVERO1 (WEGSTN) ITER= 4 *** CONVERGED ***

		X	OLD X	ERROR
TOTAL MOLEFLOW	LBMOL/HR	0.7026121D+04	0.7026120D+04	0.5849371D-03
H2 MOLEFLOW	LBMOL/HR	0.1911757D+04	0.1911757D+04	0.4067034D-04
CO MOLEFLOW	LBMOL/HR	0.4068268D+04	0.4068267D+04	0.7849911D-03
CO2 MOLEFLOW	LBMOL/HR	0.3101350D+03	0.3101357D+03	-.7538698D-03
CH4 MOLEFLOW	LBMOL/HR	0.5070422D+03	0.5070418D+03	0.3540336D-03
N2 MOLEFLOW	LBMOL/HR	0.4181912D+02	0.4181911D+02	0.4359405D-05
H2S MOLEFLOW	LBMOL/HR	0.1428840D+03	0.1428838D+03	0.1345955D-03
H2O MOLEFLOW	LBMOL/HR	0.2547994D+01	0.2547994D+01	0.7900218D-08
C6H6 MOLEFLOW	LBMOL/HR	0.2431579D+02	0.2431579D+02	0.3316912D-06
CH3OH MOLEFLOW	LBMOL/HR	0.1735146D+02	0.1735144D+02	0.1981745D-04
PRESSURE	PSI	0.4210000D+03	0.4210000D+03	0.1258002D-13
MASS ENTHALPY	BTU/HR	-.1453093D+08	-.1453104D+08	0.1068983D+03

RECTISOL GAS DESULFURIZATION
FLOWSHEET SECTION

CONVERGENCE BLOCK: $OLVERO2
TEAR STREAMS: Q4 NEXFEED RGMEOH
MAXIT= 30 WAIT 1 ITERATIONS BEFORE ACCELLERATING
ACCELLERATE EVERY 0 ITERS. QMAX= 0.0 QMIN= -5.000
$OLVERO2 (WEGSTN) ITER= 7 *** CONVERGED ***

		X	OLD X	ERROR
TOTAL MOLEFLOW	LBMOL/HR	0.7764860D+03	0.7764852D+03	0.8814277D-03
TOTAL MOLEFLOW	LBMOL/HR	0.3828944D+04	0.3828862D+04	0.8200654D-01
STRM-ATTR-VA		0.3348537D+06	0.3348535D+06	0.2575449D+00
H2 MOLEFLOW	LBMOL/HR	0.1335930D-03	0.1335930D-03	0.3939022D-19
CO MOLEFLOW	LBMOL/HR	0.4289156D-02	0.4289156D-02	0.4201623D-18
CO2 MOLEFLOW	LBMOL/HR	0.1835290D+01	0.1835290D+01	0.2467404D-06
CH4 MOLEFLOW	LBMOL/HR	0.6420831D-02	0.6420831D-02	0.7352840D-18
N2 MOLEFLOW	LBMOL/HR	0.1790919D-04	0.1790919D-04	0.3282518D-20
H2S MOLEFLOW	LBMOL/HR	0.2961120D+02	0.2961106D+02	0.1384505D-03
H2O MOLEFLOW	LBMOL/HR	0.3794511D+03	0.3794511D+03	0.2753576D-13
C6H6 MOLEFLOW	LBMOL/HR	0.2708472D+02	0.2708449D+02	0.2260234D-03
CH3OH MOLEFLOW	LBMOL/HR	0.3384929D+03	0.3384924D+03	0.5167070D-03
PRESSURE	PSI	0.3500000D+02	0.3500000D+02	0.7862512D-15
MASS ENTHALPY	BTU/HR	-.3158578D+08	-.3158581D+08	0.3112046D+02
H2 MOLEFLOW	LBMOL/HR	0.0	0.0	0.0
CO MOLEFLOW	LBMOL/HR	0.0	0.0	0.0
CO2 MOLEFLOW	LBMOL/HR	0.0	0.0	0.0
CH4 MOLEFLOW	LBMOL/HR	0.0	0.0	0.0
N2 MOLEFLOW	LBMOL/HR	0.0	0.0	0.0
H2S MOLEFLOW	LBMOL/HR	0.0	0.0	0.0
H2O MOLEFLOW	LBMOL/HR	0.4178554D+01	0.4178554D+01	-.5744194D-07
C6H6 MOLEFLOW	LBMOL/HR	0.0	0.0	0.0
CH3OH MOLEFLOW	LBMOL/HR	0.3824765D+04	0.3824683D+04	0.8200660D-01
PRESSURE	PSI	0.1500000D+02	0.1500000D+02	0.3145005D-14
MASS ENTHALPY	BTU/HR	-.2493619D+08	-.2493618D+08	-.1977670D+01

COMPUTATIONAL SEQUENCE

SEQUENCE USED WAS:
SOLVSPLT $OLVERO1 PREFLSH PREWASH1 PREWASH2 H2SABS1 H2SABS2 FLSHRG1
RCYCCOND RCCOMP REFRIG3 MIXHC COOL1 SEPH2O BOTMIX RCMESPLT *RCMEPUMP
INJMEOH COOL2 $OLVERO1<--- PRWSFLSH NEXPUMP HEAT5 FLSHRGMX FLSHRG2
HTRGPUMP $OLVERO2 ABPUMP REFLUX RFLXSPLT COOL6 HEAT6 NEXSEP HEAT4 AZEO
AZCOL AZCOND MWMIX MWSEP HTRGMX HTRGSEP WWMIX H2OWSH H2OPUMP NEXMIX
COOL4 MAKEUP METHMX $OLVERO2<--- NAPHPUMP COOL5 REFRIG4 HEAT1

OVERALL FLOWSHEET BALANCE

OVERALL FLOWSHEET BALANCE (CONTINUED)

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	1909.70	1909.70	.237496D-07
CO	4052.90	4052.90	.204093D-06
CO2	299.100	299.101	-.266026D-05
CH4	502.500	502.500	.747053D-06
N2	41.7000	41.7000	.111268D-06
H2S	139.500	139.500	.175515D-05
H2O	398.800	398.800	-.462058D-08
C6H6	23.1000	23.0998	.994959D-05
CH3OH	3431.94	3431.86	.240497D-04
TOTAL BALANCE			
MOLE(LBMOL/HR)	10799.2	10799.2	.772895D-05
MASS(LB/HR)	263474.	263471.	.101160D-04
ENTHALPY(BTU/HR)	-.681346D+09	-.672056D+09	-.136357D-01

RECTISOL GAS DESULFURIZATION
PHYSICAL PROPERTIES SECTION

COMPONENTS

ID	TYPE	FORMULA	NAME OR ALIAS
H2	C	MISSING	H2
CO	C	MISSING	CO
CO2	C	MISSING	CO2
CH4	C	MISSING	CH4
N2	C	MISSING	N2
H2S	C	MISSING	H2S
H2O	C	MISSING	H2O
C6H6	C	MISSING	C6H6
CH3OH	C	MISSING	CH4O

OPTION SETS

KEY TO OPTION SET TABLES:
OPTION SET ID
MP KEYWORD MP ROUTE ID

OPTION SETS (CONTINUED)

SYSOPO		OPSETA		SYSOP14	
PHILMX	PHILMXOO	PHIVMX	PHIVMX14	PHIVMX	PHIVMX14
HVMX	HVMXOO	PHILMX	PHILMX14	PHILMX	PHILMX14
HLMX	HLMXOO	HVMX	HVMX13	HVMX	HVMX14
GVMX	GVMXOO	HLMX	HLMX13	HLMX	HLMX14
GLMX	GLMXOO	GVMX	GVMX14	GVMX	GVMX14
SVMX	SVMXOO	GLMX	GLMX14	GLMX	GLMX14
SLMX	SLMXOO	SVMX	SVMX14	SVMX	SVMX14
VVMX	VVMXOO	SLMX	SLMX14	SLMX	SLMX14
VLMX	VLMXO1	VVMX	VVMX14	VVMX	VVMX14
MUVMX	MUVMXO1	VLMX	VLMX14	VLMX	VLMX14
MULMX	MULMXO1	MUVMX	MUVMXO2	MUVMX	MUVMXO2
KVMX	KVMXO1	MULMX	MULMXO2	MULMX	MULMXO2
KLMX	KLMXO1	KVMX	KVMXO2	KVMX	KVMXO2
DVMX	DVMXO1	KLMX	KLMXO1	KLMX	KLMXO1
DLMX	DLMXO1	DVMX	DVMXO2	DVMX	DVMXO2
SIGLMX	SIGLMXO1	DLMX	DLMXO1	DLMX	DLMXO1
PHIV	PHIVOO	SIGLMX	SIGLMXO1	SIGLMX	SIGLMXO1
PHIL	PHILOO				
HV	HVOO				
HL	HLOO				
GV	GVOO				
GL	GLOO				
SV	SVOO				
SL	SLOO				
VV	VVOO				
VL	VLO1				
MUV	MUVO1				
MUL	MULO1				
KV	KVO1				
KL	KLO1				
SIGL	SIGLO1				
PHISMX	PHISMXO2				
HSMX	HSMXO2				
GSMX	GSMXO2				
SSMX	SSMXO1				
VSMX	VSMXO2				
KSMX	KSMXO1				
PHIS	PHISO2				
HS	HSO2				
GS	GSO2				
SS	SSO2				
VS	VSO1				
KS	KSO1				

MIXER (MIXER): MIXHC
INLET STREAM(S): FEED RCHCPC
OUTLET STREAM: FDMX
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	1911.75	1911.75	.109724D-08
CO	4068.18	4068.18	.901491D-08
CO2	309.760	309.760	-.137170D-06
CH4	507.009	507.009	.407783D-07
N2	41.8185	41.8185	.535393D-08
H2S	141.177	141.177	-.211811D-06
H2O	13.8000	13.8000	.0
C6H6	23.1000	23.1000	.0
CH3OH	.277063D-01	.277077D-01	-.524654D-04
TOTAL BALANCE			
MOLE(LBMOL/HR)	7016.62	7016.62	-.202030D-08
MASS(LB/HR)	147607.	147607.	-.106107D-07
ENTHALPY(BTU/HR)	-.263568D+09	-.263568D+09	.196792D-07

*** INPUT DATA ***

OUTLET PRESSURE ,PSI 427.000
TYPE OF FLASH - ONE PHASE - VAPOR
MAXIMUM NUMBER OF ITERATIONS IN FLASH 30
CONVERGENCE TOLERANCE FOR FLASH 0.100000-03

GENERAL-HEAT (HEATER): COOL1
INPUT STREAM: FDMX
OUTPUT STREAM: FDMXC Q1
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	1911.75	1911.75	.0
CO	4068.18	4068.18	.0
CO2	309.760	309.760	.0
CH4	507.009	507.009	.0
N2	41.8185	41.8185	.0
H2S	141.177	141.177	.0
H2O	13.8000	13.8000	.0
C6H6	23.1000	23.1000	.0
CH3OH	.277077D-01	.277077D-01	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	7016.62	7016.62	.0
MASS(LB/HR)	147607.	147607.	.0
ENTHALPY(BTU/HR)	-.263568D+09	-.263568D+09	-.141341D-15

*** INPUT DATA ***

TWO PHASE TP FLASH
SPECIFIED TEMPERATURE F 40.000
PRESSURE DROP PSI -3.0000
MAXIMUM ITERATION NO. 30
CONVERGENCE TOLERANCE .10000D-03
TP FLASH, NO INITIAL GUESSES ARE REQUIRED.

GENERAL-HEAT (HEATER): COOL1 (CONTINUED)

*** RESULTS ***

OUTPUT TEMPERATURE	F	40.000
OUTPUT PRESSURE	PSI	424.00
HEAT DUTY	BTU/HR	-.28679D+07
VAPOR FRACTION		1.0000

V-L PHASE EQUILIBRIUM :

COMP	F(I)	X(I)	Y(I)	K(I)
H2	.27246	.21323	.27246	7.1600
CO	.57979	.55673	.57979	5.8355
CO2	.44147D-01	.72910D-01	.44147D-01	3.3928
CH4	.72258D-01	.86562D-01	.72258D-01	4.6775
N2	.59599D-02	.56729D-02	.59599D-02	5.8870
H2S	.20120D-01	.40611D-01	.20120D-01	2.7761
H2O	.19668D-02	.64576D-02	.19668D-02	1.7067
C6H6	.32922D-02	.17813D-01	.32922D-02	1.0355
CH3OH	.39489D-05	.13707D-04	.39489D-05	1.6144

SEPARATOR-2 (SEP2): SEPH2O
INPUT STREAM - FDMXC
OUTPUT STREAMS - FDH2O
FDXH2O
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	1911.75	1911.75	.0
CO	4068.18	4068.18	.0
CO2	309.760	309.760	.0
CH4	507.009	507.009	.0
N2	41.8185	41.8185	.0
H2S	141.177	141.177	.0
H2O	13.8000	13.8000	.0
C6H6	23.1000	23.1000	.0
CH3OH	.277077D-01	.277077D-01	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	7016.62	7016.62	.0
MASS(LB/HR)	147607.	147607.	-.197171D-15
ENTHALPY(BTU/HR)	-.266436D+09	-.266669D+09	.874241D-03

SEPARATOR-2 (SEP2): SEPH2O (CONTINUED)

*** INPUT DATA ***

FLASH SPECS FOR STREAM FDH2O

TEMPERATURE (F)	MISSING
PRESSURE (PSI)	MISSING
VAPOR FRACTION	MISSING
PHASE CODE	1
KEY PHASE	2
TEMP ESTIMATE (F)	MISSING
PRES ESTIMATE (PSI)	MISSING
MAX. NO. ITERATIONS	25
CONVERGENCE TOL.	0.100000-03

FLASH SPECS FOR STREAM FDXH2O

TEMPERATURE (F)	MISSING
PRESSURE (PSI)	MISSING
VAPOR FRACTION	MISSING
PHASE CODE	1
KEY PHASE	1
TEMP ESTIMATE (F)	MISSING
PRES ESTIMATE (PSI)	MISSING
MAX. NO. ITERATIONS	25
CONVERGENCE TOL.	0.100000-03

MASS FLOW (LB/HR)
SUBSTREAM= MIXED
STREAM= FDH2O CPT= H2O FLOW= 205.000

SEPARATOR-2 (SEP2): SEPH2O (CONTINUED)

*** RESULTS ***

STREAM= FDH2O SUBSTREAM= MIXED

COMPONENT = H2O	SPLIT FRACTION =	0.82459

STREAM= FDXH2O SUBSTREAM= MIXED

COMPONENT = H2	SPLIT FRACTION =	1.00000
COMPONENT = CO	SPLIT FRACTION =	1.00000
COMPONENT = CO2	SPLIT FRACTION =	1.00000
COMPONENT = CH4	SPLIT FRACTION =	1.00000
COMPONENT = N2	SPLIT FRACTION =	1.00000
COMPONENT = H2S	SPLIT FRACTION =	1.00000
COMPONENT = H2O	SPLIT FRACTION =	0.17541
COMPONENT = C6H6	SPLIT FRACTION =	1.00000
COMPONENT = CH3OH	SPLIT FRACTION =	1.00000

MIXER (MIXER): INJMEOH
INLET STREAM(S): FDXH2O RCMTHP
OUTLET STREAM: FDMX2
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	1911.76	1911.76	.0
CO	4068.27	4068.27	.0
CO2	310.135	310.135	.0
CH4	507.042	507.042	.0
N2	41.8191	41.8191	.0
H2S	142.884	142.884	.0
H2O	2.54799	2.54799	.0
C6H6	24.3158	24.3158	.0
CH3OH	17.3515	17.3515	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	7026.12	7026.12	.0
MASS(LB/HR)	148132.	148132.	.392944D-15
ENTHALPY(BTU/HR)	-.267188D+09	-.267188D+09	-.583100D-08

MIXER (MIXER): INJMEOH (CONTINUED)

*** INPUT DATA ***

OUTLET PRESSURE ,PSI	MISSING
TYPE OF FLASH - TWO PHASE	
MAXIMUM NUMBER OF ITERATIONS IN FLASH	30
CONVERGENCE TOLERANCE FOR FLASH	0.100000-03

GENERAL-HEAT (HEATER): COOL2
INPUT STREAM: FDMX2
OUTPUT STREAM: PRWSFD Q2
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	1911.76	1911.76	.0
CO	4068.27	4068.27	.0
CO2	310.135	310.135	.0
CH4	507.042	507.042	.0
N2	41.8191	41.8191	.0
H2S	142.884	142.884	.0
H2O	2.54799	2.54799	.0
C6H6	24.3158	24.3158	.0
CH3OH	17.3515	17.3515	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	7026.12	7026.12	.0
MASS(LB/HR)	148132.	148132.	.0
ENTHALPY(BTU/HR)	-.267188D+09	-.267188D+09	-.418277D-16

*** INPUT DATA ***

TWO PHASE TP FLASH	
SPECIFIED TEMPERATURE F	-30.000
PRESSURE DROP PSI	-3.0000
MAXIMUM ITERATION NO.	30
CONVERGENCE TOLERANCE	.10000D-03

TP FLASH. NO INITIAL GUESSES ARE REQUIRED.

GENERAL-HEAT (HEATER): COOL2 (CONTINUED)

*** RESULTS ***

OUTPUT TEMPERATURE	F	-30.000
OUTPUT PRESSURE	PSI	421.00
HEAT DUTY	BTU/HR	-.40219D+07
VAPOR FRACTION		.99312

V-L PHASE EQUILIBRIUM :

COMP	F(I)	X(I)	Y(I)	K(I)
H2	.27209	.11781D-05	.27398	.23256D+06
CO	.57902	.15389D-04	.58303	37887.
CO2	.44140D-01	.80177D-03	.44440D-01	55.430
CH4	.72165D-01	.17590D-04	.72665D-01	4131.1
N2	.59519D-02	.68797D-07	.59932D-02	87116.
H2S	.20336D-01	.19475	.19129D-01	.98230D-01
H2O	.36265D-03	.11832D-01	.28325D-03	.23933D-01
C6H6	.34608D-02	.48954	.95766D-04	.19562D-03
CH3OH	.24696D-02	.30304	.38880D-03	.12830D-02

FLASH:2-OUTL (FLASH2): PREFLSH
INPUT STREAM(S): PRWSFD
OUTPUT STREAM(S): PRWSFDV PRWSFDL
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	1911.76	1911.76	.226268D-07
CO	4068.27	4068.27	.194308D-06
CO2	310.135	310.136	-.242945D-05
CH4	507.042	507.042	.699586D-06
N2	41.8191	41.8191	.105597D-06
H2S	142.884	142.884	.930311D-06
H2O	2.54799	2.54799	-.400397D-07
C6H6	24.3158	24.3158	-.176126D-06
CH3OH	17.3515	17.3514	.977742D-06
TOTAL BALANCE			
MOLE(LBMOL/HR)	7026.12	7026.12	.832518D-07
MASS(LB/HR)	148132.	148132.	-.255762D-08
ENTHALPY(BTU/HR)	-.271210D+09	-.271214D+09	.136706D-04

*** INPUT DATA ***

TWO PHASE TP FLASH		
SPECIFIED TEMPERATURE	F	-30.000
SPECIFIED PRESSURE	PSI	423.00
MAXIMUM ITERATION NO.		30
CONVERGENCE TOLERANCE		.10000D-03
TP FLASH, NO INITIAL GUESSES ARE REQUIRED.		
LIQUID ENTRAINMENT		.0

SOLID SPLIT FRACTIONS:
SUBSTREAM NO. = 1 MIXED SUBSTREAM, NO SOLID SPLITS.

FLASH:2-OUTL (FLASH2): PREFLSH (CONTINUED)

*** RESULTS ***

OUTPUT TEMPERATURE	F	-30.000
OUTPUT PRESSURE	PSI	423.00
HEAT DUTY	BTU/HR	-1712.4
VAPOR FRACTION		.99311

V-L PHASE EQUILIBRIUM :

COMP	F(I)	X(I)	Y(I)	K(I)
H2	.27209	.12024D-05	.27398	.22783D+06
CO	.57902	.15694D-04	.58304	37146.
CO2	.44140D-01	.80910D-03	.44441D-01	54.923
CH4	.72165D-01	.17922D-04	.72666D-01	4054.0
N2	.59519D-02	.70129D-07	.59932D-02	85449.
H2S	.20336D-01	.19589	.19119D-01	.97593D-01
H2O	.36265D-03	.11925D-01	.28247D-03	.23687D-01
C6H6	.34608D-02	.48885	.95256D-04	.19486D-03
CH3OH	.24696D-02	.30249	.38929D-03	.12870D-02

MIXER (MIXER): PREWASH1
INLET STREAM(S): PRWSFDV PRWSSOLV
OUTLET STREAM: X
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	1911.76	1911.76	.0
CO	4068.27	4068.27	.0
CO2	310.097	310.097	.0
CH4	507.041	507.041	.0
N2	41.8191	41.8191	.0
H2S	133.406	133.406	.0
H2O	1.97103	1.97103	.0
C6H6	.664670	.664670	.0
CH3OH	332.682	332.682	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	7307.70	7307.70	.0
MASS(LB/HR)	156053.	156053.	.372999D-15
ENTHALPY(BTU/HR)	-.305664D+09	-.305664D+09	-.151858D-06

*** INPUT DATA ***

OUTLET PRESSURE ,PSI	MISSING
TYPE OF FLASH - TWO PHASE	
MAXIMUM NUMBER OF ITERATIONS IN FLASH	30
CONVERGENCE TOLERANCE FOR FLASH	0.100000-03

SEPARATOR-2 (SEP2): PREWASH2
INPUT STREAM - X
OUTPUT STREAMS - VPRWS
LPRWS
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	1911.76	1911.76	.0
CO	4068.27	4068.27	.0
CO2	310.097	310.097	.0
CH4	507.041	507.041	.0
N2	41.8191	41.8191	.0
H2S	133.406	133.406	.0
H2O	1.97103	1.97103	.0
C6H6	.664670	.664670	.0
CH3OH	332.682	332.682	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	7307.70	7307.70	-.124457D-15
MASS(LB/HR)	156053.	156053.	-.466248D-15
ENTHALPY(BTU/HR)	-.305664D+09	-.305221D+09	-.144730D-02

SEPARATOR-2 (SEP2): PREWASH2 (CONTINUED)

*** INPUT DATA ***

FLASH SPECS FOR STREAM VPRWS

TEMPERATURE (F)	-27.8000
PRESSURE (PSI)	422.100
VAPOR FRACTION	MISSING
PHASE CODE	1
KEY PHASE	1
TEMP ESTIMATE (F)	MISSING
PRES ESTIMATE (PSI)	MISSING
MAX. NO. ITERATIONS	25
CONVERGENCE TOL.	0.100000-03

FLASH SPECS FOR STREAM LPRWS

TEMPERATURE (F)	-22.3000
PRESSURE (PSI)	423.000
VAPOR FRACTION	MISSING
PHASE CODE	1
KEY PHASE	2
TEMP ESTIMATE (F)	MISSING
PRES ESTIMATE (PSI)	MISSING
MAX. NO. ITERATIONS	25
CONVERGENCE TOL.	0.100000-03

SPLIT FRACTION

SUBSTREAM= MIXED

STREAM= VPRWS	CPT=	FRACTION=
	H2	0.99988
	CO	0.99958
	CO2	0.97594
	CH4	0.99871
	N2	0.99972
	H2S	0.81515
	H2O	0.0
	C6H6	0.0
	CH3OH	0.0025320

SEPARATOR-2 (SEP2): PREWASH2 (CONTINUED)

*** RESULTS ***

STREAM= VPRWS SUBSTREAM= MIXED

COMPONENT = H2	SPLIT FRACTION =	0.99988
COMPONENT = CO	SPLIT FRACTION =	0.99958
COMPONENT = CO2	SPLIT FRACTION =	0.97594
COMPONENT = CH4	SPLIT FRACTION =	0.99871
COMPONENT = N2	SPLIT FRACTION =	0.99972
COMPONENT = H2S	SPLIT FRACTION =	0.81515
COMPONENT = CH3OH	SPLIT FRACTION =	0.0025320

STREAM= LPRWS SUBSTREAM= MIXED

COMPONENT = H2	SPLIT FRACTION =	0.00011800
COMPONENT = CO	SPLIT FRACTION =	0.00042000
COMPONENT = CO2	SPLIT FRACTION =	0.024058
COMPONENT = CH4	SPLIT FRACTION =	0.0012890
COMPONENT = N2	SPLIT FRACTION =	0.00028200
COMPONENT = H2S	SPLIT FRACTION =	0.18485
COMPONENT = H2O	SPLIT FRACTION =	1.00000
COMPONENT = C6H6	SPLIT FRACTION =	1.00000
COMPONENT = CH3OH	SPLIT FRACTION =	0.99747

MIXER (MIXER): H2SABS1
INLET STREAM(S): VPRWS ABSRSOLV
OUTLET STREAM: Y
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	1911.53	1911.53	.0
CO	4066.56	4066.56	.0
CO2	302.636	302.636	.0
CH4	506.387	506.387	.0
N2	41.8073	41.8073	.0
H2S	108.746	108.746	.0
H2O	.0	.0	.0
C6H6	.0	.0	.0
CH3OH	3100.88	3100.88	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	10038.5	10038.5	.0
MASS(LB/HR)	243436.	243436.	.239108D-15
ENTHALPY(BTU/HR)	-.604460D+09	-.604460D+09	.423205D-06

MIXER (MIXER): H2SABS1 (CONTINUED)

*** INPUT DATA ***

OUTLET PRESSURE ,PSI	MISSING
TYPE OF FLASH - TWO PHASE	
MAXIMUM NUMBER OF ITERATIONS IN FLASH	30
CONVERGENCE TOLERANCE FOR FLASH	0.100000-03

SEPARATOR-2 (SEP2): H2SABS2
INPUT STREAM - Y
OUTPUT STREAMS - DESGS
LABSR
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	1911.53	1911.53	.0
CO	4066.56	4066.56	.0
CO2	302.636	302.636	.0
CH4	506.387	506.387	.0
N2	41.8073	41.8073	.0
H2S	108.746	108.746	.0
H2O	.0	.0	.0
C6H6	.0	.0	.0
CH3OH	3100.88	3100.88	.366628D-16
TOTAL BALANCE			
MOLE(LBMOL/HR)	10038.5	10038.5	.0
MASS(LB/HR)	243436.	243436.	-.239108D-15
ENTHALPY(BTU/HR)	-.604460D+09	-.602924D+09	-.254195D-02

SEPARATOR-2 (SEP2): H2SABS2 (CONTINUED)

*** INPUT DATA ***

FLASH SPECS FOR STREAM DESGS

TEMPERATURE (F)	-73.0000
PRESSURE (PSI)	421.200
VAPOR FRACTION	MISSING
PHASE CODE	1
KEY PHASE	1
TEMP ESTIMATE (F)	MISSING
PRES ESTIMATE (PSI)	MISSING
MAX. NO. ITERATIONS	25
CONVERGENCE TOL.	0.100000-03

FLASH SPECS FOR STREAM LABSR

TEMPERATURE (F)	-27.3000
PRESSURE (PSI)	422.100
VAPOR FRACTION	MISSING
PHASE CODE	1
KEY PHASE	2
TEMP ESTIMATE (F)	MISSING
PRES ESTIMATE (PSI)	MISSING
MAX. NO. ITERATIONS	25
CONVERGENCE TOL.	0.100000-03

SPLIT FRACTION

SUBSTREAM= MIXED

STREAM= DESGS	CPT=	FRACTION=
	H2	0.99888
	CO	0.99562
	CO2	0.57290
	CH4	0.98659
	N2	0.99682
	H2S	0.00029000
	H2O	0.0
	C6H6	0.0
	CH3OH	0.400000-04

SEPARATOR-2 (SEP2): H2SABS2 (CONTINUED)

*** RESULTS ***

STREAM= DESGS SUBSTREAM= MIXED

COMPONENT = H2	SPLIT FRACTION =	0.99888
COMPONENT = CO	SPLIT FRACTION =	0.99562
COMPONENT = CO2	SPLIT FRACTION =	0.57290
COMPONENT = CH4	SPLIT FRACTION =	0.98659
COMPONENT = N2	SPLIT FRACTION =	0.99682
COMPONENT = H2S	SPLIT FRACTION =	0.00029000
COMPONENT = CH3OH	SPLIT FRACTION =	0.400000-04

STREAM= LABSR SUBSTREAM= MIXED

COMPONENT = H2	SPLIT FRACTION =	0.0011180
COMPONENT = CO	SPLIT FRACTION =	0.0043820
COMPONENT = CO2	SPLIT FRACTION =	0.42710
COMPONENT = CH4	SPLIT FRACTION =	0.013409
COMPONENT = N2	SPLIT FRACTION =	0.0031780
COMPONENT = H2S	SPLIT FRACTION =	0.99971
COMPONENT = CH3OH	SPLIT FRACTION =	0.99996

GENERAL-HEAT (HEATER): HEAT1
INPUT STREAM: DESGS
OUTPUT STREAM: PUREGAS QH1
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	1909.39	1909.39	.0
CO	4048.74	4048.74	.0
CO2	173.381	173.381	.0
CH4	499.597	499.597	.0
N2	41.6745	41.6745	.0
H2S	.315363D-01	.315363D-01	.0
H2O	.0	.0	.0
C6H6	.0	.0	.0
CH3OH	.124035	.124035	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	6672.94	6672.94	.0
MASS(LB/HR)	134073.	134073.	.0
ENTHALPY(BTU/HR)	-.245701D+09	-.245701D+09	-.106133D-15

GENERAL HEAT (HEATER): HEAT1 (CONTINUED)

*** INPUT DATA ***

TWO PHASE TP FLASH		
SPECIFIED TEMPERATURE	F	77.000
PRESSURE DROP	PSI	-4.0000
MAXIMUM ITERATION NO.		30
CONVERGENCE TOLERANCE		.10000D-03
TP FLASH. NO INITIAL GUESSES ARE REQUIRED.		

*** RESULTS ***

OUTPUT TEMPERATURE	F	77.000
OUTPUT PRESSURE	PSI	417.20
HEAT DUTY	BTU/HR	.73779D+07
VAPOR FRACTION		1.0000

V-L PHASE EQUILIBRIUM :

COMP	F(I)	X(I)	Y(I)	K(I)
H2	.28614	.25495	.28614	8.9044
CO	.60674	.61029	.60674	7.8878
CO2	.25983D-01	.39426D-01	.25983D-01	5.2287
CH4	.74869D-01	.89027D-01	.74869D-01	6.6723
N2	.62453D-02	.62371D-02	.62453D-02	7.9444
H2S	.47260D-05	.79993D-05	.47260D-05	4.6874
CH3OH	.18588D-04	.55855D-04	.18588D-04	2.6403

FLOW-SPLITTE (FSPLIT): SOLVSPLT
INPUT STREAM - RGMETC
OUTPUT STREAMS - PRWSSOLV
ABSRSOLV
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.0	.0	.0
CO	.0	.0	.0
CO2	.0	.0	.0
CH4	.0	.0	.0
N2	.0	.0	.0
H2S	.0	.0	.0
H2O	.0	.0	.0
C6H6	.0	.0	.0
CH3OH	3430.00	3430.00	.331449D-16
TOTAL BALANCE			
MOLE(LBMOL/HR)	3430.00	3430.00	.331449D-16
MASS(LB/HR)	109904.	109904.	.0
ENTHALPY(BTU/HR)	-.372569D+09	-.372569D+09	.0

FLOW-SPLITTE (FSPLIT): SOLVSPLT (CONTINUED)

*** INPUT DATA ***

FRACTION OF FLOW STRM=ABSRSOLV FRAC= 0.90380

*** RESULTS ***

STREAM= PRWSSOLV	SPLIT= 0.096200	KEY=	0
ABSRSOLV	0.90380		0

MIXER (MIXER): BOTMIX
INLET STREAM(S): LPRWS PRWSFDL
OUTLET STREAM: LPRWSMX
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.225646	.225646	.0
CO	1.70943	1.70943	.0
CO2	7.49945	7.49945	.0
CH4	.654443	.654443	.0
N2	.117964D-01	.117964D-01	.0
H2S	34.1379	34.1379	.0
H2O	2.54799	2.54799	.0
C6H6	24.3158	24.3158	.0
CH3OH	346.475	346.475	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	417.578	417.578	.0
MASS(LB/HR)	14599.7	14599.7	.249182D-15
ENTHALPY(BTU/HR)	-.388803D+08	-.388803D+08	-.153225D-09

*** INPUT DATA ***

OUTLET PRESSURE ,PSI MISSING
TYPE OF FLASH - TWO PHASE
MAXIMUM NUMBER OF ITERATIONS IN FLASH 30
CONVERGENCE TOLERANCE FOR FLASH 0.100000-03

FLOW-SPLITTE (FSPLIT): RCMESPLT
INPUT STREAM - LPRWSMX
OUTPUT STREAMS - RCMETH
LPRWS1
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.225646	.225646	.123005D-15
CO	1.70943	1.70943	.0
CO2	7.49945	7.49945	.296081D-16
CH4	.654443	.654443	.424110D-16
N2	.117964D-01	.117964D-01	.147056D-15
H2S	34.1379	34.1379	.208139D-15
H2O	2.54799	2.54799	.174290D-15
C6H6	24.3158	24.3158	.0
CH3OH	346.475	346.475	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	417.578	417.578	.0
MASS(LB/HR)	14599.7	14599.7	.124591D-15
ENTHALPY(BTU/HR)	-.388803D+08	-.388803D+08	.0

*** INPUT DATA ***

FRACTION OF FLOW STRM=RCMETH FRAC= 0.050000

*** RESULTS ***

STREAM= RCMETH	SPLIT=	0.050000	KEY= 0
LPRWS1		0.95000	0

PUMP (PUMP): RCMEPUMP
INLET = RCMETH OUTLET = RCMTHP
PROPERTY OPTION SET OPSETA

PUMP (PUMP): RCMEPUMP (CONTINUED)

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*************************************************************************
*                                                                       *
*     ERROR IN BLOCK CALCULATIONS                                       *
*                                                                       *
*     FEED ENTHALPY MISSING. BLOCK IS BYPASSED                          *
*                                                                       *
*************************************************************************
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*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.112823D-01	.112823D-01	.0
CO	.854716D-01	.854716D-01	.0
CO2	.374972	.374972	.0
CH4	.327221D-01	.327221D-01	.0
N2	.589819D-03	.589819D-03	.0
H2S	1.70689	1.70689	.0
H2O	.127400	.127400	.0
C6H6	1.21579	1.21579	.0
CH3OH	17.3238	17.3238	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	20.8789	20.8789	.0
MASS(LB/HR)	729.985	729.985	.0
ENTHALPY(BTU/HR)	-.194402D+07	-.194398D+07	-.211839D-04

*** INPUT DATA ***

TYPE OF PUMP: 1=CENTRIFUGAL PUMP; 2, SLURRY PUMP; 3, POSITIVE DISPLACEMENT PUMP ***	
REQUIRED EXIT PRESSURE ,PSI	427.000
PUMP EFFICIENCY ,	MISSING
DRIVER EFFICIENCY ,	1.00000
SOLID FLOW RATE ,LB/HR	0.0

*** RESULTS ***

TYPE OF PUMP, (CAL)	1
VOLUMETRIC FLOW RATE CUFT/HR	16.4516
DELTA PRESSURE PSI	4.00000
FLUID POWER REQUIREMENTHP	0.0047859
BRAKE POWER REQUIREMENTHP	0.016187
ELECTRICITY REQUIREMENT HP	0.016187
PUMP EFFICIENCY (CAL)	0.29566

FLASH:2-OUTL (FLASH2): PRWSFLSH
INPUT STREAM(S): LPRWS1
OUTPUT STREAM(S): VPRWSF LPRWSF
PROPERTY OPTION SET OPSETA

FLASH:2-OUTL (FLASH2): PRWSFLSH (CONTINUED)

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.214363	.214363	-.239536D-14
CO	1.62396	1.62396	-.232442D-14
CO2	7.12448	7.12448	-.171415D-14
CH4	.621721	.621721	-.245537D-14
N2	.112066D-01	.112066D-01	-.255412D-14
H2S	32.4310	32.4310	.0
H2O	2.42059	2.42059	.550389D-15
C6H6	23.1000	23.1000	.0
CH3OH	329.151	329.151	.172697D-15
TOTAL BALANCE			
MOLE(LBMOL/HR)	396.699	396.699	.143291D-15
MASS(LB/HR)	13869.7	13869.7	-.196722D-15
ENTHALPY(BTU/HR)	-.369363D+08	-.369363D+08	.525900D-08

*** INPUT DATA ***

TWO PHASE PQ FLASH		
SPECIFIED PRESSURE	PSI	30.000
SPECIFIED HEAT DUTY	BTU/HR	.0
MAXIMUM ITERATION NO.		30
CONVERGENCE TOLERANCE		.10000D-03
LIQUID ENTRAINMENT		.0
SOLID SPLIT FRACTIONS:		
SUBSTREAM NO. = 1	MIXED SUBSTREAM, NO SOLID SPLITS.	

*** RESULTS ***

OUTPUT TEMPERATURE	F	-21.849
OUTPUT PRESSURE	PSI	30.000
HEAT DUTY	BTU/HR	.0
VAPOR FRACTION		.33237D-01

V-L PHASE EQUILIBRIUM :

COMP	F(I)	X(I)	Y(I)	K(I)
H2	.54037D-03	.34834D-06	.16248D-01	46644.
CO	.40937D-02	.11184D-04	.12284	10984.
CO2	.17959D-01	.45217D-02	.40883	90.414
CH4	.15672D-02	.16742D-04	.46667D-01	2787.4
N2	.28250D-04	.46698D-07	.84860D-03	18172.
H2S	.81752D-01	.70770D-01	.40119	5.6690
H2O	.61018D-02	.63115D-02	.22872D-05	.36238D-03
C6H6	.58231D-01	.60180D-01	.15254D-02	.25347D-01
CH3OH	.82973	.85819	.18453D-02	.21503D-02

PUMP (PUMP): NEXPUMP
INLET = LPRWSF OUTLET = LPRWSFP
PROPERTY OPTION SET OPSETA

PUMP (PUMP): NEXPUMP (CONTINUED)

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.133593D-03	.133593D-03	.0
CO	.428916D-02	.428916D-02	.0
CO2	1.73414	1.73414	.0
CH4	.642083D-02	.642083D-02	.0
N2	.179092D-04	.179092D-04	.0
H2S	27.1413	27.1413	.0
H2O	2.42056	2.42056	.0
C6H6	23.0799	23.0799	.0
CH3OH	329.127	329.127	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	383.514	383.514	.0
MASS(LB/HR)	13393.9	13393.9	.0
ENTHALPY(BTU/HR)	-.358683D+08	-.358670D+08	-.370098D-04

*** INPUT DATA ***

TYPE OF PUMP: 1=CENTRIFUGAL PUMP; 2. SLURRY PUMP; 3. POSITIVE DISPLACEMENT PUMP	***
REQUIRED EXIT PRESSURE .PSI	40.0000
PUMP EFFICIENCY .	MISSING
DRIVER EFFICIENCY .	1.00000
SOLID FLOW RATE .LB/HR	0.0

*** RESULTS ***

TYPE OF PUMP. (CAL)	1
VOLUMETRIC FLOW RATE CUFT/HR	274.440
DELTA PRESSURE PSI	10.0000
FLUID POWER REQUIREMENTHP	0.19959
BRAKE POWER REQUIREMENTHP	0.52172
ELECTRICITY REQUIREMENT HP	0.52172
PUMP EFFICIENCY (CAL)	0.38257

GENERAL-HEAT (HEATER): HEAT5
INPUT STREAM: LPRWSFP
OUTPUT STREAM: LPRWSFH Q5
PROPERTY OPTION SET OPSETA

GENERAL-HEAT (HEATER): HEAT5 (CONTINUED)

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.133593D-03	.133593D-03	.0
CO	.428916D-02	.428916D-02	.0
CO2	1.73414	1.73414	.0
CH4	.642083D-02	.642083D-02	.0
N2	.179092D-04	.179092D-04	.0
H2S	27.1413	27.1413	.0
H2O	2.42056	2.42056	.0
C6H6	23.0799	23.0799	.0
CH3OH	329.127	329.127	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	383.514	383.514	.0
MASS(LB/HR)	13393.9	13393.9	.0
ENTHALPY(BTU/HR)	-.358670D+08	-.358670D+08	.0

*** INPUT DATA ***

TWO PHASE TP FLASH		
SPECIFIED TEMPERATURE	F	50.000
PRESSURE DROP	PSI	-5.0000
MAXIMUM ITERATION NO.		30
CONVERGENCE TOLERANCE		.10000D-03

TP FLASH. NO INITIAL GUESSES ARE REQUIRED.

*** RESULTS ***

OUTPUT TEMPERATURE	F	50.000
OUTPUT PRESSURE	PSI	35.000
HEAT DUTY	BTU/HR	.87547D+06
VAPOR FRACTION		.40015D-01

V-L PHASE EQUILIBRIUM :

COMP	F(I)	X(I)	Y(I)	K(I)
H2	.34834D-06	.33355D-09	.86972D-05	26075.
CO	.11184D-04	.33295D-07	.27869D-03	8370.4
CO2	.45217D-02	.60051D-03	.98594D-01	164.18
CH4	.16742D-04	.16274D-06	.41449D-03	2547.0
N2	.46698D-07	.92491D-10	.11648D-05	12593.
H2S	.70770D-01	.37849D-01	.86056	22.736
H2O	.63115D-02	.65721D-02	.59935D-04	.91195D-02
C6H6	.60180D-01	.62178D-01	.12251D-01	.19704
CH3OH	.85819	.89280	.27833D-01	.31175D-01

FLASH:2-OUTL (FLASH2): FLSHRG1
INPUT STREAM(S): LABSR
OUTPUT STREAM(S): VFLRG1 LFLRG1
PROPERTY OPTION SET OPSETA

FLASH:2-OUTL (FLASH2): FLSHRG1 (CONTINUED)

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	2.13709	2.13709	.831203D-15
CO	17.8197	17.8197	.598111D-15
CO2	129.255	129.255	.0
CH4	6.79015	6.79015	.588618D-15
N2	.132864	.132864	.835611D-15
H2S	108.714	108.714	.0
H2O	.0	.0	.0
C6H6	.0	.0	.0
CH3OH	3100.75	3100.75	.733286D-16
TOTAL BALANCE			
MOLE(LBMOL/HR)	3365.60	3365.60	.675581D-16
MASS(LB/HR)	109364.	109364.	.133060D-15
ENTHALPY(BTU/HR)	-.357222D+09	-.357222D+09	.200583D-09

*** INPUT DATA ***

TWO PHASE PQ FLASH
SPECIFIED PRESSURE PSI 75.000
SPECIFIED HEAT DUTY BTU/HR .0
MAXIMUM ITERATION NO. 30
CONVERGENCE TOLERANCE .10000D-03
LIQUID ENTRAINMENT .0
SOLID SPLIT FRACTIONS:
SUBSTREAM NO. = 1 MIXED SUBSTREAM, NO SOLID SPLITS.

*** RESULTS ***

OUTPUT TEMPERATURE F -24.015
OUTPUT PRESSURE PSI 75.000
HEAT DUTY BTU/HR .0
VAPOR FRACTION .10198D-01

V-L PHASE EQUILIBRIUM :

COMP	F(I)	X(I)	Y(I)	K(I)
H2	.63498D-03	.27319D-04	.59616D-01	2182.2
CO	.52946D-02	.76162D-03	.44528	584.65
CO2	.38405D-01	.35601D-01	.31059	8.7244
CH4	.20175D-02	.68462D-03	.13139	191.92
N2	.39477D-04	.43041D-05	.34534D-02	802.36
H2S	.32302D-01	.32131D-01	.48863D-01	1.5208
CH3OH	.92131	.93079	.80726D-03	.86728D-03

MIXER (MIXER): FLSHRGMX
INLET STREAM(S): LFLRG1 COND
OUTLET STREAM: FLRGMX
PROPERTY OPTION SET OPSETA

MIXER (MIXER): FLSHRGMX (CONTINUED)

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.910079D-01	.910079D-01	.0
CO	2.53716	2.53716	.0
CO2	118.595	118.595	.0
CH4	2.28066	2.28066	.0
N2	.143380D-01	.143380D-01	.0
H2S	107.037	107.037	.0
H2O	.0	.0	.0
C6H6	.0	.0	.0
CH3OH	3100.72	3100.72	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	3331.28	3331.28	.0
MASS(LB/HR)	108329.	108329.	.268662D-15
ENTHALPY(BTU/HR)	-.354500D+09	-.354500D+09	-.398682D-06

*** INPUT DATA ***

OUTLET PRESSURE ,PSI	MISSING
TYPE OF FLASH - TWO PHASE	
MAXIMUM NUMBER OF ITERATIONS IN FLASH	30
CONVERGENCE TOLERANCE FOR FLASH	0.100000-03

FLASH:2-OUTL (FLASH2): FLSHRG2

INPUT STREAM(S): FLRGMX

OUTPUT STREAM(S): VFLRG2 LFLRG2

PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.910079D-01	.910079D-01	-.914940D-15
CO	2.53716	2.53716	-.525101D-15
CO2	118.595	118.595	-.149783D-15
CH4	2.28066	2.28066	-.486798D-15
N2	.143380D-01	.143380D-01	-.483950D-15
H2S	107.037	107.037	.663827D-16
H2O	.0	.0	.0
C6H6	.0	.0	.0
CH3OH	3100.72	3100.72	.733292D-16
TOTAL BALANCE			
MOLE(LBMOL/HR)	3331.28	3331.28	.682541D-16
MASS(LB/HR)	108329.	108329.	-.134331D-15
ENTHALPY(BTU/HR)	-.354500D+09	-.354500D+09	.132803D-07

*** INPUT DATA ***

TWO PHASE PQ FLASH	
SPECIFIED PRESSURE PSI	30.000
SPECIFIED HEAT DUTY BTU/HR	.0
MAXIMUM ITERATION NO.	30
CONVERGENCE TOLERANCE	.10000D-03
LIQUID ENTRAINMENT	.0

SOLID SPLIT FRACTIONS:

SUBSTREAM NO. = 1 MIXED SUBSTREAM, NO SOLID SPLITS.

FLASH:2-OUTL (FLASH2): FLSHRG2 (CONTINUED)

*** RESULTS ***

OUTPUT TEMPERATURE	F	-23.981
OUTPUT PRESSURE	PSI	30.000
HEAT DUTY	BTU/HR	.0
VAPOR FRACTION		.58570D-02

V-L PHASE EQUILIBRIUM :

COMP	F(I)	X(I)	Y(I)	K(I)
H2	.27319D-04	.83790D-06	.45222D-02	5397.0
CO	.76162D-03	.80473D-04	.11638	1446.2
CO2	.35601D-01	.31827D-01	.67618	21.246
CH4	.68462D-03	.18169D-03	.86051D-01	473.62
N2	.43041D-05	.33826D-06	.67745D-03	2002.7
H2S	.32131D-01	.31647D-01	.11428	3.6111
CH3OH	.93079	.93626	.19083D-02	.20382D-02

PUMP (PUMP): HTRGPUMP
INLET = LFLRG2 OUTLET = LFLRG2P
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.277494D-02	.277494D-02	.0
CO	.266507	.266507	.0
CO2	105.402	105.402	.0
CH4	.601710	.601710	.0
N2	.112025D-02	.112025D-02	.0
H2S	104.808	104.808	.0
H2O	.0	.0	.0
C6H6	.0	.0	.0
CH3OH	3100.69	3100.69	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	3311.77	3311.77	.0
MASS(LB/HR)	107580.	107580.	.0
ENTHALPY(BTU/HR)	-.352065D+09	-.352058D+09	-.206515D-04

*** INPUT DATA ***

TYPE OF PUMP: 1=CENTRIFUGAL PUMP;
2, SLURRY PUMP; 3, POSITIVE DISPLACEMENT PUMP ***
REQUIRED EXIT PRESSURE ,PSI 40.0000
PUMP EFFICIENCY , MISSING
DRIVER EFFICIENCY , 1.00000
SOLID FLOW RATE ,LB/HR 0.0

PUMP (PUMP): HTRGPUMP (CONTINUED)

*** RESULTS ***

TYPE OF PUMP, (CAL)	1
VOLUMETRIC FLOW RATE CUFT/HR	2,644.80
DELTA PRESSURE PSI	10.0000
FLUID POWER REQUIREMENTHP	1.92349
BRAKE POWER REQUIREMENTHP	2.85748
ELECTRICITY REQUIREMENT HP	2.85748
PUMP EFFICIENCY (CAL)	0.67314

FLASH:2-OUTL (FLASH2): RCYCCOND
INPUT STREAM(S): VFLRG1
OUTPUT STREAM(S): RCYCHC COND
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	2.04608	2.04608	.217043D-15
CO	15.2825	15.2825	.435880D-16
CO2	10.6600	10.6600	-.833192D-16
CH4	4.50948	4.50948	.0
N2	.118526	.118526	.0
H2S	1.67705	1.67705	-.132402D-15
H2O	.0	.0	.0
C6H6	.0	.0	.0
CH3OH	.277063D-01	.277063D-01	-.626112D-16
TOTAL BALANCE			
MOLE(LBMOL/HR)	34.3213	34.3213	.0
MASS(LB/HR)	1035.04	1035.04	-.109838D-15
ENTHALPY(BTU/HR)	-.272187D+07	-.272187D+07	.841157D-10

*** INPUT DATA ***

TWO PHASE PQ FLASH		
SPECIFIED PRESSURE	PSI	65.000
SPECIFIED HEAT DUTY	BTU/HR	.0
MAXIMUM ITERATION NO.		30
CONVERGENCE TOLERANCE		.10000D-03
LIQUID ENTRAINMENT		.0

SOLID SPLIT FRACTIONS:
SUBSTREAM NO. = 1 MIXED SUBSTREAM, NO SOLID SPLITS.

FLASH:2-OUTL (FLASH2): RCYCCOND (CONTINUED)

*** RESULTS ***

OUTPUT TEMPERATURE	F	-24.862
OUTPUT PRESSURE	PSI	65.000
HEAT DUTY	BTU/HR	.0
VAPOR FRACTION		1.0000

V-L PHASE EQUILIBRIUM :

COMP	F(I)	X(I)	Y(I)	K(I)
H2	.59616D-01	.23638D-04	.59616D-01	2522.2
CO	.44528	.66325D-03	.44528	671.40
CO2	.31059	.32485D-01	.31059	9.5615
CH4	.13139	.59755D-03	.13139	219.89
N2	.34534D-02	.37188D-05	.34534D-02	928.69
H2S	.48863D-01	.30570D-01	.48863D-01	1.5985
CH3OH	.80726D-03	.93566	.80726D-03	.86277D-03

COMPR-TURBIN (COMPR): RCCOMP
INPUT STREAMS: RCYCHC
OUTPUT STREAMS: RCHCP
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	2.04608	2.04608	.0
CO	15.2825	15.2825	.0
CO2	10.6600	10.6600	.0
CH4	4.50948	4.50948	.0
N2	.118526	.118526	.0
H2S	1.67705	1.67705	.0
H2O	.0	.0	.0
C6H6	.0	.0	.0
CH3OH	.277063D-01	.277063D-01	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	34.3213	34.3213	.0
MASS(LB/HR)	1035.04	1035.04	.0
ENTHALPY(BTU/HR)	-.272187D+07	-.261330D+07	-.398899D-01

*** INPUT DATA ***

TYPE : POLYTROPIC POSITIVE DISPLACEMENT COMPRESSOR

OUTLET PRESSURE ,PSI	427.000
POLYTROPIC EFFICIENCY	0.72000
MECHANICAL EFFICIENCY	1.00000
CLEARANCE FRACTION	1.00000

*** RESULTS ***

COMPR-TURBIN (COMPR): RCCOMP (CONTINUED)

INDICATED HORSEPOWER REQUIREMENT, HP	42.6717
BRAKE HORSEPOWER REQUIREMENT, HP	42.6717
NET WORK, HP	42.6717
CALCULATED OUTLET TEMP, F	369.627
VOLUMETRIC EFFICIENCY	-0.25239
DISPLACEMENT , CUFT/HR	-9,610.99

GENERAL-HEAT (HEATER): REFRIG3
INPUT STREAM: RCHCP
OUTPUT STREAM: RCHCPC QR3
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	2.04608	2.04608	.0
CO	15.2825	15.2825	.0
CO2	10.6600	10.6600	.0
CH4	4.50948	4.50948	.0
N2	.118526	.118526	.0
H2S	1.67705	1.67705	.0
H2O	.0	.0	.0
C6H6	.0	.0	.0
CH3OH	.277063D-01	.277063D-01	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	34.3213	34.3213	.0
MASS(LB/HR)	1035.04	1035.04	.0
ENTHALPY(BTU/HR)	-.261330D+07	-.261330D+07	-.890946D-16

*** INPUT DATA ***

TWO PHASE TP FLASH	
SPECIFIED TEMPERATURE F	95.000
PRESSURE DROP PSI	-2.0000
MAXIMUM ITERATION NO.	30
CONVERGENCE TOLERANCE	.10000D-03

TP FLASH, NO INITIAL GUESSES ARE REQUIRED.

GENERAL-HEAT (HEATER): REFRIG3 (CONTINUED)

*** RESULTS ***

OUTPUT TEMPERATURE	F	95.000
OUTPUT PRESSURE	PSI	425.00
HEAT DUTY	BTU/HR	-81367.
VAPOR FRACTION		1.0000

V-L PHASE EQUILIBRIUM :

COMP	F(I)	X(I)	Y(I)	K(I)
H2	.59616D-01	.35867D-01	.59616D-01	6.9662
CO	.44528	.33538	.44528	5.5644
CO2	.31059	.42510	.31059	3.0621
CH4	.13139	.12351	.13139	4.4585
N2	.34534D-02	.27201D-02	.34534D-02	5.3210
H2S	.48863D-01	.74468D-01	.48863D-01	2.7500
CH3OH	.80726D-03	.29542D-02	.80726D-03	1.1452

MIXER (MIXER): NEXMIX
INLET STREAM(S): LPRWSFH AZCOND LWWSP
OUTLET STREAM: NEXFEED
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.133593D-03	.133593D-03	.304339D-15
CO	.428916D-02	.428916D-02	.0
CO2	1.83529	1.83529	.134442D-06
CH4	.642083D-02	.642083D-02	.135086D-15
N2	.179092D-04	.179092D-04	.189184D-15
H2S	29.6112	29.6111	.467561D-05
H2O	379.451	379.451	.149804D-15
C6H6	27.0847	27.0845	.834505D-05
CH3OH	338.493	338.492	.152649D-05
TOTAL BALANCE			
MOLE(LBMOL/HR)	776.486	776.485	.113515D-05
MASS(LB/HR)	20887.6	20887.6	.186432D-05
ENTHALPY(BTU/HR)	-.831274D+08	-.831273D+08	-.879275D-06

*** INPUT DATA ***

OUTLET PRESSURE ,PSI	MISSING
TYPE OF FLASH - TWO PHASE	
MAXIMUM NUMBER OF ITERATIONS IN FLASH	30
CONVERGENCE TOLERANCE FOR FLASH	0.100000-03

FLASH:3-OUTL (FLASH3): NEXSEP
INPUT STREAM: NEXFEED
OUTPUT STREAM: VNEX AZFEED NAPHTHA
PROPERTY OPTION SET OPSETA

FLASH:3-OUTL (FLASH3): NEXSEP (CONTINUED)

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.133593D-03	.133593D-03	.271443D-08
CO	.428916D-02	.428916D-02	.452940D-08
CO2	1.83529	1.83529	.378631D-08
CH4	.642083D-02	.642083D-02	.892637D-08
N2	.179092D-04	.179092D-04	.385625D-08
H2S	29.6111	29.6111	.148844D-07
H2O	379.451	379.451	-.433826D-08
C6H6	27.0845	27.0845	.944984D-07
CH3OH	338.492	338.492	-.402093D-08
TOTAL BALANCE			
MOLE(LBMOL/HR)	776.485	776.485	.219618D-15
MASS(LB/HR)	20887.6	20887.6	.679780D-08
ENTHALPY(BTU/HR)	-.831273D+08	-.831274D+08	.127872D-05

*** INPUT DATA ***

THREE PHASE PQ FLASH		
SPECIFIED PRESSURE	PSI	30.000
SPECIFIED HEAT DUTY	BTU/HR	.0
MAXIMUM ITERATION NO.		30
CONVERGENCE TOLERANCE		.10000D-03
KEY COMPONENT ID		H2O
LIQUID STREAM SPECIFICATION CODE		1
SOLID SPLIT STREAM SPECIFICATION CODE		1
LIQUID ENTRAINMENT OF 1ST LIQUID		.0
LIQUID ENTRAINMENT OF 2ND LIQUID		.0

SOLID SPLIT FRACTIONS:
SUBSTREAM NO. = 1 MIXED SUBSTREAM, NO SOLID SPLITS.

*** RESULTS ***

OUTPUT TEMPERATURE	F	37.949
OUTPUT PRESSURE	PSI	30.000
HEAT DUTY	BTU/HR	.0
VAPOR FRACTION		.0
1ST LIQUID/TOTAL LIQUID		.96541

V-L1-L2 PHASE EQUILIBRIUM :

COMP	F(I)	X1(I)	X2(I)	Y(I)	K1(I)	K2(I)
H2	.172D-06	.168D-06	.280D-06	.186D-02	.112D+05	.186D+05
CO	.552D-05	.532D-05	.113D-04	.283D-01	.543D+04	.115D+05
CO2	.236D-02	.229D-02	.442D-02	.532	233.	449.
CH4	.827D-05	.766D-05	.253D-04	.165D-01	.220D+04	.727D+04
N2	.231D-07	.223D-07	.435D-07	.175D-03	.800D+04	.156D+05
H2S	.381D-01	.335D-01	.169	.343	9.97	50.3
H2O	.489	.506	.516D-03	.714D-02	.142D-01	.144D-04
C6H6	.349D-01	.768D-02	.794	.390D-01	3.98	411.
CH3OH	.436	.450	.323D-01	.315D-01	.702D-01	.504D-02

PUMP (PUMP): NAPHPUMP
INLET = NAPHTHA OUTLET = NAPHTHP
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.750988D-05	.750988D-05	.0
CO	.303122D-03	.303122D-03	.0
CO2	.11884O	.11884O	.0
CH4	.678654D-03	.678654D-03	.0
N2	.116964D-05	.116964D-05	.0
H2S	4.53505	4.53505	.0
H2O	.138572D-01	.138572D-01	.0
C6H6	21.3241	21.3241	.0
CH3OH	.867951	.867951	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	26.8608	26.8608	.0
MASS(LB/HR)	1853.58	1853.58	.0
ENTHALPY(BTU/HR)	236966.	237384.	-.175781D-02

*** INPUT DATA ***

TYPE OF PUMP: 1=CENTRIFUGAL PUMP; 2, SLURRY PUMP; 3, POSITIVE DISPLACEMENT PUMP	***
REQUIRED EXIT PRESSURE ,PSI	50.0000
PUMP EFFICIENCY ,	MISSING
DRIVER EFFICIENCY ,	1.00000
SOLID FLOW RATE ,LB/HR	0.0

*** RESULTS ***

TYPE OF PUMP, (CAL)	1
VOLUMETRIC FLOW RATE CUFT/HR	33.3344
DELTA PRESSURE PSI	20.0000
FLUID POWER REQUIREMENTHP	0.048486
BRAKE POWER REQUIREMENTHP	0.16399
ELECTRICITY REQUIREMENT HP	0.16399
PUMP EFFICIENCY (CAL)	0.29566

GENERAL-HEAT (HEATER): HEAT4
INPUT STREAM: AZFEED Q4
OUTPUT STREAM: AZFEEDH
PROPERTY OPTION SET OPSETA

GENERAL-HEAT (HEATER): HEAT4 (CONTINUED)

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.126083D-03	.126083D-03	.0
CO	.398603D-02	.398603D-02	.0
CO2	1.71645	1.71645	.0
CH4	.574218D-02	.574218D-02	.0
N2	.167395D-04	.167395D-04	.0
H2S	25.0760	25.0760	.0
H2O	379.437	379.437	-.149810D-15
C6H6	5.76037	5.76037	-.385469D-16
CH3OH	337.624	337.624	-.168363D-15
TOTAL BALANCE			
MOLE(LBMOL/HR)	749.624	749.624	.0
MASS(LB/HR)	19034.0	19034.0	.0
ENTHALPY(BTU/HR)	-.822218D+08	-.822218D+08	-.144132D-07

*** INPUT DATA ***

TWO PHASE PQ FLASH		
SPECIFIED PRESSURE	PSI	50.000
SPECIFIED HEAT DUTY	BTU/HR	.10000D+71
MAXIMUM ITERATION NO.		30
CONVERGENCE TOLERANCE		.10000D-03

*** RESULTS ***

OUTPUT TEMPERATURE	F	95.698
OUTPUT PRESSURE	PSI	50.000
HEAT DUTY	BTU/HR	.0
VAPOR FRACTION		.0

V-L PHASE EQUILIBRIUM :

COMP	F(I)	X(I)	Y(I)	K(I)
H2	.16820D-06	.16820D-06	.12373D-02	7356.3
CO	.53174D-05	.53174D-05	.21088D-01	3965.9
CO2	.22897D-02	.22897D-02	.49240	215.05
CH4	.76601D-05	.76601D-05	.13041D-01	1702.5
N2	.22331D-07	.22331D-07	.12822D-03	5742.0
H2S	.33451D-01	.33451D-01	.36694	10.969
H2O	.50617	.50617	.13669D-01	.27005D-01
C6H6	.76843D-02	.76843D-02	.36876D-01	4.7988
CH3OH	.45039	.45039	.54618D-01	.12127

SEPARATOR-2 (SEP2): AZCOL
INPUT STREAM - AZFEEDH
OUTPUT STREAMS - AZOVHD
LAZ
PROPERTY OPTION SET OPSETA

RECTISOL GAS DESULFURIZATION
U-O-S BLOCK SECTION

SEPARATOR-2 (SEP2): AZCOL (CONTINUED)

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.126083D-03	.126083D-03	-.405023D-07
CO	.398603D-02	.398603D-02	-.741734D-07
CO2	1.71645	1.71645	.479594D-08
CH4	.574218D-02	.574218D-02	-.917389D-07
N2	.167395D-04	.167396D-04	-.751143D-07
H2S	25.0760	25.0760	.116774D-06
H2O	379.437	379.437	-.976899D-10
C6H6	5.76037	5.76036	.960938D-06
CH3OH	337.624	337.624	-.107213D-08
TOTAL BALANCE			
MOLE(LBMOL/HR)	749.624	749.624	.107680D-07
MASS(LB/HR)	19034.0	19034.0	.273333D-07
ENTHALPY(BTU/HR)	-.822218D+08	-.794308D+08	-.339451D-01

SEPARATOR-2 (SEP2): AZCOL (CONTINUED)

*** INPUT DATA ***

FLASH SPECS FOR STREAM AZOVHD

TEMPERATURE (F)	130.000
PRESSURE (PSI)	48.0000
VAPOR FRACTION	MISSING
PHASE CODE	1
KEY PHASE	1
TEMP ESTIMATE (F)	MISSING
PRES ESTIMATE (PSI)	MISSING
MAX. NO. ITERATIONS	25
CONVERGENCE TOL.	0.100000-03

FLASH SPECS FOR STREAM LAZ

TEMPERATURE (F)	228.000
PRESSURE (PSI)	50.0000
VAPOR FRACTION	MISSING
PHASE CODE	1
KEY PHASE	2
TEMP ESTIMATE (F)	MISSING
PRES ESTIMATE (PSI)	MISSING
MAX. NO. ITERATIONS	25
CONVERGENCE TOL.	0.100000-03

SPLIT FRACTION

SUBSTREAM= MIXED

STREAM=	CPT=		FRACTION=
AZOVHD		H2	1.00000
		CO	1.00000
		CO2	1.00000
		CH4	1.00000
		N2	1.00000
		H2S	1.00000
		C6H6	1.00000
		H2O	0.0

MOLE FLOW (LBMOL/HR)

SUBSTREAM= MIXED

STREAM=	CPT=		FLOW=
AZOVHD		CH3OH	9.16286

SEPARATOR-2 (SEP2): AZCOL (CONTINUED)

*** RESULTS ***

STREAM= AZOVHD SUBSTREAM= MIXED

COMPONENT = H2	SPLIT FRACTION =	1.00000
COMPONENT = CO	SPLIT FRACTION =	1.00000
COMPONENT = CO2	SPLIT FRACTION =	1.00000
COMPONENT = CH4	SPLIT FRACTION =	1.00000
COMPONENT = N2	SPLIT FRACTION =	1.00000
COMPONENT = H2S	SPLIT FRACTION =	1.00000
COMPONENT = C6H6	SPLIT FRACTION =	1.00000
COMPONENT = CH3OH	SPLIT FRACTION =	0.027139

STREAM= LAZ SUBSTREAM= MIXED

COMPONENT = H2	SPLIT FRACTION =	-0.405023-07
COMPONENT = CO	SPLIT FRACTION =	-0.741734-07
COMPONENT = CO2	SPLIT FRACTION =	0.479594-08
COMPONENT = CH4	SPLIT FRACTION =	-0.917389-07
COMPONENT = N2	SPLIT FRACTION =	-0.751143-07
COMPONENT = H2S	SPLIT FRACTION =	0.116774-06
COMPONENT = H2O	SPLIT FRACTION =	1.00000
COMPONENT = C6H6	SPLIT FRACTION =	0.960938-06
COMPONENT = CH3OH	SPLIT FRACTION =	0.97286

SEPARATOR-2 (SEP2): AZCOND
INPUT STREAM - AZOVHD
OUTPUT STREAMS - VAZ
AZCOND
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.126083D-03	.126083D-03	.0
CO	.398603D-02	.398603D-02	.0
CO2	1.71645	1.71645	.0
CH4	.574218D-02	.574218D-02	.0
N2	.167396D-04	.167396D-04	.0
H2S	25.0760	25.0760	.0
H2O	.0	.0	.0
C6H6	5.76036	5.76036	.0
CH3OH	9.16286	9.16286	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	41.7256	41.7256	.0
MASS(LB/HR)	1673.90	1673.90	.135835D-15
ENTHALPY(BTU/HR)	-.107907D+07	-.114653D+07	.588348D-01

SEPARATOR-2 (SEP2): AZCOND (CONTINUED)

*** INPUT DATA ***

FLASH SPECS FOR STREAM VAZ

TEMPERATURE (F)	130.000
PRESSURE (PSI)	48.0000
VAPOR FRACTION	MISSING
PHASE CODE	1
KEY PHASE	1
TEMP ESTIMATE (F)	MISSING
PRES ESTIMATE (PSI)	MISSING
MAX. NO. ITERATIONS	25
CONVERGENCE TOL.	0.100000-03

FLASH SPECS FOR STREAM AZCOND

TEMPERATURE (F)	130.000
PRESSURE (PSI)	48.0000
VAPOR FRACTION	MISSING
PHASE CODE	1
KEY PHASE	2
TEMP ESTIMATE (F)	MISSING
PRES ESTIMATE (PSI)	MISSING
MAX. NO. ITERATIONS	25
CONVERGENCE TOL.	0.100000-03

SPLIT FRACTION

SUBSTREAM= MIXED

STREAM= VAZ	CPT=	FRACTION=
	H2	1.00000
	CO	1.00000
	CO2	0.98500
	CH4	1.00000
	N2	1.00000
	H2S	0.92800
	C6H6	0.75000
	H2O	0.0
	CH3OH	0.75000

SEPARATOR-2 (SEP2): AZCOND (CONTINUED)

*** RESULTS ***

STREAM= VAZ SUBSTREAM= MIXED

COMPONENT = H2	SPLIT FRACTION =	1.00000
COMPONENT = CO	SPLIT FRACTION =	1.00000
COMPONENT = CO2	SPLIT FRACTION =	0.98500
COMPONENT = CH4	SPLIT FRACTION =	1.00000
COMPONENT = N2	SPLIT FRACTION =	1.00000
COMPONENT = H2S	SPLIT FRACTION =	0.92800
COMPONENT = C6H6	SPLIT FRACTION =	0.75000
COMPONENT = CH3OH	SPLIT FRACTION =	0.75000

STREAM= AZCOND SUBSTREAM= MIXED

COMPONENT = H2	SPLIT FRACTION =	0.111022-15
COMPONENT = CO	SPLIT FRACTION =	0.111022-15
COMPONENT = CO2	SPLIT FRACTION =	0.015000
COMPONENT = CH4	SPLIT FRACTION =	0.971445-16
COMPONENT = N2	SPLIT FRACTION =	0.111022-15
COMPONENT = H2S	SPLIT FRACTION =	0.072000
COMPONENT = C6H6	SPLIT FRACTION =	0.25000
COMPONENT = CH3OH	SPLIT FRACTION =	0.25000

MIXER (MIXER): MWMIX
INLET STREAM(S): LAZ MEOHRFLX
OUTLET STREAM: MWFEED
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.0	.0	.0
CO	.0	.0	.0
CO2	.0	.0	.0
CH4	.0	.0	.0
N2	.0	.0	.0
H2S	.0	.0	.0
H2O	379.869	379.869	-.149640D-15
C6H6	.0	.0	.0
CH3OH	723.227	723.227	-.157194D-15
TOTAL BALANCE			
MOLE(LBMOL/HR)	1103.10	1103.10	-.206123D-15
MASS(LB/HR)	30017.0	30017.0	-.302994D-16
ENTHALPY(BTU/HR)	-.118118D+09	-.118118D+09	-.515326D-09

MIXER (MIXER): MWMIX (CONTINUED)

*** INPUT DATA ***

OUTLET PRESSURE ,PSI	MISSING
TYPE OF FLASH - TWO PHASE	
MAXIMUM NUMBER OF ITERATIONS IN FLASH	30
CONVERGENCE TOLERANCE FOR FLASH	0.100000-03

SEPARATOR-2 (SEP2): MWSEP
INPUT STREAM - MWFEED
OUTPUT STREAMS - WSTH2O
VMW
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.0	.0	.0
CO	.0	.0	.0
CO2	.0	.0	.0
CH4	.0	.0	.0
N2	.0	.0	.0
H2S	.0	.0	.0
H2O	379.869	379.869	.0
C6H6	.0	.0	.0
CH3OH	723.227	723.227	.157194D-15
TOTAL BALANCE			
MOLE(LBMOL/HR)	1103.10	1103.10	.206123D-15
MASS(LB/HR)	30017.0	30017.0	-.121197D-15
ENTHALPY(BTU/HR)	-.118118D+09	-.107758D+09	-.877132D-01

SEPARATOR-2 (SEP2): MWSEP (CONTINUED)

*** INPUT DATA ***

FLASH SPECS FOR STREAM WSTH2O

TEMPERATURE (F)	250.000
PRESSURE (PSI)	40.0000
VAPOR FRACTION	MISSING
PHASE CODE	1
KEY PHASE	2
TEMP ESTIMATE (F)	MISSING
PRES ESTIMATE (PSI)	MISSING
MAX. NO. ITERATIONS	25
CONVERGENCE TOL.	0.100000-03

FLASH SPECS FOR STREAM VMW

TEMPERATURE (F)	160.000
PRESSURE (PSI)	25.0000
VAPOR FRACTION	MISSING
PHASE CODE	1
KEY PHASE	1
TEMP ESTIMATE (F)	MISSING
PRES ESTIMATE (PSI)	MISSING
MAX. NO. ITERATIONS	25
CONVERGENCE TOL.	0.100000-03

SPLIT FRACTION

SUBSTREAM= MIXED

STREAM= WSTH2O	CPT=	FRACTION=
	H2	0.0
	CO	0.0
	CO2	0.0
	CH4	0.0
	N2	0.0
	H2S	0.0
	H2O	0.98900
	C6H6	0.0
	CH3OH	0.0020000

MOLE FLOW (LBMOL/HR)

SUBSTREAM= MIXED

STREAM= VMW	CPT=	FLOW=
	CH3OH	1,100.00

SEPARATOR-2 (SEP2): MWSEP (CONTINUED)

*** RESULTS ***

STREAM= WSTH2O SUBSTREAM= MIXED
COMPONENT = H2O SPLIT FRACTION = 0.98900

STREAM= WSTH2O SUBSTREAM= MIXED
COMPONENT = CH3OH SPLIT FRACTION = 0.0013132

STREAM= VMW SUBSTREAM= MIXED
COMPONENT = H2O SPLIT FRACTION = 0.011000

STREAM= VMW SUBSTREAM= MIXED
COMPONENT = CH3OH SPLIT FRACTION = 0.99869

GENERAL-HEAT (HEATER): COOL4
INPUT STREAM: WSTH2O
OUTPUT STREAM: WSTH2OC Q4
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.0	.0	.0
CO	.0	.0	.0
CO2	.0	.0	.0
CH4	.0	.0	.0
N2	.0	.0	.0
H2S	.0	.0	.0
H2O	375.690	375.690	.0
C6H6	.0	.0	.0
CH3OH	.949764	.949764	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	376.640	376.640	.0
MASS(LB/HR)	6798.49	6798.49	.0
ENTHALPY(BTU/HR)	-.453458D+08	-.453458D+08	-.246459D-15

GENERAL-HEAT (HEATER): COOL4 (CONTINUED)

*** INPUT DATA ***

TWO PHASE TP FLASH		
SPECIFIED TEMPERATURE	F	118.00
SPECIFIED PRESSURE	PSI	35.000
MAXIMUM ITERATION NO.		30
CONVERGENCE TOLERANCE		.10000D-03

TP FLASH, NO INITIAL GUESSES ARE REQUIRED.

*** RESULTS ***

OUTPUT TEMPERATURE	F	118.00
OUTPUT PRESSURE	PSI	35.000
HEAT DUTY	BTU/HR	-.11426D+07
VAPOR FRACTION		.0

V-L PHASE EQUILIBRIUM :

COMP	F(I)	X(I)	Y(I)	K(I)
H2O	.99748	.99748	.97623	.46588D-01
CH3OH	.25217D-02	.25217D-02	.23767D-01	.44865

GENERAL-HEAT (HEATER): HEAT6
INPUT STREAM: LFLRG2P Q6
OUTPUT STREAM: HTRGFD
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.277494D-02	.277494D-02	.0
CO	.266507	.266507	.0
CO2	105.402	105.402	.0
CH4	.601710	.601710	.0
N2	.112025D-02	.112025D-02	.0
H2S	104.808	104.808	.0
H2O	.0	.0	.0
C6H6	.0	.0	.0
CH3OH	3100.69	3100.69	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	3311.77	3311.77	.0
MASS(LB/HR)	107580.	107580.	.0
ENTHALPY(BTU/HR)	-.336268D+09	-.336268D+09	-.312926D-06

*** INPUT DATA ***

TWO PHASE PQ FLASH		
PRESSURE DROP	PSI	-5.0000
SPECIFIED HEAT DUTY	BTU/HR	.10000D+71
MAXIMUM ITERATION NO.		30
CONVERGENCE TOLERANCE		.10000D-03

GENERAL-HEAT (HEATER): HEAT6 (CONTINUED)

*** RESULTS ***

OUTPUT TEMPERATURE	F	124.10
OUTPUT PRESSURE	PSI	35.000
HEAT DUTY	BTU/HR	.0
VAPOR FRACTION		.64163D-01

V-L PHASE EQUILIBRIUM :

COMP	F(I)	X(I)	Y(I)	K(I)
H2	.83790D-06	.58392D-08	.12974D-04	2221.8
CO	.80473D-04	.11639D-05	.12372D-02	1063.0
CO2	.31827D-01	.56786D-02	.41320	72.763
CH4	.18169D-03	.58729D-05	.27460D-02	467.55
N2	.33826D-06	.37964D-08	.52166D-05	1374.0
H2S	.31647D-01	.10772D-01	.33612	31.202
CH3OH	.93626	.98354	.24668	.25081

MIXER (MIXER): HTRGMX
INLET STREAM(S): HTRGFD VMW
OUTLET STREAM: A
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.277494D-02	.277494D-02	.0
CO	.266507	.266507	.0
CO2	105.402	105.402	.0
CH4	.601710	.601710	.0
N2	.112025D-02	.112025D-02	.0
H2S	104.808	104.808	.0
H2O	4.17855	4.17855	.0
C6H6	.0	.0	.0
CH3OH	3822.96	3822.96	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	4038.23	4038.23	.0
MASS(LB/HR)	130798.	130798.	.111254D-15
ENTHALPY(BTU/HR)	-.398680D+09	-.398680D+09	.261075D-06

*** INPUT DATA ***

OUTLET PRESSURE ,PSI	MISSING
TYPE OF FLASH - TWO PHASE	
MAXIMUM NUMBER OF ITERATIONS IN FLASH	30
CONVERGENCE TOLERANCE FOR FLASH	0.100000-03

SEPARATOR-2 (SEP2): HTRGSEP
INPUT STREAM - A
OUTPUT STREAMS - VHTRG1
LHTRG1
PROPERTY OPTION SET OPSETA

SEPARATOR-2 (SEP2): HTRGSEP (CONTINUED)

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.277494D-02	.277494D-02	.0
CO	.266507	.266507	.0
CO2	105.402	105.402	.0
CH4	.601710	.601710	.0
N2	.112025D-02	.112025D-02	.0
H2S	104.808	104.808	.0
H2O	4.17855	4.17855	.0
C6H6	.0	.0	.0
CH3OH	3822.96	3822.96	.594757D-16
TOTAL BALANCE			
MOLE(LBMOL/HR)	4038.23	4038.23	.563053D-16
MASS(LB/HR)	130798.	130798.	-.111254D-15
ENTHALPY(BTU/HR)	-.398680D+09	-.404105D+09	.134245D-01

SEPARATOR-2 (SEP2): HTRGSEP (CONTINUED)

*** INPUT DATA ***

FLASH SPECS FOR STREAM VHTRG1

TEMPERATURE (F)	-39.7700
PRESSURE (PSI)	33.5000
VAPOR FRACTION	MISSING
PHASE CODE	1
KEY PHASE	1
TEMP ESTIMATE (F)	MISSING
PRES ESTIMATE (PSI)	MISSING
MAX. NO. ITERATIONS	25
CONVERGENCE TOL.	0.100000-03

FLASH SPECS FOR STREAM LHTRG1

TEMPERATURE (F)	190.900
PRESSURE (PSI)	35.0000
VAPOR FRACTION	MISSING
PHASE CODE	1
KEY PHASE	2
TEMP ESTIMATE (F)	MISSING
PRES ESTIMATE (PSI)	MISSING
MAX. NO. ITERATIONS	25
CONVERGENCE TOL.	0.100000-03

SPLIT FRACTION
SUBSTREAM= MIXED

SEPARATOR-2 (SEP2): HTRGSEP (CONTINUED)

*** RESULTS ***

STREAM= VHTRG1 SUBSTREAM= MIXED

COMPONENT = H2	SPLIT FRACTION =	1.00000
COMPONENT = CO	SPLIT FRACTION =	1.00000
COMPONENT = CO2	SPLIT FRACTION =	1.00000
COMPONENT = CH4	SPLIT FRACTION =	1.00000
COMPONENT = N2	SPLIT FRACTION =	1.00000
COMPONENT = H2S	SPLIT FRACTION =	1.00000
COMPONENT = CH3OH	SPLIT FRACTION =	0.370000-04

STREAM= LHTRG1 SUBSTREAM= MIXED

COMPONENT = H2O	SPLIT FRACTION =	1.00000

STREAM= LHTRG1 SUBSTREAM= MIXED

COMPONENT = CH3OH	SPLIT FRACTION =	0.99996

MIXER (MIXER): METHMX
INLET STREAM(S): LHTRG1 MUMEOH
OUTLET STREAM: RGMEOH
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.0	.0	.0
CO	.0	.0	.0
CO2	.0	.0	.0
CH4	.0	.0	.0
N2	.0	.0	.0
H2S	.0	.0	.0
H2O	4.17855	4.17855	-.137468D-07
C6H6	.0	.0	.0
CH3OH	3824.77	3824.68	.214409D-04
TOTAL BALANCE			
MOLE(LBMOL/HR)	3828.94	3828.86	.214175D-04
MASS(LB/HR)	122628.	122626.	.214278D-04
ENTHALPY(BTU/HR)	-.385287D+09	-.385279D+09	-.216222D-04

MIXER (MIXER): METHMX (CONTINUED)

*** INPUT DATA ***

OUTLET PRESSURE ,PSI	MISSING
TYPE OF FLASH - TWO PHASE	
MAXIMUM NUMBER OF ITERATIONS IN FLASH	30
CONVERGENCE TOLERANCE FOR FLASH	0.100000-03

GENERAL-HEAT (HEATER): ABPUMP
INPUT STREAM: RGMEOH
OUTPUT STREAM: RGMEOHP
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.0	.0	.0
CO	.0	.0	.0
CO2	.0	.0	.0
CH4	.0	.0	.0
N2	.0	.0	.0
H2S	.0	.0	.0
H2O	4.17855	4.17855	.0
C6H6	.0	.0	.0
CH3OH	3824.68	3824.68	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	3828.86	3828.86	.0
MASS(LB/HR)	122626.	122626.	.0
ENTHALPY(BTU/HR)	-.385279D+09	-.385279D+09	.115068D-06

*** INPUT DATA ***

TWO PHASE PQ FLASH		
SPECIFIED PRESSURE	PSI	420.00
SPECIFIED HEAT DUTY	BTU/HR	.0
MAXIMUM ITERATION NO.		30
CONVERGENCE TOLERANCE		.10000D-03

*** RESULTS ***

OUTPUT TEMPERATURE	F	190.26
OUTPUT PRESSURE	PSI	420.00
HEAT DUTY	BTU/HR	.0
VAPOR FRACTION		.0

V-L PHASE EQUILIBRIUM :

COMP	F(I)	X(I)	Y(I)	K(I)
H2O	.10913D-02	.10913D-02	.52382D-03	.47998
CH3OH	.99891	.99891	.99948	1.0006

FLOW-SPLITTE (FSPLIT): RFLXSPLT
INPUT STREAM - RGMEOHP
OUTPUT STREAMS - MEOHRFLX
RGME1
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.0	.0	.0
CO	.0	.0	.0
CO2	.0	.0	.0
CH4	.0	.0	.0
N2	.0	.0	.0
H2S	.0	.0	.0
H2O	4.17855	4.17855	.106278D-15
C6H6	.0	.0	.0
CH3OH	3824.68	3824.68	.594490D-16
TOTAL BALANCE			
MOLE(LBMOL/HR)	3828.86	3828.86	.593841D-16
MASS(LB/HR)	122626.	122626.	.0
ENTHALPY(BTU/HR)	-.385279D+09	-.385279D+09	-.154705D-15

*** INPUT DATA ***

KEY= 1 SUBSTREAM NO.= 1 CPT.= CH3OH

MOLE-FLOW (LBMOL/HR) STRM=MEOHRFLX FLOW= 394.766 KEY= 1

*** RESULTS ***

STREAM= MEOHRFLX	SPLIT=	0.10322	KEY= 1
RGME1		0.89678	0

GENERAL-HEAT (HEATER): COOL6
INPUT STREAM: RGME1
OUTPUT STREAM: RGMEC Q6
PROPERTY OPTION SET OPSETA

GENERAL-HEAT (HEATER): COOL6 (CONTINUED)

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.0	.0	.0
CO	.0	.0	.0
CO2	.0	.0	.0
CH4	.0	.0	.0
N2	.0	.0	.0
H2S	.0	.0	.0
H2O	3.74726	3.74726	.0
C6H6	.0	.0	.0
CH3OH	3429.92	3429.92	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	3433.67	3433.67	.0
MASS(LB/HR)	109969.	109969.	.0
ENTHALPY(BTU/HR)	-.345512D+09	-.345512D+09	.0

*** INPUT DATA ***

TWO PHASE TP FLASH		
SPECIFIED TEMPERATURE	F	40.000
PRESSURE DROP	PSI	-5.0000
MAXIMUM ITERATION NO.		30
CONVERGENCE TOLERANCE		.10000D-03

TP FLASH, NO INITIAL GUESSES ARE REQUIRED.

*** RESULTS ***

OUTPUT TEMPERATURE	F	40.000
OUTPUT PRESSURE	PSI	415.00
HEAT DUTY	BTU/HR	-.15789D+08
VAPOR FRACTION		.0

V-L PHASE EQUILIBRIUM :

COMP	F(I)	X(I)	Y(I)	K(I)
H2O	.10913D-02	.10913D-02	.16114D-03	.11721D-03
CH3OH	.99891	.99891	.99984	.79450D-03

GENERAL-HEAT (HEATER): COOL5
INPUT STREAM: RGMEC Q5
OUTPUT STREAM: RGMEC2
PROPERTY OPTION SET OPSETA

GENERAL-HEAT (HEATER): COOL5 (CONTINUED)

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.0	.0	.0
CO	.0	.0	.0
CO2	.0	.0	.0
CH4	.0	.0	.0
N2	.0	.0	.0
H2S	.0	.0	.0
H2O	3.74726	3.74726	.0
C6H6	.0	.0	.0
CH3OH	3429.92	3429.92	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	3433.67	3433.67	.0
MASS(LB/HR)	109969.	109969.	.0
ENTHALPY(BTU/HR)	-.362177D+09	-.362177D+09	-.309875D-11

*** INPUT DATA ***

TWO PHASE PQ FLASH		
PRESSURE DROP	PSI	-5.0000
SPECIFIED HEAT DUTY	BTU/HR	.10000D+71
MAXIMUM ITERATION NO.		30
CONVERGENCE TOLERANCE		.10000D-03

*** RESULTS ***

OUTPUT TEMPERATURE	F	31.654
OUTPUT PRESSURE	PSI	410.00
HEAT DUTY	BTU/HR	.0
VAPOR FRACTION		.0

V-L PHASE EQUILIBRIUM :

COMP	F(I)	X(I)	Y(I)	K(I)
H2O	.10913D-02	.10913D-02	.22018D-03	.20176
CH3OH	.99891	.99891	.99978	1.0009

GENERAL-HEAT (HEATER): REFRIG4
INPUT STREAM: RGMEC2
OUTPUT STREAM: RGMETC2 QR4
PROPERTY OPTION SET OPSETA

GENERAL-HEAT (HEATER): REFRIG4 (CONTINUED)

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.0	.0	.0
CO	.0	.0	.0
CO2	.0	.0	.0
CH4	.0	.0	.0
N2	.0	.0	.0
H2S	.0	.0	.0
H2O	3.74726	3.74726	.0
C6H6	.0	.0	.0
CH3OH	3429.92	3429.92	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	3433.67	3433.67	.0
MASS(LB/HR)	109969.	109969.	.0
ENTHALPY(BTU/HR)	-.362177D+09	-.362177D+09	.0

*** INPUT DATA ***

TWO PHASE TP FLASH		
SPECIFIED TEMPERATURE	F	-75.000
PRESSURE DROP	PSI	-5.0000
MAXIMUM ITERATION NO.		30
CONVERGENCE TOLERANCE		.10000D-03

TP FLASH. NO INITIAL GUESSES ARE REQUIRED.

*** RESULTS ***

OUTPUT TEMPERATURE	F	-75.000
OUTPUT PRESSURE	PSI	405.00
HEAT DUTY	BTU/HR	-.10864D+08
VAPOR FRACTION		.0

V-L PHASE EQUILIBRIUM :

COMP	F(I)	X(I)	Y(I)	K(I)
H2O	.10913D-02	.10913D-02	.57818D-04	.52126D-06
CH3OH	.99891	.99891	.99994	.98492D-05

MIXER (MIXER): WWMIX

INLET STREAM(S):	VPRWSF	VFLRG2	VAZ	VNEX
	VHTRG1	ADDH2O		
OUTLET STREAM:	WWFEED			
PROPERTY OPTION SET	OPSETA			

MIXER (MIXER): WWMIX (CONTINUED)

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.305364	.305364	.0
CO	4.16082	4.16082	.0
CO2	125.676	125.676	.0
CH4	2.90171	2.90171	.0
N2	.255434D-01	.255434D-01	.0
H2S	135.598	135.598	.0
H2O	385.000	385.000	.0
C6H6	4.34038	4.34038	.0
CH3OH	7.07515	7.07515	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	665.083	665.083	.0
MASS(LB/HR)	17818.1	17818.1	.204173D-15
ENTHALPY(BTU/HR)	-.711401D+08	-.711400D+08	-.590504D-06

*** INPUT DATA ***

OUTLET PRESSURE ,PSI	MISSING
TYPE OF FLASH - TWO PHASE	
MAXIMUM NUMBER OF ITERATIONS IN FLASH	30
CONVERGENCE TOLERANCE FOR FLASH	0.100000-03

SEPARATOR-2 (SEP2): H2OWSH
INPUT STREAM - WWFEED
OUTPUT STREAMS - ACIDGAS
LWWS
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.305364	.305364	.0
CO	4.16082	4.16082	.0
CO2	125.676	125.676	.0
CH4	2.90171	2.90171	.0
N2	.255434D-01	.255434D-01	.0
H2S	135.598	135.598	.0
H2O	385.000	385.000	.0
C6H6	4.34038	4.34038	.102316D-15
CH3OH	7.07515	7.07515	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	665.083	665.083	.0
MASS(LB/HR)	17818.1	17818.1	-.204173D-15
ENTHALPY(BTU/HR)	-.711400D+08	-.713787D+08	.334366D-02

SEPARATOR-2 (SEP2): H2OWSH (CONTINUED)

*** INPUT DATA ***

FLASH SPECS FOR STREAM ACIDGAS

TEMPERATURE (F)	89.0000
PRESSURE (PSI)	25.0000
VAPOR FRACTION	MISSING
PHASE CODE	1
KEY PHASE	1
TEMP ESTIMATE (F)	MISSING
PRES ESTIMATE (PSI)	MISSING
MAX. NO. ITERATIONS	25
CONVERGENCE TOL.	0.100000-03

FLASH SPECS FOR STREAM LWWS

TEMPERATURE (F)	40.9000
PRESSURE (PSI)	26.0000
VAPOR FRACTION	MISSING
PHASE CODE	1
KEY PHASE	2
TEMP ESTIMATE (F)	MISSING
PRES ESTIMATE (PSI)	MISSING
MAX. NO. ITERATIONS	25
CONVERGENCE TOL.	0.100000-03

SPLIT FRACTION

SUBSTREAM= MIXED

STREAM= ACIDGAS	CPT=	FRACTION=
	H2	1.00000
	CO	1.00000
	CO2	0.99940
	CH4	1.00000
	N2	1.00000
	H2S	0.99510
	H2O	0.020700
	C6H6	0.40910
	CH3OH	0.0

SEPARATOR-2 (SEP2): H2OWSH (CONTINUED)

*** RESULTS ***

STREAM= ACIDGAS SUBSTREAM= MIXED

COMPONENT = H2	SPLIT FRACTION =	1.00000
COMPONENT = CO	SPLIT FRACTION =	1.00000
COMPONENT = CO2	SPLIT FRACTION =	0.99940
COMPONENT = CH4	SPLIT FRACTION =	1.00000
COMPONENT = N2	SPLIT FRACTION =	1.00000
COMPONENT = H2S	SPLIT FRACTION =	0.99510
COMPONENT = H2O	SPLIT FRACTION =	0.020700
COMPONENT = C6H6	SPLIT FRACTION =	0.40910

STREAM= LWWS SUBSTREAM= MIXED

COMPONENT = H2	SPLIT FRACTION =	0.971445-16
COMPONENT = CO	SPLIT FRACTION =	0.111022-15
COMPONENT = CO2	SPLIT FRACTION =	0.00060000
COMPONENT = CH4	SPLIT FRACTION =	0.152656-15
COMPONENT = N2	SPLIT FRACTION =	0.138778-15
COMPONENT = H2S	SPLIT FRACTION =	0.0049000
COMPONENT = H2O	SPLIT FRACTION =	0.97930
COMPONENT = C6H6	SPLIT FRACTION =	0.59090
COMPONENT = CH3OH	SPLIT FRACTION =	1.00000

PUMP (PUMP): H2OPUMP
INLET = LWWS OUTLET = LWWSP
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.268904D-16	.268904D-16	.0
CO	.430246D-15	.430246D-15	.0
CO2	.754059D-01	.754059D-01	.0
CH4	.430246D-15	.430246D-15	.0
N2	.336130D-17	.336130D-17	.0
H2S	:664428	.664428	.0
H2O	377.031	377.031	.0
C6H6	2.56473	2.56473	.0
CH3OH	7.07515	7.07515	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	387.410	387.410	.0
MASS(LB/HR)	7245.21	7245.21	.0
ENTHALPY(BTU/HR)	-.479060D+08	-.479038D+08	-.461019D-04

PUMP (PUMP): H2OPUMP (CONTINUED)

*** INPUT DATA ***

TYPE OF PUMP: 1=CENTRIFUGAL PUMP; 2. SLURRY PUMP; 3. POSITIVE DISPLACEMENT PUMP	***
REQUIRED EXIT PRESSURE ,PSI	50.0000
PUMP EFFICIENCY ,	MISSING
DRIVER EFFICIENCY ,	1.00000
SOLID FLOW RATE ,LB/HR	0.0

*** RESULTS ***

TYPE OF PUMP, (CAL)	1
VOLUMETRIC FLOW RATE CUFT/HR	147.027
DELTA PRESSURE PSI	24.0000
FLUID POWER REQUIREMENTHP	0.25663
BRAKE POWER REQUIREMENTHP	0.86800
ELECTRICITY REQUIREMENT HP	0.86800
PUMP EFFICIENCY (CAL)	0.29566

DESCRIPTION OF STREAM CLASS HEAT

STREAM CLASS : HEAT
STREAM ATTR : HEAT

DESCRIPTION OF STREAM CLASS CONVEN

STREAM CLASS : CONVEN
SUBSTREAMS : MIXED
SUBSTRM CLASS: MIXED

Q1 Q2 QH1 Q5 QR3

STREAM ID		Q1	Q2	QH1	Q5	QR3
FROM :		COOL1	COOL2	HEAT1	HEAT5	REFRIG3
TO :					COOL5	
CLASS:		HEAT	HEAT	HEAT	HEAT	HEAT
STREAM ATTRIBUTES:						
HEAT						
Q	BTU/HR	.28679+07	.40219+07	-.73779+07	-.87547+06	.81367+05

Q4 Q6 QR4

STREAM ID		Q4	Q6	QR4
FROM :		COOL4	COOL6	REFRIG4
TO :		HEAT4	HEAT6	
CLASS:		HEAT	HEAT	HEAT
STREAM ATTRIBUTES:				
HEAT				
Q	BTU/HR	.11426+07	.15789+08	.10864+08

RECTISOL GAS DESULFURIZATION
STREAM SECTION

FDMX FDMXC FDH2O FDXH2O FDMX2

STREAM ID		FDMX	FDMXC	FDH2O	FDXH2O	FDMX2
FROM :		MIXHC	COOL1	SEPH2O	SEPH2O	INJMEOH
TO :		COOL1	SEPH2O		INJMEOH	COOL2
CLASS:		CONVEN	CONVEN	CONVEN	CONVEN	CONVEN
SUBSTREAM: MIXED		STRUCTURE: CONVENTIONAL				
H2	LBMOL/HR	1911.7461	1911.7461	0.0	1911.7461	1911.7574
CO	LBMOL/HR	4068.1825	4068.1825	0.0	4068.1825	4068.2679
CO2	LBMOL/HR	309.7599	309.7599	0.0	309.7599	310.1349
CH4	LBMOL/HR	507.0094	507.0094	0.0	507.0094	507.0421
N2	LBMOL/HR	41.8185	41.8185	0.0	41.8185	41.8191
H2S	LBMOL/HR	141.1770	141.1770	0.0	141.1770	142.8839
H2O	LBMOL/HR	13.8000	13.8000	11.3794	2.4205	2.5479
C6H6	LBMOL/HR	23.1000	23.1000	0.0	23.1000	24.3157
CH3OH	LBMOL/HR	0.0277	0.0277	0.0	0.0277	17.3514
TOTAL	LBMOL/HR	7016.6213	7016.6213	11.3794	7005.2419	7026.1208
TEMP	F	94.9741	40.0000	40.0000	40.0000	37.4983
PRES	PSI	427.0000	424.0000	424.0000	424.0000	424.0000
ENTHALPY	BTU/LBMOL	-.37563+05	-.37972+05	-.12524+06	-.37864+05	-.38028+05
VFRAC		1.0000	1.0000	0.0	1.0000	0.9973
LFRAC		0.0	0.0	1.0000	0.0	0.0026
ENTROPY	BTU/LBMOL-R	6.7999	6.0401	-33.3154	6.0577	5.8891
DENSITY	LBMOL/CUFT	0.0715	0.0794	2.6441	0.0794	0.0796
AVG MW		21.0367	21.0367	18.0150	21.0416	21.0830

RECTISOL GAS DESULFURIZATION
STREAM SECTION

PRWSFD FEED PRWSFDV PRWSFDL X

STREAM ID		PRWSFD	FEED	PRWSFDV	PRWSFDL	X
FROM :		COOL2		PREFLSH	PREFLSH	PREWASH1
TO :		PREFLSH	MIXHC	PREWASH1	BOTMIX	PREWASH2
CLASS:		CONVEN	CONVEN	CONVEN	CONVEN	CONVEN
SUBSTREAM: MIXED		STRUCTURE: CONVENTIONAL				
H2	LBMOL/HR	1911.7574	1909.7000	1911.7573	.58174-04	1911.7573
CO	LBMOL/HR	4068.2679	4052.9000	4068.2664	.75928-03	4068.2664
CO2	LBMOL/HR	310.1349	299.1000	310.0965	0.0391	310.0965
CH4	LBMOL/HR	507.0421	502.5000	507.0409	.86710-03	507.0409
N2	LBMOL/HR	41.8191	41.7000	41.8191	.33929-05	41.8191
H2S	LBMOL/HR	142.8839	139.5000	133.4062	9.4776	133.4062
H2O	LBMOL/HR	2.5479	13.8000	1.9710	0.5769	1.9710
C6H6	LBMOL/HR	24.3157	23.1000	0.6646	23.6511	0.6646
CH3OH	LBMOL/HR	17.3514	0.0	2.7163	14.6350	332.6823
TOTAL	LBMOL/HR	7026.1208	6982.3000	6977.7386	48.3816	7307.7046
TEMP	F	-30.0000	95.0000	-30.0000	-30.0000	-34.0936
PRES	PSI	421.0000	427.0000	423.0000	423.0000	420.0000
ENTHALPY	BTU/LBMOL	-.38600+05	-.37362+05	-.38669+05	-.28754+05	-.41828+05
VFRAC		0.9931	1.0000	1.0000	0.0	0.9496
LFRAC		0.0068	0.0	0.0	1.0000	0.0503
ENTROPY	BTU/LBMOL-R	4.8034	6.8104	5.0599	-33.7819	2.0335
DENSITY	LBMOL/CUFT	0.0927	0.0715	0.0936	1.3887	0.0958
AVG MW		21.0830	20.9919	20.8492	54.8053	21.3546

RECTISOL GAS DESULFURIZATION
STREAM SECTION

VPRWS LPRWS Y DESGS LABSR

STREAM ID		VPRWS	LPRWS	Y	DESGS	LABSR
FROM :		PREWASH2	PREWASH2	H2SABS1	H2SABS2	H2SABS2
TO :		H2SABS1	BOTMIX	H2SABS2	HEAT1	FLSHRG1
CLASS:		CONVEN	CONVEN	CONVEN	CONVEN	CONVEN
SUBSTREAM: MIXED		STRUCTURE: CONVENTIONAL				
H2	LBMOL/HR	1911.5317	0.2255	1911.5317	1909.3946	2.1370
CO	LBMOL/HR	4066.5577	1.7086	4066.5577	4048.7381	17.8196
CO2	LBMOL/HR	302.6362	7.4603	302.6362	173.3809	129.2553
CH4	LBMOL/HR	506.3873	0.6535	506.3873	499.5972	6.7901
N2	LBMOL/HR	41.8073	0.0117	41.8073	41.6744	0.1328
H2S	LBMOL/HR	108.7459	24.6602	108.7459	0.0315	108.7144
H2O	LBMOL/HR	0.0	1.9710	0.0	0.0	0.0
C6H6	LBMOL/HR	0.0	0.6646	0.0	0.0	0.0
CH3OH	LBMOL/HR	0.8423	331.8400	3100.8764	0.1240	3100.7523
TOTAL	LBMOL/HR	6938.5087	369.1959	.10039+05	6672.9408	3365.6018
TEMP	F	-27.8000	-22.3000	-55.1372	-73.0000	-27.3000
PRES	PSI	422.1000	423.0000	420.0000	421.2000	422.1000
ENTHALPY	BTU/LBMOL	-.38586+05	-.10154+06	-.60214+05	-.36821+05	-.10614+06
VFRAC		1.0000	0.0	0.6710	1.0000	0.0
LFRAC		0.0	1.0000	0.3289	0.0	1.0000
ENTROPY	BTU/LBMOL-R	5.1085	-53.4334	-15.4145	4.3414	-54.0575
DENSITY	LBMOL/CUFT	0.0927	1.2770	0.1204	0.1043	1.2620
AVG MW		20.7688	32.3625	24.2501	20.0919	32.4946

RECTISOL GAS DESULFURIZATION
STREAM SECTION

PUREGAS PRWSSOLV ABSRSOLV LPRWSMX

STREAM ID		PUREGAS	PRWSSOLV	ABSRSOLV	LPRWSMX	RCMETH
FROM :		HEAT1	SOLVSPLT	SOLVSPLT	BOTMIX	RCMESPLT
TO :			PREWASH1	H2SABS1	RCMESPLT	RCMEPUMP
CLASS:		CONVEN	CONVEN	CONVEN	CONVEN	CONVEN
SUBSTREAM: MIXED		STRUCTURE: CONVENTIONAL				
H2	LBMOL/HR	1909.3946	0.0	0.0	0.2256	0.0112
CO	LBMOL/HR	4048.7381	0.0	0.0	1.7094	0.0854
CO2	LBMOL/HR	173.3809	0.0	0.0	7.4994	0.3749
CH4	LBMOL/HR	499.5972	0.0	0.0	0.6544	0.0327
N2	LBMOL/HR	41.6744	0.0	0.0	0.0117	.58982-03
H2S	LBMOL/HR	0.0315	0.0	0.0	34.1378	1.7068
H2O	LBMOL/HR	0.0	0.0	0.0	2.5479	0.1273
C6H6	LBMOL/HR	0.0	0.0	0.0	24.3157	1.2157
CH3OH	LBMOL/HR	0.1240	329.9660	3100.0340	346.4750	17.3237
TOTAL	LBMOL/HR	6672.9408	329.9660	3100.0340	417.5775	20.8788
TEMP	F	77.0000	-75.0000	-75.0000	-19.4567	-19.4567
PRES	PSI	417.2000	420.0000	420.0000	423.0000	423.0000
ENTHALPY	BTU/LBMOL	-.35715+05	-.10862+06	-.10862+06	-.93109+05	-.93109+05
VFRAC		1.0000	0.0	0.0	0.0056	0.0056
LFRAC		0.0	1.0000	1.0000	0.9943	0.9943
ENTROPY	BTU/LBMOL-R	6.7567	-60.4704	-60.4704	-46.9321	-46.9321
DENSITY	LBMOL/CUFT	0.0720	1.2504	1.2504	1.2691	1.2691
AVG MW		20.0919	32.0420	32.0420	34.9628	34.9628

RECTISOL GAS DESULFURIZATION
STREAM SECTION

LPRWS1 RCMTHP RGMETC VPRWSF LPRWSF

STREAM ID		LPRWS1	RCMTHP	RGMETC	VPRWSF	LPRWSF
FROM :		RCMESPLT	RCMEPUMP		PRWSFLSH	PRWSFLSH
TO :		PRWSFLSH	INJMEOH	SOLVSPLT	WWMIX	NEXPUMP
CLASS:		CONVEN	CONVEN	CONVEN	CONVEN	CONVEN
SUBSTREAM: MIXED		STRUCTURE: CONVENTIONAL				
H2	LBMOL/HR	0.2143	0.0112	0.0	0.2142	.13359-03
CO	LBMOL/HR	1.6239	0.0854	0.0	1.6196	0.0042
CO2	LBMOL/HR	7.1244	0.3749	0.0	5.3903	1.7341
CH4	LBMOL/HR	0.6217	0.0327	0.0	0.6152	0.0064
N2	LBMOL/HR	0.0112	.58982-03	0.0	0.0111	.17909-04
H2S	LBMOL/HR	32.4309	1.7068	0.0	5.2896	27.1413
H2O	LBMOL/HR	2.4205	0.1273	0.0	.30156-04	2.4205
C6H6	LBMOL/HR	23.1000	1.2157	0.0	0.0201	23.0798
CH3OH	LBMOL/HR	329.1513	17.3237	3430.0000	0.0243	329.1270
TOTAL	LBMOL/HR	396.6986	20.8788	3430.0000	13.1848	383.5137
TEMP	F	-19.4567	-19.4027	-75.0000	-21.8493	-21.8493
PRES	PSI	423.0000	427.0000	420.0000	30.0000	30.0000
ENTHALPY	BTU/LBMOL	-.93109+05	-.93107+05	-.10862+06	-.81000+05	-.93526+05
VFRAC		0.0056	0.0056	0.0	1.0000	0.0
LFRAC		0.9943	0.9943	1.0000	0.0	1.0000
ENTROPY	BTU/LBMOL-R	-46.9321	-46.9487	-60.4704	5.3788	-42.7717
DENSITY	LBMOL/CUFT	1.2691	1.2707	1.2504	0.0064	1.3974
AVG MW		34.9628	34.9628	32.0420	36.0895	34.9241

LPRWSFP LPRWSFH VFLRG1 LFLRG1 FLRGMX

STREAM ID		LPRWSFP	LPRWSFH	VFLRG1	LFLRG1	FLRGMX
FROM :		NEXPUMP	HEAT5	FLSHRG1	FLSHRG1	FLSHRGMX
TO :		HEAT5	NEXMIX	RCYCCOND	FLSHRGMX	FLSHRG2
CLASS:		CONVEN	CONVEN	CONVEN	CONVEN	CONVEN
SUBSTREAM: MIXED		STRUCTURE: CONVENTIONAL				
H2	LBMOL/HR	.13359-03	.13359-03	2.0460	0.0910	0.0910
CO	LBMOL/HR	0.0042	0.0042	15.2824	2.5371	2.5371
CO2	LBMOL/HR	1.7341	1.7341	10.6599	118.5954	118.5954
CH4	LBMOL/HR	0.0064	0.0064	4.5094	2.2806	2.2806
N2	LBMOL/HR	.17909-04	.17909-04	0.1185	0.0143	0.0143
H2S	LBMOL/HR	27.1413	27.1413	1.6770	107.0373	107.0373
H2O	LBMOL/HR	2.4205	2.4205	0.0	0.0	0.0
C6H6	LBMOL/HR	23.0798	23.0798	0.0	0.0	0.0
CH3OH	LBMOL/HR	329.1270	329.1270	0.0277	3100.7246	3100.7246
TOTAL	LBMOL/HR	383.5137	383.5137	34.3212	3331.2805	3331.2805
TEMP	F	-21.7598	50.0000	-24.0148	-24.0148	-23.9846
PRES	PSI	40.0000	35.0000	75.0000	75.0000	65.0000
ENTHALPY	BTU/LBMOL	-.93522+05	-.91239+05	-.79306+05	-.10642+06	-.10642+06
VFRAC		0.0	0.0400	1.0000	0.0	0.0
LFRAC		1.0000	0.9599	0.0	1.0000	1.0000
ENTROPY	BTU/LBMOL-R	-43.3391	-38.8545	5.4586	-51.0526	-50.7661
DENSITY	LBMOL/CUFT	1.3974	0.1489	0.0163	1.2545	1.2544
AVG MW		34.9241	34.9241	30.1573	32.5186	32.5186

RECTISOL GAS DESULFURIZATION
STREAM SECTION

VFLRG2 LFLRG2 LFLRG2P RCYCHC COND

STREAM ID		VFLRG2	LFLRG2	LFLRG2P	RCYCHC	COND
FROM :		FLSHRG2	FLSHRG2	HTRGPUMP	RCYCCOND	RCYCCOND
TO :		WWMIX	HTRGPUMP	HEAT6	RCCOMP	FLSHRGMX
CLASS:		CONVEN	CONVEN	CONVEN	CONVEN	CONVEN
SUBSTREAM: MIXED		STRUCTURE: CONVENTIONAL				
H2	LBMOL/HR	0.0882	0.0027	0.0027	2.0460	0.0
CO	LBMOL/HR	2.2706	0.2665	0.2665	15.2824	0.0
CO2	LBMOL/HR	13.1931	105.4022	105.4022	10.6599	0.0
CH4	LBMOL/HR	1.6789	0.6017	0.6017	4.5094	0.0
N2	LBMOL/HR	0.0132	0.0011	0.0011	0.1185	0.0
H2S	LBMOL/HR	2.2297	104.8076	104.8076	1.6770	0.0
H2O	LBMOL/HR	0.0	0.0	0.0	0.0	0.0
C6H6	LBMOL/HR	0.0	0.0	0.0	0.0	0.0
CH3OH	LBMOL/HR	0.0372	3100.6874	3100.6874	0.0277	0.0
TOTAL	LBMOL/HR	19.5111	3311.7693	3311.7693	34.3212	0.0
TEMP	F	-23.9811	-23.9811	-23.9348	-24.8619	MISSING
PRES	PSI	30.0000	30.0000	40.0000	65.0000	65.0000
ENTHALPY	BTU/LBMOL	-.12482+06	-.10631+06	-.10630+06	-.79306+05	MISSING
VFRAC		1.0000	0.0	0.0	1.0000	MISSING
LFRAC		0.0	1.0000	1.0000	0.0	MISSING
ENTROPY	BTU/LBMOL-R	1.2712	-49.5367	-50.1062	5.7358	MISSING
DENSITY	LBMOL/CUFT	0.0065	1.2521	1.2521	0.0141	MISSING
AVG MW		38.3829	32.4841	32.4841	30.1573	MISSING

RECTISOL GAS DESULFURIZATION
STREAM SECTION

RCHCP RCHCPC NEXFEED VNEX AZFEED

STREAM ID		RCHCP	RCHCPC	NEXFEED	VNEX	AZFEED
FROM :		RCCOMP	REFRIG3	NEXMIX	NEXSEP	NEXSEP
TO :		REFRIG3	MIXHC	NEXSEP	WWMIX	HEAT4
CLASS:		CONVEN	CONVEN	CONVEN	CONVEN	CONVEN
SUBSTREAM: MIXED		STRUCTURE: CONVENTIONAL				
H2	LBMOL/HR	2.0460	2.0460	.13359-03	0.0	.12608-03
CO	LBMOL/HR	15.2824	15.2824	0.0042	0.0	0.0039
CO2	LBMOL/HR	10.6599	10.6599	1.8352	0.0	1.7164
CH4	LBMOL/HR	4.5094	4.5094	0.0064	0.0	0.0057
N2	LBMOL/HR	0.1185	0.1185	.17909-04	0.0	.16740-04
H2S	LBMOL/HR	1.6770	1.6770	29.6110	0.0	25.0760
H2O	LBMOL/HR	0.0	0.0	379.4510	0.0	379.4372
C6H6	LBMOL/HR	0.0	0.0	27.0844	0.0	5.7603
CH3OH	LBMOL/HR	0.0277	0.0277	338.4923	0.0	337.6244
TOTAL	LBMOL/HR	34.3212	34.3212	776.4851	0.0	749.6243
TEMP	F	369.6270	95.0000	36.8241	MISSING	37.9485
PRES	PSI	427.0000	425.0000	35.0000	MISSING	30.0000
ENTHALPY	BTU/LBMOL	-.76142+05	-.78513+05	-.10706+06	MISSING	-.11121+06
VFRAC		1.0000	1.0000	.58254-03	MISSING	0.0
LFRAC		0.0	0.0	0.9994	MISSING	1.0000
ENTROPY	BTU/LBMOL-R	7.1270	3.7058	-35.8712	MISSING	-35.8054
DENSITY	LBMOL/CUFT	0.0477	0.0739	1.6528	MISSING	1.7009
AVG MW		30.1573	30.1573	26.9001	MISSING	25.3914

RECTISOL GAS DESULFURIZATION
STREAM SECTION

NAPHTHA NAPHTHP AZFEEDH AZOVHD LAZ

STREAM ID		NAPHTHA	NAPHTHP	AZFEEDH	AZOVHD	LAZ
FROM :		NEXSEP	NAPHPUMP	HEAT4	AZCOL	AZCOL
TO :		NAPHPUMP		AZCOL	AZCOND	MWMIX
CLASS:		CONVEN	CONVEN	CONVEN	CONVEN	CONVEN
SUBSTREAM: MIXED		STRUCTURE: CONVENTIONAL				
H2	LBMOL/HR	.75099-05	.75099-05	.12608-03	.12608-03	0.0
CO	LBMOL/HR	.30312-03	.30312-03	0.0039	0.0039	0.0
CO2	LBMOL/HR	0.1188	0.1188	1.7164	1.7164	0.0
CH4	LBMOL/HR	.67865-03	.67865-03	0.0057	0.0057	0.0
N2	LBMOL/HR	.11696-05	.11696-05	.16740-04	.16740-04	0.0
H2S	LBMOL/HR	4.5350	4.5350	25.0760	25.0760	0.0
H2O	LBMOL/HR	0.0138	0.0138	379.4372	0.0	379.4372
C6H6	LBMOL/HR	21.3241	21.3241	5.7603	5.7603	0.0
CH3OH	LBMOL/HR	0.8679	0.8679	337.6244	9.1628	328.4615
TOTAL	LBMOL/HR	26.8608	26.8608	749.6243	41.7255	707.8987
TEMP	F	37.9485	38.4092	95.6979	130.0000	228.0000
PRES	PSI	30.0000	50.0000	50.0000	48.0000	50.0000
ENTHALPY	BTU/LBMOL	8822.0107	8837.5454	-.10968+06	-.25861+05	-.11068+06
VFRAC		0.0	0.0	0.0	1.0000	0.0
LFRAC		1.0000	1.0000	1.0000	0.0	1.0000
ENTROPY	BTU/LBMOL-R	-41.9443	-42.9356	-34.4189	-5.0804	-30.2616
DENSITY	LBMOL/CUFT	0.8057	0.8057	1.6551	0.0078	1.5706
AVG MW		69.0067	69.0067	25.3914	40.1168	24.5234

RECTISOL GAS DESULFURIZATION
STREAM SECTION

VAZ AZCOND MWFEED WSTH2O VMW

STREAM ID		VAZ	AZCOND	MWFEED	WSTH2O	VMW
FROM :		AZCOND	AZCOND	MWMIX	MWSEP	MWSEP
TO :		WWMIX	NEXMIX	MWSEP	COOL4	HTRGMX
CLASS:		CONVEN	CONVEN	CONVEN	CONVEN	CONVEN
SUBSTREAM: MIXED		STRUCTURE: CONVENTIONAL				
H2	LBMOL/HR	.12608-03	.13130-19	0.0	0.0	0.0
CO	LBMOL/HR	0.0039	.42016-18	0.0	0.0	0.0
CO2	LBMOL/HR	1.6907	0.0257	0.0	0.0	0.0
CH4	LBMOL/HR	0.0057	.52520-18	0.0	0.0	0.0
N2	LBMOL/HR	.16740-04	.16413-20	0.0	0.0	0.0
H2S	LBMOL/HR	23.2705	1.8054	0.0	0.0	0.0
H2O	LBMOL/HR	0.0	0.0	379.8685	375.6899	4.1785
C6H6	LBMOL/HR	4.3202	1.4400	0.0	0.0	0.0
CH3OH	LBMOL/HR	6.8721	2.2907	723.2269	0.9497	722.2771
TOTAL	LBMOL/HR	36.1635	5.5620	1103.0955	376.6397	726.4557
TEMP	F	130.0000	130.0000	211.5836	250.0000	160.0000
PRES	PSI	48.0000	48.0000	50.0000	40.0000	25.0000
ENTHALPY	BTU/LBMOL	-.25287+05	-.41719+05	-.10708+06	-.12040+06	-.85913+05
VFRAC		1.0000	0.0	0.0	0.0	1.0000
LFRAC		0.0	1.0000	1.0000	1.0000	0.0
ENTROPY	BTU/LBMOL-R	-3.1458	-22.5766	-34.8661	-21.9092	-30.3485
DENSITY	LBMOL/CUFT	0.0078	1.5370	1.3550	2.3959	0.0038
AVG MW		39.4138	44.6876	27.2115	18.0503	31.9613

RECTISOL GAS DESULFURIZATION
STREAM SECTION

WSTH2OC HTRGFD A VHTRG1 LHTRG1

STREAM ID		WSTH2OC	HTRGFD	A	VHTRG1	LHTRG1
FROM :		COOL4	HEAT6	HTRGMX	HTRGSEP	HTRGSEP
TO :			HTRGMX	HTRGSEP	WWMIX	METHMX
CLASS:		CONVEN	CONVEN	CONVEN	CONVEN	CONVEN
SUBSTREAM: MIXED		STRUCTURE: CONVENTIONAL				
H2	LBMOL/HR	0.0	0.0027	0.0027	0.0027	0.0
CO	LBMOL/HR	0.0	0.2665	0.2665	0.2665	0.0
CO2	LBMOL/HR	0.0	105.4022	105.4022	105.4022	0.0
CH4	LBMOL/HR	0.0	0.6017	0.6017	0.6017	0.0
N2	LBMOL/HR	0.0	0.0011	0.0011	0.0011	0.0
H2S	LBMOL/HR	0.0	104.8076	104.8076	104.8076	0.0
H2O	LBMOL/HR	375.6899	0.0	4.1785	0.0	4.1785
C6H6	LBMOL/HR	0.0	0.0	0.0	0.0	0.0
CH3OH	LBMOL/HR	0.9497	3100.6874	3822.9646	0.1414	3822.8231
TOTAL	LBMOL/HR	376.6397	3311.7693	4038.2251	211.2234	3827.0017
TEMP	F	118.0000	124.0989	158.3776	-39.7700	190.9000
PRES	PSI	35.0000	35.0000	25.0000	33.5000	35.0000
ENTHALPY	BTU/LBMOL	-.12343+06	-.10154+06	-.98727+05	-.90054+05	-.10062+06
VFRAC		0.0	0.0641	0.1891	1.0000	0.0
LFRAC		1.0000	0.9358	0.8108	0.0	1.0000
ENTROPY	BTU/LBMOL-R	-25.5680	-42.4790	-39.1381	3.1503	-43.2575
DENSITY	LBMOL/CUFT	2.5578	0.0944	0.0209	0.0076	1.0647
AVG MW		18.0503	32.4841	32.3900	38.9742	32.0266

RECTISOL GAS DESULFURIZATION
STREAM SECTION

RGMEOH RGMEOHP MEOHRFLX RGME1 MUMEOH

STREAM ID		RGMEOH	RGMEOHP	MEOHRFLX	RGME1	MUMEOH
FROM :		METHMX	ABPUMP	RFLXSPLT	RFLXSPLT	
TO :		ABPUMP	RFLXSPLT	MWMIX	COOL6	METHMX
CLASS:		CONVEN	CONVEN	CONVEN	CONVEN	CONVEN
SUBSTREAM: MIXED		STRUCTURE: CONVENTIONAL				
H2	LBMOL/HR	0.0	0.0	0.0	0.0	0.0
CO	LBMOL/HR	0.0	0.0	0.0	0.0	0.0
CO2	LBMOL/HR	0.0	0.0	0.0	0.0	0.0
CH4	LBMOL/HR	0.0	0.0	0.0	0.0	0.0
N2	LBMOL/HR	0.0	0.0	0.0	0.0	0.0
H2S	LBMOL/HR	0.0	0.0	0.0	0.0	0.0
H2O	LBMOL/HR	4.1785	4.1785	0.4312	3.7472	0.0
C6H6	LBMOL/HR	0.0	0.0	0.0	0.0	0.0
CH3OH	LBMOL/HR	3824.6834	3824.6834	394.7653	3429.9180	1.9422
TOTAL	LBMOL/HR	3828.8619	3828.8619	395.1966	3433.6653	1.9422
TEMP	F	148.9407	190.2625	190.2625	190.2625	60.0000
PRES	PSI	15.0000	420.0000	420.0000	420.0000	15.0000
ENTHALPY	BTU/LBMOL	-.10062+06	-.10062+06	-.10062+06	-.10062+06	-.10462+06
VFRAC		0.0803	0.0	0.0	0.0	0.0
LFRAC		0.9196	1.0000	1.0000	1.0000	1.0000
ENTROPY	BTU/LBMOL-R	-42.1387	-48.2722	-48.2722	-48.2722	-46.9864
DENSITY	LBMOL/CUFT	0.0284	1.0694	1.0694	1.0694	1.1724
AVG MW		32.0266	32.0266	32.0266	32.0266	32.0420

RECTISOL GAS DESULFURIZATION
STREAM SECTION

RGMEC RGMEC2 RGMETC2 WWFEED ACIDGAS

STREAM ID		RGMEC	RGMEC2	RGMETC2	WWFEED	ACIDGAS
FROM :		COOL6	COOL5	REFRIG4	WWMIX	H2OWSH
TO :		COOL5	REFRIG4		H2OWSH	
CLASS:		CONVEN	CONVEN	CONVEN	CONVEN	CONVEN
SUBSTREAM: MIXED		STRUCTURE: CONVENTIONAL				
H2	LBMOL/HR	0.0	0.0	0.0	0.3053	0.3053
CO	LBMOL/HR	0.0	0.0	0.0	4.1608	4.1608
CO2	LBMOL/HR	0.0	0.0	0.0	125.6764	125.6010
CH4	LBMOL/HR	0.0	0.0	0.0	2.9017	2.9017
N2	LBMOL/HR	0.0	0.0	0.0	0.0255	0.0255
H2S	LBMOL/HR	0.0	0.0	0.0	135.5976	134.9331
H2O	LBMOL/HR	3.7472	3.7472	3.7472	385.0000	7.9695
C6H6	LBMOL/HR	0.0	0.0	0.0	4.3403	1.7756
CH3OH	LBMOL/HR	3429.9180	3429.9180	3429.9180	7.0751	0.0
TOTAL	LBMOL/HR	3433.6653	3433.6653	3433.6653	665.0830	277.6727
TEMP	F	40.0000	31.6537	-75.0000	76.3097	89.0000
PRES	PSI	415.0000	410.0000	405.0000	30.0000	25.0000
ENTHALPY	BTU/LBMOL	-.10522+06	-.10548+06	-.10864+06	-.10696+06	-.84534+05
VFRAC		0.0	0.0	0.0	0.4159	1.0000
LFRAC		1.0000	1.0000	1.0000	0.5840	0.0
ENTROPY	BTU/LBMOL-R	-54.4674	-54.8256	-60.3556	-13.5507	5.9395
DENSITY	LBMOL/CUFT	1.1881	1.1933	1.2511	0.0182	0.0042
AVG MW		32.0266	32.0266	32.0266	26.7908	38.0769

LWWS LWWSP ADDH2O

STREAM ID		LWWS	LWWSP	ADDH2O
FROM :		H2OWSH	H2OPUMP	
TO :		H2OPUMP	NEXMIX	WWMIX
CLASS:		CONVEN	CONVEN	CONVEN
SUBSTREAM: MIXED		STRUCTURE: CONVENTIONAL		
H2	LBMOL/HR	.26890-16	.26890-16	0.0
CO	LBMOL/HR	.43025-15	.43025-15	0.0
CO2	LBMOL/HR	0.0754	0.0754	0.0
CH4	LBMOL/HR	.43025-15	.43025-15	0.0
N2	LBMOL/HR	.33613-17	.33613-17	0.0
H2S	LBMOL/HR	0.6644	0.6644	0.0
H2O	LBMOL/HR	377.0305	377.0305	385.0000
C6H6	LBMOL/HR	2.5647	2.5647	0.0
CH3OH	LBMOL/HR	7.0751	7.0751	0.0
TOTAL	LBMOL/HR	387.4102	387.4102	385.0000
TEMP	F	40.9000	41.1041	100.000
PRES	PSI	26.0000	50.0000	40.0000
ENTHALPY	BTU/LBMOL	-.12366+06	-.12365+06	-.12390+06
VFRAC		0.0	0.0	0.0
LFRAC		1.0000	1.0000	1.0000
ENTROPY	BTU/LBMOL-R	-29.4329	-30.7238	-26.4342
DENSITY	LBMOL/CUFT	2.6349	2.6347	2.5837
AVG MW		18.7016	18.7016	18.0150

APPENDIX B

Absorption Section Simulation

PREWASH ABSORBER

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TITLE 'RECTISOL - H2S ABSORBER 1'
DESCRIPTION 'H2S ABSORBER'
IN-UNITS ENG
HISTORY
     MSG-LEVEL PROPERTIES=2
COMPONENTS H2 H2/CO CO/CO2 CO2/CH4 CH4/N2 N2/H2S H2S/H2O H2O/
           C6H6 C6H6/CH3OH CH4O
PROPERTIES OPSETA  GLOBAL /SYSOP14
PROP-OPTIONS OPSETA SYSOP14 HVMX HVMX13/HLMX HLMX13
;PROPERTIES SYSOP14 GLOBAL
INSERT * RKAKIJ
STREAM PRWSFD TEMP=-30. PRES= 423.
     MOLE-FLOW H2 1911.8/CO 4068.8/CO2 311.4/CH4 507.2/N2 41.8/H2S 143.0/
               H2O 2.5/C6H6 24.3/CH3OH 17.3
STREAM PRWSSOLV TEMP=-75. PRES=389.
    MOLE-FLOW CH3OH 330.
FLOWSHEET
     BLOCK FLASH IN = PRWSFD OUT = PRWSFDV PRWSFDL
     BLOCK BOTMIX IN = LPRWS PRWSFDL OUT = LPRWSMX
     BLOCK H2SAB1 IN = PRWSFDV PRWSSOLV  OUT= VPRWS LPRWS
BLOCK FLASH FLASH2
    PARAM DUTY=0. PRES=423.
BLOCK BOTMIX MIXER
     PARAM NPK=2
BLOCK H2SAB1 RADFRC
     PARAM 6
     FEEDS PRWSFDV 7/ PRWSSOLV 1
     PRODUCTS VPRWS 1 1/LPRWS 6 0
     P-SPEC 6 423./ 1 422.1
     T-EST 1 -30./ 6 -20.
     L-EST 1 330./6 330.
     COL-SPECS RDV=1 Q1=0 QN=0
;    BOPT PROP-LEVEL=8 SMLV=8
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RECTISOL - H2S ABSORBER 1

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RECTISOL - H2S ABSORBER 1
FLOWSHEET SECTION

FLOWSHEET CONNECTIVITY BY STREAMS

STREAM	SOURCE	DEST	STREAM	SOURCE	DEST
PRWSFDV	FLASH	H2SAB1	PRWSFDL	FLASH	BOTMIX
LPRWSMX	BOTMIX	----	VPRWS	H2SAB1	----
LPRWS	H2SAB1	BOTMIX	PRWSFD	----	FLASH
PRWSSOLV	----	H2SAB1			

FLOWSHEET CONNECTIVITY BY BLOCKS

BLOCK	INLETS	OUTLETS
FLASH	PRWSFD	PRWSFDV PRWSFDL
BOTMIX	LPRWS PRWSFDL	LPRWSMX
H2SAB1	PRWSFDV PRWSSOLV	VPRWS LPRWS

COMPUTATIONAL SEQUENCE

SEQUENCE USED WAS:
FLASH H2SAB1 BOTMIX

OVERALL FLOWSHEET BALANCE

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	1911.80	1911.80	.159035D-10
CO	4068.80	4068.80	.158078D-10
CO2	311.400	311.400	.834087D-11
CH4	507.200	507.200	.155349D-10
N2	41.8000	41.8000	.158516D-10
H2S	143.000	143.000	-.395619D-10
H2O	2.50000	2.50000	-.232125D-09
C6H6	24.3000	24.3000	-.814522D-11
CH3OH	347.300	347.300	-.286284D-09
TOTAL BALANCE			
MOLE(LBMOL/HR)	7358.10	7358.10	.123605D-15
MASS(LB/HR)	158779.	158779.	-.807657D-11
ENTHALPY(BTU/HR)	-.307297D+09	-.307297D+09	.162807D-06

COMPONENTS

ID	TYPE	FORMULA	NAME OR ALIAS
H2	C	MISSING	H2
CO	C	MISSING	CO
CO2	C	MISSING	CO2
CH4	C	MISSING	CH4
N2	C	MISSING	N2
H2S	C	MISSING	H2S
H2O	C	MISSING	H2O
C6H6	C	MISSING	C6H6
CH3OH	C	MISSING	CH4O

OPTION SETS

KEY TO OPTION SET TABLES:
OPTION SET ID
MP KEYWORD MP ROUTE ID

OPTION SETS (CONTINUED)

SYSOPO		OPSETA		SYSOP14	
PHILMX	PHILMXOO	PHIVMX	PHIVMX14	PHIVMX	PHIVMX14
HVMX	HVMXOO	PHILMX	PHILMX14	PHILMX	PHILMX14
HLMX	HLMXOO	HVMX	HVMX13	HVMX	HVMX14
GVMX	GVMXOO	HLMX	HLMX13	HLMX	HLMX14
GLMX	GLMXOO	GVMX	GVMX14	GVMX	GVMX14
SVMX	SVMXOO	GLMX	GLMX14	GLMX	GLMX14
SLMX	SLMXOO	SVMX	SVMX14	SVMX	SVMX14
VVMX	VVMXOO	SLMX	SLMX14	SLMX	SLMX14
VLMX	VLMXO1	VVMX	VVMX14	VVMX	VVMX14
MUVMX	MUVMXO1	VLMX	VLMX14	VLMX	VLMX14
MULMX	MULMXO1	MUVMX	MUVMXO2	MUVMX	MUVMXO2
KVMX	KVMXO1	MULMX	MULMXO2	MULMX	MULMXO2
KLMX	KLMXO1	KVMX	KVMXO2	KVMX	KVMXO2
DVMX	DVMXO1	KLMX	KLMXO1	KLMX	KLMXO1
DLMX	DLMXO1	DVMX	DVMXO2	DVMX	DVMXO2
SIGLMX	SIGLMXO1	DLMX	DLMXO1	DLMX	DLMXO1
PHIV	PHIVOO	SIGLMX	SIGLMXO1	SIGLMX	SIGLMXO1
PHIL	PHILOO				
HV	HVOO				
HL	HLOO				
GV	GVOO				
GL	GLOO				
SV	SVOO				
SL	SLOO				
VV	VVOO				
VL	VLO1				
MUV	MUVO1				
MUL	MULO1				
KV	KVO1				
KL	KLO1				
SIGL	SIGLO1				
PHISMX	PHISMXO2				
HSMX	HSMXO2				
GSMX	GSMXO2				
SSMX	SSMXO1				
VSMX	VSMXO2				
KSMX	KSMXO1				
PHIS	PHISO2				
HS	HSO2				
GS	GSO2				
SS	SSO2				
VS	VSO1				
KS	KSO1				

FLASH:2-OUTL (FLASH2): FLASH
INPUT STREAM(S): PRWSFD
OUTPUT STREAM(S): PRWSFDV PRWSFDL
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	1911.80	1911.80	.891988D-16
CO	4068.80	4068.80	.279411D-16
CO2	311.400	311.400	-.182541D-15
CH4	507.200	507.200	.672438D-15
N2	41.8000	41.8000	.339973D-15
H2S	143.000	143.000	.149065D-15
H2O	2.50000	2.50000	.710543D-15
C6H6	24.3000	24.3000	.131582D-14
CH3OH	17.3000	17.3000	.102680D-14
TOTAL BALANCE			
MOLE(LBMOL/HR)	7028.10	7028.10	.129408D-15
MASS(LB/HR)	148205.	148205.	.490939D-15
ENTHALPY(BTU/HR)	-.271451D+09	-.271451D+09	-.959447D-08

*** INPUT DATA ***

TWO PHASE PQ FLASH

SPECIFIED PRESSURE	PSI	423.00
SPECIFIED HEAT DUTY	BTU/HR	.0
MAXIMUM ITERATION NO.		30
CONVERGENCE TOLERANCE		.10000D-03
LIQUID ENTRAINMENT		.0

SOLID SPLIT FRACTIONS:
SUBSTREAM NO. = 1 MIXED SUBSTREAM, NO SOLID SPLITS.

*** RESULTS ***

OUTPUT TEMPERATURE	F	-30.000
OUTPUT PRESSURE	PSI	423.00
HEAT DUTY	BTU/HR	.0
VAPOR FRACTION		.99312

V-L PHASE EQUILIBRIUM :

COMP	F(I)	X(I)	Y(I)	K(I)
H2	.27202	.12456D-05	.27391	.21992D+06
CO	.57893	.16203D-04	.58294	35981.
CO2	.44308D-01	.82466D-03	.44609D-01	54.099
CH4	.72167D-01	.18450D-04	.72667D-01	3938.9
N2	.59476D-02	.72383D-07	.59887D-02	82743.
H2S	.20347D-01	.19724	.19122D-01	.96956D-01
H2O	.35571D-03	.11650D-01	.27751D-03	.23819D-01
C6H6	.34575D-02	.48912	.94665D-04	.19356D-03
CH3OH	.24615D-02	.30112	.39351D-03	.13069D-02

MIXER (MIXER): BOTMIX
INLET STREAM(S): LPRWS PRWSFDL
OUTLET STREAM: LPRWSMX
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.225647	.225647	.0
CO	1.71056	1.71056	.0
CO2	7.53707	7.53707	.0
CH4	.654793	.654793	.0
N2	.118952D-01	.118952D-01	.0
H2S	34.2042	34.2042	.0
H2O	2.50000	2.50000	.0
C6H6	24.3000	24.3000	.0
CH3OH	346.458	346.458	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	417.602	417.602	.0
MASS(LB/HR)	14601.0	14601.0	.186870D-15
ENTHALPY(BTU/HR)	-.389450D+08	-.389450D+08	.420539D-08

*** INPUT DATA ***

OUTLET PRESSURE ,PSI	MISSING
TYPE OF FLASH - TWO PHASE	
MAXIMUM NUMBER OF ITERATIONS IN FLASH	30
CONVERGENCE TOLERANCE FOR FLASH	0.100000-03

FRACTIONATIO (RADFRC): H2SAB1
INLETS - PRWSFDV STAGE 7
PRWSSOLV STAGE 1
OUTLETS - VPRWS STAGE 1
LPRWS STAGE 6
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	1911.80	1911.80	.159035D-10
CO	4068.80	4068.80	.158078D-10
CO2	311.360	311.360	.834212D-11
CH4	507.199	507.199	.155346D-10
N2	41.8000	41.8000	.158515D-10
H2S	133.467	133.467	-.423877D-10
H2O	1.93694	1.93694	-.299604D-09
C6H6	.660743	.660743	-.299604D-09
CH3OH	332.747	332.747	-.298805D-09
TOTAL BALANCE			
MOLE(LBMOL/HR)	7309.77	7309.77	.0
MASS(LB/HR)	156129.	156129.	-.821420D-11
ENTHALPY(BTU/HR)	-.305915D+09	-.305915D+09	.171521D-06

FRACTIONATIO (RADFRC): H2SAB1 (CONTINUED)

*** INPUT DATA ***

**** INPUT PARAMETERS ****

NUMBER OF THEORETICAL STAGES	6
MAXIMUM OUTSIDE LOOPS	25
MAXIMUM INNSIDE LOOPS PER OUTSIDE LOOP	10
ALGORITHM OPTION	1
BOUNDED WEGSTEIN MODULUS FOR OUTSIDE LOOPS	1
MAXIMUM ITERATIONS FOR FEED FLASH	30
ENTHALPY BALANCE OPTION CODE	0
DESIGN SPECS METHOD OPTION CODE	1
KB UPDATING OPTION CODE	1
INNSIDE LOOP ITERATION METHOD CODE	0
KB WEIGHTING OPTION CODE	2
MAX COMP BALANCES FOR NONIDEAL OPTION	10
OUTSIDE LOOP CONVERGENCE TOLERANCE	0.100000-03
MINIMUM INSIDE LOOP CONV TOLERANCE	0.300000-05
INITIAL INSIDE LOOP CONV TOLERANCE	0.0100000
INSIDE LOOP CONV TOL REDUCTION FACTOR	0.30000
INSIDE LOOP RMS ERR FOR JACOBIAN UPDATE	1.000000-06
COMPONENT MASS BALANCE CONV TOLERANCE	0.100000-06
COMP MASS BAL FACTOR FOR NONIDEAL CASE	0.0100000
COMP MASS BAL TOL FOR NONIDEAL CASE	0.100000-04
SIMPLE MODEL SLOPE PARAMETER UPDATE TOLERANCE	0.050000
QMIN FOR BOUNDED WEGSTEIN IN OUTSIDE LOOP	0.0
QMAX FOR BOUNDED WEGSTEIN IN OUTSIDE LOOP	0.50000
BOUNDED WEGSTEIN SLOPE TOLERANCE	0.050000
FACTOR 1 FOR PERFORMANCE SPEC CONV ALG	0.100000
FACTOR 2 FOR PERFORMANCE SPEC CONV ALG	0.20000
FEED FLASH CONVERGENCE TOLERANCE	1.000000-06
QMIN FOR BOUNDED WEGSTEIN IN INSIDE LOOP	0.0
QMAX FOR BOUNDED WEGSTEIN IN INSIDE LOOP	0.50000
LIMITING MF FOR NONIDEAL SIMPLE MODEL PARAMS	0.99000
MAX FOR NONIDEAL SIMPLE MODEL PARAMS AT X=0	1.50000
MAX FOR NONIDEAL SIMPLE MODEL PARAMS AT X=.5	1.30000
MIDDLE LOOP CONVERGENCE TOLERANCE	0.20000
MANIPULATED VARIABLE FACTOR	0.100000-04

**** COL-SPECS ****

VAPOR DISTILLATE / TOTAL DISTILLATE		1.00000
CONDENSER DUTY	BTU/HR	0.0
REBOILER DUTY	BTU/HR	0.0

**** PROFILES ****

TEMP-EST	STAGE	1	TEMP, F	-30.0000
		6		-20.0000
P-SPEC	STAGE	6	PRES, PSI	423.000
		1		422.100

FRACTIONATIO (RADFRC): H2SAB1 (CONTINUED)

*** RESULTS ***

TOP TRAY TEMPERATURE	F	-35.0870
BOTTOM TRAY TEMPERATURE	F	-28.4145
TOP TRAY LIQUID FLOW	LBMOL/HR	364.426
BOTTOM TRAY LIQUID FLOW	LBMOL/HR	369.272
TOP TRAY VAPOR FLOW	LBMOL/HR	6,940.50
BOTTOM TRAY VAPOR FLOW	LBMOL/HR	6,975.47

**** PROFILES ****

STG	TEMP F	PRESS PSI	L-FLOW LBMOL/HR	V-FLOW LBMOL/HR
1	-35.087	422.10	364.43	6940.5
2	-29.669	422.28	365.50	6974.9
3	-28.710	422.46	365.19	6976.0
4	-28.489	422.64	365.03	6975.7
5	-28.427	422.82	364.97	6975.5
6	-28.415	423.00	369.27	6975.5

**** X-PROFILE ****

STAGE	H2	CO	CO2	CH4	N2	H2S
1	.63146D-03	.49280D-02	.23018D-01	.18922D-02	.34412D-04	.63294D-01
2	.64358D-03	.49013D-02	.21535D-01	.18722D-02	.34190D-04	.67330D-01
3	.64861D-03	.49139D-02	.21306D-01	.18718D-02	.34328D-04	.66754D-01
4	.65041D-03	.49209D-02	.21288D-01	.18725D-02	.34401D-04	.66352D-01
5	.64894D-03	.49091D-02	.21253D-01	.18679D-02	.34320D-04	.66171D-01
6	.61090D-03	.46301D-02	.20303D-01	.17708D-02	.32203D-04	.66811D-01

**** X-PROFILE ****

STAGE	H2O	C6H6	CH3OH
1	.17870D-19	.19386D-08	.90620
2	.58833D-16	.32254D-07	.90368
3	.18357D-12	.49977D-06	.90447
4	.56433D-09	.76808D-05	.90487
5	.17263D-05	.11806D-03	.90500
6	.52453D-02	.17893D-02	.89881

**** Y-PROFILE ****

STAGE	H2	CO	CO2	CH4	N2	H2S
1	.27542	.58599	.43781D-01	.72984D-01	.60209D-02	.15676D-01
2	.27410	.58336	.44768D-01	.72723D-01	.59930D-02	.18905D-01
3	.27406	.58327	.44687D-01	.72711D-01	.59921D-02	.19123D-01
4	.27407	.58329	.44676D-01	.72714D-01	.59923D-02	.19091D-01
5	.27407	.58331	.44675D-01	.72715D-01	.59925D-02	.19069D-01
6	.27408	.58331	.44674D-01	.72716D-01	.59925D-02	.19059D-01

FRACTIONATIO (RADFRC): H2SAB1 (CONTINUED)

STAGE	H2O	**** Y-PROFILE **** C6H6	CH3OH
1	.21007D-24	.51311D-11	.12138D-03
2	.93388D-21	.10639D-09	.15565D-03
3	.30825D-17	.16950D-08	.16268D-03
4	.96100D-14	.26169D-07	.16440D-03
5	.29531D-10	.40194D-06	.16484D-03
6	.90322D-07	.61774D-05	.16358D-03

DESCRIPTION OF STREAM CLASS CONVEN

STREAM CLASS : CONVEN
SUBSTREAMS : MIXED
SUBSTRM CLASS: MIXED

PRWSFDV PRWSFDL LPRWSMX VPRWS LPRWS

STREAM ID		PRWSFDV	PRWSFDL	LPRWSMX	VPRWS	LPRWS
FROM :		FLASH	FLASH	BOTMIX	H2SAB1	H2SAB1
TO :		H2SAB1	BOTMIX			BOTMIX
CLASS:		CONVEN	CONVEN	CONVEN	CONVEN	CONVEN
SUBSTREAM: MIXED		STRUCTURE: CONVENTIONAL				
H2	LBMOL/HR	1911.7999	.60198-04	0.2256	1911.5744	0.2255
CO	LBMOL/HR	4068.7992	.78307-03	1.7105	4067.0894	1.7097
CO2	LBMOL/HR	311.3601	0.0398	7.5370	303.8629	7.4972
CH4	LBMOL/HR	507.1991	.89169-03	0.6547	506.5452	0.6539
N2	LBMOL/HR	41.7999	.34983-05	0.0118	41.7881	0.0118
H2S	LBMOL/HR	133.4672	9.5327	34.2042	108.7957	24.6714
H2O	LBMOL/HR	1.9369	0.5630	2.5000	.14580-20	1.9369
C6H6	LBMOL/HR	0.6607	23.6392	24.3000	.35612-07	0.6607
CH3OH	LBMOL/HR	2.7466	14.5533	346.4575	0.8424	331.9041
TOTAL	LBMOL/HR	6979.7699	48.3300	417.6017	6940.4983	369.2716
TEMP	F	-29.9997	-29.9997	-24.9201	-35.0870	-28.4145
PRES	PSI	423.0000	423.0000	423.0000	422.1000	423.0000
ENTHALPY	BTU/LBMOL	-.38693+05	-.28593+05	-.93259+05	-.38665+05	-.10172+06
VFRAC		1.0000	0.0	0.0056	1.0000	0.0
LFRAC		0.0	1.0000	0.9943	0.0	1.0000
ENTROPY	BTU/LBMOL-R	5.0586	-33.8304	-47.1776	4.9817	-53.7637
DENSITY	LBMOL/CUFT	0.0936	1.3862	1.2724	0.0945	1.2813
AVG MW		20.8538	54.8248	34.9639	20.7734	32.3645

RECTISOL - H2S ABSORBER 1
STREAM SECTION

PRWSFD PRWSSOLV

STREAM ID		PRWSFD	PRWSSOLV
FROM :			
TO :		FLASH	H2SAB1
CLASS:		CONVEN	CONVEN

SUBSTREAM: MIXED		STRUCTURE: CONVENTIONAL	
H2	LBMOL/HR	1911.8000	0.0
CO	LBMOL/HR	4068.8000	0.0
CO2	LBMOL/HR	311.4000	0.0
CH4	LBMOL/HR	507.2000	0.0
N2	LBMOL/HR	41.8000	0.0
H2S	LBMOL/HR	143.0000	0.0
H2O	LBMOL/HR	2.5000	0.0
C6H6	LBMOL/HR	24.3000	0.0
CH3OH	LBMOL/HR	17.3000	330.0000
TOTAL	LBMOL/HR	7028.1000	330.0000
TEMP	F	-30.0000	-75.0000
PRES	PSI	423.0000	389.0000
ENTHALPY	BTU/LBMOL	-.38624+05	-.10862+06
VFRAC		0.9931	0.0
LFRAC		0.0068	1.0000
ENTROPY	BTU/LBMOL-R	4.7912	-60.3165
DENSITY	LBMOL/CUFT	0.0931	1.2503
AVG MW		21.0874	32.0420

MAIN ABSORBER

```
TITLE 'RECTISOL - H2S ABSORBER 2'
DESCRIPTION 'H2S ABSORBER'
IN-UNITS ENG
HISTORY
     MSG-LEVEL PROPERTIES=2
COMPONENTS H2 H2/CO CO/CO2 CO2/CH4 CH4/N2 N2/H2S H2S/H2O H2O/
           C6H6 C6H6/CH3OH CH4O
PROPERTIES OPSETA  GLOBAL /SYSOP14
PROP-OPTIONS OPSETA SYSOP14 HVMX HVMX13/HLMX HLMX13
;PROPERTIES SYSOP14 GLOBAL
INSERT * RKAKIJ
STREAM VPRWS TEMP=-35.09 PRES= 422.1
     MOLE-FLOW H2 1911.57/CO 4067.09/CO2 303.86/CH4 506.55/N2 41.79/
               H2S 108.80/H2O 0.0 /C6H6 0.0/CH3OH 0.84
STREAM ABSRSOLV TEMP=-75. PRES=389.
     MOLE-FLOW CH3OH 3100.
FLOWSHEET
     BLOCK H2SABS2 IN=VPRWS ABSRSOLV OUT= DESGS LABSR
BLOCK H2SABS2 RADFRC
     PARAM 6
     FEEDS VPRWS 7/ ABSRSOLV 1
     PRODUCTS DESGS 1 1/LABSR 6 0
     P-SPEC 6 422.1/ 1 421.2
     COL-SPECS RDV=1 Q1=0 QN=0
     T-EST 1 -50/6 0
;    BOPT PROP-LEVEL=8 SMLV=8
```

RECTISOL - H2S ABSORBER 2

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RECTISOL - H2S ABSORBER 2
FLOWSHEET SECTION

FLOWSHEET CONNECTIVITY BY STREAMS

STREAM	SOURCE	DEST	STREAM	SOURCE	DEST
DESGS	H2SABS2	----	LABSR	H2SABS2	----
VPRWS	----	H2SABS2	ABSRSOLV	----	H2SABS2

FLOWSHEET CONNECTIVITY BY BLOCKS

BLOCK	INLETS	OUTLETS
H2SABS2	VPRWS ABSRSOLV	DESGS LABSR

COMPUTATIONAL SEQUENCE

SEQUENCE USED WAS:
H2SABS2

OVERALL FLOWSHEET BALANCE

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	1911.57	1911.57	-.219979D-10
CO	4067.09	4067.09	-.217833D-10
CO2	303.860	303.860	.604595D-11
CH4	506.550	506.550	-.211887D-10
N2	41.7900	41.7900	-.218624D-10
H2S	108.800	108.800	.437444D-10
H2O	.0	.0	.0
C6H6	.0	.0	.0
CH3OH	3100.84	3100.84	.437607D-10
TOTAL BALANCE			
MOLE(LBMOL/HR)	10040.5	10040.5	.0
MASS(LB/HR)	243508.	243508.	.750244D-11
ENTHALPY(BTU/HR)	-.605085D+09	-.605084D+09	-.373447D-06

COMPONENTS

ID	TYPE	FORMULA	NAME OR ALIAS
H2	C	MISSING	H2
CO	C	MISSING	CO
CO2	C	MISSING	CO2
CH4	C	MISSING	CH4
N2	C	MISSING	N2
H2S	C	MISSING	H2S
H2O	C	MISSING	H2O
C6H6	C	MISSING	C6H6
CH3OH	C	MISSING	CH4O

OPTION SETS

KEY TO OPTION SET TABLES:
OPTION SET ID
MP KEYWORD MP ROUTE ID

OPTION SETS (CONTINUED)

SYSOPO		OPSETA		SYSOP14	
PHILMX	PHILMXOO	PHIVMX	PHIVMX14	PHIVMX	PHIVMX14
HVMX	HVMXOO	PHILMX	PHILMX14	PHILMX	PHILMX14
HLMX	HLMXOO	HVMX	HVMX13	HVMX	HVMX14
GVMX	GVMXOO	HLMX	HLMX13	HLMX	HLMX14
GLMX	GLMXOO	GVMX	GVMX14	GVMX	GVMX14
SVMX	SVMXOO	GLMX	GLMX14	GLMX	GLMX14
SLMX	SLMXOO	SVMX	SVMX14	SVMX	SVMX14
VVMX	VVMXOO	SLMX	SLMX14	SLMX	SLMX14
VLMX	VLMXO1	VVMX	VVMX14	VVMX	VVMX14
MUVMX	MUVMXO1	VLMX	VLMX14	VLMX	VLMX14
MULMX	MULMXO1	MUVMX	MUVMXO2	MUVMX	MUVMXO2
KVMX	KVMXO1	MULMX	MULMXO2	MULMX	MULMXO2
KLMX	KLMXO1	KVMX	KVMXO2	KVMX	KVMXO2
DVMX	DVMXO1	KLMX	KLMXO1	KLMX	KLMXO1
DLMX	DLMXO1	DVMX	DVMXO2	DVMX	DVMXO2
SIGLMX	SIGLMXO1	DLMX	DLMXO1	DLMX	DLMXO1
PHIV	PHIVOO	SIGLMX	SIGLMXO1	SIGLMX	SIGLMXO1
PHIL	PHILOO				
HV	HVOO				
HL	HLOO				
GV	GVOO				
GL	GLOO				
SV	SVOO				
SL	SLOO				
VV	VVOO				
VL	VLO1				
MUV	MUVO1				
MUL	MULO1				
KV	KVO1				
KL	KLO1				
SIGL	SIGLO1				
PHISMX	PHISMXO2				
HSMX	HSMXO2				
GSMX	GSMXO2				
SSMX	SSMXO1				
VSMX	VSMXO2				
KSMX	KSMXO1				
PHIS	PHISO2				
HS	HSO2				
GS	GSO2				
SS	SSO2				
VS	VSO1				
KS	KSO1				

RECTISOL - H2S ABSORBER 2
U-O-S BLOCK SECTION

FRACTIONATIO (RADFRC): H2SABS2
INLETS - VPRWS STAGE 7
ABSRSOLV STAGE 1
OUTLETS - DESGS STAGE 1
LABSR STAGE 6
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	1911.57	1911.57	-.219979D-10
CO	4067.09	4067.09	-.217833D-10
CO2	303.860	303.860	.604595D-11
CH4	506.550	506.550	-.211887D-10
N2	41.7900	41.7900	-.218624D-10
H2S	108.800	108.800	.437444D-10
H2O	.0	.0	.0
C6H6	.0	.0	.0
CH3OH	3100.84	3100.84	.437607D-10
TOTAL BALANCE			
MOLE(LBMOL/HR)	10040.5	10040.5	.0
MASS(LB/HR)	243508.	243508.	.750244D-11
ENTHALPY(BTU/HR)	-.605085D+09	-.605084D+09	-.373447D-06

FRACTIONATIO (RADFRC): H2SABS2 (CONTINUED)

*** INPUT DATA ***

**** INPUT PARAMETERS ****

NUMBER OF THEORETICAL STAGES	6
MAXIMUM OUTSIDE LOOPS	25
MAXIMUM INNSIDE LOOPS PER OUTSIDE LOOP	10
ALGORITHM OPTION	1
BOUNDED WEGSTEIN MODULUS FOR OUTSIDE LOOPS	1
MAXIMUM ITERATIONS FOR FEED FLASH	30
ENTHALPY BALANCE OPTION CODE	0
DESIGN SPECS METHOD OPTION CODE	1
KB UPDATING OPTION CODE	1
INNSIDE LOOP ITERATION METHOD CODE	0
KB WEIGHTING OPTION CODE	2
MAX COMP BALANCES FOR NONIDEAL OPTION	10
OUTSIDE LOOP CONVERGENCE TOLERANCE	0.100000-03
MINIMUM INSIDE LOOP CONV TOLERANCE	0.300000-05
INITIAL INSIDE LOOP CONV TOLERANCE	0.0100000
INSIDE LOOP CONV TOL REDUCTION FACTOR	0.30000
INSIDE LOOP RMS ERR FOR JACOBIAN UPDATE	1.000000-06
COMPONENT MASS BALANCE CONV TOLERANCE	0.100000-06
COMP MASS BAL FACTOR FOR NONIDEAL CASE	0.0100000
COMP MASS BAL TOL FOR NONIDEAL CASE	0.100000-04
SIMPLE MODEL SLOPE PARAMETER UPDATE TOLERANCE	0.050000
QMIN FOR BOUNDED WEGSTEIN IN OUTSIDE LOOP	0.0
QMAX FOR BOUNDED WEGSTEIN IN OUTSIDE LOOP	0.50000
BOUNDED WEGSTEIN SLOPE TOLERANCE	0.050000
FACTOR 1 FOR PERFORMANCE SPEC CONV ALG	0.100000
FACTOR 2 FOR PERFORMANCE SPEC CONV ALG	0.20000
FEED FLASH CONVERGENCE TOLERANCE	1.000000-06
QMIN FOR BOUNDED WEGSTEIN IN INSIDE LOOP	0.0
QMAX FOR BOUNDED WEGSTEIN IN INSIDE LOOP	0.50000
LIMITING MF FOR NONIDEAL SIMPLE MODEL PARAMS	0.99000
MAX FOR NONIDEAL SIMPLE MODEL PARAMS AT X=0	1.50000
MAX FOR NONIDEAL SIMPLE MODEL PARAMS AT X=.5	1.30000
MIDDLE LOOP CONVERGENCE TOLERANCE	0.20000
MANIPULATED VARIABLE FACTOR	0.100000-04

**** COL-SPECS ****

VAPOR DISTILLATE / TOTAL DISTILLATE		1.00000
CONDENSER DUTY	BTU/HR	0.0
REBOILER DUTY	BTU/HR	0.0

**** PROFILES ****

TEMP-EST	STAGE	1	TEMP, F	-50.0000
		6		0.0
P-SPEC	STAGE	6	PRES, PSI	422.100
		1		421.200

FRACTIONATIO (RADFRC): H2SABS2 (CONTINUED)

*** RESULTS ***

TOP TRAY TEMPERATURE	F	-72.2771
BOTTOM TRAY TEMPERATURE	F	-47.5451
TOP TRAY LIQUID FLOW	LBMOL/HR	3,248.03
BOTTOM TRAY LIQUID FLOW	LBMOL/HR	3,366.14
TOP TRAY VAPOR FLOW	LBMOL/HR	6,674.36
BOTTOM TRAY VAPOR FLOW	LBMOL/HR	6,927.49

**** PROFILES ****

STG	TEMP F	PRESS PSI	L-FLOW LBMOL/HR	V-FLOW LBMOL/HR
1	-72.277	421.20	3248.0	6674.4
2	-67.940	421.38	3315.1	6822.4
3	-64.763	421.56	3347.1	6889.5
4	-61.343	421.74	3355.6	6921.4
5	-56.120	421.92	3353.1	6929.9
6	-47.545	422.10	3366.1	6927.5

**** X-PROFILE ****

STAGE	H2	CO	CO2	CH4	N2	H2S
1	.68912D-03	.61896D-02	.36264D-01	.23176D-02	.47669D-04	.57843D-04
2	.65369D-03	.59912D-02	.55588D-01	.22923D-02	.48589D-04	.29705D-03
3	.63911D-03	.58732D-02	.63797D-01	.22553D-02	.48624D-04	.11661D-02
4	.63553D-03	.57700D-02	.63403D-01	.22110D-02	.47502D-04	.40451D-02
5	.63684D-03	.56025D-02	.54464D-01	.21365D-02	.44519D-04	.12504D-01
6	.63468D-03	.52944D-02	.38554D-01	.20178D-02	.39446D-04	.32312D-01

**** X-PROFILE ****

STAGE	CH3OH
1	.95443
2	.93513
3	.92622
4	.92389
5	.92461
6	.92115

**** Y-PROFILE ****

STAGE	H2	CO	CO2	CH4	N2	H2S
1	.28609	.60669	.26082D-01	.74877D-01	.62414D-02	.47481D-05
2	.28021	.59647	.42781D-01	.74356D-01	.61287D-02	.32183D-04
3	.27747	.59063	.52016D-01	.73642D-01	.60699D-02	.14754D-03
4	.27618	.58788	.56002D-01	.73295D-01	.60421D-02	.56848D-03
5	.27584	.58711	.55821D-01	.73186D-01	.60342D-02	.19633D-02
6	.27594	.58723	.51492D-01	.73175D-01	.60349D-02	.60568D-02

FRACTIONATIO (RADFRC): H2SABS2 (CONTINUED)

**** Y-PROFILE ****

STAGE	CH3OH
1	.18662D-04
2	.23684D-04
3	.28142D-04
4	.33816D-04
5	.44410D-04
6	.67958D-04

DESCRIPTION OF STREAM CLASS CONVEN

STREAM CLASS : CONVEN
SUBSTREAMS : MIXED
SUBSTRM CLASS: MIXED

RECTISOL - H2S ABSORBER 2
STREAM SECTION

DESGS LABSR VPRWS ABSRSOLV

STREAM ID		DESGS	LABSR	VPRWS	ABSRSOLV
FROM :		H2SABS2	H2SABS2		
TO :				H2SABS2	H2SABS2
CLASS:		CONVEN	CONVEN	CONVEN	CONVEN
SUBSTREAM: MIXED		STRUCTURE: CONVENTIONAL			
H2	LBMOL/HR	1909.4336	2.1364	1911.5700	0.0
CO	LBMOL/HR	4049.2683	17.8216	4067.0900	0.0
CO2	LBMOL/HR	174.0819	129.7780	303.8600	0.0
CH4	LBMOL/HR	499.7578	6.7921	506.5500	0.0
N2	LBMOL/HR	41.6572	0.1327	41.7900	0.0
H2S	LBMOL/HR	0.0316	108.7683	108.8000	0.0
H2O	LBMOL/HR	0.0	0.0	0.0	0.0
C6H6	LBMOL/HR	0.0	0.0	0.0	0.0
CH3OH	LBMOL/HR	0.1245	3100.7154	0.8400	3100.0000
TOTAL	LBMOL/HR	6674.3552	3366.1448	6940.5000	3100.0000
TEMP	F	-72.2771	-47.5451	-35.0900	-75.0000
PRES	PSI	421.2000	422.1000	422.1000	389.0000
ENTHALPY	BTU/LBMOL	-.36830+05	-.10673+06	-.38665+05	-.10862+06
VFRAC		1.0000	0.0	1.0000	0.0
LFRAC		0.0	1.0000	0.0	1.0000
ENTROPY	BTU/LBMOL-R	4.3544	-55.1496	4.9816	-60.3165
DENSITY	LBMOL/CUFT	0.1041	1.2745	0.0945	1.2503
AVG MW		20.0948	32.4964	20.7734	32.0420

APPENDIX C

Azeotrope Column Simulation

```
TITLE 'RECTISOL GAS DESULFURIZATION -
       METC COAL GASIFICATION PLANT - AZEOTROPE COLUMN'
DESCRIPTION ' AZEOTROPE COLUMN'
IN-UNITS ENG
HISTORY
     MSG-LEVEL PROPERTIES=2
RUN-CONTROL  MAX-TIME=60.
COMPONENTS H2 H2/CO CO/CO2 CO2/CH4 CH4/N2 N2/H2S H2S/H2O H2O/
           C6H6 C6H6/CH3OH CH4O
;PROPERTIES SYSOP14 GLOBAL
PROPERTIES OPSETA GLOBAL/ SYSOP14
PROP-OPTIONS OPSETA SYSOP14 HVMX HVMX13/HLMX HLMX13
INSERT * RKAK3
;
;
FLOWSHEET
     BLOCK AZEO IN=AZFEED         OUT=VOVHD LOVHD LAZ CQ RQ
;
;
STREAM AZFEED TEMP=96. PRES=50.
     MOLE-FLOW CO2 1.7179/H2S 24.8036/H2O 379.4412/C6H6 5.0944/CH3OH 336.4859/
               H2 0.0/CO 0.0/CH4 0.0/N2 0.0
;
DEF-STREAMS HEAT CQ RQ
BLOCK AZEO RADFRC
     PARAM 15 QMINBWOL=0.5 MAXOL=40
;    DIAG OLVAR1=7 OLVAR2=7
     P-SPEC 1 46/15 50.
     FEEDS AZFEED 3
     PRODUCTS VOVHD 1 1/LOVHD 1 0/LAZ 15 0/RQ 15/CQ 1
     COL-SPECS RDV=0.75 RR=2. D=45.
;
```

```
ASPEN BEGINS EXECUTION FOR RECTISOL GAS DESULFURIZATION

CALCULATION SEQUENCE ENTERED   TIME =      0.87/     1.99

INITIAL ENTHALPY CALCULATION FOR INLET STREAM AZFEED   OF BLOCK AZEO       TIME =      0.89,     2.02
     SUBSTREAM MIXED
     KODE = 2  NTRIAL =   4  T =   308.7      P =   .3447D+06  V =   .2298D-01  Q =   .0

ENTERING UOS BLOCK AZEO      ROUTINE: UDLO3   INTERFACE: UDLO3I  MODEL: RADFRC     TIME =      1.06/     2.20

*** OUTSIDE LOOP ***    1    1    5   .93573

*** OUTSIDE LOOP ***    2    1    3   .67116D-01

*** OUTSIDE LOOP ***    3    1    2   .41104D-01

*** OUTSIDE LOOP ***    4    1    2   .32151D-01

*** OUTSIDE LOOP ***    5    1    2   .25515D-01

*** OUTSIDE LOOP ***    6    1    2   .22831D-01

*** OUTSIDE LOOP ***    7    1    2   .20232D-01

*** OUTSIDE LOOP ***    8    1    2   .18620D-01

*** OUTSIDE LOOP ***    9    1    2   .16098D-01

*** OUTSIDE LOOP ***   10    1    2   .14345D-01

*** OUTSIDE LOOP ***   11    1    2   .12400D-01

*** OUTSIDE LOOP ***   12    1    2   .11167D-01

*** OUTSIDE LOOP ***   13    1    2   .94633D-02

*** OUTSIDE LOOP ***   14    1    2   .83332D-02

*** OUTSIDE LOOP ***   15    1    2   .71075D-02

*** OUTSIDE LOOP ***   16    1    2   .63448D-02

*** OUTSIDE LOOP ***   17    1    2   .53219D-02

*** OUTSIDE LOOP ***   18    1    2   .46608D-02

*** OUTSIDE LOOP ***   19    1    2   .39465D-02

*** OUTSIDE LOOP ***   20    1    2   .35064D-02

*** OUTSIDE LOOP ***   21    1    2   .29238D-02

*** OUTSIDE LOOP ***   22    1    2   .25526D-02

*** OUTSIDE LOOP ***   23    1    2   .21511D-02

*** OUTSIDE LOOP ***   24    1    2   .19071D-02

*** OUTSIDE LOOP ***   25    1    2   .15834D-02

*** OUTSIDE LOOP ***   26    1    2   .13813D-02
```

```
*** OUTSIDE LOOP ***    27     1     2    .11610D-02

*** OUTSIDE LOOP ***    28     1     2    .10275D-02

*** OUTSIDE LOOP ***    29     1     2    .85102D-03

*** OUTSIDE LOOP ***    30     1     2    .74088D-03

*** OUTSIDE LOOP ***    31     1     2    .62160D-03

*** OUTSIDE LOOP ***    32     1     2    .54956D-03

*** OUTSIDE LOOP ***    33     1     2    .45464D-03

*** OUTSIDE LOOP ***    34     1     2    .39553D-03

*** OUTSIDE LOOP ***    35     1     2    .33155D-03

*** OUTSIDE LOOP ***    36     1     2    .29301D-03

*** OUTSIDE LOOP ***    37     1     2    .24183D-03

*** OUTSIDE LOOP ***    38     1     2    .20832D-03

*** OUTSIDE LOOP ***    39     1     2    .17636D-03

*** OUTSIDE LOOP ***    40     1     2    .15435D-03
 **  ERROR           8663200 ROUTINE: UDLO3   BLOCK: AZEO     MODEL: UDLO3
     RADFRC NOT CONVERGED IN  40 OUTSIDE LOOP ITERATIONS.

CALCULATION SEQUENCE COMPLETED   TIME =     15.49/    17.03

REPORT WRITER ENTERED   TIME =     15.50/    17.04
     NO BLOCKS IN CONVERGENCE BLOCK CHAIN
     END OF UOS BLOCK CHAIN
     NO BLOCKS IN COST BLOCK CHAIN

REPORT GENERATED   TIME =     16.14/    17.93

                          ***  SUMMARY OF ERRORS  ***

                    PHYSICAL
                    PROPERTY          SYSTEM        SIMULATION
     TERMINAL ERRORS       0               0                 0
       SEVERE ERRORS       0               0                 0
              ERRORS       0               0                 1
            WARNINGS      38               0                 0


*******************************************
*  ASPEN SIMULATION PROGRAM ENDS EXECUTION  *
*******************************************
```

NOTE:
Outside loop convergence tolerance is 0.1D-03

RECTISOL GAS DESULFURIZATION

TABLE OF CONTENTS

RECTISOL GAS DESULFURIZATION
FLOWSHEET SECTION

FLOWSHEET CONNECTIVITY BY STREAMS

STREAM	SOURCE	DEST	STREAM	SOURCE	DEST
VOVHD	AZEO	----	LOVHD	AZEO	----
LAZ	AZEO	----	CQ	AZEO	----
RQ	AZEO	----	AZFEED	----	AZEO

FLOWSHEET CONNECTIVITY BY BLOCKS

BLOCK	INLETS	OUTLETS
AZEO	AZFEED	VOVHD LOVHD LAZ CQ RQ

COMPUTATIONAL SEQUENCE

SEQUENCE USED WAS:
*AZEO

OVERALL FLOWSHEET BALANCE

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.0	.0	.0
CO	.0	.0	.0
CO2	1.71790	1.71790	.223914D-07
CH4	.0	.0	.0
N2	.0	.0	.0
H2S	24.8036	24.8036	.193118D-07
H2O	379.441	379.441	-.112384D-09
C6H6	5.09440	5.09440	-.177418D-07
CH3OH	336.486	336.486	-.114252D-08
TOTAL BALANCE			
MOLE(LBMOL/HR)	747.543	747.543	.152081D-15
MASS(LB/HR)	18936.2	18936.2	-.112453D-09
ENTHALPY(BTU/HR)	-.820309D+08	-.820309D+08	.620908D-06

COMPONENTS

ID	TYPE	FORMULA	NAME OR ALIAS
H2	C	MISSING	H2
CO	C	MISSING	CO
CO2	C	MISSING	CO2
CH4	C	MISSING	CH4
N2	C	MISSING	N2
H2S	C	MISSING	H2S
H2O	C	MISSING	H2O
C6H6	C	MISSING	C6H6
CH3OH	C	MISSING	CH4O

OPTION SETS

KEY TO OPTION SET TABLES:
OPTION SET ID
MP KEYWORD MP ROUTE ID

OPTION SETS (CONTINUED)

SYSOPO		OPSETA		SYSOP14	
PHILMX	PHILMXOO	PHIVMX	PHIVMX14	PHIVMX	PHIVMX14
HVMX	HVMXOO	PHILMX	PHILMX14	PHILMX	PHILMX14
HLMX	HLMXOO	HVMX	HVMX13	HVMX	HVMX14
GVMX	GVMXOO	HLMX	HLMX13	HLMX	HLMX14
GLMX	GLMXOO	GVMX	GVMX14	GVMX	GVMX14
SVMX	SVMXOO	GLMX	GLMX14	GLMX	GLMX14
SLMX	SLMXOO	SVMX	SVMX14	SVMX	SVMX14
VVMX	VVMXOO	SLMX	SLMX14	SLMX	SLMX14
VLMX	VLMXO1	VVMX	VVMX14	VVMX	VVMX14
MUVMX	MUVMXO1	VLMX	VLMX14	VLMX	VLMX14
MULMX	MULMXO1	MUVMX	MUVMXO2	MUVMX	MUVMXO2
KVMX	KVMXO1	MULMX	MULMXO2	MULMX	MULMXO2
KLMX	KLMXO1	KVMX	KVMXO2	KVMX	KVMXO2
DVMX	DVMXO1	KLMX	KLMXO1	KLMX	KLMXO1
DLMX	DLMXO1	DVMX	DVMXO2	DVMX	DVMXO2
SIGLMX	SIGLMXO1	DLMX	DLMXO1	DLMX	DLMXO1
PHIV	PHIVOO	SIGLMX	SIGLMXO1	SIGLMX	SIGLMXO1
PHIL	PHILOO				
HV	HVOO				
HL	HLOO				
GV	GVOO				
GL	GLOO				
SV	SVOO				
SL	SLOO				
VV	VVOO				
VL	VLO1				
MUV	MUVO1				
MUL	MULO1				
KV	KVO1				
KL	KLO1				
SIGL	SIGLO1				
PHISMX	PHISMXO2				
HSMX	HSMXO2				
GSMX	GSMXO2				
SSMX	SSMXO1				
VSMX	VSMXO2				
KSMX	KSMXO1				
PHIS	PHISO2				
HS	HSO2				
GS	GSO2				
SS	SSO2				
VS	VSO1				
KS	KSO1				

RECTISOL GAS DESULFURIZATION
U-O-S BLOCK SECTION

```
FRACTIONATIO (RADFRC):  AZEO
  INLETS   - AZFEED    STAGE   3
  OUTLETS  - VOVHD     STAGE   1
             LOVHD     STAGE   1
             LAZ       STAGE  15
             CQ        STAGE   1
             RQ        STAGE  15
 PROPERTY OPTION SET OPSETA
```

```
*************************************************************************
*                                                                       *
*     ERROR IN BLOCK CALCULATIONS                                       *
*     COLUMN NOT CONVERGED                                              *
*                                                                       *
*************************************************************************
```

NOTE:

Column converged to 0.15D-03. Outside loop convergence tolerance is 0.1D-03.

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.0	.0	.0
CO	.0	.0	.0
CO2	1.71790	1.71790	.223914D-07
CH4	.0	.0	.0
N2	.0	.0	.0
H2S	24.8036	24.8036	.193118D-07
H2O	379.441	379.441	-.112384D-09
C6H6	5.09440	5.09440	-.177418D-07
CH3OH	336.486	336.486	-.114252D-08
TOTAL BALANCE			
MOLE(LBMOL/HR)	747.543	747.543	.152081D-15
MASS(LB/HR)	18936.2	18936.2	-.112453D-09
ENTHALPY(BTU/HR)	-.820309D+08	-.820309D+08	.620908D-06

FRACTIONATIO (RADFRC): AZEO (CONTINUED)

*** INPUT DATA ***

**** INPUT PARAMETERS ****

NUMBER OF THEORETICAL STAGES	15
MAXIMUM OUTSIDE LOOPS	40
MAXIMUM INNSIDE LOOPS PER OUTSIDE LOOP	10
ALGORITHM OPTION	1
BOUNDED WEGSTEIN MODULUS FOR OUTSIDE LOOPS	1
MAXIMUM ITERATIONS FOR FEED FLASH	30
ENTHALPY BALANCE OPTION CODE	0
DESIGN SPECS METHOD OPTION CODE	1
KB UPDATING OPTION CODE	1
INNSIDE LOOP ITERATION METHOD CODE	0
KB WEIGHTING OPTION CODE	2
MAX COMP BALANCES FOR NONIDEAL OPTION	10
OUTSIDE LOOP CONVERGENCE TOLERANCE	0.100000-03
MINIMUM INSIDE LOOP CONV TOLERANCE	0.300000-05
INITIAL INSIDE LOOP CONV TOLERANCE	0.0100000
INSIDE LOOP CONV TOL REDUCTION FACTOR	0.30000
INSIDE LOOP RMS ERR FOR JACOBIAN UPDATE	1.000000-06
COMPONENT MASS BALANCE CONV TOLERANCE	0.100000-06
COMP MASS BAL FACTOR FOR NONIDEAL CASE	0.0100000
COMP MASS BAL TOL FOR NONIDEAL CASE	0.100000-04
SIMPLE MODEL SLOPE PARAMETER UPDATE TOLERANCE	0.050000
QMIN FOR BOUNDED WEGSTEIN IN OUTSIDE LOOP	0.50000
QMAX FOR BOUNDED WEGSTEIN IN OUTSIDE LOOP	0.50000
BOUNDED WEGSTEIN SLOPE TOLERANCE	0.050000
FACTOR 1 FOR PERFORMANCE SPEC CONV ALG	0.100000
FACTOR 2 FOR PERFORMANCE SPEC CONV ALG	0.20000
FEED FLASH CONVERGENCE TOLERANCE	1.000000-06
QMIN FOR BOUNDED WEGSTEIN IN INSIDE LOOP	0.0
QMAX FOR BOUNDED WEGSTEIN IN INSIDE LOOP	0.50000
LIMITING MF FOR NONIDEAL SIMPLE MODEL PARAMS	0.99000
MAX FOR NONIDEAL SIMPLE MODEL PARAMS AT X=0	1.50000
MAX FOR NONIDEAL SIMPLE MODEL PARAMS AT X=.5	1.30000
MIDDLE LOOP CONVERGENCE TOLERANCE	0.20000
MANIPULATED VARIABLE FACTOR	0.100000-04

**** COL-SPECS ****

VAPOR DISTILLATE / TOTAL DISTILLATE		0.75000
REFLUX RATIO		2.00000
DISTILLATE RATE	LBMOL/HR	45.0000

**** PROFILES ****

P-SPEC	STAGE 1	PRES, PSI	46.0000
	15		50.0000

FRACTIONATIO (RADFRC): AZEO (CONTINUED)

*** RESULTS ***

TOP TRAY TEMPERATURE	F	121.348
BOTTOM TRAY TEMPERATURE	F	228.493
TOP TRAY LIQUID FLOW	LBMOL/HR	90.0000
BOTTOM TRAY LIQUID FLOW	LBMOL/HR	702.543
TOP TRAY VAPOR FLOW	LBMOL/HR	33.7500
BOTTOM TRAY VAPOR FLOW	LBMOL/HR	274.588
CONDENSER DUTY	BTU/HR	-1,633,890.
REBOILER DUTY	BTU/HR	4,221,060.

**** PROFILES ****

STG	TEMP F	PRESS PSI	L-FLOW LBMOL/HR	V-FLOW LBMOL/HR
1	121.35	46.000	90.000	33.750
2	182.81	46.286	89.658	135.00
3	212.98	46.571	960.89	116.29
4	221.07	46.857	973.95	258.34
5	221.66	47.143	974.90	271.41
6	222.00	47.429	975.46	272.35
7	222.34	47.714	976.00	272.91
8	222.68	48.000	976.55	273.46
9	223.01	48.286	977.09	274.00
10	223.35	48.571	977.63	274.55
11	223.68	48.857	978.16	275.08
12	224.02	49.143	978.65	275.62
13	224.41	49.429	978.86	276.10
14	225.16	49.714	977.13	276.31
15	228.49	50.000	702.54	274.59

**** X-PROFILE ****

STAGE	CO2	H2S	H2O	C6H6	CH3OH
1	.99033D-03	.89286D-01	.71783D-01	.20365	.63429
2	.10920D-03	.46907D-02	.22785	.63282D-02	.76102
3	.11393D-04	.10185D-02	.45189	.13742D-03	.54694
4	.15872D-06	.34578D-04	.44908	.33458D-05	.55089
5	.21433D-08	.11366D-05	.44890	.78970D-07	.55110
6	.29017D-10	.37435D-07	.44880	.18690D-08	.55120
7	.39425D-12	.12367D-08	.44870	.44401D-10	.55130
8	.53762D-14	.40983D-10	.44861	.10588D-11	.55139
9	.73577D-16	.13622D-11	.44852	.25342D-13	.55148
10	.10106D-17	.45418D-13	.44843	.60883D-15	.55157
11	.13928D-19	.15187D-14	.44837	.14679D-16	.55163
12	.19249D-21	.50905D-16	.44851	.35474D-18	.55149
13	.26559D-23	.17043D-17	.45006	.85253D-20	.54994
14	.35454D-25	.55565D-19	.46126	.19291D-21	.53874
15	.36425D-27	.14525D-20	.53770	.28628D-23	.46230

FRACTIONATIO (RADFRC): AZEO (CONTINUED)

**** Y-PROFILE ****

STAGE	CO2	H2S	H2O	C6H6	CH3OH
1	.50571D-01	.70516	.26047D-01	.83062D-01	.13516
2	.13385D-01	.24325	.60349D-01	.17350	.50951
3	.29994D-02	.10799	.18842	.20716D-01	.67988
4	.42375D-04	.37881D-02	.21856	.51112D-03	.77709
5	.56958D-06	.12409D-03	.21968	.12006D-04	.78018
6	.76720D-08	.40685D-05	.21983	.28268D-06	.78016
7	.10371D-09	.13380D-06	.21995	.66803D-08	.78005
8	.14071D-11	.44140D-08	.22007	.15847D-09	.77993
9	.19161D-13	.14606D-09	.22019	.37734D-11	.77981
10	.26186D-15	.48481D-11	.22031	.90191D-13	.77969
11	.35914D-17	.16141D-12	.22045	.21637D-14	.77955
12	.49429D-19	.53898D-14	.22068	.52094D-16	.77932
13	.68229D-21	.18043D-15	.22159	.12573D-17	.77841
14	.94077D-23	.60339D-17	.22722	.30194D-19	.77278
15	.12523D-24	.19401D-18	.26571	.67917D-21	.73429

DESCRIPTION OF STREAM CLASS HEAT

STREAM CLASS : HEAT
STREAM ATTR : HEAT

DESCRIPTION OF STREAM CLASS CONVEN

STREAM CLASS : CONVEN
SUBSTREAMS : MIXED
SUBSTRM CLASS: MIXED

CQ RQ

STREAM ID	CQ	RQ
FROM :	AZEO	AZEO
TO :		
CLASS:	HEAT	HEAT

STREAM ATTRIBUTES:
HEAT
Q BTU/HR .16339+07-.42211+07

RECTISOL GAS DESULFURIZATION
STREAM SECTION

VOVHD LOVHD LAZ AZFEED

STREAM ID		VOVHD	LOVHD	LAZ	AZFEED
FROM :		AZEO	AZEO	AZEO	
TO :					AZEO
CLASS:		CONVEN	CONVEN	CONVEN	CONVEN
SUBSTREAM: MIXED		STRUCTURE: CONVENTIONAL			
H2	LBMOL/HR	0.0	0.0	0.0	0.0
CO	LBMOL/HR	0.0	0.0	0.0	0.0
CO2	LBMOL/HR	1.7067	0.0111	.25590-24	1.7179
CH4	LBMOL/HR	0.0	0.0	0.0	0.0
N2	LBMOL/HR	0.0	0.0	0.0	0.0
H2S	LBMOL/HR	23.7991	1.0044	.10205-17	24.8036
H2O	LBMOL/HR	0.8790	0.8075	377.7545	379.4412
C6H6	LBMOL/HR	2.8033	2.2910	.20113-20	5.0944
CH3OH	LBMOL/HR	4.5616	7.1357	324.7884	336.4859
TOTAL	LBMOL/HR	33.7500	11.2500	702.5430	747.5430
TEMP	F	121.3479	121.3479	228.4929	96.0000
PRES	PSI	46.0000	46.0000	50.0000	50.0000
ENTHALPY	BTU/LBMOL	-.25813+05	-.70881+05	-.11071+06	-.10973+06
VFRAC		1.0000	0.0	0.0	0.0229
LFRAC		0.0	1.0000	1.0000	0.9770
ENTROPY	BTU/LBMOL-R	0.1032	-45.1479	-28.6500	-32.2971
DENSITY	LBMOL/CUFT	0.0075	0.9987	1.5831	0.4614
AVG MW		37.5458	40.6114	24.4997	25.3312

APPENDIX D

Methanol-Water Column Simulation

```
TITLE 'RECTISOL GAS DESULFURIZATION
       METC COAL GASIFICATION PLANT - METHANOL-WATER COLUMN'
DESCRIPTION ' METHANOL-WATER COLUMN'
IN-UNITS ENG
HISTORY
     MSG-LEVEL PROPERTIES=2
RUN-CONTROL  MAX-TIME=60.
COMPONENTS H2 H2/CO CO/CO2 CO2/CH4 CH4/N2 N2/H2S H2S/H2O H2O/
           C6H6 C6H6/CH3OH CH4O
;PROPERTIES SYSOP14 GLOBAL
PROPERTIES OPSETA GLOBAL/ SYSOP14
PROP-OPTIONS OPSETA SYSOP14 HVMX HVMX13/HLMX HLMX13
INSERT * RKAK3
;
;
FLOWSHEET
     BLOCK MWSEP IN=MWFEED         OUT=VMW WSTH2O  CQ RQ
;
;
STREAM MWFEED TEMP=228. PRES=50.
     MOLE-FLOW H2O 379.92/CH3OH 326.69
;
DEF-STREAMS HEAT CQ RQ
BLOCK MWSEP RADFRC
     PARAM 25 MAXOL=30 QMINBWOL=0.5
;    DIAG OLVAR1=7 OLVAR2=7
     P-SPEC 1 41/25 45.
     FEEDS MWFEED 19
     PRODUCTS VMW 1 0/WSTH2O 25 0/ RQ 25/CQ 1
     COL-SPECS RDV=0. RR=1.2 D=330.
;
```

RECTISOL GAS DESULFURIZATION

TABLE OF CONTENTS

RECTISOL GAS DESULFURIZATION
FLOWSHEET SECTION

FLOWSHEET CONNECTIVITY BY STREAMS

STREAM	SOURCE	DEST	STREAM	SOURCE	DEST
VMW	MWSEP	----	WSTH2O	MWSEP	----
CO	MWSEP	----	RQ	MWSEP	----
MWFEED	----	MWSEP			

FLOWSHEET CONNECTIVITY BY BLOCKS

BLOCK	INLETS	OUTLETS
MWSEP	MWFEED	VMW WSTH2O CO RQ

COMPUTATIONAL SEQUENCE

SEQUENCE USED WAS:
MWSEP

OVERALL FLOWSHEET BALANCE

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.0	.0	.0
CO	.0	.0	.0
CO2	.0	.0	.0
CH4	.0	.0	.0
N2	.0	.0	.0
H2S	.0	.0	.0
H2O	379.920	379.920	.188520D-13
C6H6	.0	.0	.0
CH3OH	326.690	326.690	-.217498D-13
TOTAL BALANCE			
MOLE(LBMOL/HR)	706.610	706.610	.0
MASS(LB/HR)	17312.1	17312.1	-.572635D-14
ENTHALPY(BTU/HR)	-.782342D+08	-.782340D+08	-.235042D-05

RECTISOL GAS DESULFURIZATION
PHYSICAL PROPERTIES SECTION

COMPONENTS

ID	TYPE	FORMULA	NAME OR ALIAS
H2	C	MISSING	H2
CO	C	MISSING	CO
CO2	C	MISSING	CO2
CH4	C	MISSING	CH4
N2	C	MISSING	N2
H2S	C	MISSING	H2S
H2O	C	MISSING	H2O
C6H6	C	MISSING	C6H6
CH3OH	C	MISSING	CH4O

OPTION SETS

KEY TO OPTION SET TABLES:
OPTION SET ID
MP KEYWORD MP ROUTE ID

OPTION SETS (CONTINUED)

SYSOPO		OPSETA		SYSOP14	
PHILMX	PHILMXOO	PHIVMX	PHIVMX14	PHIVMX	PHIVMX14
HVMX	HVMXOO	PHILMX	PHILMX14	PHILMX	PHILMX14
HLMX	HLMXOO	HVMX	HVMX13	HVMX	HVMX14
GVMX	GVMXOO	HLMX	HLMX13	HLMX	HLMX14
GLMX	GLMXOO	GVMX	GVMX14	GVMX	GVMX14
SVMX	SVMXOO	GLMX	GLMX14	GLMX	GLMX14
SLMX	SLMXOO	SVMX	SVMX14	SVMX	SVMX14
VVMX	VVMXOO	SLMX	SLMX14	SLMX	SLMX14
VLMX	VLMXO1	VVMX	VVMX14	VVMX	VVMX14
MUVMX	MUVMXO1	VLMX	VLMX14	VLMX	VLMX14
MULMX	MULMXO1	MUVMX	MUVMXO2	MUVMX	MUVMXO2
KVMX	KVMXO1	MULMX	MULMXO2	MULMX	MULMXO2
KLMX	KLMXO1	KVMX	KVMXO2	KVMX	KVMXO2
DVMX	DVMXO1	KLMX	KLMXO1	KLMX	KLMXO1
DLMX	DLMXO1	DVMX	DVMXO2	DVMX	DVMXO2
SIGLMX	SIGLMXO1	DLMX	DLMXO1	DLMX	DLMXO1
PHIV	PHIVOO	SIGLMX	SIGLMXO1	SIGLMX	SIGLMXO1
PHIL	PHILOO				
HV	HVOO				
HL	HLOO				
GV	GVOO				
GL	GLOO				
SV	SVOO				
SL	SLOO				
VV	VVOO				
VL	VLO1				
MUV	MUVO1				
MUL	MULO1				
KV	KVO1				
KL	KLO1				
SIGL	SIGLO1				
PHISMX	PHISMXO2				
HSMX	HSMXO2				
GSMX	GSMXO2				
SSMX	SSMXO1				
VSMX	VSMXO2				
KSMX	KSMXO1				
PHIS	PHISO2				
HS	HSO2				
GS	GSO2				
SS	SSO2				
VS	VSO1				
KS	KSO1				

RECTISOL GAS DESULFURIZATION
U-O-S BLOCK SECTION

FRACTIONATIO (RADFRC): MWSEP
INLETS - MWFEED STAGE 19
OUTLETS - VMW STAGE 1
WSTH2O STAGE 25
CQ STAGE 1
RQ STAGE 25
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.0	.0	.0
CO	.0	.0	.0
CO2	.0	.0	.0
CH4	.0	.0	.0
N2	.0	.0	.0
H2S	.0	.0	.0
H2O	379.920	379.920	.188520D-13
C6H6	.0	.0	.0
CH3OH	326.690	326.690	-.217498D-13
TOTAL BALANCE			
MOLE(LBMOL/HR)	706.610	706.610	.0
MASS(LB/HR)	17312.1	17312.1	-.572635D-14
ENTHALPY(BTU/HR)	-.782342D+08	-.782340D+08	-.235042D-05

FRACTIONATIO (RADFRC): MWSEP (CONTINUED)

*** INPUT DATA ***

**** INPUT PARAMETERS ****

NUMBER OF THEORETICAL STAGES	25
MAXIMUM OUTSIDE LOOPS	30
MAXIMUM INNSIDE LOOPS PER OUTSIDE LOOP	10
ALGORITHM OPTION	1
BOUNDED WEGSTEIN MODULUS FOR OUTSIDE LOOPS	1
MAXIMUM ITERATIONS FOR FEED FLASH	30
ENTHALPY BALANCE OPTION CODE	0
DESIGN SPECS METHOD OPTION CODE	1
KB UPDATING OPTION CODE	1
INNSIDE LOOP ITERATION METHOD CODE	0
KB WEIGHTING OPTION CODE	2
MAX COMP BALANCES FOR NONIDEAL OPTION	10
OUTSIDE LOOP CONVERGENCE TOLERANCE	0.100000-03
MINIMUM INSIDE LOOP CONV TOLERANCE	0.300000-05
INITIAL INSIDE LOOP CONV TOLERANCE	0.0100000
INSIDE LOOP CONV TOL REDUCTION FACTOR	0.30000
INSIDE LOOP RMS ERR FOR JACOBIAN UPDATE	1.000000-06
COMPONENT MASS BALANCE CONV TOLERANCE	0.100000-06
COMP MASS BAL FACTOR FOR NONIDEAL CASE	0.0100000
COMP MASS BAL TOL FOR NONIDEAL CASE	0.100000-04
SIMPLE MODEL SLOPE PARAMETER UPDATE TOLERANCE	0.050000
QMIN FOR BOUNDED WEGSTEIN IN OUTSIDE LOOP	0.50000
QMAX FOR BOUNDED WEGSTEIN IN OUTSIDE LOOP	0.50000
BOUNDED WEGSTEIN SLOPE TOLERANCE	0.050000
FACTOR 1 FOR PERFORMANCE SPEC CONV ALG	0.100000
FACTOR 2 FOR PERFORMANCE SPEC CONV ALG	0.20000
FEED FLASH CONVERGENCE TOLERANCE	1.000000-06
QMIN FOR BOUNDED WEGSTEIN IN INSIDE LOOP	0.0
QMAX FOR BOUNDED WEGSTEIN IN INSIDE LOOP	0.50000
LIMITING MF FOR NONIDEAL SIMPLE MODEL PARAMS	0.99000
MAX FOR NONIDEAL SIMPLE MODEL PARAMS AT X=0	1.50000
MAX FOR NONIDEAL SIMPLE MODEL PARAMS AT X=.5	1.30000
MIDDLE LOOP CONVERGENCE TOLERANCE	0.20000
MANIPULATED VARIABLE FACTOR	0.100000-04

**** COL-SPECS ****

VAPOR DISTILLATE / TOTAL DISTILLATE		0.0
REFLUX RATIO		1.20000
DISTILLATE RATE	LBMOL/HR	330.000

**** PROFILES ****

P-SPEC	STAGE 1	PRES, PSI	41.0000
	25		45.0000

FRACTIONATIO (RADFRC): MWSEP (CONTINUED)

*** RESULTS ***

TOP TRAY TEMPERATURE	F	199.827
BOTTOM TRAY TEMPERATURE	F	274.105
TOP TRAY LIQUID FLOW	LBMOL/HR	396.000
BOTTOM TRAY LIQUID FLOW	LBMOL/HR	376.610
TOP TRAY VAPOR FLOW	LBMOL/HR	0.0
BOTTOM TRAY VAPOR FLOW	LBMOL/HR	619.226
CONDENSER DUTY	BTU/HR	-0.108487+08
REBOILER DUTY	BTU/HR	0.107522+08

**** PROFILES ****

STG	TEMP F	PRESS PSI	L-FLOW LBMOL/HR	V-FLOW LBMOL/HR
1	199.83	41.000	396.00	.0
2	200.41	41.167	395.30	726.00
3	201.02	41.333	394.51	725.30
4	201.67	41.500	393.64	724.51
5	202.37	41.667	392.67	723.64
6	203.12	41.833	391.58	722.67
7	203.92	42.000	390.38	721.58
8	204.78	42.167	389.04	720.38
9	205.71	42.333	387.54	719.04
10	206.72	42.500	385.87	717.54
11	207.83	42.667	384.00	715.87
12	209.03	42.833	381.91	714.00
13	210.36	43.000	379.58	711.91
14	211.82	43.167	376.97	709.58
15	213.43	43.333	374.07	706.97
16	215.21	43.500	370.88	704.07
17	217.15	43.667	367.45	700.88
18	219.23	43.833	363.86	697.45
19	221.41	44.000	1058.4	685.61
20	223.74	44.167	1048.1	681.81
21	229.97	44.333	1024.5	671.53
22	244.34	44.500	998.29	647.91
23	262.10	44.667	993.32	621.68
24	271.28	44.833	995.84	616.71
25	274.11	45.000	376.61	619.23

**** X-PROFILE ****

STAGE	H2O	CH3OH
1	.12175D-01	.98783
2	.24421D-01	.97558
3	.37837D-01	.96216
4	.52535D-01	.94747
5	.68645D-01	.93136
6	.86313D-01	.91369
7	.10571	.89429
8	.12701	.87299
9	.15044	.84956

FRACTIONATIO (RADFRC): MWSEP (CONTINUED)

**** X-PROFILE ****

STAGE	H2O	CH3OH
10	.17625	.82375
11	.20469	.79531
12	.23606	.76394
13	.27066	.72934
14	.30873	.69127
15	.35040	.64960
16	.39559	.60441
17	.44369	.55631
18	.49340	.50660
19	.54251	.45749
20	.59153	.40847
21	.70736	.29264
22	.86854	.13146
23	.96206	.37941D-01
24	.99105	.89509D-02
25	.99812	.18790D-02

**** Y-PROFILE ****

STAGE	H2O	CH3OH
1	.60728D-02	.99393
2	.12175D-01	.98783
3	.18849D-01	.98115
4	.26148D-01	.97385
5	.34129D-01	.96587
6	.42858D-01	.95714
7	.52408D-01	.94759
8	.62860D-01	.93714
9	.74308D-01	.92569
10	.86854D-01	.91315
11	.10061	.89939
12	.11572	.88428
13	.13228	.86772
14	.15045	.84955
15	.17030	.82970
16	.19187	.80813
17	.21506	.78494
18	.23952	.76048
19	.26454	.73546
20	.29084	.70916
21	.36351	.63649
22	.53834	.46166
23	.79004	.20996
24	.94004	.59964D-01
25	.98675	.13252D-01

DESCRIPTION OF STREAM CLASS HEAT

STREAM CLASS : HEAT
STREAM ATTR : HEAT

DESCRIPTION OF STREAM CLASS CONVEN

STREAM CLASS : CONVEN
SUBSTREAMS : MIXED
SUBSTRM CLASS: MIXED

CQ RQ

STREAM ID	CQ	RQ
FROM :	MWSEP	MWSEP
TO :		
CLASS:	HEAT	HEAT

STREAM ATTRIBUTES:
HEAT
Q BTU/HR .10849+08 .10752+08

RECTISOL GAS DESULFURIZATION
STREAM SECTION

VMW WSTH20 MWFEED

STREAM ID		VMW	WSTH20	MWFEED
FROM :		MWSEP	MWSEP	
TO :				MWSEP
CLASS:		CONVEN	CONVEN	CONVEN
SUBSTREAM: MIXED		STRUCTURE: CONVENTIONAL		
H2	LBMOL/HR	0.0	0.0	0.0
CO	LBMOL/HR	0.0	0.0	0.0
CO2	LBMOL/HR	0.0	0.0	0.0
CH4	LBMOL/HR	0.0	0.0	0.0
N2	LBMOL/HR	0.0	0.0	0.0
H2S	LBMOL/HR	0.0	0.0	0.0
H20	LBMOL/HR	4.0176	375.9023	379.9200
C6H6	LBMOL/HR	0.0	0.0	0.0
CH3OH	LBMOL/HR	325.9823	0.7076	326.6900
TOTAL	LBMOL/HR	330.0000	376.6100	706.6100
TEMP	F	199.8271	274.1052	228.0000
PRES	PSI	41.0000	45.0000	50.0000
ENTHALPY	BTU/LBMOL	-.10057+06	-.11986+06	-.11072+06
VFRAC		0.0	0.0	0.0
LFRAC		1.0000	1.0000	1.0000
ENTROPY	BTU/LBMOL-R	-42.8432	-21.4770	-28.6650
DENSITY	LBMOL/CUFT	1.0640	2.3632	1.5835
AVG MW		31.8712	18.0413	24.5001

APPENDIX E

Hot Regeneration Column Simulation

```
TITLE 'RECTISOL GAS DESULFURIZATION
       METC COAL GASIFICATION PLANT - HOT REGENERATION COLUMN'
DESCRIPTION ' HOT REGENERATION COLUMN'
IN-UNITS ENG
HISTORY
     MSG-LEVEL PROPERTIES=2
RUN-CONTROL  MAX-TIME=60.
COMPONENTS H2 H2/CO CO/CO2 CO2/CH4 CH4/N2 N2/H2S H2S/H2O H2O/
           C6H6 C6H6/CH3OH CH4O
;PROPERTIES SYSOP14 GLOBAL
PROPERTIES OPSETA GLOBAL/ SYSOP14
PROP-OPTIONS OPSETA SYSOP14 HVMX HVMX13/HLMX HLMX13
INSERT * RKAK3
;
;
FLOWSHEET
     BLOCK HTRGSEP IN=HTRGFD VMW         OUT=VHTRG1 LHTRG1  CQ RQ
;
;
STREAM HTRGFD TEMP=124 PRES=35.
     MOLE-FLOW H2 0.0023/CO 0.2318/CO2 109.5025/CH4 0.5351/N2 .988D-03/
               H2S 105.7298/H2O 0.0/C6H6 0.0/CH3OH 3100.7482
STREAM VMW TEMP=200.4 PRES=41. VFRAC=1.0
     MOLE-FLOW H2O 8.8387/CH3OH 717.1611
;
DEF-STREAMS HEAT CQ RQ
BLOCK HTRGSEP RADFRC
     PARAM 10 QMINBWOL=0.5 MAXOL=30
     P-SPEC 1 33.5/10 35.
     FEEDS HTRGFD 3 /VMW 6
     PRODUCTS VHTRG1 1 1/LHTRG1 10 0/RQ 10/CQ 1
     COL-SPECS RDV=1. RR=1.0 D=216.
;
```

RECTISOL GAS DESULFURIZATION

TABLE OF CONTENTS

RECTISOL GAS DESULFURIZATION
FLOWSHEET SECTION

FLOWSHEET CONNECTIVITY BY STREAMS

STREAM	SOURCE	DEST	STREAM	SOURCE	DEST
VHTRG1	HTRGSEP	----	LHTRG1	HTRGSEP	----
CQ	HTRGSEP	----	RQ	HTRGSEP	----
HTRGFD	----	HTRGSEP	VMW	----	HTRGSEP

FLOWSHEET CONNECTIVITY BY BLOCKS

BLOCK	INLETS	OUTLETS
HTRGSEP	HTRGFD VMW	VHTRG1 LHTRG1 CQ RQ

COMPUTATIONAL SEQUENCE

SEQUENCE USED WAS:
HTRGSEP

OVERALL FLOWSHEET BALANCE

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.230000D-02	.230000D-02	.221884D-12
CO	.231800	.231800	.221757D-12
CO2	109.502	109.502	.222177D-12
CH4	.535100	.535100	.221718D-12
N2	.988000D-03	.988000D-03	.221888D-12
H2S	105.730	105.730	.221738D-12
H2O	8.83870	8.83870	-.117822D-13
C6H6	.0	.0	.0
CH3OH	3817.91	3817.91	-.124618D-13
TOTAL BALANCE			
MOLE(LBMOL/HR)	4042.75	4042.75	.281212D-16
MASS(LB/HR)	130930.	130930.	.255628D-14
ENTHALPY(BTU/HR)	-.399122D+09	-.390459D+09	-.217054D-01

RECTISOL GAS DESULFURIZATION
PHYSICAL PROPERTIES SECTION

COMPONENTS

ID	TYPE	FORMULA	NAME OR ALIAS
H2	C	MISSING	H2
CO	C	MISSING	CO
CO2	C	MISSING	CO2
CH4	C	MISSING	CH4
N2	C	MISSING	N2
H2S	C	MISSING	H2S
H2O	C	MISSING	H2O
C6H6	C	MISSING	C6H6
CH3OH	C	MISSING	CH4O

OPTION SETS

KEY TO OPTION SET TABLES:
OPTION SET ID
MP KEYWORD MP ROUTE ID

OPTION SETS (CONTINUED)

SYSOPO		OPSETA		SYSOP14	
PHILMX	PHILMXOO	PHIVMX	PHIVMX14	PHIVMX	PHIVMX14
HVMX	HVMXOO	PHILMX	PHILMX14	PHILMX	PHILMX14
HLMX	HLMXOO	HVMX	HVMX13	HVMX	HVMX14
GVMX	GVMXOO	HLMX	HLMX13	HLMX	HLMX14
GLMX	GLMXOO	GVMX	GVMX14	GVMX	GVMX14
SVMX	SVMXOO	GLMX	GLMX14	GLMX	GLMX14
SLMX	SLMXOO	SVMX	SVMX14	SVMX	SVMX14
VVMX	VVMXOO	SLMX	SLMX14	SLMX	SLMX14
VLMX	VLMXO1	VVMX	VVMX14	VVMX	VVMX14
MUVMX	MUVMXO1	VLMX	VLMX14	VLMX	VLMX14
MULMX	MULMXO1	MUVMX	MUVMXO2	MUVMX	MUVMXO2
KVMX	KVMXO1	MULMX	MULMXO2	MULMX	MULMXO2
KLMX	KLMXO1	KVMX	KVMXO2	KVMX	KVMXO2
DVMX	DVMXO1	KLMX	KLMXO1	KLMX	KLMXO1
DLMX	DLMXO1	DVMX	DVMXO2	DVMX	DVMXO2
SIGLMX	SIGLMXO1	DLMX	DLMXO1	DLMX	DLMXO1
PHIV	PHIVOO	SIGLMX	SIGLMXO1	SIGLMX	SIGLMXO1
PHIL	PHILOO				
HV	HVOO				
HL	HLOO				
GV	GVOO				
GL	GLOO				
SV	SVOO				
SL	SLOO				
VV	VVOO				
VL	VLO1				
MUV	MUVO1				
MUL	MULO1				
KV	KVO1				
KL	KLO1				
SIGL	SIGLO1				
PHISMX	PHISMXO2				
HSMX	HSMXO2				
GSMX	GSMXO2				
SSMX	SSMXO1				
VSMX	VSMXO2				
KSMX	KSMXO1				
PHIS	PHISO2				
HS	HSO2				
GS	GSO2				
SS	SSO2				
VS	VSO1				
KS	KSO1				

RECTISOL GAS DESULFURIZATION
U-O-S BLOCK SECTION

```
FRACTIONATIO (RADFRC):  HTRGSEP
   INLETS    - HTRGFD    STAGE   3
               VMW       STAGE   6
   OUTLETS   - VHTRG1    STAGE   1
               LHTRG1    STAGE  10
               CQ        STAGE   1
               RQ        STAGE  10
  PROPERTY OPTION SET OPSETA
```

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.230000D-02	.230000D-02	.221884D-12
CO	.231800	.231800	.221757D-12
CO2	109.502	109.502	.222177D-12
CH4	.535100	.535100	.221718D-12
N2	.988000D-03	.988000D-03	.221888D-12
H2S	105.730	105.730	.221738D-12
H2O	8.83870	8.83870	-.117822D-13
C6H6	.0	.0	.0
CH3OH	3817.91	3817.91	-.124618D-13
TOTAL BALANCE			
MOLE(LBMOL/HR)	4042.75	4042.75	.281212D-16
MASS(LB/HR)	130930.	130930.	.255628D-14
ENTHALPY(BTU/HR)	-.399122D+09	-.390459D+09	-.217054D-01

FRACTIONATIO (RADFRC): HTRGSEP (CONTINUED)

*** INPUT DATA ***

**** INPUT PARAMETERS ****

NUMBER OF THEORETICAL STAGES		10
MAXIMUM OUTSIDE LOOPS		30
MAXIMUM INNSIDE LOOPS PER OUTSIDE LOOP		10
ALGORITHM OPTION		1
BOUNDED WEGSTEIN MODULUS FOR OUTSIDE LOOPS		1
MAXIMUM ITERATIONS FOR FEED FLASH		30
ENTHALPY BALANCE OPTION CODE		0
DESIGN SPECS METHOD OPTION CODE		1
KB UPDATING OPTION CODE		1
INNSIDE LOOP ITERATION METHOD CODE		0
KB WEIGHTING OPTION CODE		2
MAX COMP BALANCES FOR NONIDEAL OPTION		10
OUTSIDE LOOP CONVERGENCE TOLERANCE		0.100000-03
MINIMUM INSIDE LOOP CONV TOLERANCE		0.300000-05
INITIAL INSIDE LOOP CONV TOLERANCE		0.0100000
INSIDE LOOP CONV TOL REDUCTION FACTOR		0.30000
INSIDE LOOP RMS ERR FOR JACOBIAN UPDATE		1.000000-06
COMPONENT MASS BALANCE CONV TOLERANCE		0.100000-06
COMP MASS BAL FACTOR FOR NONIDEAL CASE		0.0100000
COMP MASS BAL TOL FOR NONIDEAL CASE		0.100000-04
SIMPLE MODEL SLOPE PARAMETER UPDATE TOLERANCE		0.050000
QMIN FOR BOUNDED WEGSTEIN IN OUTSIDE LOOP		0.50000
QMAX FOR BOUNDED WEGSTEIN IN OUTSIDE LOOP		0.50000
BOUNDED WEGSTEIN SLOPE TOLERANCE		0.050000
FACTOR 1 FOR PERFORMANCE SPEC CONV ALG		0.100000
FACTOR 2 FOR PERFORMANCE SPEC CONV ALG		0.20000
FEED FLASH CONVERGENCE TOLERANCE		1.000000-06
QMIN FOR BOUNDED WEGSTEIN IN INSIDE LOOP		0.0
QMAX FOR BOUNDED WEGSTEIN IN INSIDE LOOP		0.50000
LIMITING MF FOR NONIDEAL SIMPLE MODEL PARAMS		0.99000
MAX FOR NONIDEAL SIMPLE MODEL PARAMS AT X=0		1.50000
MAX FOR NONIDEAL SIMPLE MODEL PARAMS AT X=.5		1.30000
MIDDLE LOOP CONVERGENCE TOLERANCE		0.20000
MANIPULATED VARIABLE FACTOR		0.100000-04

**** COL-SPECS ****

VAPOR DISTILLATE / TOTAL DISTILLATE		1.00000
REFLUX RATIO		1.00000
DISTILLATE RATE	LBMOL/HR	216.000

**** PROFILES ****

P-SPEC	STAGE 1	PRES. PSI	33.5000
	10		35.0000

FRACTIONATIO (RADFRC): HTRGSEP (CONTINUED)

*** RESULTS ***

TOP TRAY TEMPERATURE	F	-39.7738
BOTTOM TRAY TEMPERATURE	F	190.843
TOP TRAY LIQUID FLOW	LBMOL/HR	216.000
BOTTOM TRAY LIQUID FLOW	LBMOL/HR	3,826.75
TOP TRAY VAPOR FLOW	LBMOL/HR	216.000
BOTTOM TRAY VAPOR FLOW	LBMOL/HR	4.04275
CONDENSER DUTY	BTU/HR	-4,309,380.
REBOILER DUTY	BTU/HR	-0.101024+08

**** PROFILES ****

STG	TEMP F	PRESS PSI	L-FLOW LBMOL/HR	V-FLOW LBMOL/HR
1	-39.774	33.500	216.00	216.00
2	142.43	33.667	246.29	432.00
3	176.14	33.833	3640.2	239.06
4	188.02	34.000	3717.0	539.45
5	189.55	34.167	3830.8	616.29
6	189.80	34.333	3832.8	4.0428
7	190.06	34.500	3834.8	6.0328
8	190.31	34.667	3836.8	8.0167
9	190.58	34.833	3729.5	10.006
10	190.84	35.000	3826.8	4.0428

**** X-PROFILE ****

STAGE	H2	CO	CO2	CH4	N2	H2S
1	.13661D-08	.58364D-06	.14440D-01	.53658D-05	.13790D-08	.20464
2	.25300D-08	.50395D-06	.31021D-02	.25715D-05	.16756D-08	.90703D-02
3	.33724D-10	.12790D-07	.75826D-03	.13820D-06	.33558D-10	.28801D-02
4	.13432D-12	.90951D-10	.49569D-04	.20178D-08	.19050D-12	.36171D-03
5	.48167D-15	.58006D-12	.27441D-05	.26242D-10	.97055D-15	.36773D-04
6	.27177D-15	.55564D-12	.29253D-05	.34491D-10	.76526D-15	.37885D-04
7	.10306D-15	.35805D-12	.30982D-05	.34729D-10	.40459D-15	.39006D-04
8	.29202D-16	.16942D-12	.31553D-05	.26538D-10	.15808D-15	.39754D-04
9	.61313D-17	.56799D-13	.26861D-05	.14060D-10	.44537D-16	.36567D-04
10	.22537D-17	.28844D-13	.24284D-05	.95421D-11	.20127D-16	.34679D-04

**** X-PROFILE ****

STAGE	H2O	CH3OH
1	.13604D-05	.78092
2	.43789D-05	.98782
3	.12627D-04	.99635
4	.18310D-03	.99941
5	.23084D-02	.99765
6	.23078D-02	.99765
7	.23072D-02	.99765
8	.23065D-02	.99765
9	.23084D-02	.99765
10	.23097D-02	.99765

RECTISOL GAS DESULFURIZATION
U-O-S BLOCK SECTION

FRACTIONATIO (RADFRC): HTRGSEP (CONTINUED)

STAGE	H2	CO	CO2	CH4	N2	H2S
		**** Y-PROFILE		****		
1	.10648D-04	.10731D-02	.50691	.24773D-02	.45741D-05	.48888
2	.53248D-05	.53687D-03	.26068	.12413D-02	.22877D-05	.34676
3	.60653D-07	.12569D-04	.74638D-01	.64938D-04	.41549D-07	.14210
4	.22757D-09	.86306D-07	.50995D-02	.93253D-06	.22645D-09	.19189D-01
5	.81013D-12	.54837D-09	.28388D-03	.12111D-07	.11489D-11	.19662D-02
6	.45429D-12	.52235D-09	.30149D-03	.15834D-07	.90062D-12	.20189D-02
7	.17123D-12	.33472D-09	.31810D-03	.15860D-07	.47342D-12	.20717D-02
8	.48222D-13	.15750D-09	.32276D-03	.12057D-07	.18391D-12	.21045D-02
9	.10063D-13	.52508D-10	.27376D-03	.63547D-08	.51520D-13	.19295D-02
10	.36765D-14	.26518D-10	.24659D-03	.42906D-08	.23150D-13	.18240D-02

STAGE	H2O	CH3OH
	**** Y-PROFILE	****
1	.15398D-09	.64589D-03
2	.68025D-06	.39078
3	.45115D-05	.78318
4	.85207D-04	.97563
5	.11043D-02	.99665
6	.11051D-02	.99657
7	.11059D-02	.99650
8	.11067D-02	.99647
9	.11091D-02	.99669
10	.11111D-02	.99682

DESCRIPTION OF STREAM CLASS HEAT

STREAM CLASS : HEAT
STREAM ATTR : HEAT

DESCRIPTION OF STREAM CLASS CONVEN

STREAM CLASS : CONVEN
SUBSTREAMS : MIXED
SUBSTRM CLASS: MIXED

CQ RQ

STREAM ID	CQ	RQ
FROM :	HTRGSEP	HTRGSEP
TO :		
CLASS:	HEAT	HEAT

STREAM ATTRIBUTES:
HEAT

Q	BTU/HR	.43094+07	.10102+08

RECTISOL GAS DESULFURIZATION
STREAM SECTION

VHTRG1 LHTRG1 HTRGFD VMW

STREAM ID		VHTRG1	LHTRG1	HTRGFD	VMW
FROM :		HTRGSEP	HTRGSEP		
TO :				HTRGSEP	HTRGSEP
CLASS:		CONVEN	CONVEN	CONVEN	CONVEN
SUBSTREAM: MIXED		STRUCTURE: CONVENTIONAL			
H2	LBMOL/HR	0.0023	.86245-14	0.0023	0.0
CO	LBMOL/HR	0.2318	.11038-09	0.2318	0.0
CO2	LBMOL/HR	109.4932	0.0092	109.5025	0.0
CH4	LBMOL/HR	0.5351	.36515-07	0.5351	0.0
N2	LBMOL/HR	.98800-03	.77022-13	.98800-03	0.0
H2S	LBMOL/HR	105.5970	0.1327	105.7298	0.0
H2O	LBMOL/HR	.33259-07	8.8387	0.0	8.8387
C6H6	LBMOL/HR	0.0	0.0	0.0	0.0
CH3OH	LBMOL/HR	0.1395	3817.7698	3100.7482	717.1611
TOTAL	LBMOL/HR	216.0000	3826.7505	3316.7507	725.9998
TEMP	F	-39.7738	190.8430	124.0000	200.4000
PRES	PSI	33.5000	35.0000	35.0000	41.0000
ENTHALPY	BTU/LBMOL	-.91306+05	-.10065+06	-.10159+06	-.85630+05
VFRAC		1.0000	0.0	0.0660	1.0000
LFRAC		0.0	1.0000	0.9339	0.0
ENTROPY	BTU/LBMOL-R	3.0763	-43.2091	-42.4045	-30.4428
DENSITY	LBMOL/CUFT	0.0076	1.0657	0.0920	0.0060
AVG MW		39.0607	32.0097	32.4992	31.8712

APPENDIX F

Water Wash Column Simulation

```
TITLE 'RECTISOL - WATER WASH COLUMN 2'
DESCRIPTION 'WATER WASH COLUMN'
IN-UNITS ENG
HISTORY
     MSG-LEVEL PROPERTIES=2
COMPONENTS H2 H2/CO CO/CO2 CO2/CH4 CH4/N2 N2/H2S H2S/H2O H2O/
           C6H6 C6H6/CH3OH CH4O
PROPERTIES OPSETA  GLOBAL /SYSOP14
PROP-OPTIONS OPSETA SYSOP14 HVMX HVMX13/HLMX HLMX13
;PROPERTIES SYSOP14 GLOBAL
INSERT * RKAKIJ
STREAM VPRWSF TEMP=-21.8755 PRES=30.
     MOLE-FLOW H2 0.2323/CO 1.7165/CO2 5.8682/CH4 0.6301/N2 0.0122/
               H2S 5.3386/H2O 0.32D-04/C6H6 0.0207/CH3OH 0.0256
STREAM VFLRG2 TEMP=-24.06 PRES=30.
     MOLE-FLOW H2 0.0856/CO 2.2428/CO2 15.5406/CH4 1.693/N2 .99D-03/
               H2S 2.5633/CH3OH 0.0421
STREAM VAZ TEMP=130. PRES=48.
     MOLE-FLOW H2 .1395D-03/CO 0.0041/CO2 1.8238/CH4 0.0056/N2 .178D-04/
               H2S 22.7487/H2O 0.0/C6H6 4.8206/CH3OH 7.668
STREAM VHTRG1 TEMP=-75.32 PRES=33.5
     MOLE-FLOW H2 0.0023/CO 0.2318/CO2 109.5024/CH4 0.5351/N2 0.988D-03/
               H2S 105.7155/H2O 0.0/C6H6 0.0/CH3OH 0.0177
STREAM ADDH2O TEMP=100. PRES=40.
     MOLE-FLOW H2O 385.
FLOWSHEET
     BLOCK WWMIX IN = VPRWSF VFLRG2 VAZ VHTRG1    OUT=WWFEED
     BLOCK H2OWSH IN=WWFEED ADDH2O  OUT=ACIDGAS LWWS
BLOCK H2OWSH RADFRC
     PARAM 4
     FEEDS WWFEED 4/ADDH2O 1
     PRODUCTS ACIDGAS 1 1/LWWS 4 0
     P-SPEC 4 26./1 25.
     COL-SPECS RDV=1 Q1=0 QN=0
     T-EST 1 80/4 0
;    BOPT PROP-LEVEL=8 SMLV=8
;
BLOCK WWMIX MIXER
```

RECTISOL - WATER WASH COLUMN 2

TABLE OF CONTENTS

RECTISOL - WATER WASH COLUMN 2
FLOWSHEET SECTION

FLOWSHEET CONNECTIVITY BY STREAMS

STREAM	SOURCE	DEST	STREAM	SOURCE	DEST
WWFEED	WWMIX	H2OWSH	ACIDGAS	H2OWSH	----
LWWS	H2OWSH	----	VPRWSF	----	WWMIX
VFLRG2	----	WWMIX	VAZ	----	WWMIX
VHTRG1	----	WWMIX	ADDH2O	----	H2OWSH

FLOWSHEET CONNECTIVITY BY BLOCKS

BLOCK	INLETS	OUTLETS
WWMIX	VPRWSF VFLRG2 VAZ VHTRG1	WWFEED
H2OWSH	WWFEED ADDH2O	ACIDGAS LWWS

COMPUTATIONAL SEQUENCE

SEQUENCE USED WAS:
WWMIX H2OWSH

OVERALL FLOWSHEET BALANCE

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.320339	.320340	-.287075D-10
CO	4.19520	4.19520	-.287074D-10
CO2	132.735	132.735	-.286791D-10
CH4	2.86380	2.86380	-.287074D-10
N2	.141958D-01	.141958D-01	-.287073D-10
H2S	136.366	136.366	-.284646D-10
H2O	385.000	385.000	.200865D-10
C6H6	4.84130	4.84130	.735944D-12
CH3OH	7.75340	7.75340	.211151D-10
TOTAL BALANCE			
MOLE(LBMOL/HR)	674.089	674.089	.0
MASS(LB/HR)	18215.9	18215.9	-.876706D-11
ENTHALPY(BTU/HR)	-.726359D+08	-.726359D+08	-.808623D-07

RECTISOL - WATER WASH COLUMN 2
PHYSICAL PROPERTIES SECTION

COMPONENTS

ID	TYPE	FORMULA	NAME OR ALIAS
H2	C	MISSING	H2
CO	C	MISSING	CO
CO2	C	MISSING	CO2
CH4	C	MISSING	CH4
N2	C	MISSING	N2
H2S	C	MISSING	H2S
H2O	C	MISSING	H2O
C6H6	C	MISSING	C6H6
CH3OH	C	MISSING	CH4O

OPTION SETS

KEY TO OPTION SET TABLES:
OPTION SET ID
MP KEYWORD MP ROUTE ID

RECTISOL - WATER WASH COLUMN 2
PHYSICAL PROPERTIES SECTION

OPTION SETS (CONTINUED)

SYSOPO		OPSETA		SYSOP14	
PHILMX	PHILMXOO	PHIVMX	PHIVMX14	PHIVMX	PHIVMX14
HVMX	HVMXOO	PHILMX	PHILMX14	PHILMX	PHILMX14
HLMX	HLMXOO	HVMX	HVMX13	HVMX	HVMX14
GVMX	GVMXOO	HLMX	HLMX13	HLMX	HLMX14
GLMX	GLMXOO	GVMX	GVMX14	GVMX	GVMX14
SVMX	SVMXOO	GLMX	GLMX14	GLMX	GLMX14
SLMX	SLMXOO	SVMX	SVMX14	SVMX	SVMX14
VVMX	VVMXOO	SLMX	SLMX14	SLMX	SLMX14
VLMX	VLMXO1	VVMX	VVMX14	VVMX	VVMX14
MUVMX	MUVMXO1	VLMX	VLMX14	VLMX	VLMX14
MULMX	MULMXO1	MUVMX	MUVMXO2	MUVMX	MUVMXO2
KVMX	KVMXO1	MULMX	MULMXO2	MULMX	MULMXO2
KLMX	KLMXO1	KVMX	KVMXO2	KVMX	KVMXO2
DVMX	DVMXO1	KLMX	KLMXO1	KLMX	KLMXO1
DLMX	DLMXO1	DVMX	DVMXO2	DVMX	DVMXO2
SIGLMX	SIGLMXO1	DLMX	DLMXO1	DLMX	DLMXO1
PHIV	PHIVOO	SIGLMX	SIGLMXO1	SIGLMX	SIGLMXO1
PHIL	PHILOO				
HV	HVOO				
HL	HLOO				
GV	GVOO				
GL	GLOO				
SV	SVOO				
SL	SLOO				
VV	VVOO				
VL	VLO1				
MUV	MUVO1				
MUL	MULO1				
KV	KVO1				
KL	KLO1				
SIGL	SIGLO1				
PHISMX	PHISMXO2				
HSMX	HSMXO2				
GSMX	GSMXO2				
SSMX	SSMXO1				
VSMX	VSMXO2				
KSMX	KSMXO1				
PHIS	PHISO2				
HS	HSO2				
GS	GSO2				
SS	SSO2				
VS	VSO1				
KS	KSO1				

MIXER (MIXER): WWMIX
INLET STREAM(S): VPRWSF VFLRG2 VAZ VHTRG1

OUTLET STREAM: WWFEED
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.320339	.320339	.0
CO	4.19520	4.19520	.0
CO2	132.735	132.735	.0
CH4	2.86380	2.86380	.0
N2	.141958D-01	.141958D-01	.0
H2S	136.366	136.366	.0
H2O	.320000D-04	.320000D-04	.0
C6H6	4.84130	4.84130	.0
CH3OH	7.75340	7.75340	.0
TOTAL BALANCE			
MOLE(LBMOL/HR)	289.089	289.089	.0
MASS(LB/HR)	11280.1	11280.1	.322512D-15
ENTHALPY(BTU/HR)	-.249352D+08	-.249352D+08	-.503956D-07

*** INPUT DATA ***

OUTLET PRESSURE ,PSI	MISSING
TYPE OF FLASH - TWO PHASE	
MAXIMUM NUMBER OF ITERATIONS IN FLASH	30
CONVERGENCE TOLERANCE FOR FLASH	0.100000-03

FRACTIONATIO (RADFRC): H2OWSH
INLETS - WWFEED STAGE 4
ADDH2O STAGE 1
OUTLETS - ACIDGAS STAGE 1
LWWS STAGE 4
PROPERTY OPTION SET OPSETA

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (LBMOL/HR)			
H2	.320339	.320340	-.287075D-10
CO	4.19520	4.19520	-.287074D-10
CO2	132.735	132.735	-.286791D-10
CH4	2.86380	2.86380	-.287074D-10
N2	.141958D-01	.141958D-01	-.287073D-10
H2S	136.366	136.366	-.284646D-10
H2O	385.000	385.000	.200865D-10
C6H6	4.84130	4.84130	.735944D-12
CH3OH	7.75340	7.75340	.211151D-10
TOTAL BALANCE			
MOLE(LBMOL/HR)	674.089	674.089	.0
MASS(LB/HR)	18215.9	18215.9	-.876726D-11
ENTHALPY(BTU/HR)	-.726359D+08	-.726359D+08	-.635620D-07

RECTISOL - WATER WASH COLUMN 2
U-O-S BLOCK SECTION

FRACTIONATIO (RADFRC): H2OWSH (CONTINUED)

*** INPUT DATA ***

**** INPUT PARAMETERS ****

NUMBER OF THEORETICAL STAGES	4
MAXIMUM OUTSIDE LOOPS	25
MAXIMUM INNSIDE LOOPS PER OUTSIDE LOOP	10
ALGORITHM OPTION	1
BOUNDED WEGSTEIN MODULUS FOR OUTSIDE LOOPS	1
MAXIMUM ITERATIONS FOR FEED FLASH	30
ENTHALPY BALANCE OPTION CODE	0
DESIGN SPECS METHOD OPTION CODE	1
KB UPDATING OPTION CODE	1
INNSIDE LOOP ITERATION METHOD CODE	0
KB WEIGHTING OPTION CODE	2
MAX COMP BALANCES FOR NONIDEAL OPTION	10
OUTSIDE LOOP CONVERGENCE TOLERANCE	0.100000-03
MINIMUM INSIDE LOOP CONV TOLERANCE	0.300000-05
INITIAL INSIDE LOOP CONV TOLERANCE	0.0100000
INSIDE LOOP CONV TOL REDUCTION FACTOR	0.30000
INSIDE LOOP RMS ERR FOR JACOBIAN UPDATE	1.000000-06
COMPONENT MASS BALANCE CONV TOLERANCE	0.100000-06
COMP MASS BAL FACTOR FOR NONIDEAL CASE	0.0100000
COMP MASS BAL TOL FOR NONIDEAL CASE	0.100000-04
SIMPLE MODEL SLOPE PARAMETER UPDATE TOLERANCE	0.050000
QMIN FOR BOUNDED WEGSTEIN IN OUTSIDE LOOP	0.0
QMAX FOR BOUNDED WEGSTEIN IN OUTSIDE LOOP	0.50000
BOUNDED WEGSTEIN SLOPE TOLERANCE	0.050000
FACTOR 1 FOR PERFORMANCE SPEC CONV ALG	0.100000
FACTOR 2 FOR PERFORMANCE SPEC CONV ALG	0.20000
FEED FLASH CONVERGENCE TOLERANCE	1.000000-06
QMIN FOR BOUNDED WEGSTEIN IN INSIDE LOOP	0.0
QMAX FOR BOUNDED WEGSTEIN IN INSIDE LOOP	0.50000
LIMITING MF FOR NONIDEAL SIMPLE MODEL PARAMS	0.99000
MAX FOR NONIDEAL SIMPLE MODEL PARAMS AT X=O	1.50000
MAX FOR NONIDEAL SIMPLE MODEL PARAMS AT X=.5	1.30000
MIDDLE LOOP CONVERGENCE TOLERANCE	0.20000
MANIPULATED VARIABLE FACTOR	0.100000-04

**** COL-SPECS ****

VAPOR DISTILLATE / TOTAL DISTILLATE	1.00000
CONDENSER DUTY BTU/HR	0.0
REBOILER DUTY BTU/HR	0.0

**** PROFILES ****

TEMP-EST	STAGE	1	TEMP, F	80.0000
		4		0.0
P-SPEC	STAGE	4	PRES, PSI	26.0000
		1		25.0000

RECTISOL - WATER WASH COLUMN 2
U-O-S BLOCK SECTION

FRACTIONATIO (RADFRC): H2OWSH (CONTINUED)

*** RESULTS ***

TOP TRAY TEMPERATURE	F	88.9567
BOTTOM TRAY TEMPERATURE	F	40.9311
TOP TRAY LIQUID FLOW	LBMOL/HR	382.652
BOTTOM TRAY LIQUID FLOW	LBMOL/HR	388.392
TOP TRAY VAPOR FLOW	LBMOL/HR	285.697
BOTTOM TRAY VAPOR FLOW	LBMOL/HR	2.07177

**** PROFILES ****

STG	TEMP F	PRESS PSI	L-FLOW LBMOL/HR	V-FLOW LBMOL/HR
1	88.957	25.000	382.65	285.70
2	74.823	25.333	379.85	283.35
3	49.242	25.667	378.74	280.54
4	40.931	26.000	388.39	2.0718

**** X-PROFILE ****

STAGE	H2	CO	CO2	CH4	N2	H2S
1	.28737D-07	.40555D-06	.40934D-03	.48602D-06	.82244D-09	.13093D-02
2	.30687D-07	.47408D-06	.53190D-03	.58787D-06	.97354D-09	.15993D-02
3	.35207D-07	.65667D-06	.89539D-03	.87248D-06	.13876D-08	.24713D-02
4	.11768D-09	.35038D-08	.19571D-03	.97499D-08	.45856D-11	.17146D-02

**** X-PROFILE ****

STAGE	H2O	C6H6	CH3OH
1	.99825	.29863D-04	.49094D-05
2	.99778	.41268D-04	.48360D-04
3	.99553	.78629D-04	.10188D-02
4	.97076	.73660D-02	.19962D-01

**** Y-PROFILE ****

STAGE	H2	CO	CO2	CH4	N2	H2S
1	.11213D-02	.14684D-01	.46433	.10024D-01	.49688D-04	.47498
2	.11306D-02	.14806D-01	.46874	.10108D-01	.50101D-04	.48068
3	.11419D-02	.14954D-01	.47358	.10209D-01	.50602D-04	.48587
4	.64139D-05	.11939D-03	.12726	.15768D-03	.25280D-06	.27326

**** Y-PROFILE ****

STAGE	H2O	C6H6	CH3OH
1	.27876D-01	.69319D-02	.12806D-05
2	.17449D-01	.70297D-02	.79212D-05
3	.70079D-02	.71151D-02	.66782D-04
4	.43980D-02	.59400	.79396D-03

DESCRIPTION OF STREAM CLASS CONVEN

STREAM CLASS : CONVEN
SUBSTREAMS : MIXED
SUBSTRM CLASS: MIXED

RECTISOL - WATER WASH COLUMN 2
STREAM SECTION

WWFEED ACIDGAS LWWS VPRWSF VFLRG2

STREAM ID		WWFEED	ACIDGAS	LWWS	VPRWSF	VFLRG2
FROM :		WWMIX	H2OWSH	H2OWSH		
TO :		H2OWSH			WWMIX	WWMIX
CLASS:		CONVEN	CONVEN	CONVEN	CONVEN	CONVEN
SUBSTREAM: MIXED		STRUCTURE: CONVENTIONAL				
H2	LBMOL/HR	0.3203	0.3203	.45708-07	0.2323	0.0856
CO	LBMOL/HR	4.1952	4.1951	.13608-05	1.7165	2.2428
CO2	LBMOL/HR	132.7350	132.6589	0.0760	5.8682	15.5406
CH4	LBMOL/HR	2.8638	2.8637	.37868-05	0.6301	1.6930
N2	LBMOL/HR	0.0141	0.0141	.17810-08	0.0122	.99000-03
H2S	LBMOL/HR	136.3661	135.7001	0.6659	5.3386	2.5633
H2O	LBMOL/HR	.32000-04	7.9640	377.0360	.32000-04	0.0
C6H6	LBMOL/HR	4.8413	1.9804	2.8608	0.0207	0.0
CH3OH	LBMOL/HR	7.7534	.36587-03	7.7530	0.0256	0.0421
TOTAL	LBMOL/HR	289.0893	285.6975	388.3918	13.8442	22.1683
TEMP	F	-26.4680	88.9567	40.9310	-21.8755	-24.0600
PRES	PSI	30.0000	25.0000	26.0000	30.0000	30.0000
ENTHALPY	BTU/LBMOL	-.86254+05	-.86337+05	-.12351+06	-.83453+05	-.12801+06
VFRAC		0.9590	1.0000	0.0	0.9981	0.9999
LFRAC		0.0409	0.0	1.0000	0.0018	.18555-06
ENTROPY	BTU/LBMOL-R	3.0760	5.8200	-29.6140	5.2378	1.0466
DENSITY	LBMOL/CUFT	0.0068	0.0042	2.6366	0.0064	0.0065
AVG MW		39.0195	38.2420	18.7703	36.2342	38.9216

RECTISOL - WATER WASH COLUMN 2
STREAM SECTION

VAZ VHTRG1 ADDH2O

STREAM ID		VAZ	VHTRG1	ADDH2O
FROM :				
TO :		WWMIX	WWMIX	H2OWSH
CLASS:		CONVEN	CONVEN	CONVEN
SUBSTREAM: MIXED		STRUCTURE: CONVENTIONAL		
H2	LBMOL/HR	.13950-03	0.0023	0.0
CO	LBMOL/HR	0.0041	0.2318	0.0
CO2	LBMOL/HR	1.8238	109.5024	0.0
CH4	LBMOL/HR	0.0056	0.5351	0.0
N2	LBMOL/HR	.17800-04	.98800-03	0.0
H2S	LBMOL/HR	22.7487	105.7155	0.0
H2O	LBMOL/HR	0.0	0.0	385.0000
C6H6	LBMOL/HR	4.8206	0.0	0.0
CH3OH	LBMOL/HR	7.6680	0.0177	0.0
TOTAL	LBMOL/HR	37.0709	216.0057	385.0000
TEMP	F	130.0000	-75.3200	100.000
PRES	PSI	48.0000	33.5000	40.0000
ENTHALPY	BTU/LBMOL	-.27864+05	-.92170+05	-.12390+06
VFRAC		0.9128	0.9250	0.0
LFRAC		0.0871	0.0749	1.0000
ENTROPY	BTU/LBMOL-R	-0.0892	1.5985	-26.4342
DENSITY	LBMOL/CUFT	0.0083	0.0091	2.5837
AVG MW		39.8695	39.0622	18.0150