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A STUDY OF THE OPTIMIZATION OF

ETHYLENE PRODUCTION IN A TUBULAR

REACTOR

ΒY

RICHARD W. J. ROBERTSON

A THESIS

PRESENTED IN PARTIAL FULFILLMENT OF

THE REQUIREMENTS FOR THE DEGREE

OF

MASTER OF SCIENCE IN CHEMICAL ENGINEERING

AΤ

NEWARK COLLEGE OF ENGINEERING

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Newark, New Jersey 1972

APPROVAL OF THESIS

A STUDY OF THE OPTIMIZATION OF ETHYLENE PRODUCTION IN A

TUBULAR REACTOR

ΒY

RICHARD W. J. ROBERTSON

FOR

DEPARTMENT OF CHEMICAL ENGINEERING

NEWARK COLLEGE OF ENGINEERING

BY

FACULTY COMMITTEE

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Abstract

The pyrolysis of ethane is a complex reaction involving six individual reactions in a reactant mixture of thirteen components. It is further complicated by the deposition of carbon along the reactor walls. The carbon buildup eventually necessitates reactor shutdown. During the intermediate stages the reactor experiences a gradual increase in inlet pressure which affects the reaction conditions. Optimum temperature profiles exist because the yield goes up with increasing temperature, but, consequently, the reactor must be shut down and cleaned out with increasing frequency. The combined effect causes the yearly production of ethylene to go through an optimum.

To find this optimum a computer program was developed with the ability of handling 25 simultaneous reactions involving up to 25 components. It calculates the carbon deposition profile and the changing pressure profiles, as a function of a predetermined reaction gas temperature profile. The reactor will remain in production until the inlet pressure exceeds eight atmospheres. The average yearly production rate is calculated, assessing a reactor shut down penalty of 24 and 48 hours required for the cleaning of the clogged pyrolysis tubes.

The optimum exit temperature for the 24 hour penalty

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was $1127^{\circ}K$ with a corresponding 57% one pass ethane conversion. The 48 hour penalty lowers the optimum exit temperature to $1124^{\circ}K$ and a 50.5% ethane conversion.

The practice of increasing pressure to compensate for carbon buildup results in accelerated carbon deposition and is detrimental to overall production scheme.

The program given here is immediately applicable to any plug flow system, the only additional requirement being the physical and thermodynamic constants for the additional components. The program could, for example, be used to calculate the production of acetylene.

Acknowledgments

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Chapter 1

Introduction

Optimization of Ethylene Production

To perform an optimization one needs some sort of plant description to form an objective function such as production rate or profit margin which must be optimized in terms of the independent variables. 1

Historically, plant data were used in deriving mathematical models by regression analysis. Some plants had even been deliberately disturbed in order to obtain enough data to determine the independent variables into which the plant was being fitted.⁽⁴⁷⁾

This method has many drawbacks such as noise in the plant data causing unreliability in the readings and a limited range of conditions under which the data is collected. Conditions outside of the range of those specifically studied must be calculated by the relatively unreliable method of extrapolation.

An alternative method is to simulate the plant based on the physical and chemical conditions. This simulated model can then be perturbed to determine the effect on the function to be optimized.

In this study, the objective function will be the yearly production rate of ethylene. The temperature profile in the reactor will be the independent variable.

In order to describe plant conditions as thoroughly and accurately as possible, a model should consider the entire plant, including recycle streams, separators and peripheral equipment as well as the reactor. This is not the intent of this study.

It was decided that the optimization of production rate would be most meaningful and would give optimum conditions close to the optimum based on an overall profit objective function.

Pyrolysis of Ethane Process

Ethylene is a basic raw material used in the manufacture of polyethylene and polyethylene copolymers. Plant sizes range between 50 to 250 million pounds per year. The pyrolysis of ethane is very economically profitable because the raw material, ethane, would have a minimum value as a fuel gas. Ethylene is produced by cracking of feed stock in furnaces at temperatures up to 1250°K.

Almost all larger refineries have several furnaces which operate with different feed stocks, notably various proportions of ethane. propane and butane. The reactor pressure and temperature profiles and feed rates are also varied. The products from these different streams are generally combined into one stream after quenching to stop the production of unwanted byproducts.

The program PYRO is able to handle each set of feed stocks independently and perform separate optimizations for each furnace. In this study, only the case of pure ethane and steam as feed was considered. The program is also capable of optimizing the production of acetylene by an increase in the residence time. The program is capable of handling any gas or gas solid phase system of reactions. PYRO calculates the changing concentration and pressure profiles as functions of an induced temperature profile.

Carbon Deposition

Carbon is one of the byproducts of the pyrolysis reactions. Carbon is deposited on the wall of the reactor and results in a continuously changing reactor radius. The changing radius results in a change in the inlet pressure because the outlet pressure is maintained at about 2 atmospheres. Eventually the inlet pressure reaches a value which is too high to keep the system operating. When this occurs, the reactor must be shut down for cleaning.

The yearly production rate of ethylene is defined as the total amount of ethylene produced in a year. The yearly production rate is affected by both the yield of ethylene from ethane and the percent of the time the reactor is in production.

An increase in yield causes an increase in the yearly production rate. An increase in the frequency of reactor shutdown causes a drop in the yearly production rate.

An increase in reactor outlet temperature increases both the yield of ethylene and the rate of carbon deposition, hence causing an increase in the frequency of reactor shutdown. Due to these combined effects, the yearly production rate of ethylene will go through an optimum. The yearly production rate will first increase because the increase in yield is the dominant effect. However, the frequency of reactor shutdown first starts to slow down the increase in production rate and then reverses the upward trend. The temperature at which the reversal takes place represents the outlet temperature which will optimize the yearly production rate.

Under extreme conditions, the reactor may be shut down every 40 hours for a 24 - 48 hour cleaning. Under the mildest conditions, the reactor could continue to operate for years between shutdowns with a yield of only 8% ethylene from ethane.

The optimum is also shifted toward the lower end of the temperature range due to the formation of byproducts.

Chemistry of Pyrolysis

The chief products from thermal cracking furnaces vary from feed to feed. For the feed considered in this study,

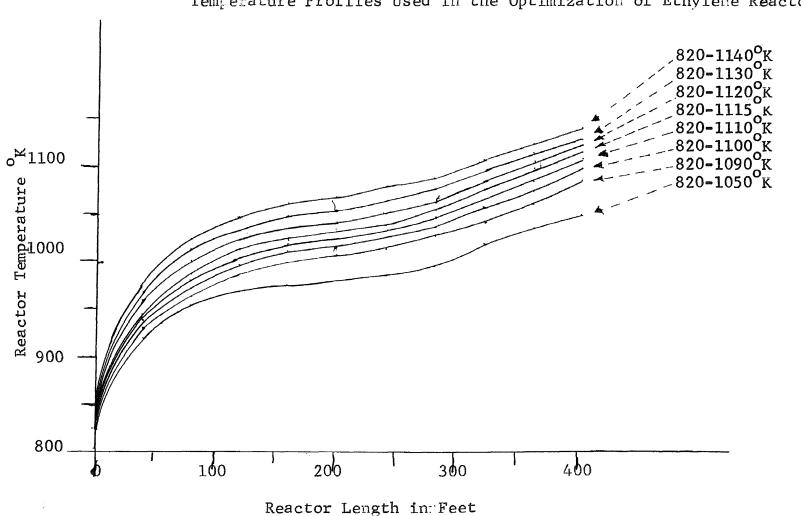
the chief products were ethane, ethylene, acetylene, methane, hydrogen and coke. Small amounts of aromatics were also formed. As an approximation these were defined to have the properties of C4's and C6's alpha olefins.

The six equations considered in this study were: (48)

	Order Forward	Order Reverse	
$C_2H_6 \rightarrow C_2H_4 + H_2$	1	1-1 (1	1)
$C_2H_6 \rightarrow CH_4 + \frac{1}{2}C_2H_4$	1	1-1 (2	2)
$C_2H_4 \rightarrow C_2H_2 + H_2$	1	1-1 (3	3)
$C_2H_2 \rightarrow 2C + H_2$	2	1-1 (4	4)
$2C_{2}H_{2} \rightarrow C_{4}H_{4}$ (i.e.) C4's	1	1 (5)
$C + H_2 O \rightarrow CO + H_2$	1-0	1-1 (6)

The temperature profiles were estimated from the published temperature profiles for pyrolysis furnaces. ⁽⁴⁷⁾ Other profiles were then produced in such a way that the initial temperature remained the same and the increase in temperature along the reactor length was paralleled to the original profile plus an increment proportional to the difference between the final outlet temperature and the distance along the reactor length. In this study, only these temperature profiles were imposed upon the system to determine the optimum.

<u>Figure 1</u>



Temperature Profiles Used in the Optimization of Ethylene Reactor

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Chapter 2

Review of the Literature

Use of Computers in Pyrolysis

(46) Shah wrote a computer program to calculate the composition profiles throughout a purolysis furnace. Simultaneous mass and energy balances were used with a forced parabolic pressure profile. The kinetic data were corrected by obtaining data from two furnaces, one cracking ethane and the second cracking primarily propane. The Arrhenius constants were adjusted to make the model agree with the data from the furnaces.

Shah then varied a number of parameters in order to determine their effect of yield. The following was observed:

> "Increase in the inlet pressure led to a 1. increased decomposition of ethane; however the percent of ethane yielding ethylene decreased owing to the increase in the rate of side reactions relative to the conversion rate of ethane to ethylene."

The increase in pressure necessary to overcome 2. the pressure drop caused by carbon deposition increased the rate of carbon deposition. 3. As the steam to feed ratio was increased two fold there was a slight increase in ethane decomposition and ethylene yield. The steam also suppressed the formation of coke and polymerization reactions. The coke had a detrimental effect on the heat transfer through the reactor wall and required additional heat input to maintain the same temperature profile.

4. As the <u>feed rate</u> was increased the percent yield of ethylene dropped off, however the total production rate increased (i.e. the selectivity factor increased). This increase was the result of suppression of side reactions because there was a decrease in gas residence time in the tube with increased feed rate.

 <u>Feed temperature</u> had little effect on the overall yield, even at a temperature 300°K higher than those first used. This was due to the fact that the initial position of the reactor was used as a preheater and little reaction occurred.
 The reduction in the overall heat transfer due to carbon buildup decreased ethylene yield by 3%.

7. Reactor temperature profile had a drastic effect on ethane decomposition. However, the higher temperatures were found to reduce ethylene yield due to increase in side reaction.

A second study by Shah⁽⁴⁷⁾ showed that it was possible to reduce a complex model to a more simple one. Shah stated that this simplification was necessary despite the advent of third generation high speed computers because of the large number of individual calculations required in the more complex model. The simplified model had the disadvantage that it could not be extrapolated outside of the range of values in which it was derived. This handicap was overcome by using operating data close to the optimum conditions. This method had the further disadvantage that it could not be used with accuracy to predict models with different parameters.

Katz discussed the use of computers in engineering education in a study done at the University of Michigan ⁽⁴⁰⁾ comparing the efficiency of using finite differential techniques to using Runge-Kuta integral procedures. It was found that reactor length increments 10 to 50 times larger could be used without appreciable loss of accuracy. This enabled a considerable saving in computer time.

Andrews and Pollock ⁽²⁾ used stoichiometric and kinetic data from laboratory data to express the relationship between the main and side reactions in the cracking of butane, propane and ethane feedstock. They used rate expressions which performed a step change at 75% decomposition of the butane.

Andrews and Pollock's computer program took into account the overall rate of reaction coupled with pressure drop and heat transfer calculations.

Andrews and Pollock reported:

"... composition, temperature, pressure and enthalpy of the gas and skin temperature of the tube are determined for each tube. Average Datatron (computer) time for calculating each tube was less than 2 minutes. This speed makes it possible to investigate and select the tube diameter, length, and number of tubes needed to meet specifications for a given furnace design."

Andrews suggested that for a given furnace design, variation of feed stocks, heat flux pressure, temperature, steam rate and feed rate were readily predictable.

Myers and Watson ⁽³⁶⁾ analyzed data from the literature for the pyrolysis of propane and developed rate equations for ten reactions which contributed significantly in determining the rate and product distribution. The results were in satisfactory agreement with data found in the literature. Myers and Watson used simple stoichiometric equations but with an apparent order of reactions which was empirically evaluated from the effect of pressure on rate.

Myers and Watson reported:

"When using such apparent order of reactions to represent the net results of series or chains of reactions it must be carefully recognized that the treatment is empirical and cannot serve as a reliable basis for extended extrapolation."

Rosier and Watson⁽⁴²⁾ reported that absolute reaction rate measurements, particularly at high temperatures, were notoriously inconsistent and unreliable largely due to the difficulty of accurately determining the true effective temperature or reactor volume.

Schneider and Frolich⁽⁴⁵⁾ did work on the products from propane which was perhaps the most extensively reported in literature. But no report on kinetics was included, nor was there sufficient data from which absolute rates could be calculated.

Frey and Hepp⁽¹⁸⁾ noted in a review of the literature that no data was available which included both detailed product distribution coupled with data necessary to obtain the required absolute reaction rate.

Burk, Laskowski and Lankelma ⁽¹¹⁾ treated the decomposition of pseudo first order reactions and reported the rate in the form $(-r_a)=KC_a$ and used pseudo Arrhenius rate constants $K_c=Ae^{-E/RT}$ where

r_a = rate of decomposition of reactant A moles/

(volume)(time)

- K = reaction velocity constant in units 1/time
- C₂ = concentration of A(moles/volume)
- E = apparent energy of activation, calores/gram mole

Burk et al reported that in spite of the widely varying values of E which are reported in the literature, an average value of 63,000 calories/gram mole is in good agreement with reliable data for all normal paraffins.

Towell and Martin ⁽⁶¹⁾ developed a rigorous method to account for non-uniform temperature distribution in the analysis of kinetic data.

Bonner and Honeycutt ⁽⁸⁾ described the versatile role that the digital computer can play in both on line and off line applications.

Lindsay and Wulzen ⁽³²⁾ described the role of the digital computer in off line calculations of product yield and optimization techniques.

Feigin et al ⁽¹⁷⁾ used the computer to solve for optimum design. Feigin developed a set of equations with different parameters which the computer adjusted to find optimum operating conditions in a coil tube furnace.

Lindahl ⁽³¹⁾ used a computer program to calculate unit

operations in a refinery gas recovery process. The results were optimized in terms of equipment efficiency and process variables. The economics of the process operations and equipment changes were reviewed.

Tayyabklan ⁽⁵⁹⁾ described the use of an on line computer which controlled the values of the pyrolysis stream directly. The computer had also been programmed to obtain operational data of all sorts from the plant and produce reports for various levels of management.

Noguchi et al ⁽³⁷⁾ described a system for optimum control of a refinery.A linear program was discussed in the designing stage as well as the operational phase of a large refinery.

Chemistry of Pyrolysis

Kevorkian ⁽²⁴⁾ gave a complete review of the chemistry of light hydrocarbons at high temperature pyrolysis conditions. Amano and Uchiyama ⁽¹⁾ proposed a mechanism for the formation of propylene which predicted two different reactant zones. At lower temperatures and high propylene concentration the reaction was characterized by the formation of higher boiling materials (polymers) and it obeyed the (3/2) order rate law. At high temperatures and lower pressures the formation of the allene became important and the reaction obeyed first order kinetics. Consistent results were obtained for the

proposed mechanism when existing data was analyzed for both product distribution and reaction rate.

Reaction Rate

Swinbourne ⁽⁵⁶⁾ developed an extrapolation procedure for obtaining rate constants and final concentrations of the first order reaction. The method was applied to the pyrolysis of cyclohexyl chloride and cyclopentyl chloride and the rate constants from the pressure time data were calculated. The method was both versatile and time saving and was applicable to other pyrolysis reactions.

Szepesy, Simon and Simon (57) developed a method to determine the composition of the product stream from a pyrolysis reaction. This method involved the use of gas chromatography and was able to detect N₂, CH₄, C₂H₂, C₂H₆, C₃H₈, C₄H₁₀. The use of this "fast" analytical method when coupled with the integral rate determination of Otowell should be helpful in determination of plant kinetic data.

Equilibrium Data

Lavrov and Bakilstskii ⁽²⁶⁾ determined the composition of the equilibrium mixture obtained in the pyrolysis of hydrocarbons in the presence of oxygen and water. This was accomplished by solving the simultaneous equations arising from each individual reaction taking place in the system. The equilibrium coefficient for any compound was characteristic

of the compound at the given temperature and pressure and was a constant for all reactions. The equilibrium constant K and the partial pressure can then be calculated from the known value of the equilibrium coefficient.

Heat of Reaction

(53) Stepanov and Stepanova (53) showed how to use total enthalpy of mixture temperature diagrams in determining the amount of heat required during any stage of pyrolysis. It was possible to calculate quickly and show up any errors and inconsistencies in the calculations. The charts were directly applicable to the ethane and propane pyrolysis.

Heat Transfer

Butovski et al (12) gave mathematical equations for heat radiation exchange between coil and furnace based on the Stefan-Boltzman Law.

(52) Stepanov determined the effect of the decomposition of $(C_{1-5} \text{ and } H_2)$ on the heat transfer coefficient. With studies of the Reynolds number about 50 - 500 experimental results were approximated within 20% by the equation

$$Nu = 0.77 \text{ Re}^{2} \text{ Pr}^{4} \text{ Gr}^{1}$$
(7)

where Nu is the Nusselt number

Re is the Reynolds number

Pr is the Prandel number

Gr is the modified Grashoff number

$$Gr = gd^3 (\delta \Delta X + B\Delta T) / \sqrt{2}$$
 (8)

where § characterizes an increase in the number of moles \(\lambda\) X is the difference in conversion between the center and the pinside wall

and

Carbon Deposition

Palmer ⁽³⁹⁾ reviewed the literature and cited references relative to the kinetics and mechanism of carbon deposition during gaseous pyrolysis.

Tamai et al ⁽⁵⁸⁾ made a study to clarify the phenomenon of the decomposition of carbon on the reactor wall in the thermo decomposition of hydrocarbons. The effect of the wall material on the decomposition of methane was as follows:

1. Iron and nickel plates showed deposition of carbon.

2. Titanium, tungsten and silicon plates caused carbonization of methane.

3. Gold, silver and copper plates showed a thin, nonclinging film similar to graphite.

The differences were attributed to the affinity of carbon to the different materials of the plates.

Cahn et al (13) obtained a U.S. patent describing a decoking method for a pyrolysis tube. The tubes of the

thermo cracking furnace were decoked by cutting out the flow of hydrocarbon feed and passing steam in one of the tubes at a time so as not to completely shut down the furnace. Steam entered at 700° F (645°K) at a rate of 15 $1b/sec/ft^2$ (tube cross-sectional area). Cleaning took approximately 12 hours per tube and the procedure was carried out in the next tube.

Esso Research and Engineering Company ⁽¹⁵⁾ obtained a patent in which the claim was made that carbon would be eliminated by passing free hydrocarbons (e.g. ethane), through the cracking tube. The sulfur content was less than 20 p.p.m. Outlet temperature was 1037°K at a velocity of approximately 1000 ft/sec. The carbon was removed by the mechanical action of the high velocity gas.

Buckley et al ⁽⁹⁾ described a vertical concentric tubular reactor in which the outer annular section communicates with the central tubular section at the upper end. The reactants were fed together at the lower end of the annular section and were preheated while they flowed up, then reacted in the center tubular section and left at the lower end. Carbon deposition on the walls of the center was avoided by keeping the wall temperature below the point at which the wall metal displays catalysis activity leading to carbon deposition.

This was achieved by maintaining higher gas velocities in the annular preheating section so that the gas to outer wall heat transfer coefficient is lower than the inner wall to gas coefficient maintaining the wall temperature close to gas temperature.

Oliver ⁽³⁷⁾ described a method to clean a pyrolysis tube being fed liquid hydrocarbon feed. By switching to ethane feed every 100 hours and feeding ethane for ½ to 5 hours the pressure drop in the reactor was brought back to mormal. This allowed a reactor shut down time to be increased by a factor of six resulting in a greatly increased production rate. No explanation of the phenomenon was offered, although it was most probably due to the mechanical action of a high speed ethane flow.

Tucker ⁽⁶²⁾ described a conical design which minimized coke formation. This served as a purge which kept the tubes clean.

Heicklen et al (20) assumed that the pyrolysis of gas gave an active species (C) that could be added to carbon particles (C_n).

$$C + C_{n} \xrightarrow{} C_{n+1}$$
(9)

The particle size distribution was a function of pressure and temperature. At high pressures and temperatures the particle size was smaller. The maximum deposition rate of carbon was achieved soon after reactor start up. At lower pressures and temperatures the maximum rate of deposition occurred after more time had elapsed. The particle size also increased. Carbon deposition was assumed to be linear with the rate of production of (C).

Furnace Construction

Hennig ⁽²⁴⁾ described a vertical furnace which was packed with inert heat exchange solids which were heated to form a hot zone which occupied only a fraction of the total height. When the hot zone was near the bottom, reactants were admitted from the bottom and the hot zone moved **up** by the heating effect of the reacting mixture. Flow was reversed when the zone reached the top of the furnace and the cycle was repeated. This furnace was successful in eliminating the pre-heat section of the pyrolysis reactor.

Rosendahl ⁽⁴⁴⁾ discussed the formation of acetylene by the incomplete combustion of methane. Combustion was carried out in an electric arc.

Stepanov et al (54) designed a high pressure reactor consisting of a cylindrical vessel with internal coil as the component in a new pyrolysis process. The reactor used a contact time of .1 to .3 seconds, a pressure of 5. atmospheres and a temperature of 900°C and an outlet temperature on the wall of 1180° C with an outlet pressure of 1.2 atmospheres.

The outlet gas was immediately fed through a series of compressors with interstage brine cooler to bring the mixture to -10°C and 40 atmospheres. A yield of 39.7% ethylene was obtained along with .96 mole percent acetylene.

Chukanov et al ⁽¹⁴⁾ received a patent for an improvement of heat transfer in a pyrolysis furnace. The heat was applied via induction currents such as high frequency electric currents. In order to achieve uniform heating of the gas as well as to increase the yield of product, the decomposition was cerried out on a fixed attachment made of refractory metal or coke. To decrease radiation losses and improve heat accumulation the reactor was shielded from its immediate environment.

Mamedov et al ⁽³⁴⁾ received a patent describing a furance consisting of a combustion chamber mounted along with a recirculator of the fuel gases and equipment for heating and cracking of hydrocarbons. The continuous circular tubes connected in parallel were placed in jackets lined with fine grained, heat conducting and heat resistant packing and equipped with ribbed heating fins. This system enabled more convenient removal of tubes for decoking.

Smolen et al ⁽⁵⁰⁾ described the use of heavy oils to heat reactors where the $C_3/C_2 = 0.7$. Temperautre up to 1127°K can be achieved. It was recommended for $C_3/C_2 = 0.6$ that only horizontal fire heated reactors be used.

Supersonic Oxidative Pyrolysis

Vasil'ev et al $^{(64)}$ carried out the oxidative pyrolysis of hydrocarbons by introducting the hydrocarbons preheated to 500-600°C into oxygen at supersonic rates so that the 0_2 was unifromly distributed in the resulting mixture and no zones of extremely high temperature existed in the steel reactor lined with fire brick. Under laboratory conditions they obtained a yield of 58% ethylene from ethane. Propane yielded 57% ethylene and 14% propene. Butane gave 34% ethylene and 16% propene. Gasoline was also successfully pyrolyzed. The yield for butane and gasoline was 50% better than those obtained by conventional cracking.

Carbon black and coke were not produced and losses due to the formation of CO_2 and H_2O amounted to only 1%.

Sub-Sonic Oxidative Pyrolysis

(63) Vasil'ev et al also carried out a study in a full scale plant for three months comparing the thermo pyrolysis with thermo oxidative pyrolysis. The following table compared the results from the two runs:

Conditions	Thermo Cracking	Oxidative Cracking
Exit temperature	1093 ⁰ C	1053 ⁰ C
Butane in Kg/Hr	4071	4800
Steam in Kg/Hr	720	390
0 in Kg/Hr	-	987
N ₂ in Kg/Hr	-	53
事 書 名 智 電 智 電 雪 雪 雪 雪 雪 章 章 章 曹 章 章 章		* * * • • • • • • • • • • • • • • • • •
Overall Yield of		
Pyrolysis Gas	88.9%	107.3%
CH ₄	22.5%	29.0%
с _{2^н4}	25.5%	34.0%
^C 3 ^H 6	15.1%	13.4%
474 688 675 693 677 693 695 695 697 698 699 698 699 699 699 699 699 697 697 597		
Tars	16.1%	8.5%
Heat Load K Cal		
M Ton Feed	855,000	415,000
Heat Load K Cal		
M Ton C ₂ H ₄	3,340,000	1,240,200

The oxidative cracking was free of soot and coke formation and its efficiency based on C_{24}^{H} output was stated to be 2.0 to 2.5 times greater than that of the thermal cracking.

Pyrolysis of Heavy Feed Stock

Walker (65) described the history and problems encountered

in pyrolysis of a wide boiling mixture of naptha and gas oil. The system was originally designed for the production of ethylene and propane but has a total of 31 products including higher olefins, diolefins and higher aromatics. The reactor system includes 71 chemical species. To help solve the optimization which lies in the maximization of aromatics, two computer programs were used. One program solved a material balance and a linear program solving for 406 variables and constraints. The other was an extensive computer installation which had been successful in data logging, alarming, stream integration and in control functions but was not used in closed loop optimization or furnace control.

Thenov et al (60) ran experiments with a paraffin boiling at 250-350°C. The reactor charge was between 3.5 Kg/cm²/hr. with contact time of 0.1 to 0.5 seconds and using 25 weight percent steam.

The results are illustrated in the following table:

	Weight Percent Product		
	927 ⁰ K	1098°K	
Liquid Products	60.7	27.2	
Light Oils	18.8	13.5*	
Coke	1.5	7.5	
^C 2 ^H 4	-	31.5	
C ₃ H ₆	16.5	7.0	
C ₄ H	11.5	2.5	
$CH_4 + H_2$	16.8	39.1	

Tmenov also shows the dependency of unsaturated hydrocarbons and aromatics on temperature and reactor charge.

* The aromatic content increased with increasing temperature.

Theory

The computer program developed is capable of handling a maximum of twenty five reactions incorporating up to twenty five components. It would therefore be appropriate to discuss the theory incorporated in the program before the handling of the particular topic of this thesis.

Pyrolysis of Ethane

The generalized computer program was adapted to the pyrolysis of ethane. The reactions considered were:

	Order Forward	<u>Order Reverse</u>	
$C_2H_6 \longrightarrow C_2H_4 + H_2$	1	1-1	(1)
$C_2H_6 \rightarrow CH_4 + \frac{1}{2}C_2H_4$	1	1-1	(2)
$C_2H_4 \longrightarrow C_2H_2 + H_2$	1	1-1	(3)
$C_2H_2 \rightarrow 2C + H_2$	2	1-1	(4)
^{2C} ₂ H ₂ → C ₄ 's	1	1	(5)
$C + H_2 0 \rightarrow C0 + H_2$	1-0	1-1	(6)

I Treatment of Initial Data

A. Heat Capacity Data

It is necessary to calculate the delta heat capacity for

each reaction. This quantity will be read in the calculation of equilibrium constants as well as the overall heat balance. \triangle CP was calculated from the following relationship:

$$\Delta CP_{J} = \sum_{I=R+1}^{R+P} (CP_{I})_{J}^{*B}_{I} - \sum_{I=1}^{R} (CP_{I})_{J}^{*B}_{I}$$
(10)

- where $\underline{\bigtriangleup CP}_{J}$ is the coefficient of the Jth temperature term in the Delta heat capacity equation for the reaction Cal./g.mole/^oK.
 - P is the number of products.

$$(CP_I)_J$$
 is the coefficient of the Jth temperature term
of the Ith component in the heat capacity
equation for the component (Cal./g. mole/^OK).

- B_I is the stoichiometric coefficient of the Ith component.
- R is the number of reactants.

In order to get the heat capacity data in the same form it was necessary to curve fit heat capacity data (43) (44) to a third degree polynomial (See Appendix C).

The results of the curve fitting are as follows:

Component	A X 10 ⁰	x 10 ²	с х 10 ⁵	D X 10 ⁹	
Acety1ene	5.867	1.957	-1.296	3.466	ي مر تر ال
Iso-Butane	-1.901	9.930	-5.475	11.82	
N-Butane	0.09114	9.218	-4.761	9.577	
Iso-Butene	0.7098	8.209	-4.535	9.837	
Ethane	0.9065	4.420	-4.864	2.856	
Ethylene	0.9847	3.701	-1.945	4.042	
Hydrogen	7.010	-0.05366	0.1006	-0.2453	
Methane	4.010	1.493	-0.00173	-1.593	
Propane	-1.083	7.314	-3.788	7.672	
Propene	0.7342	5.663	-2.838	5.510	
Water	7.718	0.01285	0.3151	-1.150	
Carbon	-1.356	1,447	-1.101	3.028	
Carbon Monoxide	6.863	-0.04085	0.2480	-1.018	

Tab	1e	1
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Heat Capacity Data of Selected Components

Where

 $CP = A + BT + CT^2 + DT^3$

B. Heat of Reaction Data

It is necessary to calculate the Delta heat of reaction for each reaction per mole of the first component of each reaction. This is used in the overall heat balance. $\bigtriangleup H_T$ was calculated from the following relationship:

$$\Delta H_{T} = \sum_{I=R+1}^{R+P} (B_{I}/B_{1}) \Delta H_{I} - \sum_{I=1}^{R} (B_{I}/B_{1}) \Delta H_{I}$$
(11)

where ΔH_{T} is the Delta heat of reaction (Cal/ g mole) at 25°C.

 ΔH_{I} is the Delta heat of reaction of the Ith component of the reaction (Cal/g mole) at 25^o C. To calculate the heat of reaction, the heat of formation

was required. Following are the values of heats of formation.⁽²²⁾

Table II

Heat of Formation at 25°C

Component	Heat of Formation, Cal/g mole X 10 ⁻⁴
Acetylene	5.4194
Iso-Butane	-3.1452
N-Butane	-2.9812
Iso-Butene	0.0280
Ethane	-2.0236
Ethylene	1.2496
Hydrogen	0.0
Methane	-1,7889
Propane	-2,482
Propene	0.4879
Water	-5.7797
Carbon	0.0
Carbon Monoxide	-2.6416

Using these data the heat of reaction is calculated for each temperature using the data at 25°C and the heat capacity data.

C. Entropy

It is necessary to calculate the delta entropy data for each reaction. $\triangle S_T$ is used in the calculation of the equilibrium term for each reaction. $\triangle S_T$ is calculated from the following relationship:

$$\Delta \mathbf{S}_{\mathrm{T}} = \sum_{\mathrm{I}=\mathrm{R}+1}^{\mathrm{R}+\mathrm{P}} (\mathbf{B}_{\mathrm{I}}/\mathbf{B}_{\mathrm{I}}) \Delta \mathbf{S}_{\mathrm{I}} - \sum_{\mathrm{I}=1}^{\mathrm{R}} (\mathbf{B}_{\mathrm{I}}/\mathbf{B}_{\mathrm{I}}) \Delta \mathbf{S}_{\mathrm{I}}$$
(12)

where ΔS_{T} is the Delta entropy for the reaction (Cal/g mole $^{\circ}K$) at 25°C ΔS_{I} is the entropy of the Ith component of the reaction (Cal/g mole $^{\circ}K$) at 25°C

The following values were used:

Table III

Selected Values of Entropy

at	25°C	(22)	
----	------	------	--

Component	Entropy of Formation Cal/g mole K
Acetylene	47.997
Iso-Butane	70.42
N-Butane	74.10
Iso Butene	72.48
Ethane	54.85
Etyhle ne	52.45
Hydrogen	31.21
Methane	44.50
Propane	64.51
Propene	63.80
Water	45.106
Carbon	1.307
Carbon Monoxide	47.301

Entropy data were calculated by the program for each temperature using the data at 25°C and heat capacities.

D. Equilibrium Data

The following are the $Log(K_f)$ data used to calculate

Table IV

Selected Values of LOG(K) of Formation

Component	LOG(K) (1000°K)
Acetylene	-8.874
Iso-Butane	-14.59
N-Butane	-14.14
Iso-Butene	-13.67
Ethane	-5.701
Ethylene	-6.17
Hydrogen	0.0
Methane	-1.007
Propane	-9.983
Propene	-9.983
Water	10.05
Carbon	0.0
Carbon Monoxide	10.47

E. Calculation of the Equilibrium Constant

All equations are assumed to be reversible. The reverse kinetic rate constants will be calculated from equilibrium data developed from the equation ⁽⁴⁹⁾

 $\Delta \mathbf{F} = -\mathbf{RT} * \mathbf{LN} \quad (\mathbf{K}) \tag{13}$

 $K = \exp(-\Delta F^{\odot}/RT)$ (14)

or

using the relationship that

$$\Delta \mathbf{F} = \Delta \mathbf{H} - \mathbf{T} \Delta \mathbf{S} \tag{15}$$

and

$$\Delta \mathbf{F} = -\Delta \mathbf{H}_{O}(\mathbf{I})/\mathbf{R} + \Delta \mathbf{A}(\mathbf{I})/\mathbf{R} + \mathbf{L}\mathbf{N}(\mathbf{T}) + \Delta \mathbf{B}(\mathbf{I})/\mathbf{2}\mathbf{R} + \mathbf{T} + \Delta \mathbf{C}(\mathbf{I})/\mathbf{R}$$

$$6R * T^{2} + (D(I)/12R * T^{3} + FI(I))$$
(16)

where FI(I) is a constant of integration evaluated from a known equilibrium constant at a known temperature and using Equation (16) solved for FI(I).

The equilibrium constant for a known temperature was calculated from $Log(K_f)$. The data were taken from Selected Values of Chmiecal Thermodynamic Properties⁽⁴⁴⁾ and are shown in Table IV.

The Log_{10} (K_f) for reaction is calculated below

$$Log_{10}(K_f)$$
 Reaction = $\sum_{\text{Products}} B_K/B_1 * Log_{10}(K_f)_K$ -

$$E_{\text{Reactants}} \xrightarrow{B_{K}/B_{1}} \xrightarrow{*} \log_{10} (K_{f})_{K} (17)$$

The following equilibrium constants were either found in the literature or calculated from entropy and heat of formation data by using Equations (15) and (13):

Table V

Equilibrium Constants

Reaction	Eq. Con.	Temp. K	<u>Ref. #</u>
$C_2^{H_6} \rightarrow C_2^{H_4} + H_2$	5.51	800	(47)
$C_2H_6 \rightarrow CH_4 + \frac{1}{2}C_2H_4$	40.45	1000	Eq. (17)
$C_2H_4 \rightarrow C_2H_2+H_2$	0.036	875	(47)
$C_2H_2 \rightarrow 2C+H_2$	7.48 X 10 ⁷	1000	Eq. (17)
$2C_2H_2 \rightarrow C_4$'s	21843.	1000	E q. (17)
с+н ₂ 0⇒со+н ₂	33.8	900	(47)

$$\triangle \mathbf{F} = -\mathbf{RT} * \mathbf{LN} \ (\mathbf{K}) \qquad \text{and} \qquad (18)$$

$$\Delta \mathbf{F} = \Delta \mathbf{H} - \mathbf{T} \Delta \mathbf{S} \tag{19}$$

Shah's data⁽⁴⁷⁾ for equilibrium constants used in Table V agreed with Equations (18) and (19) from Rossini's Tables⁽²²⁾ and were used as is.

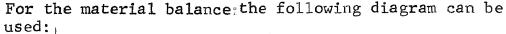
F. Kinetic Data

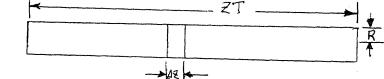
The kinetic data used in this study came from two principal sources. They were Shah⁽⁴⁷⁾ and <u>Homogenous</u> <u>Reaction Kinetics Pyrolysis of Aliphatic Hydrocarbons⁽²³⁾</u>.

	Table VI	
K	inetic Data	
Equation	<u>K</u> o	E* Cal/gm mole
$C_2H_6 \rightarrow C_2H_4 + H_2$	6.04 E 16	8.20 E 4
$2C_2H_6 \longrightarrow 2CH_4 + C_2H_4$	1.60E12	6.70 E 4
$C_2H_4 \rightarrow C_2H_2 + H_2$	1.80 E 13	7.60E4
$C_2H_2 \longrightarrow 2C + H_2$	9.70 E 12	6.20 E 4
$2C_2H_2 \rightarrow C_4$'s	2.60 E 13	6.00 E 4
$C + H_2 O \rightarrow CO + H_2$	9.26 E 3	2.13 E 4

where $K = K^{O}$	exp(-E*/RT)	(20)
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II Material Balance





A. Component Balance

IN = OUT + disappearance by reaction + accumulation expressed in terms of moles of component I.

$$(N_{I})_{IN} = (N_{I})_{OUT} + \sum_{J=1}^{IT_{T}} A_{IJ}N_{J0} \bigtriangleup X_{J} + Accumulation (21)$$

where IT_i is the total number of reactions in which I is involved.

$$A_{IJ}$$
 is the stoichiometric coefficient of the I^{LD} chemical component in the Jth reaction.

- N_{JO} is the original number of moles of the key component in the J reaction (moles).
- ΔX_J is the incremental conversion and can be calculated from the known reaction conditions and kinetic data.

 $N_{JO} \triangle X_J$ corrected so that the rate was given in terms of

..1

conversion of moles of 'component per hour was

$$N_{J0} \Delta X_{J} = 11309.7R^{2}(-R_{J}) F_{0} X_{J0} \Delta Z$$
 (23)

where
$$F_0$$
 was the total molar flow rate (1b moles/hour).
 X_{J0} was the mole fraction of the Jth component.
 $\triangle Z$ was the length of the reactor being considered.
(feet)
R was the reactor radius (feet).
(-R_J) was the reaction rate of the Jth reaction
(1b moles/ft³ sec).

$$\underbrace{\stackrel{M}{\underset{I=1}{\overset{}}}}_{I=1} (N_{I})_{IN} = \underbrace{\stackrel{M}{\underset{I=1}{\overset{}}{\underset{I=1}{\overset{I}{\underset{I=1}{\overset{}}{\underset{I=1}{\overset{}}{\underset{I=1}{\overset{I}{\underset{I=1}{\overset{I=1}{\overset{}}{\underset{I=1}{\overset{I}{\underset{I=1}{\overset{I}{\underset{I=1}{\overset{I=1}{\underset{I=1}{\overset{I=1}{\underset{I=1}{\overset{I=1}{\overset{I=1}{\underset{I=1}{\overset{I=1}{\underset{I=1}{\overset{I=1}{\underset{I=1}{\overset{I=1}{\underset{I=1}{\overset{I=1}{\underset{I=1}{\overset{I=1}{\underset{I=1}{\overset{I=1}{\underset{I=1}{\overset{I=1}{\underset{I=1}{\overset{I=1}{\underset{I=1}{\overset{I=1}{\underset{I=1}{\overset{I=1}{\underset{I=1}{\overset{I=1}{\underset{I=1}{\overset{I=1}{\underset{I=1}{\underset{I=1}{\overset{I=1}{\underset{I=1}{\underset{I=1}{\underset{I=1}{\underset{I=1}{\overset{I=1}{\underset{I=1}{\overset{I=1}{\underset{I}{I}{\underset{I=1}{\underset{I=1}{\underset{I=1}{\underset{I=1}$$

Since steady state is assumed, all component accumulation terms are zero in this study with the exception of carbon.

C. Calculation of Conversion

The calculation of an increment of conversion X_A for each reaction is derived from the following: (27)

$$T = 1/s = c_{A_0} \int_{X_1}^{X_2} dX_A / -r_A$$
 (25)

where $\uparrow = 1/S$ is the reactor space time (sec.)

-r_A is the rate of reaction (lb moles/ft³ sec).

$$C_{A_0}^{\circ}$$
 is the initial concentration of the key
component (lb moles/ft³)

This equation is differentiated with respect to X_A .

$$d\mathcal{T}/dX_{A} = (^{CA}O/ -r_{A})$$
(26)

This equation is then solved for dX_A

$$dX_{A} = (-r_{A}) d \uparrow /^{C} A_{0}$$
(27)

The following is obtained by considering finite differences:

$$\Delta X_{A} = (-r_{A}) \Delta \gamma / {}^{C}_{A_{0}}$$
(28)

Equation (28) will be used to solve for finite difference along the reactor profile. Equation (30) is really the expression for conversion in a back mix reactor. This means the solution is really the solution of a large number of back mix reactors. (i.e.)

$$\Delta X_{A} \quad (TOTAL) = \sum (\Delta X_{A})_{i} \tag{29}$$

By re-evaluating the reaction conditions at hundreds of

positions along the reactor, a good approximation of the total reactor profile can be arrived at. By restricting Max $(A X_A)_i$ to be less than or equal to .01 (and on the average equal to .005 and with a minimum value of .001) the above approximations will be good.

The value of ${\it \bigtriangleup X}_A$ is controlled by controlling the value of ${\it \curvearrowleft X}$.

$$\Upsilon = \frac{\stackrel{c}{}_{A_0} V}{\stackrel{F}{}_{A_0}}$$
(30)

where ${}^{C}A_{0}$ is the original concentration of component A in (lb moles/ft³). V is the reactor volume (ft³). ${}^{F}A_{0}$ is the molar flow rate of component A in (lb moles/hour).

$$V = \Pi R^2 L$$

$$\Delta \Upsilon = \frac{C_{A_{O}} \Delta V}{F_{A_{O}}} = \Upsilon R^{2} \frac{C_{A_{O}} \Delta L}{F_{A_{O}}}$$
(31)

by combining equations (30) and (31) the following is obtained:

$$\Delta X_{A} = {}^{C}A_{O} (-r_{A})\Delta T = \Pi R^{2}/{}^{F}A_{O} (-r_{A})\Delta L$$
(32)

thus the value of $\varDelta X_A$ can be controlled by the length (\varDelta L). The procedure to control the value of $\varDelta X_A$ was to calculate $\varDelta X_A$ for each reaction and test whether it was larger than .01. If it failed the test, a new value of \varDelta L was calculated from the equation:

The max of $ABS(\varDelta X_A)$ was found and compared with .001. If the test failed, a new $\varDelta L$ was calculated from equation (33).

In both cases the control of the program was returned to the initiation of the reactor design.

If all rates passed both tests then calculation of new reactor conditions was continued.

In order to calculate $\Delta X_A(I)$ the following must first be calculated:

$$\Im R^2 / F_{A_0} \Delta L$$
 and

 $(-r_A) = K_o e^{-E*/RT} \left(C_{F_I}^N f_i - C_{R_I}^N R_i \right)$ (34)

or

$$(-r_A) = K_o e^{-E*/RT} (CF-CR)$$
 (35)

where (-r_A) is the rate of the reaction (1b moles/ft³sec). K is the Arrhenius frequency factor (in appropriate units).

$$CF = \underbrace{\uparrow}_{I=1}^{\vee} C_{I}^{N}F_{I}$$
(36)

$$CR = \iint_{I=1}^{V} C_{I}^{N} F_{I}$$
(37)

In order to calculate $(-r_A)$, the reaction rate, it is necessary to recalculate the concentration of each chemical species $C_{_T}$

$$(C_{I})_{OUT} = (P)_{OUT} / [(T)_{OUT} * (GAS CONSTANT)]$$
(38)

The Pressure Out point was calculated from the momentum balance. The temperature T_{OUT} was fixed by the known temperature profile of the reactor.

-r, the reaction rate, was calculated from the Arrhenius kinetics (i.e.)

$$-\mathbf{r}_{A} = \mathbf{K}_{O} \mathbf{e} \qquad \left(\mathbf{CF} - \mathbf{CR}/\mathbf{K} \right) \tag{39}$$

where K was the equilibrium constant of the Jth reaction. The Arrhenius data and order of reactants has been defined earlier in the chapter.

C. Calculation of Carbon Deposition

Carbon was deposited on the tube wall. The carbon was formed as a result of the decomposition of acetylene (Equation 5). As the carbon was deposited, it reduced the radius of the pyrolysis tube. This in turn reduced the reactor volume, increased the overall heat transfer coefficient, and increased the pressure drop in the reactor. As a result of the increased pressure drop, the inlet pressure needed to be constantly raised. This in turn accelerated the formation of carbon.

In order to duplicate this effect in the model, a changing pressure profile was simulated. This was done by assuming time uniform deposition of carbon for incremental periods of time. A new radius profile was then calculated. This procedure was repeated until an inlet pressure of 8 atmospheres was required to produce an outlet pressure of 2 atmospheres.

1. Calculation of Reactor Radius

The radius was assumed to be smooth. The reactor radius was only calculated at 101 points. The radius between these points was calculated by interpolation between the two closest known reactor positions. The reactor radius was calculated by assuming that all the solid material formed by conversion was deposited evenly over a one percent length of reactor segment. Then all other partial pressures were readjusted so that their sum was equal to the pressure before solid carbon deposition occurred.

To achieve this it was first necessary to calculate the equivalent volume of the solid component.

$$Vol = ((F_a)_{Deposited} MW/ \varphi) *t$$
(40)

where $\frac{F_a}{I}$ was the molar flow rate of the solid material (lb moles/hr.).

- MW was the molecular weight of the material being deposited (1b/ 1b mole).
- \forall was the density of the material being deposited $(1b/ft^3)$.
- t was the time during which the material was deposited (hours).

Once the volume was calculated, the new reactor radius was calculated from

$$R_{\rm N} = \sqrt{R_0^2 - Vol/(.01 \ ZT)}$$
 (41)

where $\ensuremath{\,R_{\rm N}}$ was the new reactor radius in feet.

 $\underset{0}{\overset{R}{\overset{}}}$ was the old reactor radius in feet.

ZT was the total reactor radius in feet.

T was 3.14159.

III Momentum Balance

For the momentum balance, Net Flux of Momentum + Net Pressure Force of Element + Resistance to Flow = 0.

Net Flux of Momentum =
$$(V_2^2 - V_1^2/2gc) D_{DN}$$
 (42)

Resistance to Flow =
$$((V_2 + V_1)/2)^2 F Z/R/2gc)D_{IIN}$$
 (43)

Net Pressure Force on Element =
$$(-\Delta F)$$
 (44)

+
$$P = DEN(V_A^2 * \Delta F' * DZ/R + (V_2^2 - V_1^2) 2gc)$$
 (45)

The friction factor is calculated from

$$f = 64/Re$$
 $Re \leq 3500$ (46)

$$f = 0.00560 + .5/Re^{.32} Re_{7} 3500$$
(47)

The calculation of velocity (V_2) was achieved by first assuming velocity V_2 and calculating pressure P_2 . Using the new pressure it was possible to calculate a new **velocity** thus and calculate P_2 . This procedure was followed until the velocity V_2 was within a certain tolerance of V_2 guessed.

V₂ is then calculated from the equation

$$V_2 = (FA)_{OUT} / 2 \Re R^2 * (T2/P2) / GC$$
 (48)
GC is the Gas Constant, 1.413 at. ft³/lb mole ^oK.

A. Calculation of Viscosity

The viscosity of the solution was determined by calculating the viscosity of each component as though it were a pure component from the equation

$$U_{i} = 2.6693 \times 10^{-5} \text{ MT/6}^{2} \Omega_{V}$$
(49)

where U, is the viscosity of the Ith component Lb ft/sec.

M is the molecular weight.

T is the temperature in ^OK.

6 is the collision parameter in Angstroms.

 $\mathcal{N}_{\mathcal{T}}$ is a slowly varying function of the dimensionless temperature KT/ $\!\!\!\mathcal{E}$.

Since the function was only given in tabular form, the author decided to curve fit it using a Marquardt nonlinear curve fitting subroutine. (See Appendix B). This resulted in the following equation.⁽⁴⁾

 $\Omega_{U} = \exp(.4398828 - .44245917 \text{ LN} (\text{KT}/\varepsilon) + 0.08640182 \\
\text{LN}^{2} (\text{KT}/\varepsilon) - 0.0077884511 \text{ LN}^{3} (\text{KT}/\varepsilon)) (50)$

The viscosity of the gas mixture was then calculated (66) and (10) from the equation

$$U \text{ mix} = \sqrt{8} \sum_{I=1}^{N} \left(\begin{array}{c} X(I) & U(I) \\ N \\ J=1 \end{array} \right) \left[X(J) \left[1 + \frac{U(I)}{U(J)} \right]^{\frac{1}{2}} \left[\frac{M(J)}{M(I)} \right]^{\frac{1}{4}} \right]^{\frac{1}{4}} \left[\frac{1 + \frac{M(I)}{M(J)}}{M(J)} \right]^{\frac{1}{2}} \right]$$
(51)

where X(I) is the mole fraction of component I.

U(I) is the viscosity of component I Lb/ft/sec.

M(I) is the molecular weight of component I, lb/lb mole.

B. Calculation of Friction Factor

The friction factor is calculated from the correlations between friction factor and Reynold's number. For Reynold's number below 3500 the laminar flow relationship is used.⁽¹⁶⁾

$$f = 64/N_{Re}$$
(52)

and for Reynold's number greater than 3500 the relationship becomes (16)

$$f = 0.00560 + .5/(N_{Re})^{.32}$$
 (53)

The Reynolds number is recalculated from

$$N_{Re} = 2R * O * V / V is$$
 (54)

where R is the radius of the reactor in feet.

e is the gas density, lb/ft³.
V is the velocity of the reactor gas, ft/sec.

C. Calculation of Pressure Drop

The pressure drop in the reactor was calculated from (35) the Bernouli equation.

$$P = (VelA^{2} * f * L/R + (Vel_{2}^{2} - Vel_{1}^{2})/(62.4*2116.8)$$
(55)

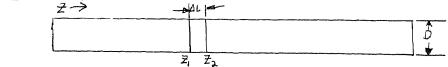
where P was the pressure drop in atmospheres

Vel₁ was the velocity at the beginning of the reactor segment, ft/sec.

- L/R was the length to radius ratio, ft/ft.
- VelA was the average velocity in the reactor segment, ft/sec.
 - f was the friction factor.

IV Heat Balance Equation

The heat supplied by heat transfer throughout the reactor tube must equal the net heat of reaction plus the sensible heat.



Heat in = Heat of Reaction + Sensible Heat

$$\mathrm{UA}\,\Delta\,\mathrm{T}_{1} = \sum_{i=1}^{6} (\Delta\,\mathrm{H})_{i} (\mathrm{F}_{J}\,\Delta\,\mathrm{X}_{J})_{i} + \sum_{J=1}^{1} \mathrm{F}_{J}\mathrm{CP}_{i}\,\Delta\,\mathrm{T}_{2}$$
(56)

- where U is the overall heat transfer coefficient, BTU/hour, ft², ^oF
 - A is the area through which heat is transmitted $D^2/4 \Delta L$, ft².
 - T₁ is the difference between the temperature on the outside tube wall and the mean temperature of the gas stream, ^OK.
 - H₁ is the heat of reaction of the i equation, BTU/1b mole.
 - F_J is the molar flow rate of the Jth key component of reaction i, Lb moles/hr.
 - XJ is the extent of reaction of the Jth key component of reaction i.
 - CP_i is the heat capacity of the ith component BTU/ lb moles ^OK.
 - ^T₂ is the difference between the temperature at some point Z_1 and $Z_1 + \triangle L$, ^OK.

Sinced forced temperature profiles were used, each small increment of reactor was treated as an isothermal backmix reactor and an energy balance was not necessary.

Chapter 4

Discussion of Results

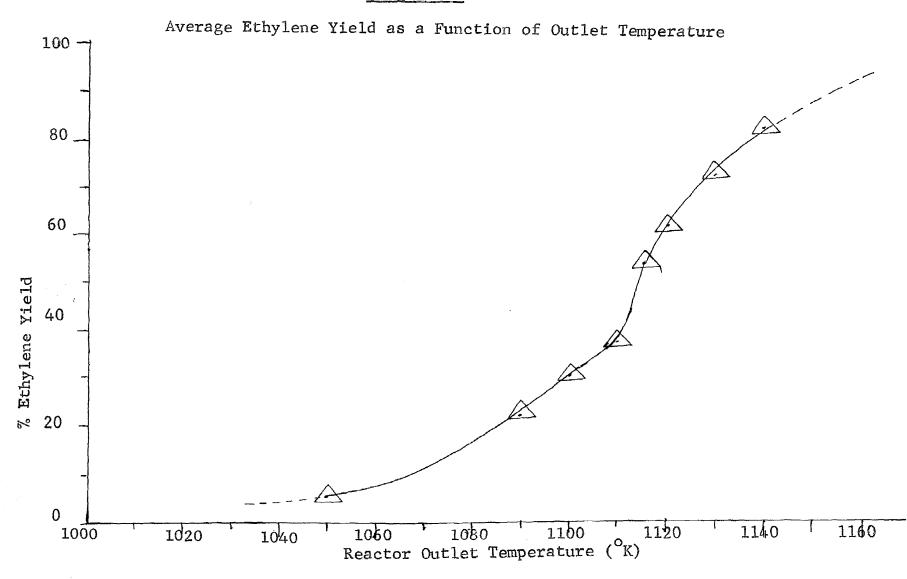
Using the results set forth in Tables 7, 8, 9 and 10, the production of ethylene in the reactor was optimized.

In Table 7 were listed the different temperature profiles which were used, the resulting inlet and outlet pressures in atmospheres, the percent yield, the inlet and outlet velocities and the number of hours the reactor had been run since the last cleaning. Several conclusions were drawn from this table and Figure 2:

 The yield of ethylene rose sharply with increasing temperature. At the higher temperature the slope of the yield curve approached zero. This curve, called an So curve, is characteristic for endothermic reactions.
 In System 1, 820-1050^OK, the effect of decreasing space time on percent yield became apparent. This effect was best observed by comparing the yield of ethylene with the same initial pressure. It became clear that the computer was able to detect and calculate even small differences in space time and predict a decreasing yield.

The space time was being decreased by two effects: a) There was physically less room in the reactor due to the carbon build-up.

Figure 2



b) The velocity of the outgoing gases increased due to the increase in pressure drop resulting from carbon build-up.

Of these two effects the second was by far the more important as only a small volume of the reactor was taken up by the carbon build-up.

3. The carbon build-up became much more pronounced as the exit temperature was increased.

This effect was also seen in Table 8 and Figures 3, 4, and 5.

Table ⁸ showed the effect that the increasing exit temperature had on each of the important components. Appendix G contains the same information as it was derived from the computer, as well as representative plots of pressure, temperature, and reactant and product profiles as a function of reactor position.

Figure 5 showed the effect of reactor exit temperature on the frequency of reactor shut down. The reactor shut down time was calculated from the time the clean reactor first started up until the time the inlet pressure reached 8 atmospheres.

Since the computer was calculating in relatively large increments of reactor run time, the results were represented

graphically (Figures 3 and 4) and extrapolated to a pressure

of 8 atmospheres to predict the exact run time.

System	Press In (At.)	Press. Out (At.)	Percent Yield	Veloc. In Ft/Sec	Veloc. Out Ft/Sec	Time Since Start Up Hours
1 820-1050	5.85	2.00	6.57	209	860	0
	5.85	1.98	6.54	209	877	800
	5.85	1.96	6.52	209	895	1600
	5.85	1.94	6.49	209	913 924	2400
	5.90	2.11	6.70	207	834	3200
	5.90	2.09	6.68	207	843	4000
	5.90	2.07	6.65	207	852 869	4800
	5.90	2.04 2.02	6.63	207 207	887	5600 6400
	5.90 5.90	2.02	6.60 6.58	207	926	7200
	5.90	1.97	6.55	207	920 947	8000
	5.90	1.97	6.33	207	947 970	8800
	5.95	2.12	6.73	205	840	9600
	5.95	2.10	6.70	205	858	10400
	5.95	1.97	6.57	205	1022	14400
2 820-1090	5.85	2.00	18.9	209	865	0
	5.90	2.01	18.9	206	1040	400
	5.98	2.11	19.3	204	1089	800
	6.18	2.20	20.8	191	9 2 8	1200
	6.18	2.20	20.8	191	940	1600
	6.38	2.00	22.2	185	1028	2000
	6.58	2.00	22.4	175	1035	2400
	6.98	2.00	24.6	161	1173	2800
3 820-1100	5.85	1.93	26.1	209	1025	0
	5.95	2.16	26.6	205	991	200
	6.15	2.00	28.9	198	881	400
	6.35	2.00	29.4	192	907	600
	6.55	2.00	30.2	186	1039	800
	6.95	2.00	32.5	175	1068	1000
	7.75	2.00	36.0	153	1099	1200

Table 7. Pressure, Yield and Velocity Conditions as a Function of Reactor Time

Table 7 (Cont'd.)

System	Press. In (At.)	Press. Out (At.)	Percent Yield	Veloc. In Ft/Sec	Veloc. Out Ft/Sec	Time Since Start Up Hours
4 820 - 1110	5.85 6.05 6.25 6.45 7.05	2.05 2.00 2.00 2.00 2.00	34.1 35.1 37.2 36.8 42.0	209 203 195 189 173	1022 852 869 1085 1242	0 100 200 300 400
5 820-1115	5.88 6.00 6.20 6.60 7.00	2.00 2.00 2.00 2.00 2.00		210 203 197 185 174	1084 926 964 903 1208	0 50 100 150 200
6 820-1120	5.85 6.05 6.25 6.45 6.85 7.65		55.5 58.2 59.5 59.8 62.2 66.6	209 202 195 189 178 159	920 835 881 1048 1070 997	0 30 60 90 120 150
8 820-1130	5.85 5.85 6.05 6.05 6.25 6.45 6.65 7.05 7.45	2.00 2.00 2.00 2.00 2.00 2.00 2.00 2.00 2.00 2.00	67.1 65.1 69.2 67.3 69.9 71.3 71.9 74.7 76.0	209 209 202 202 195 189 189 173 163	971 1081 865 1119 978 978 1051 976 1090	0 10 20 30 40 50 60 70 80
9 820-1140	6.25 6.45 6.65 6.85 7.25	2.00 2.00 2.00 2.00 2.00 2.00	81.3 79.6 81.5 82.6 83.2 83.4 85.1	209 209 202 195 189 183 178 168 155	810 990 959 842 1125 954 1017 1159 1123 1082	0 5 10 15 20 25 30 35 40 45

System	Acety1- ene X 10 ³	150 Butane X 10 ³	Ethane	Ethyl- ene	Hydro- gen	Methane	e Water	Carbon Monoxide X 10 ⁵	Time Since Start Up Hours
1 820-	1.538	0726	101 24	0 501	0 2/2	.3928	70,133	.0355	0
1050 [°] к	1.527	.0736 .0727	121.34 121.37	8.531 8.500	8.343 8.312	.3928	70.133	.0349	800
1030 K			121.37				70.135	.0344	1600
	1.516	.0726		8.470	8.283	.3805		.0344	2400
	1.506	.0710	121.44		8.259	.3794	70.135		
	1.602	.0878	121.15	8.709	8.518	.3905	70.132	.0390	3200
	1:590	.0798	121.19	8.676	8.486	.3893	70.132	.0380	4000
	1.579	.0788	121.12	8.644	8.454	.3881	70.132	.0375	4800
	1.567	.0788	121.25	8.612	8.422	.3869	70.133	.0368	5600
	1.555	.0795	121.29	8.579	8,390	.3857	70.134	.0366	6400
	1.545	.0760	121.33	8.547	8.358	.3845	70.135	.0357	7200
	1.533	.0752	121.36	8.515	8.327	.3833	70.135	.0352	8000
	1.522	.0743	121.39	8.483	8.269	.3821	70.136	.0347	8800
	1.614	.0837	121.13	8.739	8.546	.3926	70.133	.0346	9600
	1.601	.0827	121.16	8.750	8.513	.3914	70.134	.0354	10400
	1.540	.0777	121.30	8.538	8.349	,3851	70.137	.0355	14400
		:	SYSTEM CO	NTINUES T	O FUNCTION	NORMALLY	Ŷ		
2 820-	11.77	.736	105.38	24.49	24.08	.885	70.33	.791	0
1090 ⁰ K	11.86	.765	105.25	24.58	24.17	.881	70.34	.817	400
	12.29	.843	104.86	25.01	24.59	. , 907	70.34	.876	800
	16.32	1.522	100.68	28.88	28.39	1.043	70.33	1.532	1600
	16.64	1.752	100.64	29.11	28.63	1.058	70.34	1.711	2000
	19.22	2.43	98.42	31.26	30.74	1.414	70.35	2.361	2400
	22.40	3.47	95.87	33.75	32.20	1.240		3.362	2800
]	REACTOR S		FOR CLEANIN	VG (2900	Hrs.)		

Table 8

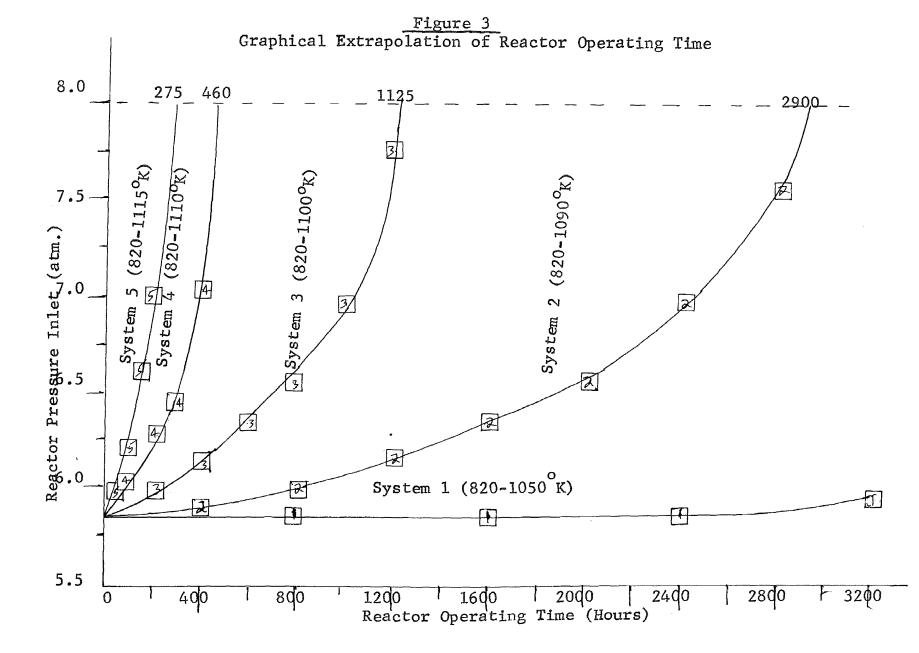
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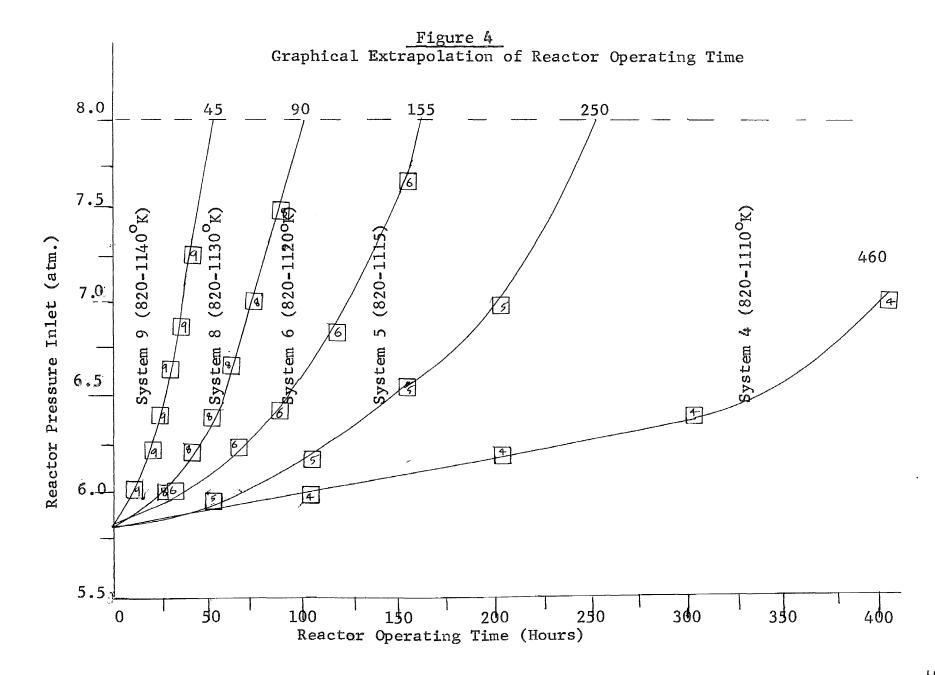
Table 8 (Cont'd)

System	Acety1-	Iso	······································	Ethy1-	Hydro-	Methane	Water	Carbon	Time Since
	enge X	Butaņe	Ethane	ene	gen			Monoxide	Start Up
	10	10						X 10 ⁵	Hours
3 820-	22.2	1.41	95.90	33.85	33.30	1.15	70.38	1.69	0
1100 ⁰ К	23.2	1.63	95.14	34.58	34.05	1.19	70.37	1.87	200
	27.3	2.31	9 2. 01	37.53	36.97	1 .2 7	70.36	2.43	400
	29.4	2.81	90.67	38.91	38.33	1.32	70.36	2.87	600
	30.0	3.11	90.28	39.28	38.69	1.35	70.35	2.99	800
	34.8	4.30	87.80	42.27	41.65	1.45	70.35	3.82	1000
	42.2	6.91	82.83	46.51	45.81	1.61	70.34	5.63	1200
		Rea	ctor Shut	Down For	c Cleanin		Hours)		
4 820-	33.3	2.43	88.12	41.44	40.90	1.37	70.40	2.91	0
1110 [°] K	40.3	3.51	83.90	45.59	44.97	1.49	70.39	4.04	100
	45.5	4.51	81.03	48.38	47.74	1.58	70.40	5.02	200
	45.4	5.04	81.55	47.83	47.18	1.58	70.36	5.05	300
	58.5	8.61	74.58	54.63	53.93	1.80	70.38	8.46	400
	Reactor Shut Down For Cleaning (460 Hours)								
5 820-	76.6	5.06	67.10	62.30	61.60	1.90	70.56	9.45	0
1115 ^о к	86.6	6.95	62.23	65.94	65.28	2.01	70.51	10.23	50
	91.4	8.13	61,48	67.67	66.90	2.07	70.50	11.40	100
	105.0	11.50	56.74	72.35	71.53	2.22	70.48	14.20	150
	108.0	12.60	55.67	73.28	72.56	2.28	70.49	15.70	200
		Rea	ctor Shut	Down For	c Cleanin	g (250 Ho	ours)		
6 820-	105	7.64	56.98	72.17	71.45	2.14	70.54	12.0	0
1120 ⁰ К		10.1	53.44	75.59	74.91	2.25	70.53	14.6	30
	121	11.6	51.66	77.30	76.62	2.31	70.53	16.2	60
	124	11.2	51.25	70.70	77.00	2.34	70.53	17.0	90
	134	15.4	48.06	80.77	80.09	2.45	70.53	20.4	120
	157	23.2.	42.07	85.56	85.93	2.66	70.55	30.2	150
6		Re	actor Shu	it Down Fo	or Cleani	ng (155 H	Hours)		

System	Acety1- ene _X 10 ³	150 Butane X 10 ³	Ethane	Ethy1- ene	Hydro- gen	Methane	Water	Carbon Monoxide X 10 ⁵	Time Since Start Up Hours
8 820-	161	11.9	41.66	87.23	86.63	2.48	70.64	22.0	0
1130 ⁰ K	152	10.3	43.80	85.15	85.54	2.43	70.63	19.3	10
	173	14.5	38.85	89.93	89:39	2.56	70.64	26.0	20
	162	12.2	41.45	87.41	86.83	2.50	70.62	21.9	30
	177	15.6	37.94	90.80	90.26	2.60	70.64	31.5	40
	185	18.1	35.98	92.69	92.18	2.67	70.65	31.5	50
	189	19.6	35.15	93.48	92.98	2.71	70.65	34.1	60
	207	25.1	31.43	97.07	96.64	2.84	70.66	4 3. 0	70
	215	27.8	29.68	98.75	98.36	2.91	70.68	49.9	80
		REAC	TOR SHUT	DOWN FOR	CLEANING	(90 Hrs.))		
9 820-	250	18.4	24.44	104.06	103.88	2,85	70.75	38.4	0
1140°K	238	16.1	26.95	101.97	101.72	2.81	70.73	35.1	5
1140 R	260	21.2	22.85	105.56	105.45	2.91	70.73	45.6	10
	246	18.2	25.11	103.44	103.16	2.86	70.72	38.4	15
	261	22.2	22.52	105.86	105.75	2,94	70.71	44.1	20
	271	25.0	20.99	107.32	107.28	3.00	70.72	49.4	25
	276	26.6	20.09	108.18	108.17	3.04	70.71	51.8	30
	277	27.3	19.86	108.37	108.39	3.07	70.71	54.2	35
	292	32.4	17.61	110.53	110.67	3.15	70.73	64.2	40
					CLEANING (

Table 8 (Cont'd)





<u>Table 9</u>

Reactor Shut Down Time

Exit Temperature ^O K	Reactor Shut Down Time Hours	System Num- ber
1050	(83,100)#	1
1090	2900	2
1100	1125	3
1110	460	4
1115	250	5
1120	155	6
1130	90	8
1140	45	9

#Estimated from regressed curve fit

Plotting the results from the reactor shut down time against reactor exit temperature resulted in a straight line on semi log paper (See Figure 5).

To find a scheme which would optimize the average yearly production rate it was decided to assume two different periods of time required to clean the tubes. An optimum production rate was then calculated for each of these penalty times. The two times chosen were 24 hours and 48 hours.

The average yield for the entire run from start up to shut down was then determined.

$$PAV = \sum_{i=1}^{n} ((percent yield)_{i})/n$$
 (57)

where (percent yield) is the yield for one increment of carbon deposition

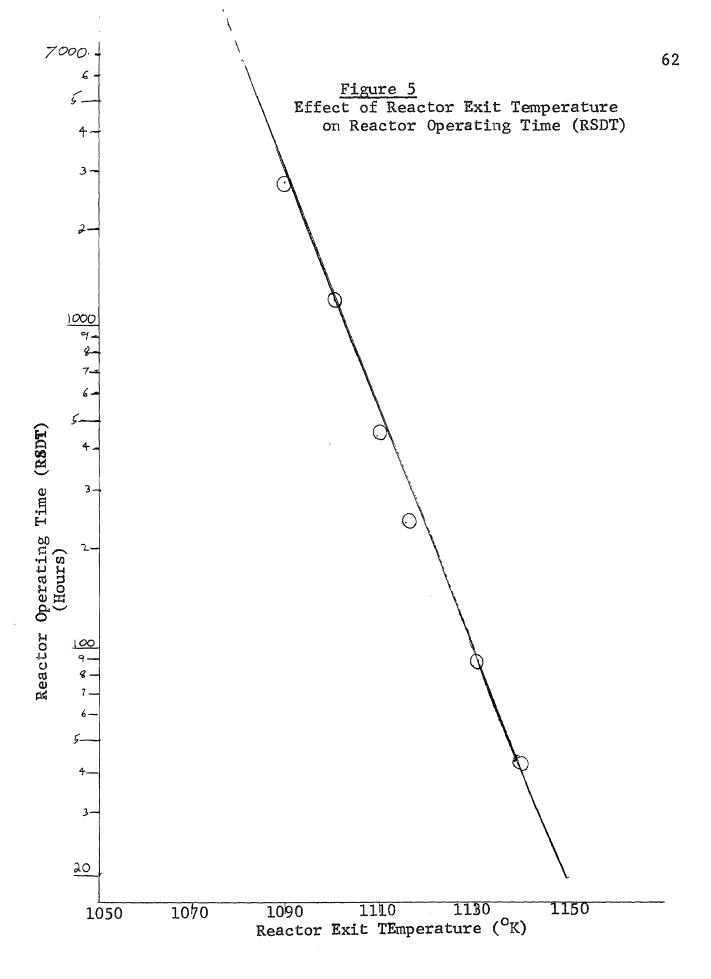
n is the number of increments required to raise the inlet pressure to 8 atmospheres.

The average yearly production rate (AYPR) becomes

$$AYPR=PAV(1 - \frac{P}{RSDT+P})$$
(58)

where P is the assessed penalty for cleaning the reactor, hours.

RSDT is the time the reactor operated between start up and shut down, hours.



The pressure profile presented in Appendix G followed the normal expected results. Since the main reactions increased the number of moles in the reactor, an increase in pressure was expected. This was balanced by the Bernouli pressure drop.

In addition there was a contraction in the reactor walls due to the build-up of carbon which also effects the pressure drop. The pressure at first started to drop off slowly but as the velocity of the gas mixture picked up (due to pressure drop, increasing temperature and increasing number of moles) the pressure drop became much more severe. As a result, the majority of the pressure drop occurred at the end of the reactor.

Under the most_{sever} operating conditions (System 9, 820-1140^oK) and after appreciable carbon build-up, there was actually an increase in the pressure in the initial portion of the reactor. Appendix G (System 9, 820-1140^oK) at 40 and 45 hours of run time shows this effect most graphically.

In addition the pressure drop at the end of the reactor became so severe that the calculated velocity exceeded the speed of sound. Since this was impossible, the equations being used were no longer applicable under these conditions. To prevent invalid results the program checked for this limiting case and if found, increased the inlet pressure until the outlet velocity was less than that of sound.

The model also found that the pressure near the end of the reactor went through a critical pressure due to changing reactor radius and that the pressure was not able to fall below this critical pressure without destroying the validity of the equations. When this critical pressure was above desired outlet pressure, it was no longer possible to force a pressure convergence. Since the reacting gases were quenched at the end of the reactor and the pressure was dropped by allowing expansion into a larger container, this effect caused no unreliability and was a predictable result.⁽²⁵⁾

Equilibrium

Since the production of ethylene was endothermic, it was expected that the equilibrium would be shifted in favor of product formation with increasing temperature. The equilibrium however was unfavorably affected by high pressure, and product formation was more favorable for lower pressure profiles.

These combined effects were ideally suited to the ethylene reaction because the temperature profile was increasing and the pressure profile was decreasing near 64

the end of the reactor. The rate of reaction also increased with increasing temperature.

These combined effects resulted in little reaction at the beginning of the reactor, which acted primarily as a preheater section, but near the middle the reaction rate rose sharply. At the extreme end of the reactor the components were near equilibrium as the rate of production of ethylene declines despite the increasing temperature and decreasing pressure.

Temperature

It was necessary to determine whether or not the temperature on the outside of the reactor pipe would melt the reactor tube. In order to determine this, the reaction conditions for the most severe case and at the highest heat flux and maximum carbon deposition were determined. The details of these calculations are given in Appendix I. It was determined that at carbon deposition twice the maximum thickness calculated before reactor shut down, there was a 347° K temperature increase from the temperature of the gas stream to that of the outside tube. This resulted in a skin temperature of $1,467^{\circ}$ K. This temperature was still inside the safe operating temperature of 23 or 25% Cr, 70\% Ni and 55\% Fe steel. ⁽¹⁹⁾ listed as $2,200^{\circ}$ F or or 1,478°K, although twice the maximum expected amount of carbon was deposited.

Model Verification

The verification of a model with actual plant results was an essential step in justification of simulation results. Exact matching of results was very difficult.

In this case there were not plant data to verify the results, but the results were compared with a second model⁽⁴⁷⁾ in work done by Shah. Both authors used the same kinetic data and the temperature profiles in this study were derived from Shah's.

Shah adjusted the original kinetic data to conform with actual plant conditions. In this study, this refinement in data was not possible. In addition, Shah did not state his reactor diameter. Therefore there was some discrepancy between Shah's results and those herein contained.

A comparison of Shah's results and the author's is given in Table 10. If the author had actual plant conditions it would be relatively easy to adjust the Arrhenius Frequency Factor to conform with the actual results (See Program Logic - Data Input). Shah did not state what his outlet gas pressure was for his model. Table 10 clearly illustrates that there was a discrepancy in the product yields with temperature profiles between Shah's case and this study. The important thing is that the commercially acceptable yield (between 40 -50%) on both the main and side reaction profiles agree for both studies. No explanation was given for the discrepancy in the exit temperature required to achieve these profiles.. Only comparison with actual plant data could justify either result.

Since the carbon deposits only at the end of the reactor (about the last 25%) it would be possible to make this last section replaceable by the use of a second parallel pipe with appropriate valves. An alternate scheme would be to increase the radius of the last section of the reactor. See Appendix G - Program Output.

Table	10
-------	----

S	hah	System - 1 820-1050°K	System - 5 820-1115 ⁰ K
Total Feed Lb Moles/Hr	170.9	200	200
Steam to Feed Ratio	.363	.350	.350
Inlet Pressure (At.)	4.43	5.85	5.85
Outlet Pressure (At.)	?	2.00	2.00
Reactor Length (Ft.)	394.	400.	400.
Tube Radius (Ft.)	?	.125	.125
Gas Inlet Temperature ^O K	818.3	820.0	820.0
% Ethylene Yield	45.83%	6.5%	47.9%
<u>Moles Methane</u> Moles Ethane Changed	.0177	.00302	.0146
<u>Moles Acetylene</u> Moles Ethane Changed	.00053	.0000118	.000589

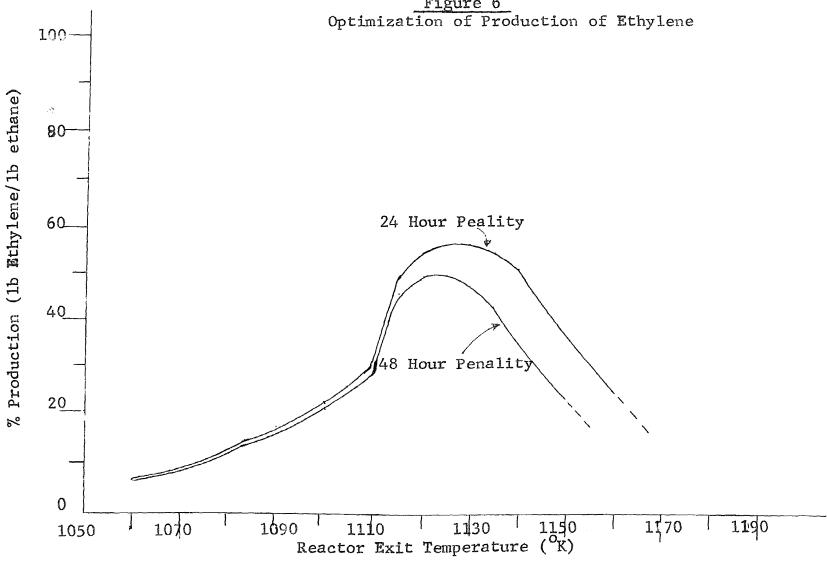
Comparison of Shah's Results with this Study

Figure 6 depicts the final graphical optimization of the ethylene reactor. The percent yearly production of ethylene versus reactor exit temperature is depicted. The percent yearly production of ethylene was defined as the ratio of pound moles of ethylene being produced in one year to the pound moles of ethane continuously available for the reactor.

It is important to note that the optimization is being performed on the production of ethylene and not on the overall conversion of ethane to ethylene.

The two parameters being used were a 24 and a 48 hour penalty required to close down the reactor, clean the reactor out, and start up the reactor. It was apparent from Figure 6 that the amount of time required to perform these cleaning operations materially affects the overall yearly production by as much as 7 percent when operating near the optimum. The optimum reaction exit temperature also showed ϑ 3^oK change due to the different penalty times.

The optimum yearly production rate was relatively flat and allowed a 10 to 15⁰K range of outlet temperatures without materially affecting the overall yearly production rate.



<u>Figure 6</u> Optimization of Production of Ethylene

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Chapter 5

Conclusions

1. Yield

The optimum yearly average of 59 percent conversion of the available ethane to ethylene can be achieved with an outlet temperature of 1127°K.

2. Carbon Deposition

- A. The rate of carbon deposition increases with increasing inlet reactor pressure.
- B. The practice of increasing inlet reactor pressure to compensate for carbon build-up is detrimental to optimization.

3. Reactor Operating Time

The length of time the reactor could be operated before being shut (RSDT) down for cleaning can be calculated from the following relationship:

$$RSDT = -\exp(TEMP - 1181.4)/11.6$$
 (59)

where RSDT was the reactor run time, Hours.

TEMP was the reactor outlet temperature, ${}^{o}K$

4. Calculation of different feeds could be started to enable optimization of all feed streams which will be reacted separately. These other feeds may contain propane and butane or combinations of all three.

5. By increasing the reactor residence time, by decreasing feed rates, increasing reactor length and/or reactor radius, this program could be used to calculate the optimum production of acetylene.

6. Since PYRO is completely general and made with provision for easy change in calculating procedures, it could be used for calculation of any gas phase reaction in a plug flow reactor.

7. PYRO is also able to handle any component which settles out as either a liquid or a solid and could therefore be used under conditions near the boiling or sublimation point of one or more of the reactants or products.

8. PYRO is able to make adjustments in the Arrhenius Probability Factor. This makes it suitable in fitting known product distribution and could be used in conjunction with SNOWJO (See Appendix B) to automatically calculate the best factors.

Chapter 6

Recommendations

1. The program PYRO uses fixed temperature profiles. It would be possible to add an energy balance and calculate the gas temperature from the temperature on the skin of the reactor. The skin temperature could either have a fixed temperature profile or be calculated from first principles using the geometry of the furnace and position of the burners, solving the resulting 3 dimensional heat transfer equation.

The calculation of the reactor gas temperature from reactor skin temperature would be more meaningful due to the effect of carbon deposition on the overall heat transfer coefficient.

2. In this study only one feed rate was considered. The production of ethylene could be further optimized by varying the feed rate and finding an optimum of the locus of feed rates.

3. Variation of the amount of steam mixed with the feed should also result in still better optimum. It might even be necessary to increase the steam rate as the carbon deposition necessitates increase in pressure, thus making it possible to keep the same rate of feed of ethane but to increase the proportion of steam to increase the overall pressure.

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Appendix A

Program Logic and Theory

PYRO consists of four functions and one main program. The main program calls the functions in order to perform certain specific operations. It was found to be more convenient to separate the functions in this manner as it makes the functions more accessible to debugging without unintentionally destroying the logic of the main program. This makes it considerably easier for a later user to make changes in functions without having to understand every nuance of the main program.⁽⁵¹⁾

The four functions are:

1. <u>Cards 1 - 30</u> PRR(IS) This is a function designed to calculate the carbon profile along the reactor wall. It is capable of handling up to 25 solid components being thus deposited. It also readjusts the partial pressure of all the components to account for the change of solid to gaseous state (i.e. carbon (g) to carbon (s). The computer first treats the carbon as though it were a gas and PRR removes the gas and treats it as a solid. It is necessary to readjust all the partial pressures so as to make the sum of the pressures equal to the sum of the pressures when each component was considered to be a gas.

2. <u>Cards 31 - 44</u> REQC(T,I) This is a function designed to calculate the reciprocal of the equilibrium constant at temperature R for Reaction I.

All equations are assumed to be reversible. The reverse rate constants will be calculated from equilibrium data developed from the equation (49)

$$\Delta \mathbf{F} = -\mathbf{Rt} + \mathbf{LN} \quad (\mathbf{K}) \tag{1}$$

or
$$K = \exp(-\Delta F^{O}/RT)$$
 (2)

using the relationship that

$$K_{c} = K_{f}/K_{r}$$
 or $K_{r} = K_{f}/K_{c}$ (3)

where
$$\Delta F = H - T \Delta S$$
 (4)

$$\Delta F = -\Delta H_0(I)/RT + \Delta A(I)/R * LN(T) + \Delta B(I)/2R * T +$$

$$\Delta C(I)/6R * T^{2} + \Delta D(I)/12R * T^{3} + FI(I)$$
 (5)

where FI(I) is a constant of integration evaluated from a known equilibrium constant at a known temperature and using the above equation to solve for FI(I).

The equilibrium constant for a known temperature calculated from $\text{Log}_{10}(\text{K}_{f})$ data taken from Selected Values of Chemical Thermodynamic Properties. (44)

The Log (K_f) for reaction is calculated below:

$$Log_{10}(K_{f}) Reaction = \sum_{Products} B(K)/B(1) * Log_{10}(K_{f_{K}}) - \sum_{Reactants} B(K)/B(1) * Log_{10}(K_{f_{K}})$$
(6)

3. <u>Cards 45 - 150</u> PRESD(T) This function calculates the pressure drop in the segment of the reactor under consideration. It is subdivided into (a) calculation of viscosity (b) calculation of friction factor (c) calculation of pressure drop.

(a) Cards 45 - 74 Calculation of Viscosity

The viscosity of the solution is determined by calculating the viscosity of each component as though it were a pure component from the equation

$$U(I) = 2.6693 * 10^{-5} \sqrt{MT/6^2} \Omega_v$$
 (7)

where V is the viscosity of the component in grams per centimeter per second raised to the -1 power.
 T is the temperature in degrees Kelvin (^OK).
 6 is the collision parameter in Angstrom units (^OA).
 Ω_v is a slowly varying function of the dimensionless temperature KT/ε.

Since the function is only given in tabular form, the author decided to curve fit it using a Marquardt non-linear curve fitting subroutine. (See Appendix B). This results in the following equation.⁽⁴⁾

$$\Omega_{v} = \exp(.4398828 - .44245917 \ln (KT/E) + 0.08640182 \ln^{2} (KT/E) - 0.0077884511 \ln^{3} (KT/E))$$
(8)

The viscosity of the gas mixture was then calculated from the equation (66) (10)

$$U \text{ mix } = \sqrt{8} \sum_{I=1}^{N} \frac{X(I) \ U(I)}{\sum_{J=1}^{N} \left(X(J) \ \left[1 + \frac{U(I)}{U(J)} \right]^{\frac{1}{2}} \left[\frac{M(J)}{M(I)} \right]^{\frac{1}{2}} \right)^{\frac{N}{2}} \left[1 + \frac{M(I)}{M(J)} \right]^{\frac{1}{2}} }$$
(9)

where X(I) is the mole fraction of component I

U(I) is the viscosity of component I

M(I) is the molevular weight of component I

Since it is determined that the viscosity is only a slowly changing function going from 2.17×10^{-5} to 2.76×10^{-5} lb/ft-sec between extreme reaction conditions (differences between inlet and outlet viscosity.) The viscosity is only calculated at intervals of every 1% of reactor distance. This was found to save considerable computer time, thus making the program more practical.)

(b) <u>Cards 79-94</u> <u>Calculation of Friction Factor</u>

The friction factor is calculated from the correlations between friction factor and Reynold's number. For Reynold's below 3000 the laminar flow relationship is used (16)

$$f = 64/N_{Re}$$
(10)

and for Reynold's number greater than 300 the relationship becomes

$$f = 0.00560 + .5/(N_{Re})^{.32}$$
 (11)

The Reynold's number is recalculated from

$$N_{Re} = 2R*\varphi * V/Vis$$
 (12)

where R is the radius of the reactor = $f(Z, \mathcal{I})$

i.e. R is a function of its position in the reactor and the length of time the reactor has been in operation. This function is calculated by the main program PYRO.

P is the density of the reacting medium = f(C(I) - C(IS), T, P(Z)) (13)

i.e. φ is a function of the concentration of each component, the temperature of the reactor and the pressure of the reactor segment.

$$\Psi = \sum_{I=1}^{IS} P(I) \text{ SMWT}(I)/RT$$
(14)

where P is the partial pressure of component $I(A \top)$ SMWT is the molecular weight of component I

and the second secon

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R is the gas constant = 1.314. $(AT \ \mathcal{C}^{*3/_{Lb} \ mole \ ^{*}K})$ T is the temperature of the reactor. $(^{\circ}K)$ IS is the total number of components.

(c) <u>Cards 95 - 135</u> <u>Calculation of Pressure Drop</u>

The pressure drop in the reactor is calculated from the Bernouli equation⁽³⁵⁾

 $P = (Ve1A^2 * F * L/R + Ve12^2 - Ve1 1^2) / (62.4 * 2116.8)$ (15)

where P is the pressure drop in atmospheres VelA is the average velocity in the reactor segment f is the friction factor

- L is the length of the reactor segment under consideration.(f^{\pm})
- **R** is the radius of the reactor in feet (See (b) Calculation of Friction Factor)
- Vel 2 is the velocity at the end of the reactor segment.
- Vel 1 is the velocity at the beginning of the reactor. segment.(fT/Sec)

```
62.4 is twice the gravity constant in foot pounds force
per pound mass per second squared (Ft Lb<sub>f</sub>/
Lb<sub>m</sub> • Sec<sup>2</sup>)
```

2116.8 is the conversion factor to convert from pound feet per square inches to atmospheres. This function is calculated recurrently as the value of VA and V2 is dependent on the value of the pressure drop. The pressure drop is calculated until the difference between two successive calculations is less than .1%.

4. <u>Cards 136 - 150</u> HEATR (T2,I)

This function calculates the heat of reaction at Temperature T2 and for Reaction I.

HEATR is calculated by

$$HEATR(T2,I) = HEATR(T1,I) + \int_{T_1}^{T_2} C_P(I) dT$$
 (16)

<u>Cards 151 - 816</u> The main program (PYRO) is easily divisible into many subparts which facilitate comprehension of the program. In order to discuss the program, the author will cite the number on the extreme left of the print-out of the program.

<u>Cards 151 - 171</u> These cards tell the computer how much storage space must be allotted for the different dimension variables. Some of the variables are used in the functions are are linked by named common statements. This makes the storage location for these variables identical for each program, subprogram or function in which they appear. The author has also preset certain variables at specified values and has defined some variables to be literal constants. This is used in the output to help define the reaction equations and will help any future users in spotting errors in input.

<u>Cards 172 - 261</u> These cards are used for input of data and initial calculations of constants which will be used by the program.

<u>Input Set 1 Cards 172 - 174</u> These cards read in factors by which the Arrhenius frequency factor is changed. This allows for adjustment in rate of reaction in order to make the calculated and actual product rates agree.

<u>Input Set 2 Card 175</u> This card reads in the number of reactions (IR) and the number of chemical species (IS) including inerts.

Input Set 3 Cards 177 - 179 These cards read in computer GO TO instruction IGOW.

IGOW = 1 means read in entirely new data set.

IGOW = 2 means read in new temperature profile only and begin calculations anew.

IGOW = 3 means stop (no more data).

Z(I) is the temperature profile of reactor from beginning to end in 10% increment of reactor length.

Card (I) is **the alphanum**eric identification of reaction system. (i.e. this card identifies the new temperature profile etc.)

IB, IZZ, IPLOT are three more computer control variables.

IB is the number of hours that constitutes an increment in carbon deposition. IZZ is the total number of increments before the computer goes on to a new case.

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IPLOT controls the output from calculations.

IPLOT = 1 means	plot results	do not write out detailed calculation
IPLOT = 2 means	plot results	write out detailed calculation
IPLOT = 3 means	do not plot results	write out detailed calculation
IPLOT = 4 means	do not plot results	do not write out detailed calculation

Input Set 4 Cards 180 - 181

These cards initialize the reactor conditions.

T is the temperature at the inlet of the reactor $(^{\circ}K)$

PT is the pressure at the inlet of the reactor (atmospheres)

PRESS is the maximum allowable inlet pressure (atmo-

spheres)

ZT is the total length of the reactor (feet)

DL is the initial reactor increment (feet)

POUT is the minimum outlet pressure (atmospheres)

Input Set 5 Cards 182 - 194 These cards set up reaction equations.

SF(I) and SR(I) are the number of components in the forward reaction and in the reverse direction of the Ith reaction (i.e. if Reaction 5 were $2H_2 + 0_2 \rightarrow 2H_2 0$) SF(5) = 2 (two components H_2 and 0_2 in forward direction), SR(5) = 1 (one component $H_2 0$ in reverse direction).

IA(I,M) is the identity of chemical species in reaction I position M. (i.e. in the above example, if water were the second chemical species, hydrogen were the fifth and oxygen the tenth, then

IA(5,1)=5 IA(5,2)=10 IA(5,3)=2

Input Set 6 Cards 195 - 202 These cards read in the initial partial pressure (in atmospheres) of each component. The concentration of each component is then calculated using the ideal gas law C(I)=P(I)/GC/T

Input Set 7 Cards 203 - 205 These cards supply the alphanumeric identity of each component (limit - 20 characters to name). ENAME(20*I) I = 1, IS.

Note: The next four card sets have internal identification to make sure the cards are in proper sequence. This is called Check ID.

Input Set 8 Cards 206 - 208 These cards contain the heat capacity data for each component in the form

 $C_{p}(J)(Ca1/g \text{ mole } ^{O}K)=CP(J,1)+CP(J,2)*T+CP(J,3)*T^{2}+CP(J,4)*T^{3}$

(17)

where C_P is the heat capacity for the J component in calories per gram moles degrees Kelvin (Cal/g mole ^OK). See Appendix (H) for methods of evaluating heat capacity.

Input Set 9 Cards 209 - 212 This data set contains the Arrhenius frequency factor EA(I) and activation energy EE(I) for the Ith reaction.

Input Set 10 Cards 213 - 215 This card set contains entropy DS(J), enthalpy DH(J) and $log(K_F)$ for calculation of equilibrium for the Jth component.

Input Set 11 Cards 216 - 219 This data set contains CLJ(J,1), CLJ(J,2) constants of Lennard and Jones, the collision parameter in Angstroms (Å) and K/\mathcal{E} (K^{O-1}). If the component is a solid the constant of Lennard and Jones is set equal to zero and the density of the solid is read in as DE(J) Lbs/ft³ of the Jth component.

<u>Cards 220 - 261</u> These cards set up the remaining constants required for the program. These constants include delta heat capacity, heat of reaction, delta entropy and equilibrium data expressed as a function of temperature for each reaction.

<u>Cards 220 - 233</u> These cards calculate the \triangle CP of reaction by solving the equation

$$DC_{p}(I,L) = \sum_{M=SF(I)+1}^{SF(I)+SR(I)} C_{p}(IA(I,M),L)*B(I,M) - \sum_{M=1}^{SF(I)} C_{p}(IA(I,M,L)*$$

$$B(I,M) \qquad (18)$$
which is
$$\sum_{Products} C_{p} * (Coefficient) - \sum_{Reactants} C_{p} *$$

(Coefficient)

Cards 234 - 261 The delta heat of reaction, delta $Log(K_F)$ and the delta entropy for each of the reactions was calculated.

$$ST(I) = \sum_{B(J,1)}^{Products} B(I,M)/B(I,1) DS(IA(J,M) - \sum_{B(J,M)}^{Reactants} B(J,M)/B(J,1) * DS(IA(J,M)) = \Delta S^{O}$$
(19)

$$HT(I) = \sum_{A=1}^{Products} B(I,M)/B(I,1) DH(IA(J,M)) - \sum_{A=1}^{Reactants} B(I,M)/B(I,1) DH(IA(J,M)) - DH(IA(J,M$$

$$FT(I) = \sum_{k=1}^{\text{Products}} B(I,M)/B(I,1) DF(IA(J,M)) - \sum_{k=1}^{\text{Reactants}} B(I,M)/B(I,1) DF(IA(J,M)) DF(IA(J,M)) - \sum_{k=1}^{\text{Reactants}} B(I,M)/B(I,1)$$

<u>Cards 262 - 331</u> This section of the program writes out the reaction system and helps the user to identify any error

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he has made on the data input.

The first page of print-out includes the name of each component (a letter and a number computer assigned designation for each component), the heat capacity data for each component, the heat of formation (298°K), the entropy (298°K) and $\log_{10}(K_{\rm F})$ at temperature TT.

On the second part of the page the constants of Lennard and Jones, the molecular weight and the initial concentration of each component are written.

On the second page of print-out the reaction system is written in symbolic form with each component assigned a letter designation given on the first page. The Arrhenius frequency factor and activation energies are given. The delta heat capacity is listed.

On the second half of the second page the delta log (K_F) is given, as well as the constant of integration for calculation of the equilibrium constant. The order of reaction by component is listed.

<u>Cards 340 - 422</u> This section contains all the format statements used in PYRO. It controls the input and output of of all data used and generated by PYRO.

<u>Cards 332 - 339 and 423 - 578</u> This section is the heart of the program. It is this section in which the actual calculations of the changing composition and pressure profile takes place.

<u>Card 332</u> Statement 110 is the card which the computer uses every time it starts a new set of calculations.

<u>Cards 333 - 339 and Cards 423 - 458</u> The cards initialize values used in the program as computer controls. This section resets values which may have been changed during previous runs, such as the reactor radius profile.

<u>Card 436</u> This card is used as partial reinitializer in that **not** all values are reset. It is used in repeat calculations where one or more criterion were not met during the calculation of the reactor profile.

These criteria include:

A. Pressure

- 1. Maximum pressure at inlet = PRES
- 2. Pressure at outlet
 - a. POUT [±] .2 (atmospheres) and velocity of reactor medium less than the speed of sound.
- or b. Greater than (POUT ⁺ .1) atmosphere and velocity of reactor medium less than velocity of sound.

B. Carbon Profile

1. Carbon blocking tube

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- 2. Total number of carbon increments exceeded
- Convergence on desired outlet pressure not obtainable within 20 complete sets of reactor design.
- C. Reaction is so slow that all increments of conversion are less than 10^{-76} .

<u>Cards 453 - 454</u> These cards set up the number of increments calculated between complete print-out of data.

<u>Card 458</u> This card sets up initial reactor length increment.

<u>Cards 459 - 460</u> These cards are the controlling DO loops which allow increments of calculations. Control is returned to these DO loops after each complete calculation is completed.

<u>Card 461</u> This card calculates the incremental length of convergence.

<u>Card 463</u> This card calculates the position in the reactor.

<u>Cards 464 - 468</u> These cards calculate the temperature in the reactor.

<u>Cards 469 - 474</u> These cards calculate the reactor radius from the previous completed carbon profile. The radius is assumed to be smooth. Since the reactor radius is only defined at 101 points the radius in between these points is calculated by interpolation between the two closest known reactor positions.

<u>Cards 477 - 510</u> These cards calculate each individual increment of conversion DXA(I) for each equation (I=I,IR). The calculation of DXA(I) is derived from (27)

$$\gamma = \frac{1}{S} = C_{A_0} \int_{X_1}^{X_2} dX_{A}' - r_{A}$$
 (22)

This equation is solved for the increment of conversion by differentiating with respect to X_A .

$$\frac{d\Upsilon}{dX_{A}} = \frac{G_{A_{O}}}{(-r_{A})}$$
(23)

This equation is then solved for dX_A

$$dX_{A} = (-r_{A})d\gamma / C_{A_{0}}$$
(24)

The following is obtained by considering finite differences:

$$\Delta \mathbf{x}_{\mathbf{A}} = (-\mathbf{r}_{\mathbf{A}}) \Delta \gamma / \mathbf{c}_{\mathbf{A}_{\mathbf{0}}}$$
(25)

Equation (25) will be used to solve for finite difference along the reactor profile. Equation (25) is really the expression for conversion in a back mix reactor. This means the solution is really the solution of a large number of back mix reactors. (i.e.)

$$\Delta X_{A} (TOTAL) = \Sigma (\Delta X_{A})_{i}$$
(26)

By evaluating the reaction conditions at hundreds of positions along the reactor, a good approximation of the total reactor profile can be arrived at. By restricting Max (X_A)_i to be less than or equal to .01 (and on the average equal to .005 and with a minimum value of .001) the above approximations will be good. Also by using these small increments of conversion we can approximate

$$\mathcal{E}A = \frac{V_{F} - V_{I}}{V_{I}} = 0 \quad \text{because } V_{F} \cong V_{I}$$
(27)

where $\mathcal{E}A$ is the volume function of expansion.

 V_F is the final volume. V_T is the initial volume

The value of DX_A is controlled by controlling the value of \mathcal{N} (=1/space time (sec.)).

$$\mathcal{T} = \frac{C_{A_0} V}{F_{A_0}}$$
(28)

where C_{A_0} is the original concentration of component A (1b mole/ft³)

V is the reactor volume in cubic feet

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F_{A0} is the molar flow rate of component A (lb mole/ time)

$$V = \pi R^2 L$$

$$\Delta \Upsilon = \frac{C_{A_0} \Delta V}{F_{A_0}} = \Im R^2 \qquad \frac{C_{A_0} \Delta L}{F_{A_0}}$$
(29)

by combining equations (25) and (29) the following is obtained:

$$\Delta X_{A} = {}^{C_{A}}_{O} (-r_{A}) = \mathcal{T} R^{2} / {}^{F_{A}}_{O} (-r_{A}) \Delta L$$
(30)

thus the value of XA can be controlled by the length (Δ L). The procedure to control the value of DXA is to calculate DXA for each reaction and test whether it is larger than .01. If it fails the test a new value of DXA is to calculate DXA for each reaction and test whether it is larger than .01. If it fails the test a new value of Δ L is calculated from the equation:

$$DL = ABS(DL*.005)/DXA(I))$$
(31)

The max of ABS(DXA) is found and compared with .001. If the test fails, a new DL is calculated from equation (31).

In both cases the control of the program is returned to

the initiation of the reactor design.

If all rates pass both tests then calculation of new reactor conditions is continued.

In order to calculate DXA(I) the following must first be calculated:

$$R^2/F_A \stackrel{\Delta L}{\underset{O}{\to}} and (-r_A)$$

$$(-r_{A}) = K_{o}e^{-E*/RT} (C_{F_{I}}^{n}i - KT C_{R_{i}}^{N}i) = K_{o}e^{-E*/RT} (CF-CR)$$
(32)

where

 $(-r_{A})$ is the rate of the reaction (calculated by Card 493) Lb Moles/ft³ sec

$$K_{o} \quad \text{is the Arrhenius frequency factor} \\ E* \quad \text{is the Arrhenius energy of activation (cal/g.mole)} \\ R \quad \text{is the gas constant (btu/lb.mole}^{O}F) \\ T \quad \text{is the temperature in absolute units (}^{O}F) \\ C_{F_{I}} \quad \text{is the concentration of the reactants (lb.mole/ft}^{3}) \\ C_{R_{I}} \quad \text{is the concentration of the products (lb.mole/ft}^{3}) \\ M_{F_{I}} \quad \text{is the order of the I}^{\text{th}} \text{ forward reactant} \\ M_{R_{I}} \quad \text{is the order of the I}^{\text{th}} \text{ reverse reactant} \\ C_{F=I} \quad C_{F=I} \quad (Calculated by cards 481 - 485) \\ C_{F=I} \quad C_{F=I} \quad (Calculated by cards 481 - 485) \\ C_{F=I} \quad C_{F=I}$$

$$CR = \prod_{I=1}^{N} \binom{M}{R_{I}}$$
 (Calculated by cards 486 - 492)

Since each new reactor segment is considered to be the start of a perfect back mix reactor, F_{A_0} has to be recalculated each time. This calculation is done by a material balance performed later on in the program. The results from the previous material balance are available in the present calculation.

<u>Card 495</u> This card shows the calculation for DXA(I) the factor 1.13093355E4 comes from the combining of and the conversion factor converting($-r_A$) from sec. to hours.

(i.e. 1.13097355E4 = 1 * 3600)

<u>Cards 512 - 564</u> These cards calculate the material balance, the pressure drop, the carbon profile and set up the intermediate values which will be saved for output.

<u>Card 513</u> This card calls the function PRR(IS) which carries with it information on the amount of carbon formed. PRR(IS) then converts this to an equivalent amount of solid carbon which is deposited evenly over a 1% length of reactor segment. PRR then readjusts all other partial pressures so that their sum is equal to the pressure before carbon deposi-

Cards 514 - 535 These cards calculate the material

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balance. This calculation is accomplished by summing the increment of conversion (in terms of concentration and pressure) along the reactor segment. This total change in concentration is used to calculate a molar flow rate.

TMPH = TMPH(1+
$$\triangle$$
 TMPH) when
 \triangle TMPH = \triangle C * GC * T/P (32)
 \triangle C is the total change in concentration (1b m/ft³)
GC is the gas constant $\left(\frac{At. ft^3}{Lb mole O_K}\right)$

<u>Card 536</u> This card calculates the pressure drop by calling the function PRESD(T). While the pressure drop is being calculated it also calculates the new partial pressure and concentration of each component.

During the calculations several posibilities occur which must be detected and the appropriate action taken.

<u>Cards 538 - 540</u> If pressure drop sets the value of MB equal to

Value of MB	Condition	Correction	
2000	RENU less than 0 (due to	Start reactor design	
	estimated pressure below	again with a higher	
	0 atmospheres)	pressure.	

Value of MB	Condition	Correction
3000	Velocity of gas greater	Start reactor design
	than sound	again with a higher
		pressure
5000	Reactor tube blocked with carbon	Terminate calculation on this data set. Start new temperature
		Start new cemperature
		profile.

<u>Card 541</u> If the pressure falls .2 atmospheres below the minimum pressure in the reactor exit (2 atmospheres), the reactor design is started again with a higher pressure.

<u>Cards 542 - 543</u> These cards calculate the molar flow rate of each component.

<u>Cards 544 - 553</u> These cards test to see that at least one conversion was greater than the minimum conversion of .1% (otherwise the reactor design will take up unnecessary computer time). Note there is a maximum length of conversion which corresponds to 1% of the reactor length.

<u>Cards 554 - 564</u> These cards are used to output initial values of concentrated molar flow rates and conversion along the first increment of reactor length.

Cards 565 - 578 These cards are executed only after

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every 8 increments of conversion. They are used to prepare data for output after the reactor is totally designed. Control is returned to beginning of DO loop.

<u>Cards 579 - 813</u> This section of PYRO controls output and is used to converge the pressure so that it falls between the limits set up by the user. It also informs user of any misinformation fed to the computer so that detection and correction of outputare made easier.

<u>Cards 579 - 586</u> These cards write out the final conditions at the end of the reactor.

<u>Cards 590 - 598</u> These cards test for different final conditions to make sure they meet certain requirements.

<u>Card 590</u> This card checks to see if $P = P \stackrel{+}{=} .2$

<u>Card 591</u> If the condition in Card 590 is not met and if on some previous calculation it was determined that the initial condition giving acceptable outlet conditions was bypassed, then the increment by which the pressure is changed is cut by a factor of 2.

(i.e.
$$P_{IN} = P_{IN} + P - P/2 - P/4 + P/g$$
) (34)

where P_{IN} is the pressure at inlet P_{IN} is the original guess.

In this case the second increment resulted in a value too

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low and the pressure had to be increased by an amount 1/8 P. This convergence technique will always produce an acceptable answer (if one exists) provided that the answer was bracketed because

$$\sum_{M=1}^{L} (\frac{1}{2})^{M} \Delta P = \Delta P$$
(35)

proving that it is possible to reach either extreme of the bracketed answer by allowing one or more terms in the summation to be subtracted. Any intermediate value would eventually be arrived at.

<u>Card 593</u> If the velocity of sound has been exceeded, the upper limit is removed from the pressure and replaced with the restriction that the speed of sound is not to be exceeded. (i.e.)

 $P \stackrel{\scriptstyle{\leq}}{=} P$ - .2, and velocity < velocity of sound (36)

<u>Cards 595 - 598</u> These cards decide whether to add or subtract the next pressure increment: ITEST EQUALS 1 if the first time through. ITEST = 2 if last increment was added. ITEST = 3 if last increment was subtracted.

<u>Cards 604 - 628</u> These cards plot out results if desired. <u>Cards 629 - 665</u> These cards write out detailed calculation if desired. <u>Cards 666 - 684</u> These cards write out the final reactor condition.

<u>Cards 685 - 697</u> This section adds pressure increment and starts calculations all over again. (Set values on ITEST = 2)

<u>Cards 698 - 704</u> This section subtracts pressure increment and starts program over again. (Sets values on ITEST = 3)

<u>Cards 705 - 714</u> These cards prepare the reactor profile for printing. This section also updates the reactor profile so that the previous profile becomes the working profile used in the next set of reactor design. These cards are only executed if all criteria have been met. Card 714 writes out the reactor profile.

<u>Cards 715 - 721</u> This section resets initial conditions for the next set of reactor calculations.

<u>Card 722</u> This card checks to make sure that the maximum number of completed reactor calculations equal to IZZ has not been exceeded. If it hasn't, the program continues. Otherwise, a new temperature profile is read and a new case is started.

<u>Card 723</u> This card makes sure the inlet pressure is less than the maximum allowable pressure. If it isn't, the program is continued. Otherwise, a new temperature profile is read and a new case is started. <u>Card 724</u> This card is a conditional branch to program reinitialization.

<u>Cards 725 - 727</u> These cards are executed only if the tube is blocked with carbon. These cards print out the information that the tube is blocked, set the value of IZZ so that it will read a new temperature profile and then give control to Cards 705 - 723.

<u>Cards 728 - 756</u> These cards are only executed at the termination of calculation from a particular temperature profile.

Card 728 This card prints out the information that there was an unstable temperature profile causing ocillation in the calculations which would continue indefinitely if not checked for and handled properly.

<u>Cards 729 - 749</u> These cards are executed only if the IPLOT variable is either 1 or 2. These cards plot up the reactor profile.

<u>Cards 750 - 751</u> These cards are used as final identification of the temperature profile.

Cards 752 - 753 These cards reinitialize constants.

<u>Cards 754 - 763</u> These cards read in the new temperature profile. If the variable IGOW is equal to:

IGOW	Computer Will
1	Read in completely new reaction system.
2	Begin calculation with present system and new
	temperature profile
3	Stop

<u>Cards 764 - 778 and 807 - 813</u> These cards are used to terminate the program because of bad data input. The data is identified by variables on the data output. This identity must correspond to an internally generated variable or the computer program is terminated and the location and reason for termination are given.

<u>Cards 779 - 866</u> These cards are used to generate the equilibrium data, the heat capacity of reaction data and the delta heat of reaction data. The information is put in tabular form and calculations are terminated.

Appendix B

Use of Marquardt's Non-Linear Square Fit Program

- I General Description and Limitation
- II Requirement to Use Program

III Flexibility

- IV Explanation on How to Use Snowjo
 - V Example One: Heat Capacity of Carbon
 Example Two: Heat Capacity of Acetylene
 Example Three: Determination of *Λ*χ (Lennard and Jones
 Collision Integral) as a function of KT/E

Appendix B

Use of Marquardt's Non Linear Least Square Fit Program

I. General Description and Limitations

The Marquardt Program works by adjusting the value of a set of components till the value calculated from the adjusted parameter equation minus the observed value (the quantity squared) is equal to a minimum.

(i.e.) (Observed - Predicted)² = Minimum
The program can handle ten independent variables, 500
observation points and 50 adjustable parameters.

II. Requirements

a. The user must supply a set of data with at least as many variables as there are adjustable parameters.

b. The user must supply a set of initial guesses for the values of the adjustable constants.

- c. The user must supply three subroutines.
 - <u>Sub Z</u> This subroutine, called only once during the run of the program, is used to get data into more easily handled form by allowing the user to expand the scale of either the ordinate or the abcissa.
 - 2. <u>F Code</u> This subroutine is used to define the predicted values and the residue (i.e.) the

difference between the observed and the predicted values.

3. <u>P Code</u> - This subroutine calculates analytical partials of the function with respect to each of the adjustable parameters. This subroutine need not be supplied if the user is weilling to use the somewhat less exact partials: calculated by the program using difference methods (if this latter technique is used, none of the initial guesses for the value of the adjustable parameters may be zero).

III. Flexibility

This program also allows the user to select initial values of the adjustable parameters and let them remain fixed throughout any run of the program. The program has been adapted by the author to allow many runs on the same set of data without reintroducing the entire set of data but simply selecting different sets of initial guesses for the fixed parameters.

It is also possible to enter a set of constants so that the value of any given variable will not fall below (or above) a given value, never turn negative or will not be N times as great as the value of any other adjustable parameter.

IV. Method of Data Input

- 1. First Card Set Format (2013)
- Col. 1 3 Number of sets of data or observations (≤ 500)
- Col. 4 6 Number of variables and fixed parameters (= 50)
- Col. 7 9 Number of fixed parameters (≤ 49)
- Col. 10 12 Number of independent variables (≤ 10)
- Col. 13 15 A zero means results not plotted. A one means the results are plotted by computer.
- Col. 16 18 Number of contraints on variable parameters (≤ 50)
 - 2. Second Card Set Format (2013)
- Col. 1 3 Not used but nust contain a zero
- Col. 4 6 A zero means analytical derivatives used (Calculated by P Code). A one means estimated derivative used (Calculated by program).
- Col. 7 9 A zero means abbreviated form and not plots used. A (one - ninety nine) means the number of detailed printouts and plots used before abbreviated form is used. The last iteration is always detailed.
- Col. 10 12 A zero means no forced stop (i.e. the program keeps calculating until one of the convergence criterion is met or until the program is cut manually.

A (one - ninety nine) is the number of iterations used before the program is forced off by going to the convergence calculation.

Col. 13 - 15 Not used but must contain a zero

Col. 16 - 18 A zero means non linear confidence region is desired.

A one means non linear confidence region not desired.

3. Third Card Set Format (2F10.0)

- Col. 1 10 Left side of plot usually smallest value of any observed data point.
- Col. 11 20 Spread of plot (usually largest minus smallest observed data point.)
 - 4. Fourth Card Set

If Col. 7 - 9 Card 1 equals zero, omit this card. If it equals (1 - 49) list the excluded parameters Format (2513) 25 to the card. (i.e.) This will be a list of the parameters which are fixled. If there are 3 fixed parameters, 1-7-10, then the card would like like: bb1 bb7 b10

5. Fifth Card Set Format (7F10.0)

This card sets the parameters used to calculate confidence and convergence criteria. If set equal to zero the program will supply its own values for details.

6. Sixth Card Set

This card set reads the initial guess for the parameter (both fixed and variable) Format (7F10.0) seven to the card.

7. Seventh Card Set

This card set it used to generate format code for the next set of cards Format (20A4). This card will have an open parenthesis in Col. One followed by the specific format followed by a closed parenthesis. If there are 5 independent variables, Card 7 might look like (6F10.0) or (6E10.0) or any other suitable format.

8. Eighth Card Set

This card set reads in observed data points and the corresponding value of the independent variables. The format is the one generated in card 7. There will be as many cards in Card Set Eight as there are observation points, or if all the data for one set of observation points will not fit on one card, there will be multiple cards,

9. Ninth Card Set

This set contains any information called for by the subroutine supplied by user, using the user's own format.

10. Tenth Card Set

If Col. 1 - 5 is less than zero (the rest of the card being filled in with zeroes) the next set of data read in will be Card Set One and the program will start on a new problem.

If Col. 1 - 5 is equal to zero (the rest of the card also containing all zeroes) the program will stop.

If Col. 1 - 5 is greater than zero the program will read Card Set Ten as a new set of values as initial guesses for the fixed and variable parameters. The program will be reinitialized (Sub Z will not be recalled) and the program will be run through again. At the end of its run the next card will be read in as Card Set 10.

Subroutine Sub (Z)

Subroutine Sub Z(Y,X,B,PRNT,NPRNT,N) is used to calculate the initial values used in the program. If desired, Subroutine Z can be the following:

SUBROUTINE SUB Z (Y,X,B,PRNT,NPRNT,N) COMMON Y(500),X(500,10)B(50),PRNT(5)

RETURN

END

SUBROUTINE F CODE (Y,X,B,PRNT,F,I,RES)
SUBROUTINE F CODE (Y,X,B,PRNT,F.I.RES)
COMMON Y(500),X(500,10)B(50),PRNT(5)
F-f(X(I,1),X(I,2)...X(I,N),B(1),B(2)...B(M))
N = Number of independent variables
M = Number of parameters
RES = Y(1)-F

RETURN

END

Note: If you want to brach to next case for any reason

just set I=1000 as a result of not meeting some criterion.

(i.e.) If (X(I,2).GE.X(1,3)) I=1000 etc.

This will stop calculations on your program and branch to the next set of imput data.

SUBROUTINE P CODE (P,X,B,PRNT,F,I,)

```
COMMON Y(500), X(500, 10), B(50), PRNT(5)
```

DIMENSION P(50)

P(N)=dF/dE(N)=f(X(I,1),X(I,2)...X(I,M),B(1),B(2)...B(MM)Requires that N=(1,MM) one partial for each derivative

P(1) =P(2) = $P(3) = f_3()$

 $P(MM) = f_{MM}()$

Note: MM = total number of parameters

The I in X(I,1) or X(I,3) etc. is the set of data the program is calling for. The I value is supplied by the program.

RETURN

END

HOW TO USE NON LINEAR PROGRAM ON DISK

The non linear least square curve fit is on disk as a subroutine therefore it will be necessary to write a dummy program to use it.

// JOB CC 305/0003, RATE F, 3600, 10000, RICHARD ROBERTSON

// FORTRAN

PROGRAM RATE F

CALL SNOWJO

END

SUBROUTINE SUB Z(Y,X,B,PRNT,NPRNT,N)

RETURN END

SUBROUTINE F CODE (Y,X,B,PRNT,F,I,RES)

RETURN

END

SUBROUTINE P CODE (P,X,B,PRNT,F,I,)

RETURN

END

// EXEC

(DATA

// EXEC RATEF, UTZ

DATA

// EXEC RATEF, UTZ

DATA

ETC.

Example

The following program is designed to fit heat capacity data of carbon.

The original data was in the form

$$C_{\rm P} = 2.673 + 2.617 \times 10^{-3} \, \text{T} \times 1.169 \times 10^{5} / \text{T} \times 2$$
 (1)

This equation was evaluated at 28 temperatures between 500 and 1175[°]K using a very simple computer program. The results were punched by the computer in a (2F16.7) format, the heat capacity being the observed value and the temperature being the independent variable.

After being run via the non linear curve fitting program the equation was changed to the following form.

$$C_{p}=2.673 + 4.4973 \times 10^{-2} + 4.6362 \times 10^{-6} T \times 2 - 2.16009 \times 10^{-9} T \times 3$$
 (2)

The second form is now consistent with the form of the rest of the heat capacity data.

Sub Z was not used and a very short Sub Z program was written.

F Code defined T as equal to X(I,1) and F = b(1) + b(2)*T + b(3)*T*T* + b(4)*T*T*T. F now becomes the predicted value. RES=Y(I)-F is the difference between the predicted value F and the observed value Y(I).

P Code defined T as equal to X(I,1) and $\partial F / \partial B(1) = P(1) = 1$ $\partial F / \partial B(2) = P(2) = T$ $\partial F / \partial B(3) = P(3) = T*T$ $\partial F / \partial B(4) = P(4) = T*T*T$.

In this program B(1) was fixed, so that the following data input was used:

Card Set 1

```
Number of observations = 28
Number of parameters = 4 io B(1)-B(2)-B(3)-B(4)
Number of fixed parameters = 1 only B(1) fixed
Number of independent variables = 1 only temperature
```

Results of be plotted = 1

Number of constraints = 0

Card Set 2

Col. 1 - 3 = 0

Number of detailed printouts = 20

Number of iterations before forced of f = 20

Col. 13 - 15

Non linear confidence region = 0 is desired

Card Set 3

```
Lowest value = 3.000
(Highest value - 10)
10 - 3 = 7.000
```

Card Set 4

The first parameter is fixed = 1

Card Set 5

7 zeroes. Space 10 spaces apart, allowing computer to fix the values.

<u>Card Set 6</u>

The initial guesses for B(1) = 2.673

<u>Card Set 7</u>

The format for the rest of the data is (2F16.7)

Card Set 8

The data heat capacity = 3.5139

temperature = 500.0

is repeated for all 28 observations.

Card Set 9

This card set is not used (none of the subroutines have any cards to read).

Card Set 10

0.00 0. 0. 0.

This is what the computer is desired to do. The first value is 0. so that the computer will stop when it gets to this point. // JOB CC 305/003, RROB, 1800, 10000 RICHARD ROBERTSON

```
// PARAM LIST=YES, DEBUG=YES, MAP=YES, CODE=1
```

// FORTRAN

PROGRAM IBWTT

CALL SNOWJO

STOP

END

SUBROUTINE SUB Z(Y,X,B,PRNT,NPRNT,N)

```
COMMON Y(500), X(500, 10), B(50), PRNT(5)
```

NPRNT=0

RETURN

END

SUBROUTINE FCODE (Y,X,B,PRNT,F,I,RES)

```
COMMON Y(500)X(500,10),B(50),PRMT(5)
```

T=X(1,1)

```
F=B(1)+B(2)*T+B(3)*T*T+B(4)*T*T*T
```

RES=Y(I)-F

RETURN

END

SUBROUTINE PCODE (P,X,B,PRNT,F,I) COMMON Y(500),X(500,10),B(50),PRNT(5) DIMENSION P(50) P(1)=1 P(2)=T P(3)=T*T P(4)=T*T*T RETURN

END

DATA SET

Card Set 1 28 4 1 1 1 0 Card Set 2 0 20 20 0 0 0 Card Set 3 3. 7. <u>Card Set 4</u> 1 Card Set 5 Ō. 0. 0. 0. 0. 0. 0. Card Set 6 2.673 .002617 .000009 .00000002 Card Set 7 (2F16.0)Card Set 8 3.5139000 500.00000 3.6227981 525.00000 3.7259038 550.00000 3.8242023 575.00000 3.9184778 600.00000 4.0093610 625.00000 4.0973637 650.00000 4.1829044 675.00000 4.2663286 700.00000 4.3479231 725.00000 4.4279278 750.00000 4.5065445 775.00000 4.5839438 800.00000 4.6602711 825.00000 4.7356507 850.00000 4.8101893 875.00000 4.8839791 900.00000 4.9570998 925.00000 5,0296210 950.00000 5.1016033 975.00000 5.1730000 1000.0000 5.2441579 1025.0000 5.3148183 1050.0000 5.3851177 1075.0000 5.4550885 1100.0000 5.5247596 1125.0000 5.5941569 1150.0000 5.6633033 1175.0000 Card Set 9 - not used Card Set 10 0.00 0.0 0.0 0.0

Example 1

Heat Capacity of Carbon

In this example the heat capacity of carbon was not available in the standard form, It was available as:

$$C_{p \text{ Carbon}} = A + BT + C/T^2$$
(3)

The heat capacity of carbon was fit to the form:

$$C_{\mathbf{P} \text{ Carbon}} = \mathbf{A} + \mathbf{BT} + \mathbf{CT}^2 + \mathbf{DT}^3$$
(4)

The value of A was fixed as a constant.

All of the heat capacity data used in this study were obtained from <u>Selected Values of Chemical Thermodynamic</u> <u>Properties</u>.⁽⁴³⁾ (44)

The result of this curve fitting is found on page 118.

Example 2

Heat Capacity of Acetylene

The heat capacity of acetylene was fit between 300 and 1500° K. Data was in 100° increments. The standard error for this range was found to be .0941. The percent average standard error became .0941/15.45 * 100 \cong .6%

The final equation became

$$C_{P CH \equiv CH} = 5.867 + 1.957 * 10^{-2}T - 1.296 * 10^{-5}T^{2} +$$

3.466 * 10^{-9}T^{3} (5)

where T is ^OK.

The values of the heat capacity for each component are listed in Appendix C.

ACETYLENP EPSILON TEST HEAT CARACITY . . N mp 13 P = M = K = 4 0 1 FF = 0.400E 01 0.200E 01 E = 0.500E-04 TAU = 0,100E=02 T = (5) PARAMETERS 0.34664522E=08 0.58672009E 01 0,19574307E=01 -0.12957129E-04 0.00E 00 0.70E 02 • 90 ·۷ v v v v ¥ v v v Y 5) PARAMETERS 0.58672009E 01 0.19574307E-01 -0.12957129E-04 0.346645228-08 DIFE DBS. PRED 0.10532000E 02 0.10666945E 02 -0.13494492E 00 0.11973000E-02-0.11845635E 02 0.12736416E 00. 0.12967000E 02 0.12848379E 02 0.11862087E 00 -0.13728000E-02--0-13695959E_02 0.32040596E=01 _0.14336000E__02_ 0.14409216E 02 =0.73215485E-01 0.14933000E 02 0.15008903E 02 -0.75902939E-01 0.15449000E 02 0.15515825E 02 -0.66824913F-01 0.15922000E_02 0-15950808E-02 =0.28807640F=01 0.16352997E_02 0.16334625E 02 0.18371582E-01 0.16744003E 02 0.16688126E 02 0.55877686E-01 0.17098999E 02 0.17032028E 02 0.66970825F-01 0.17417999E_02 0.17387177E 02 0.30822754E-01 0.17703995E 02 0.17774368E_02 -0-70373535E-01 _PHI_ S.E. LAMBDA ANALYTIC PARTIALS USED 0.79793751E=01___ 0.94159245E=01 0.1005=06_ PTP INVERSE 0.15125728E 02 -0.59988748E-01 0.69572809E-04 -0.24528543E=07 =0:59988689E-01 0.24802075E=03 =0,29545390E=06 0.10609866E=09 -D.13140883E-12 0.69572707E-04____ -0.29545379E-06 0.35979486E-09 0,48670381E-16 _=0.24528489E-07_ D.10609855E=09 4 =0.13140866E=12 PARAMETER CORRELATION MATRIX 1.0000 -0.9794 0.9431 -0.9040 2 -0.9794 1.0000 0,9657 -0.9891 0.9431 -0.9891 _1.0000 =0.9930 =0.9040 0.9657 -0.9930 1.0000 SUPPORT PLANE STD DNE - PARAMETER LOWER_ UPPER ERROR LOWER UPPER \sim 0.44023924E 01 3.73320093E 01 0.36620224E 00 0.51347961E 01 0.65996046E 01 S 0.25505837E-01 0.13642777E-01 0,14828830E-02 Q.16608540E-01 0.22540070E-01 0.17860357E-05 -0.20101259E=04 -0.58129863E=05 3 -0.16529200E-04 -0.93850576E-05 میں۔ ویتیں۔ حوالیہ 0.60940266E=0B 0.65689387E-09 0.83887675E=09 4 0.21526645E-08 0.47802367E-08

4 0+65	1689387E-09	0.21526645E-08	0.47802367E=08	0.83887675E-09	0.60940266E=08	
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Example 3

Determination of Lennard and Jones Collision Intergral

In the subroutine Pressure Drop (see Program Logic) it was necessary to determine the viscosity of the reactor components. This was done by calculating the viscosity of each component from the equation #

$$\mathcal{M} = 2.6693 * 10^{-5} \sqrt{MT/\Lambda_{\mu}^2}$$
(6)

This made it necessary to calculate the value of Previous to this the values were only available in table form requiring linear interpolation between values.

It was decided that the program would be more flexible if this data could be curve fitted. Plotting the values on log-log paper gave a slowly curving line when lent itself to a polynomial fit.

The values of the Lennard and Jones parameter were fed into SNOWJO with the corresponding values of KT/\mathcal{E} .⁽⁵⁾ The log of each value was taken (in SUBZ) and SNOWJO proceded to curve fit the data in the identical way that the heat capacity data was curve fitted.

[#]See Pressure Drop in Program Logic to get details.

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ð [;]	ALL AS A FUNCTION OF KT/E EPSILON TEST	Ø
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۵ '	N 7, 79 K 8 4 P 8 0 M 8 1 FF 8 0.400E 01 Y 8 0.200E 01 E 8 0.500E=04 TAU 8 0.100E=02	(°,
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0 !!	(3) PARAMETERS 0.44369495E 00 =0.44127321E 00 0.83573699E=01 =0.72000735E=02	*
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0,10242472E 01 0,11086845E 01 -0,1	=1.20397 84437370E-01 -1.04982	-8,81% -4,20%
0.10242472E 01 0.11086845E 01 =0. 0.96622318E 00 0.10073919E 01 =0.	=1.20397 =1.20397 =1.04982 =1.04982 =0.91629	-8,81% -4,20% -1.07%
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$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{c} -8,81\% \\ -4,20\% \\ -4,20\% \\ -1,07\% \\ 0,90\% \\ 2,17\% \\ 2,89\% \\ 3,27\% \\ 3,37\% \\ 3,37\% \\ 3,34\% \\ 2,21\% \\ 2,98\% \\ 2,21\% \\ 2,98\% \\ 2,21\% \\ 2,98\% \\ 2,21\% \\ 1,23\% \\ 0,97\% \\ 1,23\% \\ 0,97\% \\ 0,69\% \\ 0,42\% \\ 0,22\% \\ -1,34\% \\ -0,21\% \\ -0,21\% \\ -0,50\% \\ -0,85\% \\ -0,85\% \\ -0,85\% \\ -1,05\% \\ \end{array}$
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	-8,81% -4,20% -1,07% 0,90% 2,17% 2,89% 3,27% 3,37% 3,34% 3,27% 3,34% 2,27% 2,89% 3,27% 3,34% 2,27% 2,98% 2,27% 2,98% 2,27% 2,44% 2,12% 1,80% 1,23% 0,97% 0,69% 0,42% 0,22% -1,34% -0,21% -0,21% -0,55% -0,85% -1,05% -1,15%
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{c} -8,81\% \\ -4,20\% \\ -4,20\% \\ -1,07\% \\ 0,90\% \\ 2,17\% \\ 2,89\% \\ 3,27\% \\ 3,37\% \\ 3,37\% \\ 3,34\% \\ 2,21\% \\ 2,98\% \\ .2,72\% \\ 2,44\% \\ 2,12\% \\ 1,23\% \\ 0,97\% \\ 1,23\% \\ 0,97\% \\ 0,69\% \\ 0,42\% \\ 0,22\% \\ -1,34\% \\ -0,21\% \\ -0,35\% \\ -0,65\% \\ -0,80\% \\ -0,85\% \\ -1,05\% \\ \end{array}$

	0. 19966996E 00 0.21117239E 00 001112000-101-00		\bigcirc
)	0.18977923E 00 0.20248295E 00 0.17981803E 00 0.19298651E 00 -0,13170481E-01		******
	0.17981803E 00 0.19298851E 00 =0.13170481E=01 0.17058617E 00 0.18412876E 00 =0.13542593E=01	0.69315 -1.44%	1975
2	0,16126829E 00 0,17558306E 00 =0,14314771E=01	0.74194 -1.45%	()
٠ أ	0.14496589E 00 0.15936208E 00 -0.14396191E-01		
	0,12927192E 00 0,14419544E 00 =0,14923513E=01	0.83291 -1.50%	®
<u>)</u>	0,11511254E 00 0,12997228E 00 =0,14859736E=01		630
4	0.10165393E 00 0.11659753E 00 =0.14943602E-01 0.88926554E-01 0.10398883E 00 =0.15062273E=01		
3 8	0,88926554E=01 0,10398883E 00 =0,15062273E=01 0,77886820E=01 0,92074990E=01 =0,14188170E=01		0
* 5	0.66723824E=01 0.80793738E=01 =0.14069915E=01		100
01	0,56379993E-01 0,70090353E-01 -0,13710361E-01		
۰۰ ک	. 0.46883907E-01 0.59916530E-01 -0.13032623E-01	1,098611.20%	
21	0.382582E8E-01 0.50229009E-01 -0.11970721E-01		
	0.29558558E=01 0.40990096E=01 =0.11431538E=01	<u>1,16315</u> <u>-1.05%</u>	en.
3	0,21761809E=01 0,32165952E=01 =0,10404143E=01		0
	0.13902843E-01 0.23725528E-01 -0.98226853E-02		
•	0,69755837E=02 0,15641946E=01 =0,86663626E=02		Ò
3	0.10002159E-03 0.78900009E-02 -0.79900213E-02 		U
	0.68232194E-020.44753775E-030.72707571E-02 0.13085250E-010.67058951E-020.63793547E-02		
3	0.19080866E-010.13583827E-010.54920390E-02		\mathcal{O}
-	-0.24805132E=01 =0.20217992E=01 =0.45871399E=02		
	-0.30459180E-01 -0.26609089E-01 -0.38500912E-02	1.41099 -0.39%	
2	-0.36663998E-01 -0.327760885-01 -0.38879104E-02	1,43508 -0,21%	0
	-0.40822014E-01 -0.38731933E-01 -0.20900816E-02		
	-0.47196459E-01 -0.44488713E-01 -0.27077459E-02		673
<u></u>	-0.50556742E-01 -0.50057437E-01 -0.49930438E-03		S.
	-0,55089977E-01 =0,55448513E-01 0,358536848-03 -0,59537705E-01 =0,60671106E-01 0,113340098-02		
3			\bigcirc
	-0.67957640E-01 -0.70645392E-01 0.26877522E-02	1.58923 0.34%	
	•0,72033226E=01 =0,75412512E=01 0,33792853E=02	1.60944 0.41%	
Ð	<u>-0,75909555E-01</u> <u>-0,80042958E-01</u> 0,41334033E-02	1,79176 1,05%	0
	=0,10948002E 00 =0,12007189E 00 0,10591865E=01		
Э	-0.13616341E 00 =0.15157807E 00 0.15414655Em01		O
2	-0,15805829E 00 -0,17726833E 00 0,19210041E+01 -0,17685652E 00 -0,19878101E 00 0,21924496E+01		1997 - S
	-0,19334209E:00 -0,21717340E 00 0,23831308E+01		
3	-0,29679006E 00 -0,32178968E 00 0,24999619E-01	3,40120 1.75%	0
	-0,35596085E 00 -0,37365979E 00 0,17698944E-01		
~	-0.39779454E 00 -0.40827864E 00 0.10484099E-01		-
3	-0.43016773E 00 -0.43463361E 00 0.44658780E-02		0
	-0.45649529E 00 -0.45621389E 00 -C.28139353E-03 -0.47900391E 00 -0.47470230E 00 -0.43016076E-02		:
			0
-	-0,51533574E 00 -0.50574875E 00 -0.95869899E-02		94 .
	SUM OF SQUARES 0,25807E-01	<u> </u>	
9	-0.53068829E 00 -0.51923728E 00 -0.11451006E-01	1 (0
~	PHI S.E. LAMBDA A	ANALYTIC PARTIALS USED	***
0	0.25806993E=01 0.18549748E=01 0.100E=04		<u>_</u>
	PTP_INVERSF		
6	10,29627133E+010,60996935E=020,13612781E=01	1 0.316574085+02	3
			*
0	4 0+31657459E=02 0,37040552E=02 =0,69517009E=02	2 0.14202138E=02)
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The results were:

$$LN(\Omega_{K}) = .4437 - .4413 LN(\frac{KT}{\varepsilon}) + .08357 LN^{2}(\frac{KT}{\varepsilon}) - .007200 LN^{3}(\frac{KT}{\varepsilon})$$
(7)

$$\int \mathbf{K} = \int \boldsymbol{\mu} = \mathbf{E} \mathbf{X} \mathbf{P} \left(.4437 - .4413 \, \mathbf{L} \mathbf{N} \left(\frac{\mathbf{K} \mathbf{T}}{\boldsymbol{\varepsilon}} \right) + .8357 \, \mathbf{L} \mathbf{N}^2 \left(\frac{\mathbf{K} \mathbf{T}}{\boldsymbol{\varepsilon}} \right) - .0072 \, \mathbf{L} \mathbf{N}^3 \, \left(\frac{\mathbf{K} \mathbf{T}}{\boldsymbol{\varepsilon}} \right) \right)$$

The results from this regression analysis are given in the preceding 3 pages.

Appendix C

Heat Capacity

Component Number	Component
1	Acetylene
2	Iso-Butane
3	Normal Butane
4	Iso-Butene
5	Ethane
6	Ethylene
7	Hydrogen
8	Methane
9	Propane
10	Propene
11	Water
12	Carbon
13	Carbon Monoxide

<u>``</u>	<u>L</u>	2	3	4	5	6	7		9			12	- 13
800	15.009	48.550	48.268	42.394	25.799	20,217	7.099	15.031	37.118	30.697	9.249	4.727	7.603
810	15.063	48.892	48.609	42.676	25.996	20.352	7.105	15.146	37.389	30.913	9.279	4.753	7.619
820	15.117	49.228	48.946	42.954	26.191	20.486	7.111	15.261	37.656	31.127 31.337	9.308 9.338	4.779	7,635
830	15.170	49.559	49.277	43.227	26.384	20.018	7.117 7.123	15.488	36.178	31.545	9.368	4.803	7,667
850	15.273	50.206	49.927	43.762	26.763	20.876	7.130	15.600	38.434	31.750	9.398	4.851	7.683
860	15.323	50.521	50.244	44.023	26.948	21.002	7.136	15.712	38.686	31.952	9.428	4.874	7.699
870	15.372	50.833	57.558	44.280	27.132	21.126	$\frac{7.143}{7.149}$	15.823	38.934 39.179	32.151	9.458	4.896	7.715
880 890	15.421	51.139 · 51.441	50.866	44.533	27.314 27.493	21.249 21.370	7.156	16.041	39.179	32.347 32.540	9.488	4.910	7,747
900	15.516	51.738	51.470	45.028	27.670	21.489	7.163	16.149	39.658	32.731	9.548	4.959	7.763
910	15.562	52.030	51.765	45.270	27.844	21.606	7.170	16.256	39.892	32.919	9.578	4.979	7,778
920	15.608	52.318	52.056	45.508	28.017	21.722	7.176	16.362	40.123	33.104	9.608	4.998	7.794
930 940	15.653	52.601	52.343	45.743	28.188	21.836	7.183	16.468	40.351	33.287 33.467	9.638	5.017	7.810
950	15.741	53.155	52.904	46.201	28.522	22.059	7.197	16.675	40.795	33.645	9.698	5.053	7.841
960	15.784	53.426	53.179	46.425	28.686	22.169	7.205	16.778	41.014	33.820	9.728	5.071	7,856
970	15.827	53.693	53.449	46.645	28.848	22.276	7.212	16.879	41.229	33.992	9.758	5.087	7.872
980	15.869	53.955	53.716	46.862	29.005	22.382	7.219	16.980	41.441	34.162	9.788	5.104	7.887
990	15.910 15.951	54.213 54.468	53.978 54.237	47.076	29.166	22.487	7.226	17.079	41.649 41.855	34.330 34.495	9.818 9.548	5.120 5.135	7.902 7.917
1010	15.991	54.719	54.492	47.494	29.476	22.692	7.241	17.276	42.057	34.658	9.878	5.151	7,932
1020	16.031	54.965	54.744	47.698	29.628	22.792	7.249	17.372	42.257	34.818	9.907	5.165	7,947
1030	16.070	55.209	54.991	47.900	29.778	22.891	7.256	17.468	42.454	34.977	9.937	5.180	7,962
1040 1050	16.109	55.448	55.235 55.476	48.098	29.926	22.988 23.084	7.264	17.562	42.648	35.133 35.286	9.966	5.194	7,991
1050	16.186	55.916	55.713	48,486	30.216	23.179	7.279	17.748	43.027	35.438	10.025	5.221	8,005
1070	16.224	56.145	55.946	48.675	30.358	23.273	7.287	17.840	43.213	35.587	10.054	5.235	8.019
1080	16.261	56.371	56.177	48.862	30.498	23.365	7.294	17.930	43.396	35.734	10.084	5.248	8.033
1090	16.298	56,593	56.403 56.627	49.047	30.637	23.455	7.302	18.020	43.577	35.879	10.113	5.260	8.060
1110	16.371	57.028	56.847	49.407	30.908	23.633	7.318	18,195	43.930	36.163	10.170	5.285	8.074
1120	16.407	57.241	57.065	49.584	31.041	23.721	7.326	18.281	44.103	36.302	10.199	5.297	8.087
1130	16.443	57.451	57.279	49.758	31.172	23.807	7.334	18.366	44.273	36.439	10.228	5.309	8.100
1140 1150	16.479	57.658	57.490 57.698	49.929	31.301	23.891	7.342	18.450	44.441	36.574	10.256	5.321	8.113 8.126
1160	16.549	58.063	57.904	50.266	31.429 31.554	23.975 24.058	7.350	18.533	44.771	36.838	10.312	5.344	3,138
1170	16.584	58.262	58.106	50.430	31.678	24.139	7.356	18.695	44.932	36.968	10.340	5.356	8,151
1180	16.619	58.458	58.306	50.593	31.801	24.220	7.374	18.774	45.091	37.095	10.368	5.367	8,163
1190	16.654	58.651 58.842	58.502 58.697	50.753 50.912	31.921	24.299	7.382	18.852	45.248	37.221 37.345	10.395	5.379	8.174 8.186
1200	16.688	28.842	28.09(20.912	32.040	24.378	7 200	18.929	45,403	21.242	10.462	2.270	0.100

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Appendix D

Equilibrium Constants

Equation No.	Equation
1	$C_2H_6 \longrightarrow C_2H_4 + H_2$
2	$C_2H_6 \longrightarrow CH_4 + \frac{1}{2}C_2H_4$
3	$C_2H_4 \longrightarrow C_2H_2 + H_2$
4	$2C_2H_2 \longrightarrow C_4's$
5	$C + H_2 O \longrightarrow CO + H_2$
6	$C + H_2^{0} \longrightarrow CO + H_2^{-}$

TEMP	EQUILIBRUM CONSTANTS (KF)
	EQUATION (S) NUMBER
800	5.9610E-02 1.9785E 02 1.8067E-06 6.5951E 08 1.8549E-01 6.8955E 01 1.5820E 00 1.4906E 03
810	6.6285E-02 1.7956E 02 2.7817E-05 6.6394E 08 1.8711E-01 5.6326E 01 1.6491E 00 1.4160E 03
820	7.3523E-02 1.6333E 02 4.2387E-06 6.6837E 08 1.8874E-01 4.6241E 01 1.7173E 00 1.3466E 03
830	8.1359E-02 1.4890E 02 6.3943E-06 6.7279E 08 1.9037E-01 3.8175E 01 1.7856E 00 1.2819E 03
840	8.9822E-02 1.3603E 02 9.5535E-06 6.7722E 08 1.9200E-01 3.1612E 01 1.8571E 00 1.2217E 03
850	9.8941E-02 1.2452E 02 1.4141E-05 6.8165E 08 1.9363E-01 2.63145 01 1.9287E 00 1.1654E 03
860	1.0875E-01 1.1421E 02 2.0743E-05 6.8607E 08 1.9526E-01 2.1999E 01 2.0014E 00 1.1128E 03
870	1.1929E-01 1.0495E 02 3.0164E-05 6.9050E 08 1.9690E-01 1.8469E 01 2.0751E 00 1.0636E 03
880	1.3058E-01 9.6614E 01 4.3495E-05 6.9491E 08 1.9854E-01 1.5557E 01 2.1497E 00 1.0174E 03
890	1.4266E-01 8.9100E 01 6.2211E-05 6.9933E 08 2.0019E-01 1.3172E 01 2.2254E 0J 9.7414E 02
900	1.5556E-01 8.2309E 01 8.8280E-05 7.0375E 08 2.0183E-01 1.1187E 01 2.3019E 00 9.3345E 02
910	1.6931E-01 7.6163E 01 1.2433E-04 7.0817E 08 2.0348E-01 9.5359E 00 2.3794E 00 8.9519E 02
920	1.8396E-01 7.0587E 01 1.7380E-04 7.1258E 08 2.0513E-01 8.1568E 00 2.4577E 00 8.5922E 02
930	1.9952E-01 6.5520E 01 2.4124E-04 7.1698E 08 2.0678E-01 7.0007E 00 2.5369E 00 8.2527E 02
940	2.1603E-01 6.0909E 01 3.3253E-04 7.2140E 08 2.0844E-01 6.0283E 00 2.6168E 00 7.9328E 02
950	2.3354E-01 5.6701E 01 4.5531E-04 7.2580E 08 2.1010E-01 5.2073E 00 2.6976E 00 7.6305E 02
960	2.5206E-01 5.2801E 01 6.1937E-04 7.3020E 08 2.1176E-01 4.5120E 00 2.7791E 00 7.3450E 02
970	2.7164E-01 4.9346E 01 8.3728E-04 7.3460E 08 2.1342E-01 3.9211E 00 2.8612E 00 7.0749E 02
980	2.9229E-01 4.6127E 01 1.1250E-03 7.3900E 08 2.1509E-01 3.4175E 00 2.9441E 00 6.8193E 02
990	3.1406E-01 4.3173E 01 1.5025E-03 7.4340E 08 2.1675E-01 2.9868t 00 3.0276E 00 6.5771E 02
1000	3.3698E-01 4.0458E 01 1.9953E-03 7.4779E 08 2.1842E-01 2.6175E 00 3.1117E 00 6.3473E 02
1010	3.6107E-01 3.7958E 01 2.6349E-03 7.5217E 08 2.2010E-01 2.2999E 00 3.1964E 00 6.1293E 02
<u> </u>	3.8638E-01 3.5656E 01 3.4607E-03 7.5656E 08 2.2177E-01 2.0259E 00 3.2816E 00 5.9222E 02
1040	4.1292E-01 3.3530E 01 4.5215E-03 7.6093E 08 2.2345E-01 1.7890E 00 3.3674E 00 5.7254E 02 4.4072E-01 3.1566E 01 5.8772E-03 7.6531E 08 2.2513E-01 1.5836E 00 3.4536E 00 5.5380E 02
1050	4.6983E-01 2.9749E 01 7.6015E-03 7.6968E 08 2.2682E-01 1.4050E 00 3.5404E 00 5.3599E 02
1060	5.0026E-01 2.8066E 01 9.7843E-03 7.7405E 08 2.2850E-01 1.2495E 00 3.6275E 00 5.1901E 02
1070	5.3205E-01 2.6504E 01 1.2535E-02 7.7841E 08 2.3019E-01 1.1135E 00 3.7151E 00 5.0282E 02
1080	5.6519E-01 2.5055E 01 1.5985E-02 7.8277E 08 2.3188E-01 9.9452E-01 3.8030E 00 4.8737E 02
1090	5.9976E-01 2.3707E 01 2.0294E-02 7.8712E 08 2.3357E-01 8.9004E-01 3.8913E 00 4.7264E 02
1100	6.3575E-01 2.2452E 01 2.5654E-02 7.9146E 08 2.3527E-01 7.9816E-01 3.9799E 00 4.5857E 02
1110	6.7319E-01 2.1284E 01 3.2292E-02 7.9581E 08 2.3697E-01 7.1719E-01 4.0688E 00 4.4510E 02
1120	7.1213E-01 2.0193E 01 4.0482E-02 8.0015E 08 2.3867E-01 6.4565E-01 4.1580E 00 4.3224E 02
1130	7.5256E-01 1.9175E 01 5.0547E-02 8.0448E 08 2.4037E-01 5.8233E-01 4.2473E 00 4.1993E 02
1140	7.9453E-01 1.8224E 01 6.2867E-02 8.0880E 08 2.4207E-01 2.2616E-01 4.3370E CO 4.0814E 02
1150	8.3802E-01 1.7334E 01 7.7896E-02 8.1313E 08 2.4378E-01 4.4269E 00 3.9685E 02
1160	8.8308E-01 1.6501E 01 9.6159F-02 8.1744E 08 2.4549F-01 4.3182E-01 4.3169E 00 3.8602E 02
1170	9.2975E-01 1.5720E 01 1.1827E-01 8.2175E 08 2.4720F-01 3.9218E-01 4.6070E 00 3.7564E 02
1180	9.7800E-01 1.4987E 01 1.4497E-01 8.2605E 08 2.4891E-01 3.5676E-01 4.6973E 00 3.6568E 02
1190	1.0279E 00 1.4299E 01 1.7709E=01 8.30355 08 2.5063E=01 3.2505E=01 4.7877E 00 3.5612E 02
1200	1.0794E 00 1.3652E 01 2.1559E-01 8.3464E (8 2.5230E-01 2.9663E-01 4.8781E 00 3.4694E 02
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Particular and and an entry operation in the second	

Appendix E

Enthalpy of Reaction

Reaction No.	Reaction
1	$C_2H_6 \longrightarrow C_2H_4 + H_2$
2	$C_2H_6 \longrightarrow CH_4 + \frac{1}{2}C_2H_4$
3	$C_2H_4 \rightarrow C_2H_2 + H_2$
4	$C_2H_2 \rightarrow 2C + H_2$
5	$2C_2H_2 \rightarrow C_4$'s
6	$C + H_2^0 \rightarrow CO + H_2$

$\begin{array}{c c c c c c c c c c c c c c c c c c c $					Entha	1py of R	eaction-	<u> </u>		·····
No. No. <th>Cemp 0 4</th> <th>1 2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th></th> <th>8</th> <th></th> <th></th>	Cemp 0 4	1 2	3	4	5	6		8		
810 1.10000 04-1.32500 04 3.22500 04-2.75640 04 3.38450 03-7.76508 03 820 1.19150 04-1.38550 04 5.226010 04 1.39050 03-7.76508 03 840 1.19420 04-1.38510 04 5.28170 04 1.39050 03-7.76508 03 840 1.19420 04-1.38510 04 5.28300 04 1.09710 04 3.39050 03-7.76528 04 3.40500 03-7.77524 03 850 1.19476 04-1.38510 04 5.28480 04 1.09220 04 1.40220 03-7.77528 04 3.44102 03-7.77524 03 860 1.19476 04 1.28420 03-7.775326 04 3.42204 03-7.77921 03 03 03 03 03-7.77924 03	1	1 19855 04-1 20125	04 8 37476 04		2 1 10200	02-2 74015	D4 2 2780E	03-7 62405 03		
820 1,1915 04-1,2359 04 5,2226 03 1,22226 03-2,7671E 04 3,3952E 03 1,2621E 03-1,6805E 03 830 1,1928E 04-1,3857E 04 5,2017E 04 1,0579E 03 1,2621E 03-2,7659E 03 3,4050E 03-7,7039E 03 840 1,1942E 04-1,385E 04 5,20317E 04 1,0579E 03 1,2621E 03-2,7659E 04 3,4050E 03-7,759E 03 1,422E 03-7,759E 04 3,4050E 03-7,759E 03 1,422E 03-7,759E 04 3,4160E 03-7,759E 03 1,422E 03-7,759E 04 3,4160E 03-7,759E 03 1,422E 03-7,759E 03 1,422F 03-7,759E 03-7,759E 03-7,759E 03-7,759E 03-7,759E 03-7,759E	and the second se	1.1900E 04-1.3825E	04 5.2766E 04	1.0113E 0	3 1.2024	03-2.76846	04 3.38456	03-7.6428E U3		
840 1.9422 04-1.3607C 04 5.2677C 03 1.2620E 03-2.7655C 04 3.4603E 03-7.7198E 03 850 1.1967E 04-1.3681C 04 5.2833C 01 3.4602C 03-7.7198E 03 860 1.1967E 04-1.391C 04 5.2843C 04 3.4402C 03-7.7392E 03 870 1.1978C 04-1.391C 04 5.2842C 03-7.7532C 03 3.7752E 03 880 1.1999E 04-1.3954C 04 5.2842C 03-7.7532C 03 3.4229E 03 3.4229E 03-7.7592C 03 910 1.2000E 04-1.3954C 04 5.2922C 03-7.7624C 04 3.4229E 03-7.7624C 03-7.76954C 03 3.4229E 03-7.7624C 03-7.76954C 03 3.4229E 03-7.76954C 03-7.76954C 03 3.4229E 03-7.76954C 03-7.69574C 03 3.4229E 03-7.76954C	820	1.1915E 04-1.3839E	04 5.2784E 04	1.0268E 0	3 1.22228	03-2.76778	04 3.39066	03-7.6618E 03		
850 1:1954: 04-1:3896: 04 5:2838: 04 1:0735: 03 1:2821: 03-2:7635: 04 3:4405: 03-7:7394: 03 860 1:1978: 04-1:3896: 04 5:2848: 04 1:1047: 03 1:3225: 03-2:7635: 04 3:4402: 03-7:7394: 03 870 1:1978: 04-1:3896: 04 5:2848: 04 1:1047: 03 1:3225: 03-2:7635: 04 3:4402: 03-7:7394: 03 870 1:2000: 04-1:3950: 04 5:2848: 04 1:1300: 03 1:3432: 03-2:7635: 04 3:4420: 03-7:7992: 03 900 1:2000: 04-1:3950: 04 5:2838: 04 1:1300: 03 1:3432: 03-2:7635: 04 3:4226: 03-7:7893: 03 910 1:2000: 04-1:3930: 04 5:2932: 04 1:1829: 03 1:4426: 03-2:7630: 04 3:4225: 03-7:78376: 03 920 1:2007: 04-1:3936: 04 5:2932: 04 1:1829: 03 1:4455: 03-2:7630: 04 3:4223: 03-7:98376: 03 920 1:2037: 04-1:4004: 04 5:2938: 04 1:1829: 03 1:4455: 03-2:7622: 04 3:423: 03-7:9809: 03 920 1:2046: 04-1:3920: 04 5:2932: 04 1:1424: 03 1:4662: 03-2:764: 04 3:423: 03-7:9809: 03 920 1:2045: 04-1:4020: 04 5:2936: 04 1:2428: 03 1:4645: 03-2:764: 04 3:423: 03-7:9809: 03 920 1:2046: 04-1:4020: 04 5:2936: 04 1:2428: 03 1:4645: 03-2:764: 04 3:423: 03-7:9809: 03 920 1:2046: 04-1:4020: 04 5:2936: 04 1:2428: 03 1:4645: 03-2:764: 04 3:423: 03-7:9809: 03 920 1:2046: 04-1:4020: 04 5:2936: 04 1:2428: 03 1:4645: 03-2:764: 04 3:423: 03-7:9809: 03 920 1:2046: 04-1:4020: 04 5:2936: 04 1:2452: 03		1.1928E 04-1.3853E	04 5.2801E 04	1.0423E 0	3 1.24211	03-2.76716	04 3.39628	03-7.6809E 03		
860 1,976 [04-1,3936 [04]; 28448 [04], 1.0891 [03], 3022 [03-2,765 [04]; 3,4172 [03-7,7394 [03] 870 1,978 [04-1,3926 [04]; 2875 [04], 1.203 [03], 1.2428 [03-2,765 [04]; 3,4174 [03-7,7792 [03] 880 1,999 [04-1,3926 [04]; 2875 [04], 1.203 [03], 1.2428 [03-2,765 [04]; 3,4174 [03-7,7792 [03] 900 1,2000 [04-1,3956 [04]; 2,2000 [04], 1.516 [03], 1.3022 [03-2,763 [04]; 3,4279 [03-7,8193 [03] 910 1,2020 [04-1,3972 [04]; 2.2000 [04], 1.516 [03], 1.4028 [03-2,763 [04]; 3,4229 [03-7,8193 [03] 910 1,2020 [04-1,3972 [04]; 2.2000 [04], 1.516 [03], 1.4048 [03-2,763 [04]; 3,4229 [03-7,8193 [03] 920 1,2020 [04-1,3972 [04]; 2.2000 [04], 1.816 [03], 1.4048 [03-2,760 [04]; 3,4238 [03-7,803 [03] 920 1,2020 [04-1,3972 [04]; 2.2048 [04]; 1.2428 [03], 1.4048 [03-2,760 [04]; 3,4295 [03-7,8976 [03] 920 1,2037 [04-1,4036 [04]; 2.2938 [04]; 1.2428 [03], 1.406 [03-2,760 [04]; 3,4295 [03-7,9049 [03] 930 1,2045 [04-1,4036 [04]; 2.2938 [04]; 1.2428 [03], 1.5078 [03-2,760 [04]; 3,4295 [03-7,9049 [03] 940 1,2045 [04-1,4032 [04]; 2.2938 [04]; 1.2428 [03], 1.5078 [03-2,760 [04]; 3,4295 [03-7,904 [03] 950 1,205 [04-1,4036 [04]; 2.2938 [04]; 1.2428 [03], 1.5078 [03-2,760 [04]; 3,4295 [03-7,904 [03] 960 1,205 [04-1,4036 [04]; 2.2938 [04]; 1.260 [03]; 1.5078 [03-2,760 [04]; 3,4295 [03-7,904 [03] 970 1,206 [04-1,403 [04]; 2.2938 [04]; 1.2603 [04]; 1.276 [03]; 2.760 [04]; 3,4295 [03-		1.1942E 04=1.3867E	04 5.2817E 04	1.0579E 0	3 1.2821	03-2.76595	04 3.40136	03-7.7198E 03		
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1090 1.2111E 04-1.4276E 04 5.3021E 04 1.4464E 03 1.7827E 03-2.7599E 04 3.4C40E 03-8.2139E 03 1100 1.2112E 04-1.4294E 04 5.3023E 04 1.4617E 03 1.8041E 03-2.7599E 04 3.3999E 03-8.2139E 03 1110 1.2113E 04-1.4312E 04 5.3023E 04 1.4768E 03 1.8055E 03-2.7600E 04 3.3996E 03-8.2559E 03 1120 1.2113E 04-1.4330E 04 5.3024E 04 1.4920E 03 1.8655E 03-2.7600E 04 3.3956E 03-8.2769E 03 1120 1.2113E 04-1.4348E 04 5.3024E 04 1.5071E 03 1.8658E 03-2.7603E 04 3.3810E 03-8.2979E 03 1140 1.2113E 04-1.4366E 04 5.3022E 04 1.5222E 03 1.8898E 03-2.7603E 04 3.3810E 03-8.3189E 03 1140 1.2113E 04-1.4366E 04	1080	1.2110E 04-1.4256E	04 5.3020F 04	1.4139E 0	$\frac{3}{1},\frac{7614}{7614}$	03-2.75996	04 3.40786	03-8.1929E 03	·····	
1110 1.2113E 04-1.4312E 04 5.3023E 04 1.4768E 03 1.8255E 03-2.7600E 04 3.3956E 03-8.2559E 03 1120 1.2113E 04-1.4330E 04 5.3024E 04 1.4920E 03 1.8469E 03-2.7601E 04 3.3956E 03-8.2559E 03 1130 1.2113E 04-1.4348E 04 5.3024E 04 1.5071E 03 1.8683E 03-2.7602E 04 3.3861E 03-8.2979E 03 1140 1.2113E 04-1.4366E 04 5.3022E 04 1.5222E 03 1.8898E 03-2.7603E 04 3.3810E 03-8.2979E 03 1140 1.2113E 04-1.4366E 04 5.3022E 04 1.5222E 03 1.8898E 03-2.7603E 04 3.3810E 03-8.3189E 03 1150 1.2112E 04-1.4364E 04 5.3022E 03 1.9132E 03-2.7604E 04 3.3756E 03-8.3399E 03 1160 1.2109E 04-1.4402E 04 1.5672E 03	1090	1.2111E 04-1.4276E	04 5.3021E 04	1.4464E D	3 1.7827	03-2.7599t	04 3.404UE	03-8.2139E 03	······	
1120 1.2113E 04-1.4330E 04 5.3024E 04 1.4920E 03 1.210E 03-8.2769E 03 1130 1.2113E 04-1.4348E 04 5.3024E 04 1.5071E 03 1.8683E 03-2.7602E 04 3.3861E 03-8.2979E 03 1140 1.2113E 04-1.4366E 04 5.3023E 04 1.5572E 03 1.8683E 03-2.7603E 04 3.3810E 03-8.2979E 03 1150 1.2112E 04-1.4366E 04 5.3022E 04 1.5972E 03 1.8898E 03-2.7604E 04 3.3810E 03-8.3189E 03 1150 1.2112E 04-1.4364E 04 5.3022E 04 1.5972E 03 1.9113E 03-2.7604E 04 3.3756E 03-8.3189E 03 1160 1.21109E 04-1.4402E 04 5.3019E 04 1.5672E 03 1.9232E 03-2.7607E 04 3.3699E 03 1170 1.2109E 04-1.4439E 04 1.5672E 03 1.9243E 03-2.7607E <td< th=""><th>1100</th><th>1.2112E 04-1.4294E</th><th>04 5.3023E 04</th><th>1.4617E 0</th><th>3 1.80418</th><th>03-2.7599t</th><th>04 3.3999E</th><th>03-8.2349E 03</th><th></th><th></th></td<>	1100	1.2112E 04-1.4294E	04 5.3023E 04	1.4617E 0	3 1.80418	03-2.7599t	04 3.3999E	03-8.2349E 03		
1130 1.2113E 04-1.4348E 04 5.3024E 04 1.5071E 03 1.8683E 03-2.7602E 04 3.3861E 03-8.2979E 03 1140 1.2113E 04-1.4366E 04 5.3023E 04 1.5222E 03 1.8898E 03-2.7603E 04 3.3810E 03-8.3189E 03 1150 1.2112E 04-1.4364E 04 5.3022E 04 1.5372E 03 1.9113E 03-2.7604E 04 3.3756E 03-8.3189E 03 1160 1.2111E 04-1.4402E 04 5.3021E 04 1.5522E 03 1.9328E 03-2.7607E 04 3.3699E 03 1160 1.2107E 04-1.4402E 04 5.3019E 04 1.5672E 03 1.9543E 03-2.7607E 04 3.3699E 03 1170 1.2109E 04-1.4439E 04 5.3019E 04 1.5672E 03 1.9543E 03-2.7607E 04 3.3580E 03-8.4029E 03 1180 1.2107E 04-1.4439E 04 1.5821E 03 1.9758E	1120	1.2113E 04-1.4312E	04 5.3023E 04	1.4/08E 0	3 1.82556	03-2,7600E	04 3.39305	03-8.2769E 03		
1140 1.2113E 04-1.4366E 04 5.3023E 04 1.5222E 03 1.8898E 03-2.7603E 04 3.3810E 03-8.3189E 03 1150 1.2112E 04-1.4384E 04 5.3022E 04 1.5372E 03 1.9113E 03-2.7604E 04 3.3756E 03-8.3189E 03 1160 1.2111E 04-1.4402E 04 5.3021E 04 1.5522E 03 1.9132E 03-2.7604E 04 3.3756E 03-8.3899E 03 1160 1.2101E 04-1.4402E 04 5.3019E 04 1.5522E 03 1.9328E 03-2.7607E 04 3.3699E 03 1170 1.2109E 04-1.4439E 04 5.3019E 04 1.9543E 03-2.7607E 04 3.3540E 03-8.4029E 03 1180 1.2107E 04-1.4439E 04 1.5821E 03 1.9758E 03-2.7607E 04 3.3540E 03-8.4029E 03 1190 1.2105E 04-1.4457E 04 1.5970E 03 1.9973E 03-2.7607E 04		1.2113E 04-1.4348E	04 5.3024E 04	1.5071E 0	3 1.86835	03-2.7602E	04 3.3861E	03-8.2979E 03		· · · · · · · · · · · · · · · · · · ·
1160 1.2111E 04-1.4402E 04 5.3021E 04 1.5522E 03 1.9328E 03-2.7606E 04 3.3699E 03-8.3609E 03 1170 1.2109E 04-1.4420E 04 5.3019E 04 1.9543E 03-2.7607E 04 3.3641E 03-8.3819E 03 1180 1.2107E 04-1.4439E 04 5.3017E 04 1.9758E 03-2.7609E 04 3.3580E 03-8.4029E 03 1180 1.2105E 04-1.4439E 04 5.3017E 04 1.9758E 03-2.7609E 04 3.3580E 03-8.4029E 03 1190 1.2105E 04-1.4457E 04 5.3015E 04 1.9973E 03-2.7611E 04 3.3517E 03-8.4238E 03		1.2113E 04-1.4366E	04 5.3023E 04	1.5222E 0	3 1.88988	03-2.7603E	04 3.3810E	03-8.3189E 03		
1170 1.2109E 04-1.4420E 04 5.3019E 04 1.9543E 03-2.7607E 04 3.3641E 03-8.3819E 03 1180 1.2107E 04-1.4439E 04 5.3017E 04 1.9758E 03-2.7609E 04 3.3580E 03-8.4029E 03 1190 1.2105E 04-1.4457E 04 5.3015E 04 1.9973E 03-2.7611E 04 3.3517E 03-8.4238E 03		1.2112E 04-1.4384E	04 5.3022E 04	1.5372E 0	3 1.91136	03-2.76046	04 3.3756E	03-8.3399E 03		······································
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1190 1.2105E 04-1.4457E 04 5.3015E 04 1.5970E 03 1.9973E $03-2.7611E$ 04 3.3517E 03-8.4238E 03	1180	1.2107E 04-1.4439E	04 5.3017E 04	1.58218 0	3 1.9758F	03-2.7609E	04 3,3580E	03-8.4029E 03	······································	
1200 1.2102E 04-1.4476E 04 5.3012E 04 1.6118E 03 2.0189E 03-2.7614E 04 3.3451E 03-8.4448E 03		1.2105E 04-1.4457E	04 5.3015E 04	1.5970E 0	3 1.99736	03-2.7611E	04 3,3517E	03-8.4238E 03		
	1200	1.2102E 04-1.4476E	04 5.3012E 04	1.6118E 0	3 2.01898	03-2.7614E	04 3.3451E	U3-8.4448E U3		
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Appendix F

Computer Program

ORTRAN IV030 SOURCE PROC	RAM PRR FUNCTION 06/16/71 PAGE	SE 0001
1 FUNCTION PRRI	15)	10
2 COMMON/PD/RAD), P(25), DN, SMWT(25), CLJ(25, 2), IS, VI(25), AMWT, VEL1, DL	20
	2H,RAD1(100),DE(25),21C,ZTT	30
4 COMMON/SET/MY	,MZ,18	<u>40</u> 50
5 PT=(. 6 PT2=0.		60
7 HRS=18		
8 00 1 I=1, IS		BO
9. IF(CLJ(1,2), N	E.Q.)PT2=PT2+P(1)	90
10 1 PT=PT+P(I)		100
11 DQ 2 I=1, IS		110
<u>12</u> IF(CLJ(1,2),E 13 GD T() 2		120
	TT=ZIC)/ZTT*99,	140
15 VOL=TMPH*SMWT	(1)*P(1)/PT/DE(1)*HP.S	150
16 PI=3.14159 ⁻		160
17 DLR=ZTT/100.		170
18 IF((RADI(1J)*	#2=VOL/DLR/PI).LE.O.)MZ=5000	· · · · · · · · · · · · · · · · · · ·
	JRETURN	/ ·
20 RADI(IJ)=SQRT	(RADI(1J)**2=VOL/DLR/P1)	180
21 IF(CLJ(1,2), F 22 2 P(1)#P(1)#PT/	Q.Q.)P(I)=0.	200
$\frac{22}{23} \qquad PRR \neq PT$	<u>P12</u>	210
	AND. (MZ.EQ.1) GD TO 1001	220
25 RETURN		230
26 1001 WRITE(6,9001)PRR,RADI(1),VOL	240
27 9001 FURMAT(J FUN	CTION PRR(IS) 1/1 PR=11PE14.5.5X 'RAD1(1)=11PE14.5.5X1	250
<u>28 1VDL=11PE14,5)</u> 29 RETURN		270
30 END		280
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ORTRAN_IV	130 SOURCE PROGRAM REQC FUNCTION 06/16/71 PAGE 0002	
31	FUNCTION REQC(T,1) 290	
32	CDMM0H/FE/DCP(25,4),HD(25),SD(25),FD(25),F1(25) 300	
33	COMMON/SET/MY.MZ 310	
34	R=1,987	
35	RR=1,3143 330	
36	ELNK==HO(I)/R/T+DCP(I,1)/R*LOG(T)+DCP(I,2)/(2.*R)*T+DCP(I,3)/(6.*R 340 1)*T*T+DCP(I,4)/(12.*R)*T**3+FI(I) 350	
	1)*T*T+UCP(I)4)/(12,*R)*T**3+F1(I) 350 240	_
38	REPC=EXP(=ELNK) 360 IF((MY-EQ-1)-AND-(MZ-EQ-1))GU TU 1001 370	
39		
40		
41 1001	WRITE(6,9001)REQC,T,1 390	
42 9001		
43		
44	<u>END</u> 420	
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FORTRAN IV030 SOURCE PROGRAM PRESD FUNCTION 06/16/71	PACE 0003	
45 FUNCTION PRESD(T)	430	
46 . COMMON/PD/RAD, P(25), DN, SMWT(25), CLJ(25,2), IS, VI(25), AMWT, VEL1	, DL 440	
47 COMMON/PT2/TT, RN1, RN2, VIS		
48 CDMMDN/SET/MY,MZ	460	
49 PT=PRR(15)	470	
50 IF (MZ, EQ. 5000) RETURN		e
51 C THIS SUBRINITINE CALULATES PRESSURE DROP FROM BERNDULIE LAW 52 C MODIFIED TO TAKE FRICTION LOSS INTO CONSIDERATION	480	
52 C MODIFIED TO TAKE FRICTION LOSS INTO CONSIDERATION	490	
50 IF(MY.NE.1)GD TO 1		
54 IF(MZ_NE_1)G() TO 11	F A	
55 A=0,4398818	510	
56 B==0,44245917	520	
57 C=0.086401820	530	,
58 D#=0.0077484511 59 PRESDT=0.	<u> </u>	
60 11 DD 2 I=1/15	220	
61 IF(CLJ(1,2),EQ.Q) GO TO 2	570	
$\frac{61}{62} = \frac{17(CLJ(1)2)}{E \neq LOG(T/CLJ(1)2)}$	580	
62 E#LUG((/(LJ(I)2)) 63 VI(I)=2.6603E=5#SQRT(SMWT(I)#T)/(CLJ(I)1)##2#EXP(A+B*E+C*E**2	250 2+D+E+ 500	
64 1*3))	600	
65 2 CONTINUE	610	~~~~~
66 VIS=0.	620	
67 DO 3 (+1) IS	630	
68 IF(CLJ(I,1),EQ.0,)GD TD 3	640	
69 V P(I)/PT*VI (I)	650	
	660	
71 (DD 4 J=1, IS	670	
72 IF(CLJ(J+1).E0.0.)G0 T0 4	680 .	
<u>73</u> <u>U=U+P(J)/PT+1_/SCRT(B_)/(1+SMWT(I)/SMWT(J))+(1+(VI(I)/VI(J)</u>)**,5 690	
74 <u>1*(SNWT(J)/SNWT(I))**.25)**2</u>	700	
75 4 CONTINUE	710	<u> </u>
76 VIS•VIS+V/U	720	
77 3 CONTINUE	730	
78 VISevIS*.0672	740	
791 AMWT=0.	750	
80 VEL2=1,1620929F=4*T/(PT=PRESDT)/RAD**2*DN		
<u>81 D0 5 1±1,15</u>	760	
B2 5 AMWT=P(I)/PT*SMWT(I)+AMWT	770	
B3 C GC IN AT. *FT**3 /(OK LB. NULES)	780	<u> </u>
	800	
85 DEH=PT/(GC*T)*ANWT 86 IF(DEN_LE.0.)GD TD 21	810	
86 IF(DEN_LE_0_)GO TO 21 B7 6 VELA=(VEL1+VEL2)/2.	820	
B8 RENU=2.*RAD*DEN*VELA/VIS	830	
80 RENUE2.+RADIFUENTVELATVIS	840	
90 IF(RENULE.3500.)G0 T0 20	850	~~~~~~
90 IFRENULE, 3300, 760 TO 20	860	<u> </u>
92 20 F=64./KENU	870	
93 GO TU 100	880	
94 10 F=0.00560+.5/(RENU**.32)	890	
		- N

DRTRAN IV	D30 SOURCE PROGRAM PRESD FUNCTION 06/16/71 PAGE 0	0004
95 100	PRESD=DEN*(VELA**2*F*DL/RAD+VEL2**2=VEL1**2)/62.4/2116.8	900
96	PRESI)=ABS(PRESD)	910
<u>97</u> 98	P2=PT=PRESD IF(P2.LE.O.)GD TO 21	920
<u>9</u> 9	VEL2=1.1620929E=04*T/P2/RAD**2*DN	930
100	IF(PRESD,EQ.0.)GO TO 7	940
101	IF(4BS((PRESDT=PRESD)/PRESD).LE001)GD TD 7 PRESDT=PRESD	95 <u>0</u> 960
103	DEN#(P2+pT)/(2.*GC*T)*AMWT	970
104		980
105 7	PT2=0, DC 9 I=1/IS	990 1000
106	P12@PT2+P(1)	1010
108	$D[1 \mid 8 \mid 1 = 1 + 1]$	1020
109 8	P(1)=P(1)*(PT2=PRESD)/PT2	1030
110	IF((MY,EQ,1),AND,(MZ,EQ,1))GD TO 1001	1040 1050
111	VEL1=VEL2 1F(VEL1.6E.1214.5)SU TO 22	1050
113	IF(VEL1.GE.SQRT(7.37495E4*P2/DEN))GD_TD_22	
114	RETURN	1060
115 22 116	MZ=3000 PT=,5	
117	RETURN	
118 1001	WRITE(6,900))RENU, VIS, DEN, F, VEL1, VEL2, VELA, T, PRESD	1070
119	VEL1=VEL2	1080
121 19	WRITE(6,900)RAD, DEN, VELA, VIS, RENU	1100
122	WRITE(6,902)T, PT, (P(1), I=1, IS), GC, AMWT, P2	
123	MZ=2000 RETURN	1110
125 21	WRITE(6,902)T,PT,(P(1),I=1,IS),GC,AMWT,P2	1110
126	HZ=2000	
127	RETURN	
<u>128 900</u> 129 901	FORMAT(' RAD='1PE12.5'DEM, VELA, VIS, RENU'4(2x, 1PE12.5)) FORMAT(' PRESSURE DROP ='1PE12.5'DEN, VELA, DL, VEL1, VEL2'5(2x, 1PE12,	1140
130	15))	1160
131 902	FURMAT(1 T PT P(1)_6(12), GC AMWT '10(1X, F8,2))	
<u>132 9001</u> 133	FORMAT(! FUNCTION PRESD(T)'/' RENU='1PE14.5,5X'VIS='1PE14.5,5X'DEN 1='1PE14.5,/' FRICTION FACTUR= '1PE14.5,5X'V1,V2,VA='3(1PE14.5,5X)/	<u>1180</u> 1190
134	11 TEMPERTURE=10PF8.2, PRESSURE D=11PE14.5)	1200
135	END	1210
<u> </u>		,

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د آن	FORTRAN IV030 SDURCE PROGRAM HEATR FUNCTION 06/16/71 PAGE 0005	- 0
	136 FUNCTION HEATR(T2,1) 1220	- 6.3
6 ²	137 CDMMON/FE/DCP(25,4),HT(25),ST(25) 1230 138 CDMMON/SET/MY,MZ 1240	Ö
6 01	139 TI*T2 1250	
O 11 ⁻	140 HEATROHT(I) 1260 141 T1=298.15 1270	0
2		-
0	143 X=1 1290	
	144 1 HEATR=HEATR+DCP(I,L)*(T2**L/X=T1**L/X) 145 IF((MY.EQ.L).AND.(MZ.EQ.L))GO TO 1001 1310	
· ·	146 <u>RETURN</u>	-
0	147_1001 WRITE(6,9001)HEATR, T2,1	0
-	148 RETURN 1340 149 9001 FORMAT(' HEATR(T,1)'/ \PE14.5'('OPF8.2,','I2')') 1350	-
•	150 ENQ 1360	<u> </u>
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DRTRAN IVO	30 SDURCE PROGRAM 06/16/71	PAGE DOD6
151	PROGRAM PYRD	
152	COMMON 14(25,10), SF(25), Z(11), SR(25), B(25,10), C(25), ENAME(5)	0), 1380
	1CP(25,4),EA(25),EE(25),IUAT8(44),DH(25),DS(25), DF(25),	BB(25, 1420
	2 10)	1400
155	COMMON/FE/DCP(25,4),HT(25),ST(25),FT(25),FI(25)	1410
156	COMMON/PD/RAD, P(25), DN, SNWT(25), CLJ(25,2), IS, VI(25), AMWT, VE	1, DL 1420
157	COMMON/PT2/TT, RN1, RN2, VIS	1440
158	COMMON/TM/TMPH, RADI(100), DE(25), ZIC, ZTT	1450
160	COMMUN/SET/MY, MB, IB DIMENSIUN DXA(25), TM(25), PPI(25), RADF(100), CARD(80)	1460
161	DIMENSION WZIC(50), WT(50), WTMPH(50), WPT(50), WVEL1(50), WC(25)	
	1M(25,50), WDXA(25,50), F(25)	
	DIMENSION RADU(100,25)	
164	DATA DXA/25*0./.F/25*1./	
165	· INTEGER IDATA(43)/141, 181, 101, 121, 181, 101, 121, 151, 161, 141, 111, 111,	K!, L! 1860
166 1	!כּן צו לואן לאן לואן לואן לואן לואן לאלו לואן לואן	1,1+1 1870
	2,1,1,1,1,1,2,1,1,1,4,1,1,5,1,16,1,17,1,18,1,19,10,1,1<1,1,1,1,1/	1880
168	INTEGER IDATP(9)/11N1, 12N1, 13N1, 14N1, 15N1, 16N1, 17N1, 18N1, 19	1/
169	IDATP(1)=IDATP(1)	N / A A
170		1480
171 172 107	1GUTU=1 READ(5,953),ID,F(ID)	1430
173	IF(ID,EG,25)GD TO 100	
	GO TO 107	
175 100	READ(5,900, END=99)1R, IS	1500
	TOTAL NUMBER OF REACTIONS, IS=TOTAL NUMBER OF CHEMICAL SPECIES	
	READ(5,943)IGOW, (2(11),11=1,11)	1520
	READ(5,950)CARD	1530
	READ(3,958)18,122,1PLOT	
180	READ(5,919)T, PT, PRES, ZT, DL, POUT	1540
	TINET	
182 C IAU 183	I.M)=IDENTITY OF CHEMICAL SPECIES IN CHEMICAL REACTION POSIT INTEGER SF,SR	1570
184	GC=1.3143	1580
185	READ(5,901)(SF(I),SR(I),I=1,IR)	1590
186		1600
187	IT=SF(1)+SR(1)	1610
188	READ(5,901)10,(IA(I,M),M=1,IT)	1620
189 1	IF (10.NE.I)G0 T0 101	1630
190 C B(1)	MICDEFFICIENT OF M CHEMICAL SPECIES IN REACTION I	1640
191	DO 2 1=1/1R	1650
172	[T=SF(])+SR(])	1660
193	READ(5,903)ID, (B(I,M), M=1, IT), (BB(I,M), M=1,IT)	_1670
194 2	IF(I0.NE.I)GO TO 102	1680
) IS THE INITIAL CONCENTRATION OF THE J COMPONENT (8 PER CARL) 1690
190	$\frac{\text{READ}(5,904)(C(J),J=1,IS)}{(J=0)}$	1700
19"	ÇT=0. DQ 18 [=1,15	1720
198	P(1)=C(1)	1730
<u>199</u> 200	PPI(I)=C(1)	1740
200		

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201 PT=CT+P(1)	1750	
202 18 C(I)=P(I)/GC/T	1760	
203 C ENAME(1)15 THE NAME OF EACH COMPONENT (MAX 20 LETTERS) 4 P		
204 IT#IS#20	1780	
205 READ(5,905)(ENAME(J),J=1,IT) 206 DU 3 J=1,IS	1790 1800	
207	1800	
208 3 IF(ID.NE.J)GO TO 103	1820	
209 DO 4 1=1,1K	1830	·····
210 READ(5,907)1D,EA(I),EE(I)	1840	
211 EA(I)#EA(I)*F(I)		
212 4 IF (10, NE, 1) GO TO 104	1850	· ·
	1890	
214 READ(5,908) ID, DS(J), DH(J), OF(J) 215 5 IF(ID, NE, J) GD TO 105	1900	
215 5 IF(ID.NE.J) GD TO 105 216 00 21 J=1,15	1910 1920	
217 READ(5,911) ID,(CLJ(J,M),M=1,2),SMWT(J)	1930	
218 IF(CLJ(J,2),EQ.D.)READ(5,940)DE(J)	1940	
219 21 IF(10,NE,J)60 TO 106	1950	
00_6_I=1,1R	1960	
221 DO 7 L=1,4	1970	
222 7 DCP(1,L)=0. 223 I1=SF(1)+1	1980	<u> </u>
$\frac{223}{12 + SR(1) + SF(1)}$	2000	·
225 DO 8 Mallal2	2010	
226 J=IA(I,M)	2020	
_227 DD 8 L=1,4	2030	
228 8 DCP(I_L)=DCP(I_L)+B(I_M)+CP(J_L)/B(I_L) 229 I2#SF(I)	DAFA	
229 I2#SF(1) 230 DD 6 M =1,12	2050 2060	
231 J=[A(I,M)	2000	
232 DO 6 L=1,4	2080	
233 6 DCP(1,L)=DCP(1,L)=B(1,M)*CP(J,L)/6(1,1)		
234 C TEMPERATURE	2100	
235 R1=1.987 236 00 9 I=1.1R	2110 2120	
237 FT(1)=0.	2120	
238 \$T(1)=0	2140	
239 HT(n)=0	2150	· · · · · · · · · · · · · · · · · · ·
240 11=SF(1)+1	2160	
241 12#SR(1)+SF(1)	2170	
242	2180	A
243 J=IA(I,M)	2190	
244 <u>ST(I)=ST(I) +B(I,M)*DS(J)/B(I,1)</u> 245 FT(I)=FT(I)+B(I,M)*DF(J)/B(I,1)	2200	
$\frac{245}{246} \frac{\text{FT}(1) + \text{FT}(1) + \text{B}(1, M) + \text{OF}(J) / \text{B}(1, J)}{246} \frac{10}{\text{HT}(1) + \text{HT}(1) + \text{B}(1, M) + \text{OH}(J) / \text{B}(1, J)}$	2210	
<u>12#SF(1)</u>	2230	
248 DD 9 M=1,12	2240	
249 J=IA(I,M)	2250	· · · · · · · · · · · · · · · · · · ·
250 FT(1) = FT(1) = B(1, M) + DF(J)/B(1, 1)	2260	
		ê;

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251 ST(1)#ST(1)=B(1,M)*DS(J)/B(1,1)	2270	
252 9 HT(I)=H(I)=B(I,M)*DS(J)/R(I,1)	2280	
$\frac{253}{154} = \frac{1}{1} \frac{1}{1$	2290 2300	
254 TT#298.15 255 DD 29 M=1,4	2300	
256 X=M	2320	
257 29 HT(I)=HT(I)=DCP(I,M)/X+TT#H	2330	
258 READ(5,908)IJ,TT,F1(I)		
259 IF(FI(I),GT,O,)FI(I)=LOG(FI(I)) 240 10 FI(I)=UCATO(TT, I)(D1(TT)=DCD(T, I)(D1H)DC(TT)=DCD(I, 2)(2, (P)+T		
260 19 FI(1)=HEATR(TT,I)/R1/TT+FI(I)=DCP(:,1)/R1*LOG(TT)=DCP(1,2)/2./R1*T 261 1T=DCP(I,3)/6./R1*TT**2=DCP(I,4)/12./R1*TT**3		
262 C NOW WE HAVE THE REACTION SYSTEM, IT WILL BE PRINTED DUT,	2380	
263 C COMPONENT IDENTIFICATION	2390	
264 WRITE(6:909)	2400	
265 WRITE(6,910)	2410	
266 DU 11 J=1,1S	2420	
267 JJ1=1+20*(J=1) 268 JJ2=20*J	2430	
269 JJ2=20#J 269 11 WRITE(5,912)(ENAME(JJ),JJ=JJ1,JJ2),IDATA(J),J,(CP(J,M),M=1,4),DH(J	2450	
270 1), DS(J), DF(J)	2460	
271 16010=1	2470	
272 WRITE(6,920)	2480	
	2490	
274 JJ1=1+20*(J=1) 275 JJ2=20*J	2500 2510	<u> </u>
276 17 WRITE(6,917)(ENAME(JJ),JJ=JJ1,JJ2),IDATA(J),J,(CIJ(J,M),M=1,2),SMM	2520	
$\frac{277}{1}$	2530	
278 WRITE(6,913)	2540	
279 DO 12 I=1,1R	2550	
280 II=2 281 IF (FE(I)_FQ.0.)11=1	2560	
282 I2#SF(I) .	2580	
283 DU 14 M=1,12	2590	
284 J=IA(I,M)	2600	
285 MM=M+3+1	2610	
$\frac{286}{10 \text{ ATB}(MM) = 10 \text{ ATA}(J)}{287}$	2620	
287 J=H(1,H)+29.01 288 MM=H*3=2	2630	
288 MM=M#J=2 289 IDATA(J)=IDATA(J)	2650	
290 NM=M*3	2660	· · · · · · · · · · · · · · · · · · ·
291 14 IDATB(MM)=IDATA(28)	2670	
292 MM=SF(1)*3	2680	
293 KKE40	2690	
294 GD TD (122,121),11 295 121 IDATE(MM)=IDATA(KK)	<u>2700</u> 2710	
295 121 IDATB(MM)=IDATA(KK) 296 MM=MN+1	2710	<u> </u>
297 122 KK#KK+1	2730	
298 IDATB(MM)=IDATA(KK)	2740	
299 MM=M/+1	2750	
300 KK#KK+1	2760	
		·

301 IDATB(MM) # IDATA(KK)	2770
302 [1=SF(I)+1	2780
303 [2=SF(1)+SR(1)	2790
304 DO 15 NeI1, 12	2800 2810
305 J#IA(IJM) 306 MM#M#3=1 +II	2810
300 MM###3#L +11 307 IQATB(MM)=IDATA(J)	2830
$\frac{104161047410474437}{104161047437}$	2840
309 MM=M*3m2+TT	2850
310 1DATB(MM)=IDATA(J)	2860
311 MM#M#3+II	2870
312 15 IDATB(MM)=IDATA(28)	2880
313 00 16 Jalim, 44	2890
$314 16 \qquad \text{IDATB}(J) = \text{IDATA}(29)$	2900
315 12 WRITE(6,915)1, (INATB(M), M=1,40), EA(I), EE(I), (DCP(I,M), M=1,4)	2910
316 WRITE(6, 927)	2920
317 DO 28 J=1, IR 12-55(1), 50(1)	2930
318 I2#SF(J)+SR(J) 319 DO 32 I#1/12	2940 2950
320 I3=IA(J,i)	2960
321 32 IDATS(I)=IDATA(I3)	2970
322 28 WRITE(6, 726) J. FT(J), FI(J), (1DATB(I), BB(J, I), I=1, 12)	2980
23READ(5,902),RAD,TMPH	2990
24READ(5,900)KEYR,KEYP	3000
125 TMPHI_TMPH	3010
26 RAUU=RAD	3020
227 ZTT=ZT 328 IGDT()=1	3030
328 IGOTU=1 329 PDP=.2	3040
320PSAVEN5,85	
331 IF(KEYR, EQ. 0)GD TO 92	
332 110 WRITE(6,918)	3050
HR=0.	
334 MAZE#1	
	987.0
36 C T*GAS TEMPERATURE AT ENTRANCE, PRES*PRESSURE DF GAS, ZT=LENGTH DF REAC 37 HR#D.	<u>3060</u> 3070
338 C DZ=INCREMENTAL CHANGE IN REACTOR, CI=CONCENTRATION OF INERTS, A=T=A(1)+	3070
$\frac{1}{339} C A(2)Z + A(3) Z + L + A(4) + Z + 3$	3100
340 900 FDRMAT(212)	3110
341 901 FORMAT(4012)	3120
342 902 FORMAT(2F10.3)	3130
343 903 FORMAT(12,25F3.2)	3140
344 904 FDRMAT(12F6.5)	3150
345 905 FORMAT(80A1)	3160
346 906 FORMAT(4E16.8,17)	3170
347 907 FURMAT(12, E7.1, E10.4)	3180
348 908 FORMAT(12,3F9.2) 349 909 FORMAT(11 PROGRAM PYROT/T PROGRAMMER RICHARD ROBERTSONT/T DR. HAN	3190
349 909 FURMATI'L PRUGRAM PYXD'/' PRUGRAMMER RICHARD'RÜBERTSONT/' DR. HAN 350IESIAN ADVISORI/' AS MASTER THESIS REQUIREMENTI)	3200
LEATEN ONTLIND AJ MAJIGO INGVIJ NEVUINENENIIJ	5240

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351 910 FORMAT (1H1'IDENTIFICATION OF REACTION SYSTEM!/T5'COMPONENT'T22'CO	0 3220
352 1 NO. 'T44'HEAT CAPACITY DATA'T81'DELTA=H'T98'DELTA=S'T116'LUG(K) '	
353 1T291A1, T43'B', T561C1, T68, 10')	3240
354 911 FURMAT(12,3X,3F5.0)	3250
355 912 FORMAT(1 1,20A1,1A1 ,12,4(2X,1PE10,3),3(3X,1PE15,8))	3260
356 913 FORMAT(1H1, REACT ON SYSTEM!/! EQUATION!, T45, ARRHENIUS RATE CONS	
357 ITANT 1, T75, IDELTA HEAT CAPACITY DATA FOR REACTION 1/1H TTI DELTA A	3280
358 21, T83, IDELTA BIT95, IDELTA CI, T107 IDELTA DI, T51 K(0) I, T61 EI)	3290
359 915 FORMAT(1H , 12, 2X, 40A1, 6(1PE)0, 3, 2X))	3300
360 916 FURMAT(1H)	3310
361 917 FORMAT(1 1,21A1,12,5X,F5,3,5X,F5,1,5X,F7,2,1PE12,4)	3320
<u>362 918 FORMAT(1H1)</u>	3330
363 919 FORMAT(6E12.5)	3340
364 920 FURMAT(10 COMPONETI, T19, CO NOI, T36, LENNARD-JUNES MOL, WT. 1, T62	
365 1'INITAL CONCENTRATION'/T36'PARAMETERSI/T31'(A) (DEG-K)')	3360
366 921 FORMAT(11COMPONENT IDENTIFICATION'12' DUT OF PLACE 'IS,' ID')	
367 924 FORMAT('IARRHENIUS IDENTIFICATION'I2' OUT OF PLACE 'I5,' ID') 368 925 FORMAT('IENTHALPHY IDENTIFICATION'I2' OUT OF PLACE 'I5,' ID')	
	7/ 10
369 926 FORMAT(! 112,2(5X,1PE12,5),5X,6(5X,1A1,'**('OPF3,1')')) 370 927 FORMAT('0','E0',T13'LOG(K) REACTION CONSTANT OF INTEGERATION '	3420
371 110X, OPDER OF REACTION BY CONPONENT!)	3440
372 928 FURMAT(1 112, 1PE14, 4, E14, 4, E14, 4)	3450
373 929 FORMAT(' ITERATION NUMBUR='13,/' NO CONCENTRATION TMPH	3460
374 1 DXA1)	3470
375 930 FURMAT('O DL CHANGED TU'IPE15.5.5X, 'ZIC='IPE14.5)	3480
376 931 FORMAT('I ALL DXA= 0, SYSTEM MUST BE CHANGED TO ALLOW REACTION')	3490
377 932 FORMAT (' 1#'12,2X'RA#'1PE14,5,2X'DXA(1)#'1PE14,5,2X'CF,CR#'2E14,5	5 3500 .
378 1,2X1REQC=11PE14.5./5HORATE1=(1PE14.5)	3510
379 933 FORMAT(1 1 25(1PE14.5,5X,12/1 1))	3520
380 934 - FDRMAT(' 112,1PE12.5)	3530
381 935 FORMAT(11), LENNARD JINES CONSTANTS', 12, 'CARD ID', 12, 'INTERNAL')	3540
382 936 FORMAT(101,3(5X)1PE16,7)	3550
383 937 FORMAT('IREACTOR IS 'FLO.2' FEET LONG AND 'F6.3' FEET IN RADIUS'/'	1 3560
384 1 TOTAL MOLES / HOUR ARE'FO, 1'POUND MOLES AT PRESSURE'FR, 3'A VEL	L 3570
385 20CITY OF 11PE12.51 AT TEMPERATURE10PF8.11DEG K1/1 INITIAL REACTOR	3580
386 JINCREMENT (OL '1PE12.5'FEET')	3590
387 938 FORMAT(1 112,14X,1PE14,4)	3600
388 939 FORMAT(1 1,12,1PE14.5,E14.5)	3610
389 940 FDRMAT(F10.0)	3620
390 942 FORMAT(PRESSURE IS' 1PE14.5' VELOCITY 1PE14.4 FEET/SEC. 1)	3630
<u>391 943 FURMAT(13,11F7,2)</u>	3640
392 944 FDRMAT(1 110(F9.6,2X))	3650
393 945 FORMAT(1)1, T25, IREACTOR RADIUS PROFILE AFTER 19,2,1 HOURS1//)	
394 946 : FURMAT(1 12,1-1,1A1,2X,20A1,1PE14,5,5X,E14,5)	3670
395 948 FURMAT(1 112,1PE14,4,E14,4)	3680
396 949 FORMAT(1: UNSTABLE TEMPERATURE PROFILE NEW CASE!)	369
397 950 FORMAT(80A1) 398 951 FORMAT(1 180A1)	3700
398 751 FORMAT(1 180A1) 399 952 FORMAT(10VELOCITY OF GAS GREATER THAN SOUND!)	5/10
400 953 FORMAT(12,E8.2)	
400 922 FUNMALLERERER	
	,,,,,,,
	· · · · · · · · · · · · · · · · · · ·

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401 954 FURMAT('O REACTOR TUBE COMPLETELY BLOCKED WITH CARBON!)		
402 955 FORMAT(I REACTOR RADIUS PRUFILE FROM START TO CLOSE DOWNI)		*
403 956 FORMAT(T20, TEMPERATURE REACTANT PRODUCT PROFILEST)		
404 958 FDRMAT(313)		
405 960 FORMAT(T9'0%'T29'20%'T49'40%'T69'60%'T89'80'T109'100%')		
406 961 FORMAT(1 1F4.0, 1FY1)		
407 922 FORMAT('ICUEFFICIENT IDENTIFICATION'I2' DUT OF PLACE 'I5' ID') 408 923 FORMAT('ICP(HEAT CAP) IDENTIFICATION'I2' DUT OF PLACE 'I5' ID')		
409 962 FORMAT(.115' '125' '135' '145' '155' '165' '175' '185' '195' '105'		
410 1(1115)()		·····
411 963 FORMAT(IO REACTOR PRODUCT (E) REACTANT(R) TEMPERATURE(T) PRESSURE(
412 1P) AFTER F8.0'HOURS OF RUN')		
413 965 - FORMAT(OCONVERSION OF 120A1116 120A11151F6,21%)		
414 966 FORMAT(0, PT 17601 (1/7591 CL)		
415 967 FORMAT(///.25X.80A1)		·····
416 968 FORMAT(' 'F8.2' FT'T59'CL'/T60' ') 417 969 FORMAT(' 'I4.3X.3(' 'L1PE11.4.9E11.4./))		
418 970 FORMAT('ITEMP EQUILIBRUM CONSTANTS'/10/T30/EQUATION S NUMBER!		
419 1/15X10(5X12,4X))		
420 973 FORMAT(! 1,15,4X,13(F7.3,2X))	₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩	
421 9934 FORMAT(REACTOR POSITION 1PE14.5 FEET // TEMPERTURE OPF8.2 DEGREE	3720	
422 1-K MOLAR FLUW RATE 1PE14.5 POUND MOLES PER HOUR 1)	3730	
423 C DENCE DENSITY DE CARLON AT UL LZOODEG. E	3740	
424 C TEMPERTURE ON DUTSIDE WALL OF REACTOR WILL BE ASSUMED CONSTANT 425 CC RAD_RADIUS DEPIPE IN FEFT	37503760	
426 ISS MAXO (IR, IS)		
427IM=MINO(18,15)	3770	No - 1 0 - 10 - 10 - 10 - 10 - 10 - 10 - 1
428 IG0=1	3780	
429 IF(IR.EQ.IS)IGD=3	3790	
430 IF(IR.LT.IS)160=2	3800	
	3810	
432 p0 48 1=1,100 433 RADF(1)=RAD	3820	······
434 48 RADI(I)=RAD	38303840	
425 ITESTEL	3850	
436 58 MA=1	3860	
437 TMPH=TMPHI	3870	
438 PT=PI	3880	
439 PT=0.	3890	
440 D0 57 1=1/1S 441 57 PT=PT+P(1)	3900	
442 DD 60 1=1/100	<u>3910</u> 3920	
443.60 RADI(I)=RADF(1)	3920	
444 RAD=RADF(1)	3940	
445 TeTIN		
446 PI=PT	3950	
447 VEL1=1.1620929600E=4*TMPH*T/PT/RAD**2	3960	
448 WRITE(6,937)ZT,RAD, TMPH, PT, VEL1, T, DL	3970	
449 R≡1,9β7 450 ZT≠ZTT	3980	· · · · · · · · · · · · · · · · · · ·
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459 DD 30 460 DD 30 461 25 DLL=MI 462 IF(MA, 463 JIC=ZI 464 IF(ZIC 465 XN=ZIC 466 IIN=XN 466 IIN=XN 467 XXN=II 468 TR=Z(I 469 RAF=RA 470 IJ=100 471 RIJ=IJ 472 RJ=100 473 IF(IJ, 474 IF(IJ, 475 TT=T 476 T=TR 477 DU34 478 ND=0 479 II=1 480 I2=SF(483 DD 35 484 J=IA(I 485 IF(BB(487 CR=1 488 I1=SF(489 I2=SR(490 D0 36 491 J=IA(1 492 IF(BB(494 RA=EA(1 495 IF(P(K	<pre></pre>	4000 4010 4020 4030 4040 4040 4040 4040 4070 4080 4090 4120 4130 4140 4150		
453 MI=8 454 M10=MT 455 MMM=1 456 MZ=0. 457 ZICI=0. 458 DL=ZTT 459 DD 30 460 DD 30. 461 25 462 IF(MA. 463 7IC=ZI 464 IF(ZIC 465 XN=ZIC 466 IIN=XN 467 XXN=II 468 TR=Z(II 468 TR=Z(II 468 TR=Z(II 469 RAF=RA 470 IJ=100 471 RIJ=IJ 472 RJ=100 473 IF(IJ., 475 TT=T 476 T=TR 477 D034 I 478 ND=0 479 II=1 480 I2=SF(483 DD 35 484 J=IA(II 485 IF(BB(487 CR=1 488 I1=SF(T+1000 0. T*.01001 MB=1.M10 MY=1.MI I*(MZ=1)+MY .GT.9)GO TD 55 IC+DL .GF.ZTT)GO TD 33 //TT*10.+1. N IN IN IN IN IN)+(Z(IIN+1)=Z(IIN))*(XN=XXN) AD 0.001=(ZTT=ZIC)/ZTT*99. LE.99)RAD=RADF(IJ)+(RADF(IJ+1)=RADF(IJ))*(RIJ=RJ)	4020 4030 4040 4070 4080 4090 4120 4120 4130 4140		
454 M10=MT 455 MMM=1 456 MZ=0. 457 ZICI=Q 458 DL=ZTT 459 DD 30 460 DD 30 461 Z5 462 IF(MA. 463 ZIC=ZI 464 IF(ZIC 465 XN=ZIC 466 IIN=XN 466 IIN=XN 466 TR=Z(I 468 TR=Z(I 469 RAF=RA 467 XXN=II 468 TR=Z(I 469 RAF=RA 470 IJ=100 471 RJ=100 472 RJ=100 473 IF(IJ. 474 IF(IJ. 475 TI. 476 T=TR 477 D034 I 478 ND=0 479 II=1 480 IZ=SF(481 K=IA(I) 482 CF=1. 483 DD 35	Q. MB=1,M10 MY=1,M1 I*(MZ=1)+MY GT.9)GO TD 55 IC+DL C.GF.ZTT)GO TO 33 //TT*10.+1. N IN IN (IN)+(Z(IIN+1)=Z(IIN))*(XN=XXN) AD 0.001-(ZTT=ZIC)/ZTT*99. J. 0.000-(ZTT=ZIC)/ZTT*99. LE.99)RAD=RADF(IJ)+(RADF(IJ+1)=RADF(IJ))*(RIJ=RJ)	4030 4040 4070 4080 4090 4090 4120 4120 4130 4140		
455 MMH=1 456 MZ=0. 457 ZICI=0. 458 DL=ZTT 459 DD 30. 460 DD 30. 461 25 462 IF(MA. 463 7IC=7I 464 IF(ZIC 465 XN=ZIC 464 IF(ZIC 465 XN=ZIC 466 IN=XN 466 IN=XN 467 XXN=II 468 TR=Z(I 469 RAF=RA 470 IJ=100 471 RIJ=IJ 472 RJ=100 473 IF(IJ. 474 IF(IJ. 475 IT=T 476 T=TR 477 DU34 I 478 ND=0 479 II=1 480 J2=SF(481 K=IA(I. 482 CF=1. 483 DD 35 484 J=IA(I. 485 IF(CL	Q. MB=1,M10 MY=1,M1 I*(MZ=1)+MY GT.9)GO TD 55 IC+DL C.GF.ZTT)GO TO 33 //TT*10.+1. N IN IN (IN)+(Z(IIN+1)=Z(IIN))*(XN=XXN) AD 0.001-(ZTT=ZIC)/ZTT*99. J. 0.000-(ZTT=ZIC)/ZTT*99. LE.99)RAD=RADF(IJ)+(RADF(IJ+1)=RADF(IJ))*(RIJ=RJ)	4040 4070 4080 4090 4120 4130 4140		
456 MZ=0. 457 ZICI=0. 457 ZICI=0. 458 DL=ZTT 459 DD 30. 460 DD 30. 461 25 0461 25 0461 25 462 IF(MA. 463 ZIC=ZI 464 IF(ZIC 465 XN=ZIC 466 IIN=XN 467 XXN=II 468 TR=Z(I 469 RAF=RA 470 IJ=100 471 RIJ=IJ 472 RJ=100 473 IF(IJ, a) 474 IF(IJ, a) 475 IT=T 476 T=TR 477 DD34 478 ND=0 479 I=1 480 I2=SF(481 K=IA(I. 482 CF=1. 483 DD 35 484 J=IA(I. 485 IF(CL 486 I=SF(E	0. T*,01001 MB=1,M10 MY#1,MI I*(MZ=1)+MY .GT,9)G0 TD 55 IC+DL .GF,ZTI)G0 TD 33 //TT*10.+1. N IN IN)+(Z(IIN+1)=Z(IIN))*(XN=XXN) AD 0.001-(ZIT=ZIC)/ZTT*99. LE,99)RAD=RADF(IJ)+(RADF(IJ+1)=RADF(IJ))*(RIJ=RJ)	4070 4080 4090 4120 4130 4140		
457 ZICI=0 458 DL=ZTT 459 DD 30 460 DU 30 461 Z5 462 IF(MA) 463 ZIC=ZI 464 IF(ZIC 465 XN=ZIC 466 IIN=XN 466 IIN=XN 467 XXN=II 468 TR=Z(I) 469 RAF=RA 470 IJ=100 471 RIJ=IJ 472 RJ=100 473 IF(IJ, 474 IF(IJ, 475 TI=T 476 T=TR 477 D034 478 ND=0 479 I]=1 480 IZ=SF(481 K=IA(I) 452 CF=1. 483 DD 35 484 J=IA(I) 485 IF(CL 488 I]=SF(489 I2=SR(490 D0 36 491 J=IA(1)	0. T*,01001 MB=1,M10 MY#1,MI I*(MZ=1)+MY .GT,9)G0 TD 55 IC+DL .GF,ZTI)G0 TD 33 //TT*10.+1. N IN IN)+(Z(IIN+1)=Z(IIN))*(XN=XXN) AD 0.001-(ZIT=ZIC)/ZTT*99. LE,99)RAD=RADF(IJ)+(RADF(IJ+1)=RADF(IJ))*(RIJ=RJ)	4080 4090 4120 4130 4140		
458 DL=ZTT 459 DD 30 460 DD 30 461 25 462 IF(MA. 463 ZIC=ZI 464 IF(ZIC 463 ZIC=ZI 464 IF(ZIC 465 XN=ZIC 466 IN=XN 466 IN=XN 467 XXN=II 468 TR=Z(I) 468 TR=Z(I) 469 RAF=RA 470 IJ=100 471 RIJ=IJ 472 RJ=100 473 IF(IJ. 474 IF(IJ. 475 TI=I 476 T=TR 477 D034 <i< td=""> 478 ND=0 479 II=1 480 IZ=SF(483 DD 35 484 J=IA(I) 485 IF(CL 486 SIF(BE) 487 CR=1 488 I1=SF(489 I2=SR(</i<>	T* 01001 NB=1,M10 MY=1,MI I*(MZ=1)+MY .GT.9)GO TO 55 IC+DL .CF.ZTT)GO TO 33 2/ZTT*10.+1. N IN IN)+(Z(IIN+1)=Z(IIN))*(XN=XXN) AD 0.001=(ZTT=ZIC)/ZTT*99. J 0.000=(ZTT=ZIC)/ZTT*99. .LE.99)RAD=RADF(IJ)+(RADF(IJ+1)=RADF(IJ))*(RIJ=RJ)	4080 4090 4120 4130 4140		
459 DD 3Q 460 DD 3Q 461 25 DLL=MI 462 IF(MA, 463 7IC=ZI 464 IF(ZIC 465 XN=ZIC 466 IIN=XN 467 XXN=II 468 TR=Z(I 469 RAF=RA 469 RAF=RA 470 IJ=100 471 RIJ=IJ 472 RJ=100 473 IF(IJ, 474 IF(IJ, 475 TIT 476 T=TR 477 DD34 478 ND=0 479 II=1 480 J2=SF(483 DD 35 484 J=IA(I 485 IF(BB(485 IF(BB(487 CR=1 488 I1=SF(489 I2=SR(490 D0 36 491 J=IA(I) 492 IF(BL(493 JESE(NB=1,M10 MY=1,MI I*(MZ=1)+MY .GT.9)GO TD 55 IC+DL .GF.2TT)GO TD 33 .//TT*10.+1, N IN IN IN)+(Z(IIN+1)=Z(IIN))*(XN=XXN) AD 0.001=(ZTT=ZIC)/ZTT*99, J 0.000-(ZTT=ZIC)/ZTT*99, LE.99)RAD=RADF(IJ)+(RADF(IJ+1)=RADF(IJ))*(RIJ=RJ)	4080 4090 4120 4130 4140		4
460 DD 30 461 25 DLL=MI 462 IF(MA, 463 7IC=7I 464 IF(21C 465 XN=ZIC 466 IIN=XN 466 IIN=XN 466 IIN=XN 466 TR=Z(I 468 TR=Z(I 469 RAF=RA 470 IJ=100 471 RIJ=IJ 472 RJ=100 473 IF(IJ, 474 IF(IJ, 475 TI=I 476 T=TR 477 D034 I 478 ND=0 479 I1=1 480 I2=SF(481 K=IA(I) 482 CF=1. 483 DD 35 484 J=IA(I) 485 IF(CL 486 J=SF(487 CR=1 488 I1=SF(489 I2=SR(490 D0 36 491 J=IA(1)	MY#1,MI I*(MZ=1)+MY GT,9)GO TD 55 IC+DL .GF,ZTT)GO TO 33 //TT*10.+1, N IN IN IN IN IN O_001=(ZTT=ZIC)/ZTT*99, J 0.000-(ZTT=ZIC)/ZTT*99, LE,99)RAD=RADF(IJ)+(RADF(IJ+1)=RADF(IJ))*(RIJ=RJ)	4080 4090 4120 4130 4140		· · · · · · · · · · · · · · · · · · ·
461 25 DLL=MI 462 IF(MA, 463 ZIC=ZI 464 IF(ZIC 465 XN=ZIC 466 IN=XN 466 IN=XN 466 XN=ZIC 466 IN=XN 466 XN=ZIC 466 XN=ZIC 466 XN=ZIC 466 XN=ZIC 466 XN=ZIC 466 XN=ZIC 467 XXN=II 468 TR=Z(I 469 RAF=RA 470 IJ=100 471 RIJ=ZIJ 472 RJ=100 473 IF(IJ,= 474 IF(IJ,= 475 TI=I 476 T=TR 477 DU34 478 ND=0 479 II=1 480 IZ=SF(481 K=IA(I) 482 CF=1, 483 DO 35 484 J=IA(I) 485 IF(CL) </td <td>I*(MZ=1)+MY GT.9)GO TD 55 IC+DL .GF.ZTT)GO TO 33 //TT*10.+1. N IN IN IN IN IN O.001=(ZTT=ZIC)/ZTT*99. J 0.000=(ZTT=ZIC)/ZTT*99. LE.99)RAD=RADF(IJ)+(RADF(IJ+1)=RADF(IJ))*(RIJ=RJ)</td> <td>4080 4090 4120 4130 4140</td> <td></td> <td></td>	I*(MZ=1)+MY GT.9)GO TD 55 IC+DL .GF.ZTT)GO TO 33 //TT*10.+1. N IN IN IN IN IN O.001=(ZTT=ZIC)/ZTT*99. J 0.000=(ZTT=ZIC)/ZTT*99. LE.99)RAD=RADF(IJ)+(RADF(IJ+1)=RADF(IJ))*(RIJ=RJ)	4080 4090 4120 4130 4140		
462 IF (MA, 463 7 IC = 7 I 464 IF (21C 465 XN=2 IC 466 I N=XN 467 XXN=11 468 TR=2 (I 469 RAF=RA 470 I J= 100 471 R J= 100 472 R J= 100 473 IF (I J_ a) 474 IF (I J_ a) 475 IT=T 476 T=TR 477 D034 I 478 ND=0 477 D034 I 480 I2=SF (481 K=IA(I) 482 CF=1, 483 D0 35 484 J=IA(I) 485 IF (CL 488 I1=SF (489 I2=SR (490 D0 36 491 J=IA(1) 492 IF (CL 493 36 IF (BL (493 G IF (CL 493 J=IA(1) 494 RA=EA (.GT.9)GO_TD_55 IC+DL .GF.2TT)GO_TD_33 //TT*10.+1. N IN IN IN IN O_0001-(ZTT=ZIC)/ZTT*99. J 0.000-(ZTT=ZIC)/ZTT*99. LE.99)RAD=RADF(IJ)+(RADF(IJ+1)=RADF(IJ))*(RIJ=RJ)	4090 4120 4130 4140		
463 7 IC = 7 I 464 IF (21C 465 XN = 2 I C 466 I N = XN 467 XXN = 1 I 468 TR = 7 (I 469 RAF = RA 470 I J = 100 471 R J = 100 472 R J = 100 473 IF (I J = 474 IF (I J = 475 IT = T 476 T = TR 477 D034 I 478 ND=0 477 J = 14 480 I 2 = SF (483 DD 35 484 J = I A (I 485 I F (CL 486 35 I F (CL 488 I = SF (489 I = SF (490 D0 36 491 J = I A (I 492 I F (CL 493 36 494 R A = EA (495 I F (P (K	IC+DL .CF.ZTT/GO_TD_33 //TT#10.+1. N IN IN IN (IN)+(Z(IIN+1)=Z(IIN))*(XN=XXN) AD 0.001-(ZTT=ZIC)/ZTT#99. LE.99)RAD=RADF(IJ)+(RADF(IJ+1)=RADF(IJ))*(RIJ=RJ)	4120 4130 4140		
465 XN=ZIC 466 IIN=XN 467 XXN=II 468 TR=Z(I 469 RAF=RA 470 IJ=100 471 RIJ=IJ 472 RJ=100 473 IF(IJ, 474 IF(IJ, 475 TITT 476 T=TR 477 D034 I 478 ND=0 479 II=1 480 I2=SF(481 K=IA(I) 482 CF=1. 483 DD 35 484 J=IA(I) 485 IF(BB(487 CR=1 488 I1=SF(489 12=SR(490 D0 36 491 J=IA(I) 492 IF(BB(493 36 494 RA=EA(<pre>2/7.TT*10.+1, N IN IN)+(Z(IIN+1)=Z(IIN))*(XN=XXN) AD 0.001=(ZTT=ZIC)/ZTT*99, J 0.000=(ZTT=ZIC)/ZTT*99, LEE.99)RAD=RADF(IJ)+(RADF(IJ+1)=RADF(IJ))*(RIJ=RJ)</pre>	<u>4130</u> 4140		
466 IIN=XN 467 XXN=II 467 XXN=II 468 TR=Z(I 469 RAF=RA 470 IJ=100 471 RIJ=IJ 472 RJ=100 473 IF(IJ. 474 IF(IJ. 475 TI=T 476 T=TR 477 DU34 I 478 ND=0 479 II=1 480 I2=SF(481 K=IA(I) 483 DD 35 484 J=IA(I) 485 IF(CL) 486 35 487 CR=1 488 I1=SF(489 I2=SR(490 DO 36 491 J=IA(I) 492 IF(CL) 493 36 IF(BR(494 RA=EA(495 IF(P(K)	N IN IN)+(Z(IIN+1)=Z(IIN))*(XN=XXN) AD 0.001=(ZTT=ZIC)/ZTT*99, J 0.000=(ZTT=ZIC)/ZTT*99, LE.99)RAD=RADF(IJ)+(RADF(IJ+1)=RADF(IJ))*(RIJ=RJ)	<u>4130</u> 4140		
466 IIN=XN 467 XXN=II 467 XXN=II 468 TR=Z(I 469 RAF=RA 470 IJ=100 471 RIJ=IJ 472 RJ=100 473 IF(IJ. 474 IF(IJ. 475 TI=T 476 T=TR 477 DU34 I 478 ND=0 479 II=1 480 I2=SF(481 K=IA(I) 483 DD 35 484 J=IA(I) 485 IF(CL) 486 35 487 CR=1 488 I1=SF(489 I2=SR(490 DO 36 491 J=IA(I) 492 IF(CL) 493 36 IF(BR(494 RA=EA(495 IF(P(K)	N IN IN)+(Z(IIN+1)=Z(IIN))*(XN=XXN) AD 0.001=(ZTT=ZIC)/ZTT*99, J 0.000=(ZTT=ZIC)/ZTT*99, LE.99)RAD=RADF(IJ)+(RADF(IJ+1)=RADF(IJ))*(RIJ=RJ)	<u>4130</u> 4140		
468 TR=Z(I 469 RAF=RA 470 IJ=100 471 RIJ=IJ 472 RJ=100 473 IF(IJ, 474 IF(IJ, 475 IT=T 476 T=TR 477 D034 478 ND=0 477 D14 480 I2=SF(481 K=IA(I) 482 CF=1, 483 DD 35 484 J=IA(I) 485 IF(CL) 486 35 IF(CL) 488 I1=SF(489 I2=SR(490 D0 36 491 J=IA(1) 492 IF(CL) 493 36 494 RA=EA(495 IF(PK)	<pre>IN)+(Z(IIN+1)=Z(IIN))*(XN=XXN) AD</pre>	<u>4130</u> 4140		
469 RAF=RA 470 IJ=100 471 RIJ=IJ 472 RJ=100 473 IF(IJ, 474 IF(IJ, 475 IT=T 476 T=TR 477 D034 I 478 ND=0 479 II=1 480 I2=SF(481 K=IA(I) 482 CF=1, 483 DD 35 484 J=IA(I) 485 IF(CL) 486 35 IF(CL) 488 I1=SF(489 I2=SR(490 D0 36 491 J=IA(1) 492 IF(CL) 493 36 494 RA=EA(495 IF(PK)	AD 2.001-(ZTT=ZIC)/ZTT#99, 1 2.000-(ZTT=ZIC)/ZTT#99, 1.E.99)RAD=RADF(IJ)+(RADF(IJ+1)=RADF(IJ))*(RIJ=RJ)	<u>4130</u> 4140		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0.001-(ZTT~ZIC)/ZTT*99.)).000-(ZTT~ZIC)/ZTT*99. LE.99)RAD=RADF(IJ)+(RADF(IJ+1)=RADF(IJ))*(RIJ+RJ)	<u>4130</u> 4140		
471 RIJ#IJ 472 RJ=100 473 IF(IJ. 473 IF(IJ. 474 IF(IJ. 475 IT.T 476 T=TR 477 D034 I 478 ND=0 479 I.1=1 480 I2=5F(481 K=IA(I) 482 CF=1. 483 DD 35 484 J=IA(I) 485 IF(CL) 486 J=IA(I) 485 IF(CL) 486 I=SF(489 I2=SR(490 D0 36 491 J=IA(I) 492 IF(CL) 494 RA=EA(495 IF(PK)]).000-(ZTT-Z1C)/ZTT*99. LE.99)RAD=RADF(IJ)+(RADF(IJ+1)=RADF(IJ))*(RIJ=RJ)	4140		
471 RIJ#IJ 472 RJ=100 473 IF(IJ. 473 IF(IJ. 474 IF(IJ. 475 IT.T 476 T=TR 477 D034 I 478 ND=0 479 I.1=1 480 I2=5F(481 K=IA(I) 482 CF=1. 483 DD 35 484 J=IA(I) 485 IF(CL) 486 J=IA(I) 485 IF(CL) 486 I=SF(489 I2=SR(490 D0 36 491 J=IA(I) 492 IF(CL) 494 RA=EA(495 IF(PK)]).000-(ZTT-Z1C)/ZTT*99. LE.99)RAD=RADF(IJ)+(RADF(IJ+1)=RADF(IJ))*(RIJ=RJ)	4140	; ;	·
473 IF(IJ, 474 IF(IJ, 475 IT=T 476 T=TR 477 D034 I 478 ND=0 479 I1=1 480 I2=SF(481 K=IA(I) 483 DD 35 484 J=IA(I) 485 IF(CL) 486 35 487 CR=1 488 I1=SF(489 I2=SR(490 DD 36 491 J=IA(I) 492 IF(CL) 493 36 IF(BR) 494 RA=EA(495 IF(P(K)	LE.99)RAD=RADF(IJ)+(RADF(IJ+1)=RADF(IJ))*(RIJ=RJ)	4150		
474 IF(IJ) 475 II=I 476 T=TR 477 DU34 I 478 ND=0 479 I]=1 480 I2=SF(481 K=IA(I) 482 CF=1, 483 DD 35 484 J=IA(I) 485 IF(CL) 486 35 487 CR=1 488 I]=SF(489 I2=SR(490 DD 36 491 J=IA(1) 492 IF(CL) 493 36 494 RA=EA(495 IF(P(K)	LE,99)RAD=RADF(IJ)+(RADF(IJ+1)=RADF(IJ))*(RIJ=RJ)		·	
475 II=I 476 I=TR 477 0034 I 478 ND=0 479 I]=1 480 I2=SF(481 K=IA(I) 452 CF=1. 483 DD 35 484 J=IA(I) 485 IF(CL) 486 35 487 CR=1 488 I1=SF(489 I2=SR(490 DD 36 491 J=IA(1) 492 IF(CL) 494 RA=EA(495 IF(PK)		4160	·····	
476 T=TR 477 DU34 I 478 ND=0 479 I]=1 480 I2=SF(481 K=IA(I, 452 CF=1, 483 DD 35 484 J=IA(I, 485 IF(CL, 486 35 487 CR=1, 488 I1=SF(489 I2=SR(490 DO 36 491 J=IA(1, 492 IF(CL, 493 36 IF(BB(494 RA=EA(495 IF(P(K)	GE.100)RAD=RADF(100)	4170	·····	
477 0034 I 478 ND=0 479 I]=1 480 I2=5F(481 K=IA(I 482 CF=1 483 DD 35 484 J=IA(I 485 IF(CL 486 35 IF(BB(487 CR=1 488 I]=SF(489 I2=SR(490 DO 36 491 J=IA(I) 492 IF(CL 493 36 IF(BR(494 RA=EA(I) 495 IF(P(K)		4180		
475 ND=0 479 I]=1 480 I2=5F(481 K=IA(I) 482 CF=1. 483 DD 35 484 J=IA(I) 485 IF(CL) 486 35 487 CR=1 488 I]=SF(489 I2=SR(490 DO 36 491 J=IA(I) 492 IF(CL) 493 A=EA(I) 494 RA=EA(I)		4190		······
479 11=1 480 I2=SF(481 K=IA(I 482 CF=1 483 DD 35 484 J=IA(I 485 IF(CL 486 35 487 CR=1 488 I1=SF(489 I2=SR(490 DD 36 491 J=IA(I 492 IF(CL 493 36 IF(BR(494 RA=EA(495 IF(P(K	<u>Alsir</u>	4200		
480 I2=SF(4B1 K=IA(I) 482 CF=1, 483 DD 35 484 J=IA(I) 485 IF(CL) 486 35 487 CR=1 488 I1=SF(489 I2=SR(490 DD 36 491 J=IA(1) 492 IF(CL) 493 36 IF(BB(494 RA=EA(495 IF(P(K)		4210	······································	
481 K=1A(1) 452 CF=1. 483 DD 35 484 J=1A(1) 485 IF(CL) 486 35 486 35 487 CR=1 488 11=SF(489 12=SR(490 DD 36 491 J=1A(1) 492 IF(CL) 493 36 494 RA=EA(495 IF(P(K)		4220		
452 CF=1. 483 DD 35 484 J=IA(I 485 IF(CL 486 35 487 CR=1 488 I1=SF(489 12=SR(490 DD 36 491 J=IA(1) 492 IF(CL 493 36 IF(BB(494 RA=EA(495 IF(P(K)		4230		
483 DD 35 484 J=IA(I 485 IF(CL 486 35 IF(BB(486 35 IF(BB(488 I1=SF(489 I2=SR(490 DD 36 491 J=IA(I 492 IF(CL 493 36 IF(BR(494 RA=EA(495 IF(P(K)		4240 4230		
484 J=IA(I 485 IF(CL 485 IF(BB(486 35 IF(BB(487 CR=1 488 I1=SF(489 I2=SR(490 D0 36 491 J=IA(I) 492 IF(CL) 493 36 IF(BB(494 RA=EA(495 IF(P(K)	H=11.10	4250		
485 IF(CL) 486 35 IF(BB(487 CR=1 488 I1=SF(489 I2=SR(490 D0 36 491 J=IA(1) 492 IF(CL) 493 36 IF(BB(494 RA=EA(495 IF(P(K)		4280		
486 35 IF(BB(487 CR=1 488 I1=SF(489 I2=SR(490 D0 36 491 J=IA(1) 492 IF(CL) 493 36 IF(BB(494 RA=EA(495 IF(P(K)	J(J.2).EQ.0.)ND=1	4280		
487 CR#1 488 11=SF(489 12=SR(490 D0 36 491 J=1A(1) 492 IF(CL 493 36 JF(BB(494 RA=EA(495 IF(P(K)	(I,M).NE.O.)CF#CF#C(J)##BB(I,M)	4290		
488 11=SF(489 12=SR(490 DD 36 491 J=1A(1) 492 IF(CL) 493 36 IF(RB(494 RA=FA(495 IF(P(K)	Letten and a second sec	4300		······································
489 12=SR(490 DD 36 491 J=1A(1) 492 IF(CL) 493 36 IF(BR) 494 RA=FA(495 IF(P(K)	(1)+1	4310		
490 DD 36 491 J#1A(1) 492 IF(CL) 493 36 IF(BB(1)) 494 RA=FA(1) 495 IF(P(K))	$(1)+S_{E}(1)$	4320		
491 J#1A(1) 492 IF(CL) 493 36 IF(BB(1)) 494 RA=FA(1) 495 IF(P(K))	M#11.12	4330		
492	1 - M N	4340		
<u>493 36 IF(BB(</u> 494 RA=EA(495 IF(P(K	J(J,2),EQ.0.)ND=1	4350		
<u>494 RA=EA(</u> 495 IF(P(K	(1,11).NE.O.)CR=CR*C(J)**88(1,M)	4360	·	
<u>495 IF(P(K</u>	(1)*EXP(aEE(1)/R/T)*(CE-CR*REOC(T,1))	4380		
-72 <u></u>	(1.NE.0.10XA(I)=1.130973355E4*DL#RA*RAG**2/TMPH*PT/P(K)	4370		
496 IF(P(K	().EQ.0.)DXA(1)=0.	4390		
497 IF(ND.)	NE.0)60 TO 54	4400		
498 <u>GD TO</u>	42			
499 54 IF(DXA	(NU) = LE = O = DXA(NU) = O = O	4420		
500 68 IF((AB	S(DXA(1)), GE, 1, E-2), AND, (F(J), LE, 9,)) GD, TO 20			· · · · · · · · · · · · · · · · · · ·
	TENNIS A STREAM THE AND A			
			······································	· · · · · · · · · · · · · · · · · · ·
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501	IF(DXA(1), GE., 1) DXA(1)=DXA(1)*.1		
502 34	IF(QXA(I),GE, 1)GO TO 20	4440	
503 504 20	GO TO 23 ZIC#ZIC=DL	4440	
504 20 505	DL=ABS(DL*,Q05/DXA(I))		
	REQ=REQC(T,I)	4470	
506 507	RATE=EA(I)*EXP(=EE(I)/R/T)	4480	
507 508	WRITE(6,930)DL,ZIC	4490	· · · · · · · · · · · · · · · · · · ·
<u>508</u> 509	WRITE(6,932)],RA,DXA(]),CF,CR,REQ,RATE	4500	
510	MAHMA+1	4510	······
511	GO TO 25	4520	
512 23	CN=0.	4530	
513	PT2=PRR(IS)	4540	· · · · · · · · · · · · · · · · · · ·
514		4550	
515	K=1A(1,1)	4560	
516		4570	
517	12=SF(I)	4580	
518	DO 38 M#11,12	4590	
519	JETA(I,M)	4600	
520	DN=DN=B(I,M)/B(I,1)*C(K)*DXA(I)	4610	
521 38	P(J)=P(J)=B(I,M)/B(I,1)*P(K)*DXA(1)	4620	
522	11=7F(1)+1	4630	
523	12 = SR(1) + SE(1)	4640	······································
524	DO 39 M#11,12	4650	
525	J=IA(I,M)	4660	
526	$DN=DN+B(I_{J}H)/B(I_{J})+C(K)+DXA(I)$	4670	· · · · · · · · · · · · · · · · · · ·
527 39	P(j)=P(j)+B(I_M)/B(1_1)*P(K)*DXA(1)	4680	
528	CT=O.	4690	
529		4700 4710	· · · · · · · · · · · · · · · · · · ·
530	$\frac{C(1)=P(1)/T/GC}{CT=CT=CT+CT}$	4710	·
531 37		4730	· · · ·
532	RN1=CT RN2=CT-DH	4730	
533	TMPH=TMPH+DN+GC+T/PT+TMPH	4750	
534	DN=TMPH=DH=CC=T/PT+TMPH DN=TMPH	4750	
535 536	PD=PRESD(T)	4770	······································
530	PT=PRR(IS)	4780	· · · · · · · · · · · · · · · · · · ·
538	IF(M8.EQ.5000.)GD T0 72		
539	IF(M6.EQ.3000)GB TD 71		· · · · · · · · · · · · · · · · · · ·
540	IF(NB_EQ.2000)PT=.5		
541	IF(PT_LE.(POUT=.2))GU TO 69		
542	DD 40 J=1,15	4800	· · · · · · · · · · · · · · · · · · ·
543 40		4810	
544		4820	
545 44	DO 43 IX=1.1R	4830	
546 43	$D = AMA \chi I (ABS(D \chi \Delta (I \chi)) \cdot D)$	4840	
547	1F(D.EQ.0.)G0 TD 26	4850	
548	IF(D,GE, 001010U TO 24	4860	
549 27	$IF(OL_GE_{A,O}) * ZTT) CO TO 24$	4870	
550	DL=ABS(DL=,005/D)		
			·····
			ī
			(

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551	1F(DL.GE01*TT)DL=.01001*TT	4890	
552	WRITE(6,930)DL,ZIC	4900 4910	i
553	WRITE(6,933)(DXA(1),1,1=1,1R)	4710	
554 24	IF(MB.NE.1)CU TO 31	4930	
555 556	IF(MY,GE,2)GD TD31 WRITE(6,942)PT,YEL1	4940	
557	WRITE(6,928)(J,C(J),TM(J),DXA(J),J=1,IM)	4950	
558	GO TU(46,47,31),IGO	4960	
559 46	II=IS+1	4970	·
560	WRITE(6,938)(J,DXA(J),J=II,IR)	<u>4980</u> <u>4990</u>	
561	<u>CO TO 31</u>	5000	
562 47 563	II=IR+1 WRITE(6,939)(J,C(J),TM(J),J=II,IS)	5010	
564 31	CONTINUE		
565	ZICI#ZICI+DL		
566	IF(ZICI, LE, (ZTT/25,))GO TO 30	•	
567	ZICI#O,	·	· · · · · · · · · · · · · · · · · · ·
568	NZ#MZ+1		
569 570	WZIC(HZ)=7 WT(HZ)=T		
571	WTMPH(MZ)=TMPH		
572	WPT(MZ)=PT		
573	WVEL1(MZ)=VEL1		
574	DD 70 J=1,155		
575	$\frac{WC(J,MZ) RC(J)}{WTM(J,MZ) = TM(J)}$	•	
576 577 70	WTM(J,MZ)=TM(J) WOXA(J,MZ)=DXA(J)		
578 30	CONTINUE		
579 33	PT.PT2	5190	
580 69	IWMZ=HZ	5400	
581	WRITE(6,918)	<u>5200</u> 5210	
<u>582</u> 583	WRITE(6,951)CARD WRITE(6,9934)ZIC,T,TMPH	5220	
584	PTTE#PT		
585.	IF(MAZE.EQ.2)PT=2.		
586	WRITE(6,942)PT,VEL1	5230	
587	PT#PTTE		
588	DD 64 I=1,15	5240	
589 64	P(1)=PPI(1)	5250	· · · · · · · · · · · · · · · · · · ·
590	IF((PT.GE.(POUT2)).AND.(PT.LE.(POUT+.2)))GO T() 65	5260	
591	IF(KK,EQ,2)PDP=PDP/2		
592	IF(KK,EQ.2)GO TO 63		
593	IF((PT.GE.POUT+,2),AND,(ITEST.EQ.2))PDP=POP/2.	5260	
594	IF((MAZE, EQ. 2), AND, (PT, GE, (POUT., 2)))GO TO 65		
595	IF(MAZE,EQ,2)GD TU 63		
596	IF((PT,LE.PDUT=.2).AND,(ITEST,EQ.3))PDP=PDP/2.	5280	
	- TUDT OF DOUR ON AND INTEET ED ANNULA		······································
597	IF((PT, GE. PDUT+.2). AND. (ITEST, EQ. 2))KK=2		
598	IF((PT.LE.POUT=.2).AND.(ITEST.EQ.3))KK=2	6.00	
599	<u>GD TO 63</u>	5290	
600 71	MAZE=2		
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ORTRAN IV	030 SOURCE PROGRAM PYRO PROGRAM 06/16/71 PAGE 0015	
601	_ PTe. 5	
602	WRITE(6,952)	· · · · · · · · · · · · · · · · · · ·
603	GD TU 69	
604 65	IF(IPLUT,GT.2)G0 T0 91	
605	WRITE(6,918)	
606	WRITE(6,916)	
_607	WRITE(0,916)	
608	WRITE(6,962)	
609 610 81	DD 81 1#14,116	
611	CALL PLOT(1, '*N') CALL PLOT(1, ' ')	
612		
613		
614	J2=WTM(KEYR, I)/WTM(KEYR, 1)*100.+15.	
615	$J_{3} = (WT(1) - Z(1)) / (Z(11) - Z(1)) + 100 + 15$	
616	$J4=(WPT(I)=2_{a})/6_{a}+100_{a}+15$	
617 82	CALL PLOT(14) 1×N1, J1, 1EN1, J2, 1RN1, J3, 1TN1, J4, 1PN1, 116, 1×01)	
618	J1=TM(KEYP)/WTM(KEYR,1)+100.+15.	
619	J2=TM(KEYR)/WTM(KEYR,1)*100.+15.	
620	J3=115	
621		· · · · · · · · · · · · · · · · · · ·
622	CALL PLDT (14, 1*N1, J1, 1EN1, J2, 1RN1, J3, 1TN1, J4, 1PN1, 116, 1*01)	
623	DD 63 [=14,116	
624 83	CALL PLUT(1, 1*N1)	
625		
627	WRITE(6,951)CARD WRITE(6,963)HR	
628	WRITE(6,918)	
629 91		
630	IF((IPLDT,GT,3),DR,(IPLDT,LT,2))GD TD 90	
631	MMMs2	
632	00 75 Imlelwar	
633	PT=WPT(1)	
634	VEL1=KVEL1(I)	
635	2IC=WZIC(I)	
636	T=WT(1) TMPH=WTMPH(1)	
638		
639		
640	TM(J)=NTM(J,I)	
641 76	DXA(J) = WDXA(J, 1)	
642	MMN=/MN+1	
643	1F(MMM_LE,L)GD_TD_41	
644		
645	WRITE(6,918)	
646 .	WRITE(5,951)CARD	
647 41	WRITE(6,9934)71C,7,TMPH	·····
648	YIELD=TM(KEYP)/TMPHI/PPI(KEYR)*PI*100+	
649 650	J2=KEYR+20 J1=J2=19	
	<u>VA7V6 # 17</u>	
·····		
		·····
		· · · · · · · · · · · · · · · · · · ·

DATRAN IV	DE SOURCE PROGRAM PYRO PROGRAM OF	0/16/71 PAGE 0016	
4.5.1			
651		۵٬۰۰۰ ۲۰۰۰ ۲۰۰۰ ۲۰۰۰ ۲۰۰۰ ۲۰۰۰ ۲۰۰۰ ۲۰۰۰	<u> </u>
653	WRITE(6,965)(ENAME(L), L=J1, J2), (ENAME(L), L=J3, J4), YI		
654	WRIJE(6,942)PT,VEL1		
655	WRITE(6,929)I		
656	WRITE(6,928)(J,C(J),TM(J),DXA(J),J=1,JM)	n	
657	GO TO(42,45,75),190		
658 42	II=IS+1	α _{το} το ποιεία το παταγραφικό το ματαγραφικό το τημ <u>αριατοριατού ματαγραφικό το ποιο το ποιο</u> Παταγραφικό το το ποιο τ	······································
659	WRITE(6,938)(J,DXA(J),J=II,IR)		
660	<u>G0 T0 75</u>		
661 45	II#IR+1		
662	WRITE(6,939)(J,C(J),TM(J),J=11,15)		
663 75	WRITE(6,916)		
664	WRITE(6,918)		<u>، د</u>
665 90	WRITE(6,951)CARD.	5310	
666	MB #1	۲ 	
667	MY#1	5320	
668		5330	
669 670	WRITE(6,916)	5340	
671 59	DD 59 J=1,JR Reutt=Reuc(t,j)	5350	
672	WRITE(6,916)	5370	
673	PRETT#PRESD(T)	5380	
674	DO 51 J=1,15	5390	الما الما الما المحمد موجود بالمان مجموع من المحمد من معن المان المان من 1000 ال المن عن 1000 الم
675	I1=1+(I=1)=20	5400	
676	I2=I*20	5410	
677 51	WRITE(6,946) I, IDATA(I), (ENAME(J), J=11, 12), C(1), TH(1)	5420	
678	<u>YIELO#TM(KEYP)/TMPHI/PPI(KEYR)*PI*100.</u>		
679	J2#KEYR#20		
680	J1=J2=19		
681	J4=KEYP*20		
682	J3=J4=19 WRITE(6,965)(ENAME(1),1=J1,J2),(ENAME(1),1=J3,J4),YIE		
684	GD_TD_50	5430	
685 63	PTI=PI	5440	
686	IF(PT_LT_POUT)CD TD 49	5450	
687	GO TO 61	5460	
688 49	PDIR=PI=PT	5470	
689 67	PTI=PI	5490	······································
690	PI=PI+POP		
691	IF(PI,GE,8,1)GO TO 56	5510	· · · · · · · · · · · · · · · · · · ·
692	00 53 1=1,15	5520 .	
693	PP1(1)=PP1(1)*P1/PT1	5530	
694	P([]=PP[(])	5540	
695 53	C(1)=P(1)/T/GC	5550	
696	ITEST=2	5560	
697	GD TO 58	5570	
698 61	PTI=PI	5580	
699	PI=PDP		
700	DD 62 1=1.15	5610	
			(H_
			t
			······································

FORTRAN IV030 SOURCE PROGRAM PYRD PROGRAM	06/16/71 PAGE 0017
701 PPI(1)=PPI(1)+PI/PTI	5620
702 62 P(I)=PPI(I)	5630
703 ITEST#3	5640
704 GD TD 58	5650
705 50 T=TIN	5660
706 TMpH=TMpHI	5670
707 HR=HR+18	
708 IGDTD#IGUTO+1	5720
709 WRITE(6,945)HR	5730
710 RADI(100)=RADI(99)	
711 DO 52 1=1,100	5740
712 RADD(1, IGOTO) #RL91(1)	
713 52 RADF(1)=RADI(1)	5750
714 WRITE(6,944)RADI	5760
715 /1AZE=1	
716 PDP=,2	
717 DD 66 I=1,15	5770
718 P(I)=PPI(I)	
719_66C(1)=P(1)/GC/820, 720ITEST=1	5790
	5800
721 MA=1 722 IF(IGDTD_GE,177)GD_TD_56	
723 IF(PT_LT_PRES)G0 TO 58	5820
724 <u>GD TU 56</u>	5830
725 72 WRITE(6,954)	
726 IGNT0=122	
727 CD TU 50	
728 55 WRITE(6,949)	5840
729 56 WRITE(6,918)	
730 IF(1PLUT.GT.2)GD TO 95	
731WRITE(6,955)	
732 WRITE(6,968)ZTT	
733 IGOTO=IGNTN=1	
734 DD 77 J=9,111	
735 77 CALL PLOT(J, **N*) 736 CALL PLUT(1, * *)	
737 00 78 J=2,100,2	
73811=102=J	
739IJK=0,	
740 DD 79 I=1,IGUTD	
741 [JK=1JK+1	
742 IF(IJK.GT.9)IJK#1	
743 J2=RAUD(J1+1)/RADI(1)*50+60.	
744 J3=120=J2	
745 79 CALL PLOT (9, 1+N1, J2, IDATP(1JK), J3, IDATP(1J)	K),111,1*N()
746 78 CALL PLOT (60, 1+ 1)	
747 DD 80 J#9,111	
748 80 CALL PLUT(J, 1*N1)	
749 95 CALL PLOT(1, 1)	
750 WRITE(6,966)	
	4
	·

ORTRAN IVO30 SOURCE PROGRAM PYRO PROGRAM	06/16/71 PAGE 0018	
751 WRITE(6,967)CARD 752 IGCTO=1		
753 MA#1	5860	
754 READ(5,943)IGOW, (Z(II), II=1,11)		
755 READ(5,950)CARD	5880	
756 READ(5,956)18,122,1PL0T 757 PT=0.		······
758 DD 73 1=1,1S		
759 73 PT=PT+PP1(1)	······································	
760 00 74 I=1, IS		
761 PP1(I)≠PP1(I)≠PSAVE/PT 762 74 P(I)=PP1(I)		
762 /4 P(1)#PPI(1) 763 GD TD(100,110,111), IGDW	5890	
764 101 CONTINUE	5900	
765 WRITE(6,921)1,10	5910	
765 STOP111	5920	
767 102 CONTINUE 768 WRITE(6,922)1,10	5940	
769 STUP112	5950	
770 103 CONTINUE	5960	<u></u>
771 WRITE(6,923)J, ID	5970 5980	
772 \$TUP113 773 104 CONTINUE	5980	
774 WRITE(6/924)1/10	6000	
775 STOP114	6010	
776 105 CONTINUE	6020	<u> </u>
777 WRITE(6,925)J,10 778 \$TOP115	6040	
779 111 CONTINUE	6050	
780 WRITE(6,918)		
781 92 WRITE(6,970)(1,1 #1,1 R)		
782 D0 84 IT=800,1200,10 783 J=(IT=800)/10+1		
784 T=IT		
785 DD 85 N#1, IR		
786 85 WC(J,N)=1./REQC(T,N) 787 84 WRITE(6,969)IT.(WC(J,N),N=1./R)		
787 84 WRITE(6,969)17,(WC(J,N),N=1,IR) 788 WRITE(6,918)		
789 WRITE(6,916)		
790 WRITE(6,916)		. <u></u>
791 DD 86 1T=800,1200,10		
792 J=([T=800)/10+1 793 T=11		
794 DD 87 N=1,1R		
795 87 WC(J,N)=HEATR(T,N)	· · · · · · · · · · · · · · · · · · ·	
796 86 WRITE(6,969) IT, (WC(J,N),N=1, IR)		
797 WRITE(6,918) 798 WRITE(6,916)		
799 WRITE(6,916)		
800 WRITE(6,916)		
		······································
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801			
	DD 88 17=800,1200,10		
	J=(IT=300)/10+1		
804 805 89	DD 89 N=1, IS WC (J, N)=CP (N, 2) + T+(P(N, 1)+CP(N, 3) + T++2+CP	(N)4)*T**3	
806 88	$WRITE(6,973)IT_{0}(WC(J_{0}N))N=1,15)$		
807 99 808 106	STUP99 WRITE(6,935) ID,J	<u>6060</u> 6070	
809	STOP116 '	6080	
810 26	WRITE(6,931)	6090	
811 812	WRITE(0,948)(J,C(J),DXA(J),J=1,IS) STOP26	6100	
813	END	6120	
	· · · · ·		
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Appendix G

Program Output

PROGRAM PYRO PROGRAMMER_RICHARD_RUBERISON DR. HAMESIAU_ADVISOR AS_MASTER_THESIS_REQUIREMENT		
PROGRAMMER_RICHARD_RUBERTSON		
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	CO NI	UI' SYSTEM	HEAT C	APACITY DAT/	۸	DELTA-H	DELTA-S	LUG(K)
		Α	<u> </u>	CAPACITY DATA	D			
	<u> </u>	5.457E 00	1.9576-02	-1.2Y6E-05	3.4006-09	5.41940000E 04	4.79969940E 01	-8,87380020E 00
ISO BUTANE	<u>n 2</u>	-1.901E 00		-5.4755-05	1.182E-06	-3.1452000UE 04	7.041999BOE 01	-1.45972990E 01
N-BUTARE	63	9.1145-02	9.218E-02	-4.761E-05	9.577E-09	-2,98120000E 04	7.41000/608 01	-1.41427000E 01
ISO-BUTENE	<u> </u>	7,0988-01	3.209E-02	-4.535E-05	9.837E-09	2.8000000E 02	7.24/99950F 01	-1.36689990E 01
ЕТНАНЕ	E 5	9.0655-01	4,420E-02	-1.664E-05		-2.02360000E 04	5,485000405 01	-5.70.392808 20
THYLENE		9.847F-01	3.701E-02	1.745E-05	4.042F+09	1.24960000E 04	5.24499960E 01	-6.17380049E 00
IYDROGEN		7.010E 00		l.u06E=06		0,00000000E-01	3.12109980E 01	0.0000000E-01
TETHANE			1 493F-07	-1 • 127E=07	453E=10 593E=09	-1,78890000E-01	4.45000000F 01	0.000000E+01 -1.00/49960E 00
ROPANE			7 2145-012					
		-1.053E 00	1.3145-UC	-3.788E-05	7.01/1-07	-2.48200000E 04	6.45099940E 01	-9.98390000E 00
			5.063E-02			4.87900000E 03	6.38000030F 01	-9.49.9000E 00
ATER			1.285E-04			-5.17978980E 04	4.51000020F 01	1.00597290E 01
ARBUN			1,447E-02		4.029E-00	0.000000005-01	1.30590000F 00	0.0000000E-01
ARBON MOHOXIDE	121.5		-4.085E-04			-2.64156990E 04	4.73009940E 01	1.04 70090E 01
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		PAF	RAMETERS	and Walkstonen and an allowed a second				
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CETYLENE	. A 1	4.221	185.0	26.04 0.0	0000E-01			
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IYDROGEN	67	2.915	38.0	2.02 0.0	0008-01	······································		
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1E<->1F+1G		K(D) 6.040E 16	E	DELTA A	DELIA B -7.723E-03	DELTA C 1.966E-07	DELTA D 9.400E-10	······
			6.700F 04		-2.152E-02			
IF<=>1A+1G					-1.797E-02		-8.2045-10	
1A<->2L+1G			6.200F 04		8,835E-03	-8.056E-06	2.344E-09	
2F<=>10		2.500E 13	6.000E 04		8.065E-03	-6.453E-06	1.7546-09)
1K+1L<->1M+1G		9.255E 03	2.130F 04		-1.555E-02	1.134E-05	-3.141E-09)
II<->1J+1G		2.900F 13	6.330E U4		-1.705E-02	1.0505-05	-2.407E-07	
_11<->1H+1F		3.200E_13	6.300E 04	6.077E 00	-2.119E-02	1.825E-05	-5.223E-09)
LOG(K) PEAC	TTON CONSTANT OF	INTEGERATION	DRDER	DE REACTIO	IN BY COMPON	FNT		
		$F \neq + (1 \circ 0)$	$F_{**(1,0)}$	$G^{**(1,0)}$				
1.607005 00		E**().())	H**(1.()	F**(().5)				
	-1-83660F 01	<u> </u>	$A \neq + (1, 0)$	G**(1.0)				
8.87380E QU	2.44513E_01	A**(1.0)	L**(1.0)	G**(1.0)				
-6.60699E-01	1.52761E_00	F**(2.(.) ·						
4.17880E-01	-3.64982E_01	K**(0.0)	L**(].0)	M**(1.0)	G**(].	0)		
4.93000E-01		<u>I**(1.0)</u>	J**(].O)	<u> </u>		<u></u>		
2.30260E 00	-1.43070E 01	<u>I**(].()</u>	H**(1.0)	F**(1.0)				aga - ng manakana - na aka ka kagangkan sana saran - akakan ka kana kana kana kana kana
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REACIDE IS 400.00 FEET LONG AND 0.125 FEET IN RADIUS	
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INITIAL REACTOR INCREMENTION 5.00000E-01FEET	
FUNGTION REOC(T.1)	
REQC(T, I) = 0.11963E (02(-832.71, -1))	
FUNC (IQN. REQUITED)	
PEQC(I,I) = 0.660416-02(B32.71, 2)	
FUNCTION REDC(1,1)	
REQC(T,1)= 0.14012E 06(832,71, 3)	
EUNCTION_REQC(T.I) REQC(T.J)=0.1483/L-G8(_B32.714)	
REAC(T)])= 0,1423/(-58(-832,71) 4)	· · · · · · · · · · · · · · · · · · ·
FUNCTION REGC(T,1) REAC(T,1)= 0.52409E 01(832.71, 5)	
REQC(T,1)= 0,52409L 01(.832.71, 5)	
, FHUCTION SEACTINE)	
REQC(T, T) = 0.27599L + 01(B32.71, 6)	•
FUNCTION REDC(LJ.)	
PEDP(T, I) = (0.55381) (0.01 H = 2.71 + 7)	
FUNCTION REQC(T,1)	
REQC(T,1)= 0.790391-03(_832,71, 8)	
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$\frac{FURCTION PRR(15)}{PR= 5.84930E CO} RADI(1)= 1.25000E-01 VOL= 0.00000E-01$	
	· · · · · · · · · · · · · · · · · · ·
FUNCTION PRESU(T) RENU= 3.35920E 95 VIS= 2.10064E-05 DEN= 1.37883E-01 FRICTION FACTURE 1.41227E=02 VI.V2.VAE 2.08526E 02 2.10555E 02	
RENJ= 3:35920E 95 VIS= 2:16064E-05 DEN= 1:37883E-01	
FRICILLY FACTURE 1.41227E=02 VI.V2.VAR 2.08526E 02 2.12585E 02 2.10533E 02	
	المتعقف المعرفة المتعود
FUPICT15ix_PRE(15)	
PR = 5.82657E CO RADI(1) = 1.25000E-01 V IL = 0.00000E-01	
PRESSURE 15 5,32657E 00 VELOCITY 2,1258E_02FEET/SEC.	and a second
1 0.0000E-01 0.0000E-01 3.4774E-07	ا کا باشاندان در بر در در سرمی بود و بر افغان در بر در بر در بر در بر
2 0.0000E=01 0.0000E=01 7.9707E=08	
3 0.0000E-01 0.0000E-01 0.0000E-01	
4 0.0000E-01 0.0000E-01 0.0000E-01	
53.4724E=031.2994E_020.0000E=01	
6 1,3457E-09 5.0364E-05 0.0609E-01	
7 1.2075E-09 4.5186E-05 0.000E-01	
<u>8</u>	
9_0.00000E-01	
10 0.00000E-01 0.00000E-01	
<u>11 1.67226E-03 7.00597E 01</u>	
12 0.00000E-01 0.00000E-01	
13 0.00000E-01 0.00000E-01	
DL CHANGED TO 1.97467E 00 71C= 3.36334E 02	
I = 1 RA = 1.49804E - 03 DXA(1) = 1.01384E - 02 CF, CR = 1.06182E - 03 6.41019E - 08 REQC = 1.79470E 00	
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	and the second
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SYSTEM 4 B20 TU LUIO DEG K	
SYSTEM 4 B20 TO 1110 DEG K REACTOR POSITION 4.01496E 02FEET TEMPERTUKE 1109.70DEGREE-K MOLAK FLOW RATE 2.46192E 02POUND MOLES PER HOUR PRESSURE IS 2.05028E 00 VELOCITY 1.0218E 03FEET/SEC.	
PRESSURE IS 2.05023E 00 VELNCITY 1.0218E 03FEET/SEC.	
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SYSTEM 4 820 TU 1110 DEG K	
REACIDE POSITIUN 1.60160E OIFEET	
TEMPERTURE 370.85DEGREE-K MOLAK FLUM RATE 2.00001F 02POUND MOLES PER HOUR	
CONVERSION DE ETHANE TO ETHYLENE IS 0.00%	
PRESSURE IS 5,75501E_00_VELUCITY_2.2506E_02FEET/SEC.	
NO CONCENTRATION TAPH DXA	·····
1 6.9505E-16 2.7526E-11 2.8885E-06 2 0.000E-01 0.0000E-01 4.4513E-07	
	·····
	and the second
4 4.1865E=20 1.6581E=15 4.8535E=05 3.2809E=03 1.2994E 02 3.8228E=12	
<u>6 1.9288E-06 7.6391E-04 4.0692E-21</u>	
<u>7 1.7771E-08 7.0383E-04 0.0000E-01</u> <u>8 3.0340E-09 1.2016E-04 0.0000E-01</u>	
9	
<u>10</u> <u>0.00000E-01</u> <u>0.00006E-01</u> <u>11</u> <u>1.76894E-03</u> <u>7.06596E-01</u>	
<u>12 6.74616E-20 0.00000E-01</u> 13 7.19814E-24 2.85085E-19	
REACIOR PUSITIUN 3.20320E OIFEET	- annos
TEMPERTURE 921.70DEGREE-K HULAR FLOW RATE 2.00011E 02POUND MOLES PER HOUR	····
TERECKTORE 921. TODESKEERK HOLAK TEW KATELIZ. OUTTE OZTUSNU HOLGS CEK HOUK	and the second
CONVERSION DE ETHANE ID ETHYLENE IS 0.01%	
PRESSURE IS 5.65592E 00 VELUCITY 2.4244E 02FEET/SEC.	
NO CUNCENTRATION TAPH DXA	
1 1.0335E-13 4.4287E-09 3.0626E-05	
$\frac{1}{2} = \frac{1}{0} \cdot \frac{1}{0} $	ana ana amin'ny soratra dia mampina dia
<u>3</u> 0.0000E-01 0.0000E-01 2.0006E-07	
4 5.4656E-17 2.3310E-12 3.2526E-04	
5 3.0465E-03 1.2993E 02 3.5542E-10	
6 2.5157E-07 1.0729E-02 1.0894E-17	
7 2.3845E-07 1.0169E-02 0.0000E-01	
8 2.6228E-08 1.1195E-03 0.0002E-01	
9 0.00000E-01 0.00000E-01	
10 0.00000E+01 0.00000E+01	an a
<u>11 1.64277E-03 7.00597E 01</u>	
12	
13 2.11735E-20 9.02993E-16	
•	•
	<u></u>

SYSTEM 4 820 TO 1110 DEG K		
REACTOR POSITION 4.80480E 01	FEET	
TEMPERTURE 953.04DEGREE-K M	NAP FLIN PATE 2	00074E 02PDHND MOLES PER HOUR
TEMERIONE 722. GADLOREER ML	ILAN I CON MAIL 2	Course of the second se
CONTROLING C CTITLE	TO ETHYLENE	
CONVERSION OF ETHANE		<u>IS 0.06%</u>
	VELUCITY 2.5553	E 02FEET/SEC.
ITERATION NUMBER- 3		
NO CONCENTRATION TMPH	DXA	
<u>1 3.8291E-12 1.7208E-07</u>		· · · · · · · · · · · · · · · · · · ·
2 0.0000E-01 0.0000E-01	1 1.09406-05	
3 0.0000E-01 0.0000E-01		
4 1.1292E-14 5.0744E-10		
<u>5 2.8898E-03 1.2986E 02</u>		
61,6333F-067,3399E-02		
<u>7 1.5697F-06 7.0539E-02</u>		
<u>8 1.2728E-07 5.7198E-03</u>		
9 0.00000E-01 0.00000E-01		
10 0.00000E-01 0.00000E-01		
<u>10 0.0000E-01 0.00000E-01</u> <u>11 1.55899E-03 7.00601E 01</u>		
<u>12</u> 7.11319E-15 0.00000E-01		
<u>13 1.03315E-17 4.64290E-13</u>	<u>}</u>	
REACTOR POSITION 6.40640E 01		
TEMPERTURE 965.05DEGREE-K MU		.00187E 02POUND MOLES PER HOUR
IEMPERIORE 900.000COREE-K ML	ILAR FLUW RATE 2.	-00187E 02P00ND MULES FER HOUR
CONVERSION OF ETHANE	TO ETHYLENE	IS 0.14%
PRESSURE IS 5.44347E 00 V		E 02FEET/SEC.
	ELUCITY 2.03931	
ITERATION NUMBER- 4	ΔXΔ	
NO CONCENTRATION TMPH		
<u>1 2,1366E-11 9,9156E-07</u>		
2 0.0000E-01 0.0000E-01		
<u>3 0.0000E-01 0.0000E-01</u>		
<u>4 1.5249E-13 7.0771E-09</u>		
<u>5 2.7958E-03 1.2975E 02</u>		
<u>6 3.9892E-06 1.8513E-01</u> 7 <u>3.8481E-06 1.7858E-01</u>		
8 2.8240E-07 1.3106E-02		
9 0.0000E-01 0.00000E-01		
10 0.00000E-01 0.00000E-01		
<u>11 1.50964E-03 7.00605E 01</u>		
12 5.77617E-14 0.00000E-01		
13 1.71251E-16 7.94756E-12	j	
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SYSTEM 4 820 TU 1110 DEC K		
REACTOR POSITIUN 8.00800E OIF	FEET	
TEMPERIURE 977.06DEGREE-K MOL	AR FLUW RATE	2.003/IE_02PDUND_MULES_PER_HUUR
CONVERSION OF ETHANE	TO FTHYLENE	IS 0.28%
PRESSURE IS 5.33464E 00 VE		
ITERATION NUMBER- 5		
- NO CUNCENTRATION THPH	0YA	
<u>1.7.7026E-11.3.6952E-06</u>	4.17395-04	
	2.4468E-05	
3 0.0000E-01 0.0000E-01	2.66465-06	
-4 9.7775E-13 4.6907E-08		
7.4220E-06.3.5606E-01		
90.00000E-010.00000E-01	and a second	
10 0.00000E-01 0.00000E-01		
1.46040E=037.00612E_01		
12 2,99727E-13 . 0,00000E-01		
13 1.26982E-15 6.09181E-11		
_REACTOR_POSITION9.60959E 01E	EET	
TEMPERTURE 988.27DEGREE-K MUL	AR FLOW RATE	2.00663E 02POUND MOLES PER HOUR
CONVERSION OF ETHANE	TO ETHYLENE	IS 0.51%
	LOCITY 2.8230	OE 02FEET/SFC.
ITERATION NUMBER- 6		
NO_CONCENTRATIONTMPH	DXA	
	6.3624E-04	
	3.5006E-05	
<u>3 0.0000E-01 0.0000E-01</u>	4.0256E-06	
<u>4.4972E-12</u> 2.2308E-07		
<u>5</u> 2.6060E-03 1.2927E 02	2.0889E-07 1.5907E-12	
6 1.3246E-05 6.5705E-01 7 1.2843E-05 0.3705E-01	0.0000E-01	
<u>B</u> 8.0735E-07 4.0047E-02	0.0000E-01	
<u>9.0.00000E-01</u> <u>0.00000E-01</u>		
16 0.0000E-01 0.0000E-01		
<u>11</u> 1.41244E-03 7.00623E 01		
12 1.22543E-12 U.0000CE-01		
13 6.76343E-15 3.35492E-10	a na sa	
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and the second	······	

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SYSTEM 4 820 TO 1110 DEG K		
REACTOR POSITIUN _ 1.12112E 02FFF	T	
TEMPERTURE 999.48DEGREE-K HOLAK	ELOW RATE 2.01113E 02POUND MOLES PER HOUR	
CONVERSION OF ETHALE	IO ETHYLENE IS 0.85%	
PRESSURE IS 5.11364E OO VELU	CITY 2.9235E 02FEET/SEC.	
ITERATION_NUHBER7		
ND CONCENTRATION TAPH		
1 5.9234E-10 3.0417E-05	9.6208E-04	
2 0.0000F-01 0.0000E-01	4,95982-05	
3 0.0000E-01 0.0000E-01	6.0044E-06	
4 1.6994E-11 8.7268E-07	3.7284E-03	
52.5085E-031.2881E_02	4.4178E-07	
6 2:1469E-05 1.1025E 00	6.63621-12	
7 2.0861E-05 1.0712E 00	0.0000E-01	
8 1.2196E-06 6.2627E-02	0.0000E-01	
9 0.00000E-01 0.00000E-01		
10 0.0000E-01 0.00000E-01		
<u>11 1.36441E-03 7.00640E 01</u>		
<u>12</u> 4.40788E-12 0.0000E-01		
13 2.96226E-14 1.52116E-09		
REACTOR POSITION 1.26128E 02PEE	-	
REACTOR POSITION 1.26128E 02FEE		
TEMPERTURE TOUS.USDEGREE-K HULAK	FLUW KATE 2.01767E 02PUUND MULES PER MUUR	
CONVERSION OF ETHALE	TO ETHYLENE IS 1.35%	
PRESSURE 1S 2.00336E 00 VELD	CITY 3.0234E 02FEET/SFC.	
ITERATION NUMBER- 8		
ND CONCENTRATION TAPH	DXA	
1 1.3948E-09 7.4047E-05	1.3481E-03	
- 1 - 1 - 2 - 0 - 0000E - 01 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 -	6.3847E-05	
3 0.0000E-01 0.0000E-01	8.0331E-06	
4 5.4702E-11 2.9040E-06	4.0979E-03	
5 2,4139E-03 1.2815E 02	8.0399E-07	
6 3.2983E-05 1.7510E 00	2.32526-11	
7 3.2108E-05 1.7046E 00	0.0000E-01	
8 1.7550E-06 9.3168E-02	0.0000E-01	
9 0.00000E-01 0.00000E-01	· · · · · · · · · · · · · · · · · · ·	
10 0.00000E-01 0.00000E-01		
11 1.31981E-03 7.00665E 01		
<u>12 1.30744E-11 C.00000E-01</u>		
13 1.12486E-13 5.97167E-09		
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SYSTEM 4 820 TO 1110 DEG K	
REACTOR POSITION 1.44144E 02FEET TEMPERTURE 1014.05DEGREE-K MOLAR FLUW RATE 2.02580E 02POUND MOLES PER HOUR	
TEMPERTURE 1014.05DEGREE-K MULAR FLUW RATE 2.02580E 02POUND MOLES PER HOUR	
CONVERSION OF ETHANE TO ETHYLENE IS 1.97%	
CONVERSION OF ETHANE TO ETHYLENE IS 1.97% PRESSURE IS 4.39207E 00 VELOCITY 3.1231E 02FEET/SEC.	
ITERATION NUMBER- 9	
NO CUNCENTRATION THPH UXA	
<u>1. 2.7980E-09 1.5338E-04 1.6644E-03</u>	
2 0.0000E-01 0.0000E-01 7.5408E-05	
3 0.0000E-01 0.7435E-06	
4 1.4095E-10 7.7268E-06 5.4671E-03	
<u>5 2.3228E-03 1.2733E 02 1.2299E-06</u>	
6 4.6626E-05 2.5566E 00 5.9865E-11	
7 4.5452E-05 2.4916E 00 0.0000E-01	
<u>B</u> 2.3604E-06 1.2939E-01 0.0000E-01	
9 0.00000E-01 0.00000E-01	
10 0.00000E-01 0.0000E-01	
11 1.27822E-03 7.00695E 01	
<u>12</u> <u>3.05174E-11 0.00000E-01</u>	
133,33553E-131.82848E-08	
REACTOR POSITION L.60160E 02FEET TEMPERTURE 1020.02DECREE-KMOLAR FLOW RATE2.03573E_02POUND_MULES_PER_HOUR	
TEMPERTURE 1020.02DECREE-K MOLAR FLOW RATE 2.03573E 02POUND MULES PER HOUR	• •
CONVERSION DE ETHANE TO ETHYLENE IS 2.72%	
PRESSURE IS 4.77983E 00 VELDCITY 3.2310E 02FEET/SEC.	
ITERATION NUMBER- 10	
NO CONCENTRATION THEN DXA	
1 5.0619E-09 2.8696E-04 2.0427E-03	
2 0.0000E-01 0.0000E-01 8.8604E-05	
3 0,0000E-01 0.0000E-01 1.1752E-05	
<u>4 3.0976E-10 1.7561E-05 6.3314E-03</u> 5 2.2236E-03 1.2634E 02 1.7451E-06	
6 6.2418E-05 3.5384E 00 1.3668E-10 7 6.0915E-05 3.4532E 00 0.0000E-01	
R 3.0297E-06 1.7175E-01 0.0009E-01	
9 0.00000E-01 0.00000E-01	
10 0.0000000000000000000000000000000000	
11 1.23611E-03 7.00735E 01	
12 6,39290E-11 0.00000E-01	
<u>13 8.35251E-13 4.73495E-08</u>	
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SYSTER 4 820 TU 1110 DEC K	
REACTOR POSITION 1.76176E 02EEET	
TEMPERTURE 1072.020FGREE-K MULAR FLUW RATE 2.04664E 02POUND MULES PER HOUR	
CONVERSION OF ETHANE TO ETHYLENE IS 3.55%	
PRESSURE IS 4.66467F 00 VELOCITY 3.3350F 02FEET/SEC.	
ITERATION NUMBER- 11	a an la anno 186 an fhair a na ann an Anna
ND CONCENTRATION TNPH UXA	
<u>1 8.2029E-09 4.7979E-04 2.1419E-03</u>	
3 0.0000E-01 0.0000E-01 1.2252E-05	
<u>4 5.8333E-10 3.4119E-05 6.5119E-03</u>	
<u>5 2.1412E-03 1.2524E 02 2.0794E-06</u>	
6 7:8965E-05 4.6187E 00 2.4660E-10	
7 7.7127E-05 4.5111E 00 0.000E-01	
<u>8 3.7137E-05 6.1721E-01 0.0000E-01</u>	
9 0.00000E-01 0.00000E-01	
10 0.00000E-01 0.00000E-01	
11 1.19811E-03 7.00778E 01	
12 1.06538E-16 0.00000E-01	
12 1.05238E-10 - 0.00000E-01 13 1.78764E-12 1.04559E-07	
13 1.181646-12 1.043396-07	
REACTOR POSITION 1.92192E 02FEET	and an a second state for the second
TEMPERTURE 1024.02DEGREE-K MOLAR FLOW RATE 2.05798E 02POUND MOLES PER HOUR	
CONVERSION OF FTHANS TO ETHYLENE IS 4.42%	
PRESSURE IS 4.54475E 00 VELOCITY 3.4487E 02FEE1/SEC.	
ITERATION SUBBER- 12	
NO CONCENTRATION THPH DXA	
- 2 0.0000E-01 0.0000E-01 9.4542E-05	
3 0.0000E-01 0.0000E-01 1.2759E-05	
4 9.6002E-10 5.8038E-05 6.6908E-03	
<u>5 2.0528E+03 1.2410E 02 2.3351E+06</u>	
6 9,4956E-05 5,7406E 00 3,8893E-10	
7 9.2802E-05 5.6104E 00 0.0000E-01	
8 4.3631E-06 2.6377E-01 0.0000E-01	
9 0.0.2000F-01 0.00000E-01	
10 0.00000E-01 0.00000E-01	
<u>13 3.27204E-12 1.97612E-07</u>	
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SYSTEM 4 820 TO 110 DEG K	
REACTOR POSITION 2.08208E 02EEET	an a
TEMPERIURE 1027.05DEUREE-K MULAR FLOW RATE 2.06992E 02POUND MOLES PER HOUR	······
- CONVERSION DE ETHANE TO ETHYLENE IS 5.33%	
PRESSURE 1S 4.41954F.00 VELUCITY 3.5776F.02FEET/SEC	
ITERATION_JUMATR13	······································
NO_CONCENTRATION THEH OXA	
11.6729E-U81.9466E-032.4396E-03	
2 0.0000E + 01 1.0000E + 01 1.0059E + 04	
3	
4 1.4400E-09 9.0255E-05 7.0676E-03	No. Company to agree to agree associate
$\frac{6}{7} = \frac{1.1042E - 04}{1.0202E - 00} = \frac{5.0554E - 10}{5.0554E - 10}$	Anna Alba ann a bha a' Alba agus an ann a'
7 1.0797E+04 0.7675E 00 0.0000E+01 8 4.9768E+06 3.1193E+01 0.0000E+01	Contract and the states of the
9 = 0.00000E + 01 = 0.00000E - 01	
-11 - 1.11823E - 03 - 7.00880E - 01	
12 2,35819E-10 0.00000E-01	
13 5.40908E-12 3.39028E-07	
REACTOR POSITION 2.24224E 02FEET	
TEMPERTURE 1031. OGDEGREE-K MOLAR FLOW RATE 2.08318E 02POUND MOLES PER HOUR	
	And Stations & with Reading and America
CONVERSION OF ETHANE TO ETHYLENE IS 6.33%	
PRESSURE IS A.28954E 00 VELUCITY 3.7240E 02FEET/SEC.	
ITERATION NUMBER- 14	
NO_CONCENTRATION DXA	
<u>1 2.2457E-08 1.4649E-03 2.7429E-03</u> 2 0.0000E-01 0.0000E-01 1.0992E-04	
<u>3 0.0000E-01 0.0000E-01 1.0992E-04</u>	
4 2.0468E-09 1.3345E-04 7.6496E-03	
5 1.8645E-03 1.2158E 02 2.5051E-06	
-6 1.2623E-04 5.2300E 00 8.9284E-10	
7 1.2349E-04 6.0516E 00 0.0000E-01	<u></u>
<u>8 5.5814E-06 3.6391E-01 0.0000E-01</u>	
9 0.00000E-01 0.00000E-01	
10 0.00000E-01 0.00000E-01 11 1.07506E-03 7.00946E 01	
11 1.07506E-03 7.00946E 01 12 3.42769E-10 0.00000E-01	- 24 - 24 - 24 - 24 - 24 - 24 - 24 - 24
13 6,50815E-12 5,54737E-07	
	2
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SYSTEM 4 820 TH 1110 DEG K	
- REACTOR DOCTTION - 5 40040E OBER	
TEMPETIDE 1035 NADE/DEEV MOL	AK FLOW RATE 2.09788E 02POUND MOLES PER HOUR
TEMMERIUKE 1022.000CONTERK HULP	AK FLUW KATE Z.UTIOGE UZTUONU HULETTIK HUOK
CONVERSION OF ETHANE	TO ETHYLENE IS 7.45%
CUNVERSION OF FIDARE	10 EIHILENE 15 1.497
PRESSURE IS 4.15415E 00 VEL	LUCITY 3.8876E 02FEET/SEC.
ITERATION NUMBER- 15	
O CONCENTRATION TMPH	
1 2,9449E-08 2.0030E-03	3.0720E-03
2 0.0000E-01 0.0000E-01	1.1967E-04
3 0.0000E-01 0.0000E-01	1.6930E-05
4 2.7927E-09 1.8994E-04	8.2500E-03
5 1.7659E-03 1.2011E 02	3,1947E-06
6 1.4233E-04 9.6806E 00	1.3227E-09
7 1.3932E-04 9.4755E 00	0.0000E=01
1 1.2722704 7.41227 00	
<u>B 6.1742E-06 4.1993E-01</u>	0.U000E-01
9 0.00000E-01 0.00000E-01	
0 0.00000E-01 0.00000E-01	
1 1.03071E-03 7.01025E 01	
2 4.84554E-10 · 0.00000E-01	
3 1.29012E-11 8.77461E-07	
An and a second s	
EACTOR PUSITION 2.56256E 02FE	: : : 7
PHOEDTHDE 1030 MANERSELV MILLA	NK FLOW RATE 2,11411E 02POUND MOLES PER HOUR
EMPERIORE 1007,000CONLETK MILA	K FLUW KATE 2.11411E UZENOND HULES FRA HUNK
·····	
INVERSION OF ETHANE	TO ETHYLENE IS 8.68%
	DCITY 4,0720E 02FEET/SEC.
TERATION NUMBER- 16	
D CUNCENTRATION THPH	
1 3.7770E-08 2.6883E-03	3.4259E+03
$\frac{1}{2} - \frac{3 \cdot 7770 E - 08}{2 \cdot 6353 E - 03} - \frac{3 \cdot 7770 E - 08}{2 \cdot 6353 E - 03}$	1.2976E-04
3 0.0000E-01 0.0000E-01 3 0.0000E-01 0.0000E-01	1.5669E=05
4 3.6790E-09 2.6165E-04	8.86216-03
5 1.6548E-03 1.1849E 02	<u>3.4618E-06</u>
6 1.5847E-04 1.1279E 01	1.9081E-09
7 1.5519E-04 1.1046E_01	0.0000E-01
8 6.7438E-06 4.8000E-01	0.0000E-01
9 0.00000E-01 0.00000E-01	
0 0.00000E-01 0.00000E-01	
1 9.85050E-04 7.01119E 01	· · ·
<u>3 1.89299E-11 1.34735E-06</u>	
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SYSTEM 4 820 TO 1110 DEG K	an a
REACIDE POSILION 2.72271E 02FEET	· · · · · · · · · · · · · · · · · · ·
TEMPERIURE 1043.07DEGREE-K MOLAR FLOW RATE 2.13190E 02POUND MOLES PER HOUR	
TERCERJOKE 1093.070EGREEEK MILAK FLOW AALL 2.131200 OLI DOMO HOULD YER HOUM	
CONVERSION OF ETHANE ID ETHYLENE IS 10.03%	
PRESSURE IS 3.86216E OD VELUCITY 4.2822E 02FEET/SEC.	
ITERATION NUMBER- 17	
NO CONCENTRATION TAPH DXA	
1 4.7463E-08 3.5489E-03 3.8021E-03	
2 0.0000E-01 0.0000E-01 1.4005E-04	
<u>3 0.0000E-01 0.0000E-01 2.0489E-05</u>	
4.6942E-v9.3.5099E-04.9.4764E-03	
5 1.5610E-03 1.1672E 02 3.6773E-06	
6 1.7427E-04 1.3030E 01 2.6839E-09	
7 1.7075E-04 1.2767E 01 0.0000E-01	
<u>8 7.2758E-06 5.4402E-01 0.0000E-01</u>	
Y 0+00000E=01 0+00000E=01	
10 0.0000E-01 0.00000E-01	
11 9.37839E-04 7.01233E-01	
12 8.97036E-10 · G.00000E-01	
13 2-69390E-11 2.01427E-06	
REACTOR POSITION 2.88287F 02FEFT	
TEMPERÍURE 1050.18DEGREE-K HULAK FLOW RATE 2.15224E O2POUND MOLES PER HOUR	
CONVERSION OF EIHADE TO ETHYLENE IS 11.56%	
PRESSURE IS 3.70328F 00 VELUCITY 4.5393F 02FEET/SEC.	
ITERATION NUMBER- 13	
ΝΟ CONCENTRATION THPH DXA	·
1 5.E966E-08 4.6672E-03 4.7082E-03	
2 0.0000E - 01 0.0000E = 01 1.6513E - 04	
3 0.0000E-01 0.0000E-01 2.4880E-05	
4 5.8454E-09 4.5274E-04 1.0992E-02	•
<u>5 1.4492E-03 1.1471F 02 4.1811E-06</u>	
6 1.8985E-04 1.5027E 01 3.9818E-09	
7 1.8612E-04 1.4732E-01 0.0000E-01	
8 7.7525E-06 6.1443E-01 0.0000E-01	
9 0.0000E-01 0.0000E-01	
10 0.00000E-01 0.00000E-01	
<u>11 6.96143E-04 7.01383E 01</u>	-
12 1.29284E-09 0.00000E-01	
<u>13</u> 3.74385E-11 2.96326E-06	a and an and an and a second
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	n a senera ana ana ana ana ana ana ana ana ana a
	<u>N</u>
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	and the second
SYSTEM 4 820 TU 1110 DEG K	،
REACIOR POSITIUN 3.04303E 02FEET	·····
TEMPERTURE 1060.19DEGREE-K HULAR FLOW RATE 2.17920E 02POUND MOLES PER HOUR	
CONVERSION OF ETHANE IN ETHYLENE IS 13.59%	
CONVERSION DE ETHANE IN ETHYLENE IS 13.59% PRESSURE IS 3.53804E 00 VELUCITY 4.8567E 02FEET/SEC.	an a
ITERATION_NUMBER= 19	
NO CONCENTRATION THPH DXA	
<u>3</u> 0.0000E-01 0.0000E-01 3.2908E-05 <u>4</u> 7.3617E-09 6.2235E-04 1.3647E-02	
<u>6 2:0896E-04 1.7665E 01 6.9125E-09</u>	
7 2.0500E-04 1.7331E 01 0.0000E-01 8 8.2995E-06 7.0103E-01 0.0000E-01	
<u>10 0.00000F-01 0.00000E-01</u> <u>11 8.29941E-04 7.01624E 01</u>	
<u>13 5.39224E-11 4.55854E-06</u>	
REACTOR POSITION 3.20318E 02FEET	
TEMPERIURE 1070.12DEGREE-K MULAK FLUW RATE 2.21457E O2POUND MOLES PER HOUR	
TENERTORE TOTO, TEDESREET MULAR FLOW RATE 2.2147/C VERSOND HULES FER HOOR	
CONVERSION OF ETHAME TO ETHYLENE IS 16,25%	
	an an faran ta faran an an an an anna an an an an an an an
ITERATION NUMBER- 20	· · · · · · · · · · · · · · · · · · ·
NO CONCENTRATION THEN DIA	-
<u>1 9.8457E-08 5.9565E-03 8.5501E+03</u> <u>2 0.0000E-01 2.6229E-04</u>	
	an a
<u>3 0.0000E-01 0.000E-01 4.2827E-05</u>	
<u>3 0.0000E-01 0.0000E-01 4.2827E-05</u> <u>4 9.4308E-09 8.5791E-04 1.6698E-02</u>	
3 0.0000E-01 0.0000E-01 4.2827E-05 4 9.4308E-09 2.5791E-04 1.6698E-02 5 1.1937E-03 1.0859E 02	
3 0.0000E-01 4.2827E-05 4 9.4308E-09 2.5791E-04 1.6698E-02 5 1.1937E-03 1.0859E 02 6.3979E-06 6 2.3211E-04 2.1115E 01 1.2150E-08	
3 0.0000E-01 0.0000E-01 4.2827E-05 4 9.4308E-09 0.5791E-04 1.6698E-02 5 1.1937E-03 1.0859E 02 6.3979E-06 6 2.3211E-04 2.1115E 01 1.2150E-08 7 2.2793E-04 2.0734E 01 0.0000E-01	
3 0.0000E-01 0.000E-01 4.2827E-05 4 9.4308E-09 0.5791E-04 1.6698E-02 5 1.1937E-03 1.0859E 02 6.3979E-06 6 2.3211E-04 2.1115E 01 1.2150E-08 7 2.2793E-04 2.0734E 01 0.0000E-01 8 8872E-06 8.0846E-01 0.0000E-01	
3 0.0000E-01 0.0000E-01 4.2827E-05 4 9.4308E-09 8.5791E-04 1.6698E-02 5 1.1937E-03 1.0859E 02 6.3979E+06 6 2.3211E-04 2.1115E 01 1.2150E-08 7 2.2793E-04 2.0734E 01 0.0000E-01 8 8.8872E+06 8.0846E+01 0.0000E-01 9 0.0000E-01 0.0000E-01	
3 0.0000E-01 0.0000E-01 4.2827E-05 4 9.4308E-09 2.5791E-04 1.6698E-02 5 1.1937E-03 1.0859E 02 6.3979E-06 6 2.3211E-04 2.1115E 01 1.2150E-08 7 2.2793E-04 2.0734E 01 0.0000E-01 8 8.8872E-06 8.0846E-01 0.0000E-01 9 0.0000E-01 0.0000E-01 10 0.0000E-01 0.0000E-01	
3 0.0000E-01 0.0000E-01 4.2827E-05 4 9.4308E-09 5.5791E-04 1.6698E-02 5 1.1937E-03 1.0859E 02 6.3979E+06 6 2.3211E-04 2.1115E 01 1.2150E+08 7 2.2793E+04 2.0734E 01 0.0000E+01 8 8.8872E+06 8.0866E+01 0.0000E+01 9 0.0000E+01 0.0000E+01 10 0.0000E+01 0.0000E+01 11 7.71695E+04 7.01999E 01	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
3 0.0000E-01 0.0000E-01 4.2827E-05 4 9.4308E-09 8.5791E-04 1.6698E-02 5 1.1937E-03 1.0859E 02 6.3979E-06 6 2.3211E-04 2.1115E 01 1.2150E-08 7 2.2793E-04 2.0734E 0 0.0000E-01 8 8.8872E+06 8.0846E-01 0.0000E-01 9 0.0000E-01 0.0000E-01 10 0.0000E-01 0.0000E-01 11 7.71695E-04 7.01999E 01 12 3.27867E-09 0.0000E-01 0.0000E-01	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
3 0.0000E-01 0.0000E-01 4.2827E-05 4 9.4308E-09 8.5791E-04 1.6698E-02 5 1.1937E-03 1.0859E 02 6.3979E-06 6 2.3211E-04 2.1115E 01 1.2150E-08 7 2.2793E-04 2.0734E 0 0.0000E-01 8 8.8872E+06 8.0846E-01 0.0000E-01 9 0.0000E-01 0.0000E-01 10 0.0000E-01 0.0000E-01 11 7.71695E-04 7.01999E 01 12 3.27867E-09 0.0000E-01 0.0000E-01	
3 0.0000E-01 0.0000E-01 4.2827E-05 4 9.4308E-09 8.5791E-04 1.6698E-02 5 1.1937E-03 1.0859E 02 6.3979E-06 6 2.3211E-04 2.1115E 01 1.2150E-08 7 2.2793E-04 2.0734E 0 0.0000E-01 8 8.8872E+06 8.0846E-01 0.0000E-01 9 0.0000E-01 0.0000E-01 10 0.0000E-01 0.0000E-01 11 7.71695E-04 7.01999E 01 12 3.27867E-09 0.0000E-01 0.0000E-01	
3 0.0000E-01 0.0000E-01 4.2827E-05 4 9.4308E-09 8.5791E-04 1.6698E-02 5 1.1937E-03 1.0859E 02 6.3979E+06 6 2.3211E-04 2.1115E 01 1.2150E+08 7 2.2793E+04 2.0734E 01 0.0000E+01 8 8.8872E+06 8.0846E+01 0.0000E+01 9 0.0000E+01 0.0000E+01 10 0.0000E+01 0.0000E+01 11 7.71695E+04 7.01999E 01 12 3.27867E+09 0.0000E+01	
3 0.0000E-01 0.0000E-01 4.2827E-05 4 9.4308E-09 2.5791E-04 1.6698E-02 5 1.1937E-03 1.0859E 02 6.3979E+06 6 2.3211E-04 2.1115E 01 1.2150E+08 7 2.2793E+04 2.0734E 01 0.0000E+01 8 8.8872E+06 8.0866E+01 0.0000E+01 9 0.0000E+01 0.0000E+01 0.0000E+01 10 0.0000E+01 0.0000E+01 0.0000E+01 11 7.71695E+04 1.01999E 01 12 3.27867E+09 0.0000E+01	
3 0.0000E-01 0.0000E-01 4.2827E-05 4 9.4308E-09 8.5791E-04 1.6698E-02 5 1.1937E-03 1.0859E 02 6.3979E+06 6 2.3211E-04 2.1115E 01 1.2150E+08 7 2.2793E+04 2.0734E 01 0.0000E+01 8 8.8872E+06 8.0846E+01 0.0000E+01 9 0.0000E+01 0.0000E+01 0.0000E+01 10 0.0000E+01 0.0000E+01 0.0000E+01 11 7.71695E+04 1.01999E 01 12 3.27867E+09 0.0000E+01	
3 0.0000E-01 0.0000E-01 4.2827E-05 4 9.4308E-09 2.5791E-04 1.6698E-02 5 1.1937E-03 1.0859E 02 6.3979E+06 6 2.3211E-04 2.1115E 01 1.2150E+08 7 2.2793E+04 2.0734E 01 0.0000E+01 8 8.8872E+06 8.0866E+01 0.0000E+01 9 0.0000E+01 0.0000E+01 0.0000E+01 10 0.0000E+01 0.0000E+01 0.0000E+01 11 7.71695E+04 1.01999E 01 12 3.27867E+09 0.0000E+01	
3 00000E-01 0000E-01 4827E-05 4 9.4308E-09 c.5701E-04 1.6698E-02 5 1.1937E-03 1.0859E 02 6.3970E-06 6 2.3211E-04 2.1115E 01 1.2150E-08 7 2.2793E-04 2.0734E 01 0.0000E-01 8 9.8872E-05 9.000E-01 0.0000E-01 9 0.0000E-01 0.0000E-01 0.0000E-01 10 0.0000E-01 0.0000E-01 0.0000E-01 12 3.27867E-04 1.0000E-01 0.0000E-01 13 8.06633E-11 7.33601E-06 0.000E-01	
3 00000E-01 4./027E-05 4 9.4300E-09 c.5791E-04 1.0698E-02 5 1.1947E-03 1.0859E 02 6.3979E-06 6 2.3211E-04 2.1115E 01 1.2150E-08 7 2.2793E-04 2.0736E 01 0.0000E-01 8 8.8872E-04 2.0736E 01 0.0000E-01 9 0.6.0005-01 0.0000E-01 0.0000E-01 9 0.6.0005-01 0.0000E-01 0.0000E-01 10 0.0005-01 0.0000E-01 0.0000E-01 11 7.71695E-04 7.01900E-01 0.0000E-01 12 3.27867E-09 0.0000E-01 0.000E-01 13 3.096033E-11 7.35601E-06 0.000E-01	,
3 00000E-01 0000E-01 4027E-05 4 9400E-09 25791E-04 16698E-02 5 1.1937E-03 1659E 02 63979E-06 6 2.3211E-04 2115E 01 1.2150E-08 7 2.2733E-04 2.0734E 01 0.0000E-01 8 9.8872E-05 0.0000E-01 0.0000E-01 9 0.0000E-01 0.0000E-01 0.0000E-01 10 0.0000E-01 0.0000E-01 0.000E-01 11 7.71895E-04 1.0000E-01 0.000E-01 12 2.327867E-04 1.0000E-01 0.000E-01 13 8.06633E-11 7.33601E-06 0.000E-01	,

	and a second
SYSTEM 4 820 TU 1110 DEG K	
REACTOR POSITION 3.36334E OZEFET	······································
TEMPERTURE 1076.13DEGREE-K MULAR FLUW RATE 2.25599F 02POUND MULES PER HOUR	
TEMPERIORE 1076-13DEGREE-K HILAK FLOW RATE 2-232397 UZPUOND HUES FER HUOR	
CONVERSION OF ETHANE TO ETHYLENE IS 19.35%	
CONVERSION OF ETHANE TO ETHYLENE IS 19.35%	
PRESSURE IS 3.17641E DO VELUCITY 5.6844E 02FEET/SEC.	and a second
ITERATION_HUMBER21	
NO CONCENTRATION THPH DXA	
1 1.2736E-07 1.2540E-02 9.8133E-03	
20.0000E+010.0000E+012.8942E+04	
3 0.5005E-01 0.5000E-01 4.8387E-05	
4 1.1923E-08 1.1739E-03 1.0195E-02	
62.5537E=042.5145E_011.6729E=08	a
	The second se
<u> </u>	
9 0.0000E-01 0.0000E-01	· · · · · · · · · · · · · · · · · · ·
00.00000E-010.00000E-01	
- <u>11</u> 7.13465E=047.02491E_01	
12 4.61874E-09 0.00000E-01	
13-1-1-21059E=10-1-15197E=05	
	e annound and a start of the second start of the
REACTOR POSITIUN	
JEMPERTURE LOB2, 79DEGREE-K MOLAR FLOW RATE 2,30460E 02PDUND MULES PER HOUR	
CONVERSION DE ETHANE ID ETHYLENE IS 23.02%	
PRESSURE IS 2.93334E 00 VELUCITY 6.3270E 02FEET/SEC.	
	 A set a grant consistent to the second strategy of the second s second second se Second second se Second second sec
TERATION NUMBER- 22	
NO CONCENTRATIONTAPH UXA	
1.5879E-07 1.7538E-02 5.4186E-03	
2 0.000E=01 0.000E=01 1.5306E=04	
<u>3</u> 0.0000E+01 0.0000E+01 2.0261E=05	
<u>4 1.4140E-08 1.5617E-03 9.4799E-03</u>	
<u>5 9.6307E-04 9.9740E 01 3.0322E-06</u>	
6 2.7088E-04 2.9918E 01 6.7225E-09	
7 2.6651E-64 2.9435E 01 0.0000E-01	
8 9.6270E=06 1.0633E 00 0.0000E=01	
9 0.00000E-01 0.00000E-01	
10 0.00000E+01 0.00000E+01	and an
<u>11 6.36366E-04 7.02645E 01</u>	
12 3.00634E-09 0.00000E-01	
13 1.44312E-10 1.59307E-05	an a
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SYSTEM 4 B20 TO 1110 DEG K	
REACTOR POSITION 3.71877E OZEET	
TEMPERTURE 1092.420FOREE-K MOLAR FLOW RATE 2.35887E 02POUND MOLES PER HOUR	
CONVERSION OF ETHANE TO ETHYLENE IS 27.11%	
PRESSURE IS 2.64047E DO VELUCITY 7.2583E 02FEET/SEC.	and the second sec
ITERATION NUMBER- 23	
ND CONCENTRATION TAPH DXA	and the second distance of the second s
1 1.9115E-07 2.4127E-02 6.0626E-03	
2 0.0000E-01 0.0000E-01 1.7699E-04	
3 0.0000E-01 0.0000E-01 3.1507E-05	
4 1.5775E-08 1.9911E-03 1.6739E-02	
5 7.4786E-04 9.4393E 01 2.8124E-06	
6 2.7915E-04 3.5233E 01 9.9530E-09	
7 2.7499E-04 3.4698E 01 0.0000E-01	
8 9-56405-06 1-20725 00 0-00005-01	• • • • • • •
9 0.00000E-01 0.00000E-01	
10 0.00006-01 0.00006-01	
11 5.57210E-04 7.03297E 01	
12 4.10025E-09 0.0000E-01	
13 1.68051E-10 2.12110E-05	
REACTOR POSITION 3.89648E 02FEET	
TEMPERTURE 1103.53DEGREE-K MOLAK FLOW RATE 2.42310E 02POUND MOLES PER HOUR	
CDIVERSION OF ETHANE TO ETHYLENE IS 31.93%	
PRESSURF IS 2.26581E 00 VELUCITY 8.7771E 02FEET/SEC.	All
ITERATION AUBER- 24	
NO CUNCENTRATION TAPH DIXA	
1 2.1995E-07 3.3311E-02 8.1791E-03	
2 0.0000E-01 0.0000E-01 2.0268E-04	annalization differences and agreement of months
3 0.0000E-01 0.0000E-01 3.7619E-05	
4 1.6058E-U8 2.4320E-03 1.2017E-02	
5 5.8148E-04 0.8124E 01 2.1944E-06	
6 2.7394E-04 4.1457E 01 1.4342E-08	
7 2.7007E-04 4.0901E 01 0.0000E-01	
8 9.0162E-06 1.3655E 00 0.0000E-01	
9 0.00000E-01 0.0000E-01	
10 0.0.000E-01 0.0000E-01	
11 4.64830E - 04 7.03989E(0)	
12 5.27940[-09 0.000000[-0]	
13 1.92005E-10 2.907b5E-05	
	-
	-
	-
5	-

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					an a
SYSTEM 4 820 T-1 1110 DE	EG. K			۵۰۰۰	and a superior and the second s
FUNCTION REDC(T, 1)					
$\frac{1}{REVC(T,T) = 0.15613E 010}$	(1102 52. 1)				
		· · · · · · · · · · · · · · · · · · ·			
FUNCTION REOCIT, 1)					and and the second of the second s
REQC(T,1)= 0.453921-01((1104.53.2)				
		and a second			
$\frac{FUICTION REOC(T, I)}{REQC(T, I) = 0.309211 020}$	(1109 63 3)				
EUNCTION REQUITED	(1102.52) 21				
REQC(1)1)= 0.125100=081	(1103 63. 4)	**************************************	· · · · · · · · · · · · · · · · · · ·		
-FUNCTION RE2C(1)					
REQC(T.I)= 0.4239/1 010	(1103,53, 5)				
EUNCEIUN RECC(T, 1)					
REQC(I)1)=0.130146_010	(1103,53, 6)			·	
EUNCTION RECC(I.I)					
REQC(T, I) = 0.2493.1 000	(1103.53, 7)			. <u></u>	
FUNCTION REQC(T,1) REDC(T,1)= 0.22039E-02(
REQUITITE: 0.22039E=021	1103.33.81				
FUNCTION PRR(15)					
PR= 5.84930E 00 KAL	1.25000E-01	V0L= 0.00	000E-01	***************************************	
FUNCTION PRESD(T)					
RENUA 5.85506E 05		DEN= 1.00495	F-01		
ERICTION FACTOR=1.273	344E-02 V1,V2,VA=	8.77715E 02	3.72228E 02	6.24980E 02	
TEMPERIURE= 1103.53PRESSL	UKE D= 4.20913E=01		······	· · · · · · · · · · · · · · · · · · ·	
1-A ACETYLENE	<u>2.19949E-07</u>	3.33106E-02 0.00000E-01		·	
2-5-150_BUTANE3-CN-BUTANE		0.00000E-01			
	1.60582E=08	2 43197E-03			
	5.81879E-04	8.81237E 01			
6-F ETHYLENE	2.73941E-04	4.14874E 01			
- 7-G HYDROGEN	2.70070E-04	4.09013E 01	•	1	
	9.1-1623E-06	1.36548E 00			
9-1 PROPAGE	0.00000E-01	0.00000E-01			
10-J. PROPENE	0.00000E-01	0.00000E-01 7.03969E 01			
12-L CARBON	4.04F20C-04	0.00000E-01			
13-11 CARBON HUNUXIDE	1.92005E-10	2.90/85E-05		1	and a second
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CONVERSION OF EIHAME	TO ETHYLENE	15	31.93%		
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	REACTUR	RADIUS PRUFI	ILE AFTER	100.00 H	HOURS				· · · · · · · · · · · · · · · · · · ·
0.125000 0.125000 0.125000 0.125000 0.125000 0.125000 0.125000 0.125000 0.124998 0.124998 0.124998 0.124986 0.124962 0.124986 0.124962 0.124988 0.124745 0.124988 0.124745 0.124710 0.124056 0.123949 0.122537 0.122260	0.125000 0.125000 0.124927 0.124934 0.124953 0.124953 0.124077 0.124670 0.123833	0.125000 0.125000 0.124997 0.124997 0.124982 0.124985 0.124865 0.124824		0.125000 0.125000 0.124995 0.124995 0.124937 0.124937 0.124840 0.124509	0,125000 0,125000 0,124994	0.125000 0.125000 0.124999 0.124993 0.124972 0.124973 0.124923 0.124810 0.124356 0.123147 0.119873	C.125000 0.125000 0.124999 0.124991 0.124967 0.124915 0.124915 0.124915 0.124961 0.124981 0.119466	0.125000 0.125000 0.124099 0.124990 0.124966 0.124966 0.124775 0.124775 0.124153 0.122790 0.119466	
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REACTOR IS A 40,00 FEET LUNG AND 0.125 FEET IN RADIUS TOTAL MOLES / POUR ARE 200.0PUU 10 MULES AT PRESSURE 5.849A VELOCITY OF 2.08526E 02 AT TEMPERATURE 820.0DEG 5 INITIAL REACTOR INCREMENT(DL 1.97467E_00FEET FUNCTION REOC(T, 1) $REVC(T_{2}1) = 0.11963E(2(-832,71,-1))$ EUNCTION REOC(1,1) $= REO((T_2 I) = 0.65841E - 02(.832.71, 2) = 0.65841E - 02(.71, 2) = 0.05841E - 0.05841$ ___FUNCTION_REDC(I,I)____ REDC(T, 1) = 0.14012E 0.06(-832, 71, -3)FUNCTION REQU(T,1) REQC(T)I)= 0.14637E=08(832.71, 4) EUNCTION REAC(T.I) -- FUNCTION_REDC(J,I)_____ REQC(T, 1) = -0.27599.-01(-832.71, -6)EUNCTION REAC(T.I) $REQC(T_{1}) = 0.553815 00(832.71,7)$ FUNCTION REDC(T, 1) REQC(T,I) = 0.79039E - 03(-832.71, -8)FUNCTION PRR(IS) $PR = 5.84930F_{00} = 1.401(1) = 1.25000E = 01 V01 = 0.00000E = 01$ FUNCTION PRR(IS) -PR = -5.24930E cu + ADI(1) = 1.25000E = 01 VOL = 0.00000E = 01FUNCTION PRESD(1) DEN= 1.379835-01 RENUE 3.35920E 05 VIS= 2.16064E-05 2.10555E 02 TEMPERTURE= 532.71PKESSURE D= 2.27193E-02 FUNCTION PRR(IS) VDL = 0.00000F-01PR= 5,82657E 00 RAD1(1)= 1,25000E-01 PRESSURE IS 5.32657F 00 VELOCITY 2.125BE 02EEET/SEC. 1. U. DOOL-01. U. 0000E-01. 3.4774E-07 2 0.0000E-01 0.0000E-01 7.9707E-08 3 0.0000E-01 0.0000E-01 0.0000E-01 4 0.0000E-01 0.0000E-01 0.0000E-01 5 3.4724F-03 1.2994E 02 0.0000E-01 6 1.3459E-09 5.0354E-05 0.0000E-01 7 1.20755-09 4.5186E-05 0.0000E-01 <u>8 2,7677E-18 1,0357E-05 0.0000E-01</u> 9 0.00000E-01 2.0000E-01 10 0.0000E-01 0.00000E-01 1.87220E-03 7.90597E.01 12 0.0000E-01 0.00000E-01 13 0.00000E-01 0.00000E-01 DL CHANGED TO 1.92605E 00 ZIC= 3.40338E 02 1= 1 RA= 1.51399E-03 DXA(1)= 1.00803E-02 CF.CR= 1.01745E-03 6.39166E-08 REQC= 1.77559E 00 BATE: 1.46619F 00 VELDCITY OF GAS GREATER THAN SOUND ******* 00 -

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SYSTEM 4 E20 TO 1110 DEC K REACTOR POSITION 3.93955E 02EEET TEMPERTURE 1106.22DEGREE-K MOLAR FLOW RATE 2.42293E 02POUND MOLES PER HOUR PRESSURE IS 2.00000E 00 VELUCITY 1.2709E 03FGET/SEC.	
TEMPERTURE 1106 2205LOFE_V MOLAR FLOW RATE 2,42293E 02DOUND MOLES PER HOUR	
PRESSURE IS 2.00000E 00 VELUCITY 1.2709E 03FLET/SEC.	Angele - Mark helpfallet fan gelefen falle, werennen gele fer fyr yn fel. Yn en de fan gelegen fer gelegen fer gelegen ar gelegen ar yn
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REACIDE IS 400.00 FEET LUNG AND 0.125 FEET IN RADIUS _______IDTAL MOLES / MOUR ARE 200.000000 MOLES AT PRESSURE 6.040A VELOCITY OF 2.01632E 02 AT LEMPERATURE 820.00EG K

_ TOTAL MOLES / HOUR ARE 200.000000 MOLES AT PRESSURE 6.049A VELOCITY OF 2.01632E 02 AT TEMPERATURE 820.00EG K
INITIAL REACTOR INCREMENTED 1.986066 ODFEET
FUNCTION REOC(T_1)
$REQC(T, 1) = 0.11963 \pm 02(-B32.71, -1)$
FUNCTION RECC(T, I)
REQC(T,I) = 0.65841E - 02(-832.71, 2)
FUNCTION REQC(T.1)
REQC(T, I) = 0.140120.06(.832.71,.3)
FUNCTION_REQC(TAI)
REQ((T)1)=0.14837E=081_832.71, 4)
FUNCTION_REQU(T,1)
_FUNCTION_REOC(1,1)
_ REQC(T,1)=0.27595E-01(_B32,71,_6)
FUNCTION REQC(T, I)
$REQC(T_{J_1}) = 0.55381E \ 00(-832,71,7)$
FUNCTION RE2C(T.)
REQC(T,1) = 0.79039E - 03(B32.71, B)
EUNCTION PRR(IS)
PR = 6.04930E + 00 + RADI(1) = 1.25000E - 01 + 0.00000E - 01
FUNCTION PRR(1S)
PR= 6.04929E 00 RADI(1)= 1.25000E-01 VOL= 0.00000E-01
FUNCTION PRESD(T)
PONCTION TRESULT RENU= 3.35919E 05 VIS= 2.16064E-05 DEN= 1.42616E-01 FRICTION FACIOR= 1.41227E-02 VI.V2.VA= 2.01632E 02 2.03560E 02
-FRILIDER FAULURE
TENFERTURE= B32.71PRESSURE D= 2.19422E-02
FUNCTION PRR(IS)
PR= 6.02735E_00 RADI(1)= 1.25000E=01 V.U.= 0.00000E=01
PRESSURE 15 6.02735E 00 VELUCITY 2.0550E 02FEET/SEC.
1 0.0000E+01 0.0000E+01 2.0058E+07
2 C. UODOE-D1 U. COUDE-C) 6-1104E-OB
3 0.1000E-01 0.0000E-01 0.0000E-01
4 0.0000E-01 0.0000E-01 0.000E-01
5 3.5911E-03 1.2994E 02 0.0000E-01
6 1.0670E-09 3.8610E-05 0.0000E-01
7 9,5733E-10 3.4640E-05 0.0000E-01
$\frac{8}{2.1943E-10} = \frac{7.9398E-06}{7.9398E-06} = 0.0000E-01$
9 0.0000E-01 0.0000E-01
<u>11 1.94621E-03 /.00596E 01</u>
<u>12 0.0000E=01 0.00006=01</u>
13 0.00000E-01 0.00000E-01
DL_CHANGED_TU1.97621E_0071C=3.24322E_02
1= 1 RA= 1.54377E-03 DXA(1)= 1.01305E-02 CF.CR= 1.28505E-03 8.02306E-08 REQC= 1.84423E 00
RATE= 1.20147E 00
DL_CHANGED_IU9_83156E-D]ZIC=3_93484E_02
1= 1 RA= 2.58433E-03 DXA(1)= 1.00504E-02 CF, CR= 6.59586E-04 1.33966E-07 REQC= 1.50958E 00
RAIF= 3.91931E 00
• •

SYSTEM 4 B20 TO 1110 DEC K REACIDE POSITION 4.00366E 02FEET TEOPERIURE 1109.61050PEE-K MOLAR FLOW RATE 2.49734E 02POUND MOLES PER HOUR PRESSURE IS 2.00000E DO VELOCITY 8.5195E 02FEET/SEC.	
REACIDE POSITION 4,00366E 02FEET	•
TEAPERIDRE 1109.01056PEE-K MOLAK FLUW RATE 2.49734E 02POUND MULES PLR HOUR	
PRESSURE IS 2.00000E DU VELUCITY 8.5195E 02FEEI/SEC.	
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SYSTEM 4 820 TH 1110 DEG K	
REACTOR POSITION 1.60160E 01FFFT	· · · · · · · · · · · · · · · · · · ·
TEMPERIURE 870, 850FGREE-K MULAR FLLW RATE 2,00001E 02PHUND MOLES PER HOUR	
CONVERSION DE ETHANE ID ETHYLENE IS 0.00%	
PRESSURE IS 5.95904E OD VELUCITY 2.1738E 02FEET/SEC.	
ITERATION NUMBER- 1	
NO CONCENTRATION THRH DXA	
1.7.5181E-162.8769E-112.9809E-06	
2 0.0000E-01 0.0000E-01 4.0059E-07	
3 0.0000E-01 0.0000E-01 2.8552E-08	
4.6543E-201.7810E-155.0221E-05	
5 3.3957E-U3 1.2994E U2 4.U802E-12	
62:0301E-087.1663E-044.4500E-21	
-7 1.6713E-08 7.1606E-04 0.000E-01	
<u>8</u> <u>3.1762E-09</u> <u>1.2154E-04</u> <u>0.0000E-01</u>	
9 0.00006=01 0.00000E=01	
100.0000E+01 0.00000E+01	
11	
12 7.55050E-20 0.00000E-01	
38.14742E-243.11764E-19	
FACTOR PUSITION 2.20320E OFFET	
EMPERTURE 921.70DEGREE-K MOLAR FLOW RATE 2.00011E 02POUND MOLES PER HOUR	
LOUGHL OFHIGH HELS FER HUR	
DAVERSION DE ETHANE TO ETHYLENE IS 0.01%	،
PRESSURE IS 5.86228E OD VELUCITY 2.3388E 02FFFT/SFC.	
TERATION NUMBER- 2	
VO_CONCENTRATIONTNPHUXA	
<u>1.1519E-13</u> <u>4.7409E-09</u> <u>3.7942E-05</u>	
20.5000E=010.0000E=013.6243E=06	
4 6.4863E-17 2.6695E-12 3.3695E-04	
4 6.4863E-17 2.6695E-12 3.3695E-04 5 3.1570E-03 1.2993E 02 3.9395E-10	
4 6.4863E-17 2.6695E-12 3.3695E-04 5 3.1570E-03 1.2993E 02 3.9395E-10 6 2.6963E-07 1.1097E-62 1.2484E-17	
4 6.4863E-17 2.6695E-12 3.3695E-04 5 3.1570E-03 1.2993E 02 3.9395E-10 6 2.6963E-07 1.1097E-62 1.2484E-17 7 2.5560E-07 1.6519E-02 0.0000E-01	
4 6.4863E-17 2.6695E-12 3.3695E-04 5 3.1570E-03 1.2993E 02 3.9395E-10 6 2.6963E-07 1.1097E-02 1.2484E-17 7 2.5560E-07 1.6519E-02 0.0000E-01 8 2.8076E-08 1.1555E-03 0.0000E-01	
4 6.4863E-17 2.6695E-12 3.3695E-04 5 3.1570E-03 1.2993E 02 3.9395E-10 6 2.6963E-07 1.1097E-02 1.2484E-17 7 2.5560E-07 1.6519E-02 0.0000E-01 8 2.8076E-08 1.1555E-03 0.0000E-01 9 0.0000E-01 0.0000E-01	
4 6.4863E-17 2.6695E-12 3.3695E-04 5 3.1570E-03 1.2993E 02 3.9395E-10 6 2.6963E-07 1.1097E-02 1.2484E-17 7 2.5560E-07 1.6519E-02 0.9000E-01 8 2.8076E-09 1.1555E-03 0.0000E-01 9 0.0000E-01 0.0000E-01 0 0.0000E-01 0.0000E-01	
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4 6.4863E-17 2.6695E-12 3.3695E-04 5 3.1570E-03 1.2993E-02 3.9395E-10 6 2.6963E-07 1.1097E-02 1.2484E-17 7 2.5560E+07 1.6519E-02 0.0000E-01 8 2.8076E-08 1.1555E-03 0.0000E-01 9 0.0000E-01 0.0000E-01 0.0000E-01 1 1.76231E-03 7.6059EE-01 0.02000E-01 2 7.76070E+17 0.0000E-01 0.0000E-01	
4 6.4863E-17 2.6695E-12 3.3695E-04 5 3.1570E-03 1.2993E 02 3.9395E-10 6 2.6963E-07 1.1097E-02 1.2484E-17 7 2.5560E+07 1.6519E-02 0.0000E-01 8 2.8076E-08 1.1555E-03 0.0000E-01 9 0.0000E-01 0.0000E-01 0.0000E-01 1 1.70231E-03 7.0059EE 01 0.0000E-01 2 7.70070E+17 0.0000E-01 0.0000E-01	
4 6.4863E-17 2.6695E-12 3.3695E-04 5 3.1570E-03 1.2993E-02 3.9395E-10 6 2.6963E-07 1.1097E-02 1.2484E-17 7 2.5560E+07 1.6519E-02 0.0000E-01 8 2.8076E-08 1.1555E-03 0.0000E-01 9 0.0000E+01 0.0000E+01 0.0000E-01 1 1.76231E-03 7.0059EE-01 0.0000E-01 2 7.70070E+17 0.0000E+01 0.0000E-01	
4 6.4863E-17 2.6695E-12 3.3695E-04 5 3.1570E-03 1.2993E-02 3.9395E-10 6 2.6963E-07 1.1097E-02 1.2484E-17 7 2.5560E+07 1.6519E-02 0.0000E-01 8 2.8076E-08 1.1555E-03 0.0000E-01 9 0.0000E+01 0.0000E+01 0.0000E-01 1 1.76231E-03 7.0059EE-01 0.0000E-01 2 7.70070E+17 0.0000E+01 0.0000E-01	
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4 6.4863E-17 2.6695E-12 3.3695E-04 5 3.1570E-03 1.2993E-02 3.9395E-10 6 2.6963E-07 1.1097E-02 1.2484E-17 7 2.5560E+07 1.6519E-02 0.0000E-01 8 2.8076E-08 1.1555E-03 0.0000E-01 9 0.0000E+01 0.0000E+01 0.0000E-01 1 1.76231E-03 7.0059EE-01 0.0000E-01 2 7.70070E+17 0.0000E+01 0.0000E-01	
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4 6.4863E-17 2.6695E-12 3.3695E-04 5 3.1570E-03 1.2993E 02 3.9395E-10 6 2.6963E-07 1.1097E-02 1.2484E-17 7 2.5560E+07 1.6519E-02 0.0000E-01 8 2.8076E-08 1.1555E-03 0.0000E-01 9 0.0000E-01 0.0000E-01 0.0000E-01 1 1.70231E-03 7.0059EE 01 0.0000E-01 2 7.70070E+17 0.0000E-01 0.0000E-01	
4 6.4863E-17 2.6695E-12 3.3695E-04 5 3.1570E-03 1.2993E-02 3.9395E-10 6 2.6963E-07 1.1097E-02 1.2484E-17 7 2.5560E+07 1.6519E-02 0.0000E-01 8 2.8076E-08 1.1555E-03 0.0000E-01 9 0.0000E-01 0.0000E-01 0 0.0000E-01 0.0000E-01 1 1.76231E-03 7.0059E=01 2 7.76070E=17 0.0000E-01	
4 6.4863E-17 2.6695E-12 3.3695E-04 5 3.1570E-03 1.2993E-02 3.9395E-10 6 2.6963E-07 1.1097E-02 1.2484E-17 7 2.5556E+07 1.6519E-02 0.0000E-01 8 2.8076E-08 1.1555E-03 0.0000E-01 9 0.0000E-01 0.2000E-01 0.0000E-01 0 0.0000E-01 0.2000E-01 0.0000E-01 1 1.76231E-03 7.00598E-01 0.0000E-01 2 7.76070E-17 0.0000E-01 0.0000E-01	
4 6.4863E-17 2.6695E-12 3.3695E-04 5 3.1570E-03 1.2993E-02 3.9395E-10 6 2.6963E-07 1.1097E-02 1.2484E-17 7 2.5550E+07 1.6519E-02 0.0000E-01 8 2.8076E-08 1.1555E-03 0.0000E-01 9 0.0000E-01 0.0000E-01 0 0.0000E-01 0.0000E-01 1 1.70231E-03 7.0059&E-01 2 7.76070E-17 0.0000E-01	
4 6.4863E-17 2.6695E-12 3.3695E-04 5 3.1570E-03 1.2993E-02 3.9395E-10 6 2.6963E-07 1.1097E-02 1.2484E-17 7 2.5560E+07 1.6519E-02 0.0000E-01 8 2.8076E-08 1.1555E-03 0.0000E-01 9 0.0000E-01 0.0000E-01 0 0.0000E-01 0.0000E-01 1 1.76231E-03 7.0059E=01 2 7.76070E=17 0.0000E-01	
4 6.4863E-17 2.6695E-12 3.3695E-04 5 3.1570E-03 1.2993E 02 3.9395E-10 6 2.6963E-07 1.1097E-02 1.2484E-17 7 2.5560E+07 1.6519E-02 0.0000E-01 8 2.8076E+08 1.1555E-03 0.0000E-01 9 0.0000E+01 0.0000E+01 0 0.0000E+01 0.0000E+01 1 1.70231E+03 7.0059EE 01 2 7.70070E+17 0.0000E+01	
4 6.4863E-17 2.6695E-12 3.3695E-04 5 3.1570E-03 1.2993E 02 3.9395E-10 6 2.6963E-07 1.1097E-62 1.2484E-17 7 2.5560E-07 1.6519E-02 0.0000E-01 8 2.8076E-08 1.1555E-03 0.0000E-01 9 0.0000E-01 0.0000E-01 0.0000E-01 1 0.0000E-01 0.0059E-01 0.0059E-01 1 1.76231E-03 7.6059E-01 0.0000E-01 2 7.70070E-17 0.00000E-01 0.0000E-01	
4 6.4863E-17 2.6695E-12 3.3695E-04 5 3.1570E-03 1.2993E 02 3.9395E-10 6 2.6963E-07 1.1097E-02 1.2484E-17 7 2.5560E+07 1.6519E-02 0.0000E-01 8 2.8076E-08 1.1555E-03 0.0000E-01 9 0.0000E+01 0.0000E+01 0.0000E-01 1 1.70231E-03 7.0059EE 01 2 7.70070E+17 0.0000E+01 0.0000E+01	
4 6.4863E-17 2.6695E-12 3.3695E-04 5 3.1570E-03 1.2993E 02 3.9295E-10 6 2.6903E-07 1.1097E-02 1.2484E-17 7 2.5560E-07 1.6519E-02 0.60000E-01 8 2.8076E-08 1.1555E-03 0.0000E-01 9 0.00000E-01 9.0000E-01 10 0.00000E-01 9.0000E-01 11 1.70231E-03 7.6059EE 01 12 7.76070E-17 9.00000E-01 13 2.51220E-26 1.03391E-15	
4 6.4863E-17 2.6695E-12 3.3695E-04 5 3.1570E-03 1.2993E 02 3.9295E-10 6 2.6963E-07 1.6519E-02 1.2484E-17 7 2.5560E-07 1.6519E-02 0.0000E-01 8 2.4676E-08 1.1555E-03 0.0000E-01 9 0.0000E-01 0.0000E-01 0.0000E-01 0 0.0000E-01 0.0000E-01 0.0000E-01 11 1.76231E-03 7.60598E-01 0.0000E-01 12 7.76070E+17 0.0000E-01 0.039391E-15 13 2.51220E-20 1.03391E-15 0.03391E-15	ن
4 6.4863E-17 2.6695E-12 3.3695E-04 5 3.1570E-03 1.2993E 02 3.9325E-10 6 2.6963E+07 1.1097E-02 1.2484E-17 7 2.5560E+07 1.6519E-02 0.0000E-01 8 2.3076E+08 1.1555E-03 0.0000E-01 9 0.0000E+01 0.0000E+01 0.0000E-01 9 0.0000E+01 0.0000E+01 0.0000E+01 1 1.70231E+03 7.0059EE 01 1. 2 7.76070E+17 0.0000E+01 2.00391E+15	<u>ي</u>

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85/	YTAR PASITING	4.80480E 01F	EFT.	
TEM	PERTURE 953.(4DEGREE-K MIL	AR FLOW RATE	2.00077E 02POUND MOLES PER HOUR
	an and a set of a set		alla - l'alla della d	
CON	VERSION OF ETH	HAINE	TO ETHYLEN	IE JS 0.06%
PRF	SSURE IS 5.7	150795 00 VE	10CTTY 2.46	18E 02FEFT/SFC.
LTF	RATION NUMBER-			
	CUNCENTRATION	TMPH	DXA	
	4.26568-12	1.8487E-07	1.55518-04	
	0.0000E-01	<u>v.0000E-01</u>	1.13486-05	
	0.0000E-01	0.0000E-01	1.1016E-06	
	1.35236-14	5.8565E-10	9.64396-04	
5_	2.9985E-03	1.29361 02	9.3893E-09	
6	1.75668-06	1.0076E-02	5.02518-15	
7	1.68825-06	7.31138-02	0.0000E-01	
8	1.3684E-07	5.9262E-03	0.0000E-01	
9	0.00000E-01	J.00000E-01		
10	0.00000E-01	0.0000E-01		,
	1.61768E-03	/.00602E_01		
	8.22509E-15			
13	1.23738E-17	5.35898E-13		
	and a start of the second s		······································	
REAL	CTOR POSITION	5.40640E 01F	F (- T	
		5DEGREE-K MOLA		2.00194E 02PDUND MOLES PER HOUR
003	VERSION DE ETH	ANF	TH ETHYLEN	E IS 0.15%
	SSURF IS 5.6	5826E 00 VEL	UCITY 2.53	91E 02FEET/SEC.
	RATION HUMBER-	<i>t</i> ,		
	CUNCENTRATION	THPH	OXA	
1	2.3899E-11	1.0673E-06	2.5856E-04	
2	0.00008-01	0.0000E-01	1,7097E-05	
<u> </u>	0.0000E-01	0.0000E-01	1.7608E-06	
4	1.8354E-13	8.1970E-09	1.4060E-03	
5	2.9051E-03	1.2974E 02	3.6491E-08	
6	4.3009E-06	1.9208E-01	5.9111E-14	
7	4.1488E-06	<u>1.8529E-01</u>	0.0000E-01	
<u> </u>	3.0439E-07	1.3594E-02	0.0000E-01	
9	0.00000E-01	0.0000E-01		
10_	0.00000E-01	0,00000E-01	······································	
	1.56875E-03	7.00607E 01		Amman
	6.711115-14	0.0000E-01		
13	2.06246E-16	9.21100E-12		
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			······································	
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	and a second s	ter so an anno sannanan mining sa ato ang pana sa sa		

SYSTEM 4 820 1-1 1110 DEG K	
REACTOR_POSITION	
TEMPERTURE 977. JODEUREE-K MOLAR FLOW RATE 2.00386E 02POUND MOLES PER HOUR	
TESTERS THE THESE MEAN TERM NATE OUTSIDE OPENIND HITES FER HOUR	
CONVERSION OF ETHANE TO ETHYLENE IS 0.29%	
PRESSURE IS 5.55513E OD VELUCITY 2.6213E 02FEET/SEC.	
ITERATION NUMBER- 5	
NO CUNCENTRATION THPH DXA	· · · · · · · · · · · · · · · · · · ·
1 8.6474E-11 <u>3.9958E-06</u> <u>4.2384E-04</u>	
2 0.1000E-01 0.0000E-01 2.5456E-05	
3 0.0000E-01 0.0000E-01 2.7774E-06	
4 1,1829E-12 5,4522E-08 2,0274E-03	
52,8106E-031,2955E_021,0079E-07	
6 8,2945E-06 3,5233E-01 3,5095E-13	
7 6.0233E-06 3.6962E-01 0.0000E-01	
<u>8 5.4333E-07 (.5043E-02 0.0000E-0)</u>	
9 0.00000E-01 0.00000E-01	يد ويست مراجع
10 0.0J000E-01 0.0000E-01	
-111.52001E-037.00613E-01	
12 3.50059E-13 0,00000E-01	
13 1.53854E-15 7.09157E-11	· · · · · · · · · · · · · · · · · · ·
REACTOR PUSITION 2.60959E DIFEET	and a second
REACTOR PUSITION . 2.60959E DIFEET. TEMPERIURE 988.27DEGREE-K MULAK FLUW RATE _ 2.00689E OZPOUND MULES PER HOUR	an a
CONVERSION OF ETHANE JO ETHYLENE IS 0.53%	
PRESSURE IS 5.4505BE DO VELUCITY 2.7063E 02FEET/SEC.	
ITERATION MUMBER- O	and the state of t
ND CUNCENTRALION TAPH DXA	
1 2.5553E-16 1.2157E-05 6.6307E-04	
-2 0.0000E-01 0.0000E-01 3.6482E-05	
<u>3 0.0006E-01 0.0006E-01 4.1953E-06</u>	a tanah mana sa kata yang mana sa kata sa kata sa manakatan sa
4 5,4703E-12 2.6025E-07 2.9220E-03	
<u>5 2.7166E-03 1.2924E 02 2.3486E-07</u>	
6 1,4361E-05 5.0322E-01 1.0658E-12	
$\frac{7}{1.3924E-05} = 0.6243E-01 = 0.4000E-01$	
<u>8 9.7502E-07 4.1632E-02 0.0000E-01</u>	
90.0000E-010.0000E-01	
10 0.00000E-01 0.00000E-01	
<u>11 1.47269E-03 7.00624E 01</u>	
12 1.43944E-12 0.0000E-01	
13 B.24990E-15 3.92436E-10	
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SYSTEM 4 820 TU 1110 DEG K		
REACTOR POSITION 1.12112E 02	FEET	
EMPERTURE 999,48DEGREE-K HE	LAR FLOW RATE 2.01158F 02POUND MOLES PER HOUR	
a - A - Mar - A - Mar - A - Mar		
DAVERSION OF ETHANE	TO ETHYLENE IS 0.88%	
RESSURE IS 5.34620E 00 V	ELUCITY 2.7970E 02FEET/SEC.	
TERATION NUMBER- /		
D CONCENTRATION TAPH		
<u>1 6.7066E-10 3.2966E-05</u>	1.0254E-03	
2 0.0000E-01 0.0000E-01 3 0.0000E-01 0.0000E-01	5.1708E-05	
	<u>6.2695E-06</u> 3.6930E-03	
4 2.0792E-11 1.0220E-06 5 2.6196E-03 1.2877E 02	4.98L7E-07	
	7.8318E-12	
7 2.2691E-05 1.1153E 00 8 1.3261E-06 5.5186E-02	0.0000E-01 0.0000E-01	
9 0.00000E-01 0.00000E-01		
0 0.0000E-01 0.0000E-01		
1 1.42539E+03 7.00641E 01	· · · · · · · · · · · · · · · · · · ·	
3 3.64035E-14 1.78939E-09		
EACTOR POSITION 1.20128E 026		
EMPERIURE 1008.050FGREE-K MOL	AR FLUW RATE 2.01842E 02POUND MOLES PER HOUR	
ENMERIONE TODS, OBGEGREE-K HUL	AK FLUW RATE Z.UIGHZE UZPUUNU HUKES FER HUGR	
DAVERSION OF ETHANE	TO ETHYLENE IS 1.40%	
	LUCITY 2.8P61E 02FEET/SEC.	-
KENDURE 13 3.74271E UU VE		
	LICITI COPOLE UZFETISEC.	
TERATION NUMBER- 8		
TERATION NUMBER- 8 D CONCENTRATION TOPH	AXU	
TERATION NUMBER- 8 D CONCENTRATION THPH 1.5866E-09 8.0463E-05	UXA 1.4106E-03	
TERATION NUMBER- 8 D CONCENTRATION THPH 1.5868E-09 8.0463E-05 2 0.0000E-01 0.0000E-01	UXA 1.4106E-03 6.6806E-05	
TERATION NUMBER- 8 D CONCENTRATION ThPH 1.5868E-09 8.0463E-05 2 0.0000E-01 0.0000E-01 3 0.0000E-01 0.0000E-01	UXA 1.4106E-03 6.6806E-05 8.4054E-06	
TERATION NUMBER- 8 D CONCENTRATION TAPH 1.5868E-09 8.0463E-05 2.0.0000E-01 0.0000E-01 3.0.0000E-01 0.0000E-01 4.6.7328E-11 3.4140E-06	bXA 1.4106E-03 6.6806E-05 8.4054E-06 4.9156E-03	
TERATION NUMBER- 8 D CONCENTRATION TAPH 1.5868E-09 8.0463E-05 2.0.0000E-01 0.0000E-01 3.0.0000E-01 0.0000E-01 4.6.7328E-11 3.4140E-06 5.2.5258E-03 1.2808E	bXA 1.4106E-03 6.6806E-05 8.4054E-06 4.9156E-03 9.0919E-07	
TERATION NUMBER- 8 D CONCENTRATION TAPH 1.5868E-09 8.0463E-05 2.0.0000E-01 0.0000E-01 3.0.0000E-01 0.0000E-01 4.6.7328E-11 3.4140E-06 5.2.5258E-03 1.2808E 6.3.8003E-05 1.4256E	bXA 1.4106E-03 6.6806E-05 8.4054E-06 4.9156E-03 9.0919E-07 2.7628E-11	
TERATION NUMBER- 8 D CONCENTRATION TAPH 1.5868E-09 8.0463E-05 2.0.0000E-01 0.0000E-01 3.0.0000E-01 0.0000E-01 4.6.7328E-11 3.4140E-06 5.2.5258E-03 1.2808E	bXA 1.4106E-03 6.6806E-05 8.4054E-06 4.9156E-03 9.0919E-07	
TERATION NUMBER- 8 CONCENTRATION ThPH 1 1.5868E-09 8.0463E-05 2 0.0000E-01 0.0000E-01 3 0.0000E-01 0.0000E-01 4 6.7328E-11 3.4140E-06 5 2.5259E-03 1.2808E 6 3.5003E-05 1.+256E 7 3.5049E-05 1.7772E	UXA 1.4106E-03 6.6806E-05 8.4054E-06 4.9156E-03 9.0919E-07 2.7628E-11 0.000E-01	
TERATION NUMBER- 8 0 CONCENTRATION ThPH 1 5868E-09 8.0463E-05 2 0.0000E-01 0.0000E-01 3 0.0000E-01 0.0000E-01 4 6.7328E-11 3.4140E-06 5 2.5258E-03 1.2808E 6 3.5003E-05 1.8256E 7 3.5049E-05 1.7772E 8 1.9150E-06 2.7101E-02 9 0.0000E-01 0.0000E-01	UXA 1.4106E-03 6.6806E-05 8.4054E-06 4.9156E-03 9.0919E-07 2.7628E-11 0.000E-01	
TERATION NUMBER- 8 0 CONCENTRATION ThPH 1 J.5868E-09 8.0463E-05 2 0.0000E-01 0.0000E-01 3 0.0000E-01 0.0000E-01 4 6.7328E-11 3.4140E-06 5 2.5258E-03 1.2808E 6 3.503E-05 1.8256E 7 3.5049E-05 1.7772E 8 1.9150E-06 2.7101E-02 9 0.0000E-01 0.0000E-01	UXA 1.4106E-03 6.6806E-05 8.4054E-06 4.9156E-03 9.0919E-07 2.7628E-11 0.000E-01	
TERATION NUMBER- 8 0 CONCENTRATION ThPH 1 5868E-09 8.0463E-05 2 0.0000E-01 0.0000E-01 3 0.0000E-01 0.0000E-01 4 6.7328E-11 3.4140E-06 5 2.5258E-03 1.2808E 6 3.8003E-05 1.8256E 7 3.5049E-05 1.7772E 8 1.9150E-06 2.7101E-02 9 0.0000E-01 0.0000E-01	UXA 1.4106E-03 6.6806E-05 8.4054E-06 4.9156E-03 9.0919E-07 2.7628E-11 0.000E-01	
TERATION NUMBER- 8 0 CONCENTRATION THPH 1 .586AE-09 8.0463E-05 2 0.0000E-01 0.0000E-01 3 0.0000E-01 0.0000E-01 4 6.7328E-11 3.4140E-06 5 2.554E-03 1.2808E 02 6 3.603E-05 1.7772E 00 8 1.9150E-06 9.7101E-02 9 0.0000E-01 0.0000E-01 0.0000E-01 0.0000E-01	UXA 1.4106E-03 6.6806E-05 8.4054E-06 4.9156E-03 9.0919E-07 2.7628E-11 0.000E-01	
TERATION NUMBER- 8 CONCENTRATION THPH 1.5868E-09 8.0463E-05 2.0.000E-01 0.0000E-01 3.0.000E-01 0.0000E-01 4.6.7328E-11 3.4140E-06 5.2.558E-03 1.2808E 02 6.3.8003E-05 1.7772E 00 8.1.9150E-06 9.7101E-02 9.0.0006E-01 0.0000E-01 1.38180E-03 7.00666E 01 1.35624E-11 0.0000E-01	UXA 1.4106E-03 6.6806E-05 8.4054E-06 4.9156E-03 9.0919E-07 2.7628E-11 0.000E-01 0.000E-01 0.000E-01	
TERATION NUMBER- 8 CONCENTRATION THPH 1.5868E-09 8.0463E-05 2.0.0000E-01 0.0000E-01 3.0.000E-01 0.0000E-01 4.6.7328E-11 3.4140E-06 5.2.5258E-03 1.2808E 02 6.3.8003E-05 1.7772E 00 8.1.9150E-06 9.7101E-02 9.0.0000E-01 0.0000E-01 0.0000E-01 0.0000E-01 1.35180E-03 7.00666E 01 1.35624E-11 0.0000E-01	UXA 1.4106E-03 6.6806E-05 8.4054E-06 4.9156E-03 9.0919E-07 2.7628E-11 0.000E-01 0.000E-01 0.000E-01	
TERATION NUMBER- 8 CONCENTRATION THPH 1.5868E-09 8.0463E-05 2.0.0006-01 0.0000E-01 3.0.000E-01 0.0000E-01 4.6.7328E-11 3.4140E-06 5.2.529E-03 1.2808E 02 6.3.8003E-05 1.4256E 00 7.3.5049E-05 1.7772E 00 8.1.9150E-06 9.7101E-02 9.0.0006E-01 0.0000E-01 1.38180E-03 7.00666E 01 1.355624E-11 0.0000E-01	UXA 1.4106E-03 6.6806E-05 8.4054E-06 4.9156E-03 9.0919E-07 2.7628E-11 0.000E-01 0.000E-01	
TERATION NUMBER- 8 CONCENTRATION THPH 1.5868E-09 8.0463E-05 2.0.0000E-01 0.0000E-01 3.0.000E-01 0.0000E-01 4.6.7328E-11 3.4140E-06 5.2.5258E-03 1.2808E 02 6.3.8003E-05 1.7772E 00 8.1.9150E-06 9.7101E-02 9.0.0000E-01 0.0000E-01 0.0000E-01 0.0000E-01 1.35180E-03 7.00666E 01 1.35624E-11 0.0000E-01	UXA 1.4106E-03 6.6806E-05 8.4054E-06 4.9156E-03 9.0919E-07 2.7628E-11 0.000E-01 0.000E-01 0.000E-01	
TERATION NUMBER- 8 CONCENTRATION THPH 1.5868E-09 8.0463E-05 2.0.0006-01 0.0000E-01 3.0.000E-01 0.0000E-01 4.6.7328E-11 3.4140E-06 5.2.529E-03 1.2808E 02 6.3.8003E-05 1.4256E 00 7.3.5049E-05 1.7772E 00 8.1.9150E-06 9.7101E-02 9.0.0006E-01 0.0000E-01 1.38180E-03 7.00666E 01 1.355624E-11 0.0000E-01	UXA 1.4106E-03 6.6806E-05 8.4054E-06 4.9156E-03 9.0919E-07 2.7628E-11 0.000E-01 0.000E-01	
TERATION NUMBER- 8 CONCENTRATION THPH 1.5868E-09 8.0463E-05 2.0.0006-01 0.0000E-01 3.0.000E-01 0.0000E-01 4.6.7328E-11 3.4140E-06 5.2.529E-03 1.2808E 02 6.3.8003E-05 1.4256E 00 7.3.5049E-05 1.7772E 00 8.1.9150E-06 9.7101E-02 9.0.0006E-01 0.0000E-01 1.38180E-03 7.00666E 01 1.355624E-11 0.0000E-01	UXA 1.4106E-03 6.6806E-05 8.4054E-06 4.9156E-03 9.0919E-07 2.7628E-11 0.000E-01 0.000E-01	
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1 CUNCENTRATION TAPH 1 5.8187E-09 3.1346E 2 0.0000E-01 0.0000E 3 0.3000E-01 0.0000E 4 3.6599E-10 2.0794E 5 2.3421E-03 1.2617E 5 0.7016E-05 3.6993E 7 0.7016E-05 3.6102E 8 3.316E-06 1.7947E 9 0.0000E-01 0.0000E 1 3.3216E-03 1.0070E 1 3.3200E-01 0.0000E 1 3.0000E-01 0.0000E 1 3.0000E-01 0.0000E 1 3.0000E-01 0.0000E 1 3.0078E-03 0.00741E 2 7.72540E-11 0.00006E 3 1.65311E-12 5.67314E	-04 2.1477E-03 -01 9.3156E-05 -01 1.2356E-05 -02 1.9850E-05 -02 1.9850E-05 -03 0.0009E-01 -04 -01 -01 -01 -01 -01 -01 -01 -01 -01 -01 -01 -02 -01 -03 -01 -04 -01 -01 -01 -02 -01 -03 -03 -04 -04 -05 -04 -01 -04 -03 -04 -04 -04 -05 -04 -06 -04 -07 -04 -08 -04	
1 CUNCENTRATION TAPH 1 5.8187E-09 3.1346E 2 0.0000E-01 0.0000E 3 0.3000E-01 0.0000E 4 3.6599E-10 2.0794E 5 2.3421E-03 1.2617E 5 0.7016E-05 3.6993E 7 0.7016E-05 3.6102E 8 3.316E-06 1.7947E 9 0.0000E-01 0.0000E 1 3.3216E-03 1.0070E 1 3.3200E-01 0.0000E 1 3.0000E-01 0.0000E 1 3.0000E-01 0.0000E 1 3.0000E-01 0.0000E 1 3.0078E-03 0.00741E 2 7.72540E-11 0.00006E 3 1.65311E-12 5.67314E	-04 2.1477E-03 -01 9.3156E-05 -01 1.2256E-05 -02 1.9850E-05 02 1.9850E-05 02 1.9850E-05 03 0.0002E-01 -01 -01 -01 -01 -02 -01 -03 -01 -04 -01 -01 -01 -02 -01 -03 -01 -04 -01 -01 -01 -02 -02 -03 -03 -04 -04 -01 -04 -01 -04 -02 -04 -03 -04 -04 -04 -05 -04 -06 -04 -01 -04 -03 -04 -04 -04 -05 -04 -06 -04 -07 -04 -08 -04 -09 -04	
1 CUNCENTRATION ThPH 1 5.8197E-09 3.1346E 2 0.0000E-01 0.0000E 3 0.0000E-01 0.0000E 4 3.6599E-10 2.0794E 5 2.3421E-03 1.2617E 5 0.7016E-05 3.6102E 8 3.316E-06 1.7947E 9 0.0000E-01 0.0000E 1 3.3316E-06 1.7947E 9 0.0000E-01 0.0000E 1 3.3316E-03 7.00741E 2 7.72540E-11 0.00000E 3 11E-12 5.67313E	-04 2.1477E-03 -01 9.3166E-05 -02 1.2326E-05 -05 6.6509E-03 -02 1.9850E-06 -03 0.0009E-01 -01 -01 -01 -01 -01 -01 -02 -01 -03 0.0000E-01 -04 -01 -05 -01 -01 -01 -02 -01 -03 -01 -04 -01 -05 -01 -06 -01 -01 -01 -02 -01 -03 -01 -04 -01 -05 -01 -06 -01 -07 -01 -08 -01 -01 -01 -02 -01 -03 -01 -04 -01 -05 -01 -06 -01 -07 -01 -08 -01	
1 CUNCENTRATION ThPH 1 5.8197E-09 3.1346E 2 0.0000E-01 0.0000E 3 0.0000E-01 0.0000E 4 3.6599E-10 2.0794E 5 2.3421E-03 1.26179 5 0.7016E-05 3.6102E 8 3.3316E-06 1.7947E 9 0.0000E-01 0.0000E 1 3.0336E-03 1.00000E 1 3.0378E-03 1.00741E 2 7.72540E-11 0.00000E 3 1.65311E-12 5.6731aE	-04 2.1477E-03 -01 9.3156E-05 -01 1.2256E-05 -02 1.9850E-05 02 1.9850E-05 02 1.9850E-05 03 0.0002E-01 -01 -01 -01 -01 -02 -01 -03 -01 -04 -01 -01 -01 -02 -01 -03 -01 -04 -01 -01 -01 -02 -02 -03 -03 -04 -04 -01 -04 -01 -04 -02 -04 -03 -04 -04 -04 -05 -04 -06 -04 -01 -04 -03 -04 -04 -04 -05 -04 -06 -04 -07 -04 -08 -04 -09 -04	

SYSTEM 4 820 TH 1110 DEG K	
TEMPERTURE 1022.020FGREE-K MOLAR FLUW RATE 2.04880E 02POUND MULES PER HOUR	
CONVERSION OF ETHANE ID ETHYLENE IS 3.72% PRESSURE IS 4.93200F 00 VELUCITY 3.1580E 02FEET/SEC.	
PRESSURE IS 4.93265E 00 VELUCITY 3.1580E 02FEET/SEC.	
ITERATION NUMBERI	
NO CONCENTRATION THPH DXA	
<u>1 9.4821E-09 5.2546E-04 2.2584E-03</u>	
<u>2 0.0000E-01 0.0000E-01 9.6551E-05</u>	
3 (1.0000E-01 0.0000E-01 1.2918E-05	
4 7.3169E-10 4.0547E-05 6.8660E-03	
<u>5 2.2560E-03 1.2502E 02 2.3738E-06</u>	
<u>6 8:7253E-05 4.6352E 00 2.9978E-10</u>	
	100 g (1) (0) (1)
7 8.5224E-05 4.7227E 00 0.0000E-01	
<u>B 4.1014E-06 2.2728E-01 0.0000E-01</u>	
9 0.00000E-01 0.00000E-01	
10 0.00000E-01 0.00000E-01	
11 1.26460E - 03 7.00785E 01	
<u>12 1.29830E-10 - 9.00000E-01</u>	
13 2.27536E-12 1.26091E-07	CONTRACTOR OF CONT
REACTOR POSITION 1.92192E 02FEET TEMPERTURE 1024.02DEGREE-K MOLAR FLUW RATE 2.06075E 02POUND MULES PER HOUR	
TEBPERIDRE 1024.02DEGREE-K INLAK ILDW RATE 2.060752 02200ND MULES FER NUOR	
CONVERSION OF ETHANE TO ETHYLENE IS 4.63%	
PRESSURE IS 4.82397E OU VELUCITY 3.2548E 02FEET/SEC.	
ITERATION NUMBER- 12	
ND CONCENTRATION TOPH DXA	
1 1.4050E-08 0.0204E-04 2.3729E-03	
2 0000E-01 9.9994E-05	
3 0.0000E-01 0.0000E-01 1.3495E-05	
4 1.2129E-09 6.9238E-05 7.0767E-03	
7 1.0303E-04 5.8816E 00 0.0000E-01	
<u>8 4.8413E-06 2.7636E-01 0.0000E-01</u>	
9 0.0000E-01 0.0000E-01	
10 0.00000E-01 0.00000E-01	
)1 1.22771E-03 7.00633E 01	
12 1.962696-10 0.00006-01	
13 4.20611E-12 2.40104E-07	and the second second second second second second second
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SYSTEM 4 820 TO 1110 DEG K	
REACTOR POSITIUN 2.08208E 02	
IEMPERIURE 1027.05DEGREE-K HO	ALAR FLUW RATE 2.07336E 02POUND MOLES PER HOUR
	· · · · · · · · · · · · · · · · · · ·
ONVERSION DE ETHANE	IN ETHYLENE IS 5.59%
RESSURE IS 4.71106E 00 V	VELUCITY 3.3639E 02FEET/SEC.
TERATION NUMBER- 13	
ID_CONCENTRATIONTHPH	
1 1.9581E-08 1.1545E-03	
2 0.0000E-01 0.0000E-01	1.0676E-04
3 0. LCOOE-01 0. LOOGE-01	1.4597E-05
4 1.8343E-09 1.0614E-04	
52.0786E-031.2255E_02	2.9949E-05
6 1.2324E-04 7.2657E 00	7.2493E-10
71.2051E-04 7.1045E 00	0.0006E-01
8 5.5510E-06 3.2727E-01	0.00006-01
9 0.0000E-01 0.00000E-01	
0 0.0.000E-01 9.00000E-01	
1 1.18879E-03 7.00887E 01	
2 2.92906E-10 . 0.00000E-01	
3 7.02803E-12 4.14358E-07	
ACTOR PRISITION 2.24224E 021	FEET
EMPERTURE 1031 OF GREEN MO	LAR FLUW RATE 2.08740E 02POUND MULES PER HOUR
LEAD VILL LVZ LA VILL PK_ 100	CAR I COR RATE Z. USTAGE UZPOGNA MUETS FER HOUR
UNVERSION OF LIHANS	10 ETHYLENE 15 6.66%
RESSURE 15 4.59490F DO VI	
	ELUCTIV 3.4870E 02FEET/SEC.
TERATION NUMBER- 14	
CUNCENTRATION TNPH	üXA
1 2.5492E-08 1.6178E-03	
2 0.0000E-01 0.0000E-01	
3 <u>0.0000E-01</u> 0.0000E-01	
4 2.6325E-09 1.6075E-04	
	3.3760E-06
	1,1172E-09
73865E-043.4665E_00	
<u> 5.2620E-06 3.8239E-01</u>	
90.00000E-010.00000E-01_	
0.0.000E-01 0.00000E-01	
1.14782E-03 7.00954E 01	
4.36572E-10 0.0000E-01	
1.11891E-116.83263E-07_	
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and production of the second second									•	
	YSTEM 4 820 TL									
REA	CTOR POSITION	2.40240E 02F	EET	2.10303E 02PUU		0000		-		
	FERTURE 1032.0	GDEGREE-K MUL	AK FLUW RATE	2.10303E 02PUUR	ID MULES PER D	ноок				
C D 1	VERSION DE ETU	ANE	TO STUVIEN	E <u>IS</u>	7) (LE#/					
لا. ليا با عوو	SSURE IS A A			BIE OZFEEI/SEC.	<u></u>		an ann an Annaich an Airth Californiath, an Airth Californiath, an Airth Californiath, an Airth Californiath, a			
	RATION NUMBER-		<u> </u>							
	CONCENTRATION	Тирн	UXA						*****	
	3.50198-08	2.21965-03	3.2874E-03	······································						
2	0.0000E-01	0.6000E-01	1.28066-04	······································	·····					
	0.0000E-01	0.0000E-01	1.81176-05	······································		an a				
4	3.6329E-09	2.3026E-04	8.8287E-03				······································			
5_	1.8566E-03_	1.1958E 02	3.7520E-06							
6	1.6088E-04	1.0197E 01	1.6748E-09							
7	1.5748E-04	9.9816E 00	0.0000E-01							
8	6.9736E-06	4.4200E-01	0.0000E-01						· · · · · · · · · · · · · · · · · · ·	
	0.00000E-01	0.00000E-01		·						
	0.00000E-01	0.000005-01								
	1.10605E-03	7.01034E 01					·			
$\frac{12}{13}$	1.72004E-11	- 0.00006E-01 1.09019E-06				·				
	1.720046-11	1.09019E-06							······································	
DEAL	TOR POSITION	2.56256F 02FF	с Т	······································	· · · · · · · · · · · · · · · · · · ·			······································		
TEM	PERTURE 1039.00	6DEGREE-K MOLA		2.12034E 02PUUN	IN MULES PER H	-10118				
للماحظ المرجمين		<u>Y B S Y IN CHARTER AND F</u>		L. 160010 021 001		10011	· · · · · · · · · · · · · · · · · · ·			· · · · · · · · · · · · · · · · · · ·
CON	VERSION OF FTH	AHE	TO ETHYLENE	15	9.16%	•				
PRE	SURE IS 4.3	5024E 00 VEL		SE O2FEET/SEC.						·····
	ATION NUMBER-									
10	ONCENTRALION	TMPH	DXA							
	4.5346E-08	2.9903E-03	3.6843E-03							·
2	0.0000E-01	0.0000F-01	1.3955E-04	·						
<u> </u>	0.0000E-01	0.0000E-0)	2.0077E-05		• ••••••••••••••••••••••••••••••••••••					
4	4.8505E-09	3.1986E-04	9.53072-03							·····
	1.7871F-03	1.1785E 02	4.10706-06						· · · · · · · · · · · · · · · · · · ·	
6	1.8052E-04 1.7680E-04	<u>1.1904E 01</u>	2.4488E-09 0.6000E-01							<u></u>
<u>7</u> 8	7.67532-05	<u>5.0615E-01</u>	0.0000E-01		······					
9		0.00000E-01				· · · · · · · · · · · · · · · · · · ·	····			
	0.00000E-01	0.00000E=01					·····			
	1.06321F-03	7.01130E 01		· · · · · · · · · · · · · · · · · · ·				······································	· · · · · · · · · · · · · · · · · · ·	
	8.61755E-10	0.0000E-01						an er en en menne andere andere andere an en andere andere andere andere andere andere andere andere andere an		
	2.563298-11	1.69036E-06								
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SYSTEM 4 B20 TILLIO DEG K
PEACTOR POSITION 2 79271E 02EEET
TEMPERTUKE 1043.070FGREE-K MOLAR ELUW PATE 2.13940E 02POUND MOLES PER HOUR
CONVERSION OF ETHANE TO ETHYLENE IS 10.61% PRESSURE IS 4.21976E 00 VELOCITY 3.9447E 02FEET/SEC.
NO. CUNCENTRATION TEPH UXA
<u>1 5.7616E-08 3.9643E-03 4.1121E-03</u>
2 0.0000E+01 0.0000E+01 1.5147E+04
3Q.J000E-01Z.Z160E-05
<u>4 5.2873E-09 4.3260E-04 1.0749E-02</u>
<u>5 1,6852E=U3 1,1595E_U2 4,4240E=06</u>
<u>6 2.0031E-04 1.5783E.01 3.4971E-09</u>
7 1.9626E-04 1.3505E 01 0.0000E-01
<u>B</u> <u>8.3542E-06</u> <u>5.7452E-01</u> <u>0.0000E-01</u>
90.00000E-010.00000E-01
100.03000E-010.0000E-01
<u>-11</u> <u>-1+01917E+03</u> <u>7.01245E-01</u>
12 1.17746E=09 · 0.00000E=01
13 3.71282E-11 2.55463E-06
REACTOR POSITION 2.88287E OZFEET TEMPERTURE 1050.180EGREE-K NOLAR FLUW RATE 2.16129E OZPUUND MULES PER HUUR
TEACHER LUSE. IBUECKEE-KGULAK_FLUK_KAJE2.101295_0250000 HOLES_FEA_DODK
CONVERSION DE ETHANE TO ETHYLENE IS 2.26%
PRESSURE IS 4.08341E OD VELUCITY 4.1523E 02FEET/SEC.
ITERATION NUMBER- 18
RD CONCENTRATION TOPH DXA
1 7.2517L-08 5.2392E=03 5.1241E=03
<u>2 0.0000E-01 0.0000E-01 1.7972E-04</u>
3 0.0000F-01 0.0000E-01 2.7078E-05
<u>4 7.9810E-09 5.7661E-04 1.1964E-02</u>
<u>5 1.5748E-03 1.1378E 02 5.1175E-06</u>
<u>6 2.2055E-04 1.5934E 01 5.2779E-09</u>
7 2.1623E-04 1.5622E 01 0.0000E-01 8 9.0065E-06 0.5070E-01 0.0000E-01
<u>9</u> 0.03600E=01 0.0000E=01
10 0.0000E=01 0.0000E=01
1) 9.70824E-04 7.71396E 01
12 1.73000E-09 0.00000E-01
13 5.26677E-11 3.80511E-06
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SYSTEM 4 F20 TU 1110 DEG K
REACTOR POSITION 3.04303E 02FEET
TEMPERTURE 1060.19DEGREE-K MOLAR FLUW RATE 2.1904ZE 02POUND MOLES PER HOUR
CONVERSION OF ETHANE TO ETHYLENE IS 14,46%
CONVERSION DE ETHANE TO ETHYLENE IS 14,46% PRESSURE IS 3.94491E OO VELUCITY 4.4112E O2FEET/SEC.
<u>PRESSORE 15 3.94491E 00 VELUCITI 4.4112E 0212E173EC.</u>
NO CONCENTRATION TOPO DXA
1 9.4040E+v8 7.1864E-03 7.0073E+03
2 0.0000E-01 0.0000E-01 2.2964E-04
<u>3 0.0000E-01 0.0000E-01 3.6038E-05</u>
<u>4 1.0295E-08 7.8650E-04 1.4945E-02</u>
<u>5 1.4512E-03 1.1090E 02 6.4602E-06</u>
6 2:4587E-04 1.0789E 01 9.3315E-09
7 2.4125E - 04 1.5436E 01 0.0000E - 01
<u>6 9.75015-06 7.4508E-01 0.0000E-01</u>
9 0.00000F-01 0.00000E-01
10 0.00000E-01 0.00000E-01
11 9.18162E-04 7.01643E 01
12 2.80233E-09 0.00000E-01
13 7.78020E-11 5.94549E-06
REACTOR POSITION 3.20318E 02FEET
TEMPERTURE 1070.12DEGREE-K MOLAR FLOW RATE 2.22874E 02POUND MOLES PER HOUR
CONVERSION OF ETHANE IN ETHYLENE IS 17.34%
PRESSURE IS 3.80355E DO VELUCITY 4.7254E 02FEET/SFC.
ITERATION NUMBER- 20
NO CONCENTRATION TIPH OXA
<u>1 1.2535F-07 1.0187E-02 9.4153E-03</u>
2 0.0000E-01 0.0000E-01 2.8884E-04 - 3 0.0000E-01 0.0000E-01 4.7161E-05
<u>- 3 0.0000(H01 0.0000(H01 4.710(H02</u>
<u>4 1.3586E-C8 1.1041E-03 1.6388E-02</u> <u>5 1.3182E-03 1.0713E 02 8.1375E-06</u>
6 2.7728E-04 2.2535E 01 1.6705E-08
7 2.7237E-04 2.2137E 01 0.0000E-01
8 1.0595E-05 0.0107E-01 0.0000E-01
9 0.000005-01 0.000005-01
10 0.00000E-01 0.00000E-01
11 8.63610E-04 7.02031E 01
12 4.59547E-09 0.00000E-01
13 1.20203E-10 9.76907E-06
0 N
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SYSTEM 4 820 TH 1110 DFG K	
REACTOR POSITION 3.38155F 02FEFT	· · · · · · · · · · · · · · · · · · ·
TEMPERTURE 1076.81DEGREE-K MOLAR FLOW RATE 2.27774E 02POUND MOLES PER HOUR	
TEPPENNEL IVIOLOIDEONEEN, AULANTION NATE 22271146 UZPOUNI FULES PLK HUOK	
CONVERSION OF ETHANE 10 ETHYLENE IS 21.05%	
PRESSURE IS 3.02464E OU VELOCITY 5.2267E 02FEET/SEC.	
_ITERATION_NUMBER- 21	
NO CUNCENTRATION TAPA DXA	
	······································
3 0.0000E-01 0.000E-01 2.5990E-05	
4 1.7649E-08 1.5737E-03 9.7274E-03	
5 1.1600E-03 1.0227E 02 4.1505E-06	
63.1522E-542.7352E_016.6070E-09	
7 3.0500E-04 2.6891E 01 0.0000E-01	
<u>8 1.1380E-05 1.0033E 00 0.0000E-01</u>	
9 0.00000E-01 0.00000E-01	
10 0.0000E-01 0.00000E-01	
117.95635E=047.02381E_01	
123.25656E=090.00000E=01	
13 1.63247E-10 1.43932E-05	
	an a
REACTOR POSITION 3.55939E 02FEET	and a second
TEMPERTURE 1083.480FGREE-K MOLAR FLUW RATE 2.33140E 02POUND MOLES PER HOUR	
	· · · · ·
CONVERSION DE ETHAND TO ETHYLENE IS 25.11%	
PRESSURE IS 3.42514E 00 VELOCITY 5.6649E 02FEET/SEC.	
ITERALIUS NUMBER- 22	and a second
NO CONCENTRATION TMPH DXA	
<u>1 2.1698E-07 2.0823E-02 6.1739E-03</u>	
2 0.0000E-01 0.0000E-01 1.7364E-04	
<u>3 0.0000E-01 0.0000E-01 2.9870E-05</u>	
<u>4 2.2401E-08 2.1496E-03 1.0738E-02</u>	
-5 - 1.01010 - 03 - 0.69430 - 01 - 4.18970-06	
7 3.3465E-04 3.2116E 01 0.0000E-01	
<u>8</u>),2013E=05),1529E 00 0.0000E=01	
9 0.00000E-01 0.0000E-01	·
10 0.00000E-01 0.0000E-01	
11 7.32241E-04 1.02726E 01	
12 4.65250E-09 0.00000E-01	
13 2.06538E-10 1.98213E-05	
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SY	STEM 4 820 TH	1110 DEG K							
		3.73724E 02FE	е Т						
TEMP	FRIURE 1093.51	BDEGREE-K MOLA	R FLOW RATE 2	-39234E 02PHUNE	MOLES PER HOU	UR			
an and a first of a second	411.0413 <u>6 107779</u>	CREATE CALLERY							
6 0 111	ERSION OF ETH	A + 1 F	TO STUVIENS	<u>.</u> 15_z	A 714		and an and the second states a second state of the second states and the	·····	
	SUPE 15 3.18		ID ETHYLENE		9.119	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		
			0(111 0.3094	E OZFECI/SEC.				· · · · · · · · · · · · · · · · · · ·	
	ATION NUMBER-								
	INCENTRATION	TriPH	UXA						
1	2.70928-07	2.89685-02	7.9134E-03					-	
2	0.00000-01	U.0000E-01	2.0870E-04						
3	0.0000F-01	0.0000E-01	3.7316E-05						••••••••••••••••••••••••••••••••••••••
4	2.64251-08	2.8256F-03	1.26336-02						
· 5	8.5029E-04	9.0920E 01	4.24475-06						
6		3.661CE 01	1.58436-08						and the second
			A REAL PROPERTY AND A REAL						
7	3.55731-04	3.8038E 01	0.0000E-01	······					
8	1.2285E-05	1,3137E 00	0.0000E-01						
	0.00000E-01	0.00000E-01							
_10	0.0000E-01	0.000008-01							
	6.57647E-04	7.03209E 01							
12	6.83453E-09 ·	0.00000E-01							
	2.61773E-10	2.79909E-05							
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1	3.2611E-07	4.03266-02	9.6728E-03						
2	0.0000E-01	U.0000E-01	2.3799E-04	•			·		
• 3	0.0000E-01	0.0000E-01	4,4304E-05		•		,		
4.	2.88826-08	3.5714E-03	1.40765-02						
5	6.7854E-04	5.3906E 01	3.6693E-06					n an an the factor and a second s	
6	3.6866E-04	4.5568E 01	2.3119E-08_						and and the first spectrum in the second second size of the first spectrum in
	3.63631-04	4.4965E 01	0.00006-01						and we can approximate the second
8	1.2043E-05	1.4891E 00	0.0000E-01	· · · · · · · · · · · · · · · · · · ·	······				an a a san a san an a
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13	3.20034E-10	4.23907E-05		ana ana amin'ny soratra dia mampiasa amin'ny fivondro amin'ny tanàna amin'ny faritr'o dia mampiasa amin'ny fivo					. An in the second contract of a second
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SYSTEM 4 820 TO 1110	DEG K					
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FUNCTION REDC(T,1)						
$\frac{\text{REQC}(T,I) = 0.15310E \text{ U}}{\text{REQC}(T,I) = 0.15310E \text{ U}}$	1(1104.69.1)					
EUNCTION REAC(1.1)				· · · · · · · · · · · · · · · · · · ·		
	1(1104,59,2)					
$\frac{REQC(T, I) = 0.34972E}{EVENTIONE}$	2(1104.69.3)			······		
$\frac{FUNCTIUM REDC(1,1)}{REDC(1,1)=} = 0.126020-00$						
EWETTON BENELT	811104.09.41					
-FUNCTION REOC(T, 1)						
REQC(T, I)= 0.42361E 0						
- FUNCTION REACTION				· · · · · · · · · · · · · · · · · · ·		
REQC(T, 1)=0,13177E_0		· · · · · · · · · · · · · · · · · · ·				
	0(1104,63, 7)					
FUNCTION REQC(T, 1) REQC(T, 1) = 0.22116F-02						
RED(11) = 0.22110F-0)	2(1104.69.5)	· · · · · · · · · · · · · · · · · · ·				
FUNCTION PRR(IS).						
$\frac{PR}{PR} = -6.04930E(0) = RI$	ADI(1) = 1.25000E-01	VUL= 0.0000				
-EUXCIIOU PRESD(I)	$a_{01(1)} = 1.2000F=01$		10E-01			
	VIS= 2.68387E-05	DEN= 1.04906F-	01			
	2231E-02 V12V22VA		3.91634E 02	5,77815E 02_		
$\frac{1}{1000} = \frac{1}{1000} = 1$		= /.037886 02	3.91034E UZ	5.11813E 02		
	3.26108E-07	4.03256E-02				
<u>2-8</u> <u>150</u> <u>30</u> TAHE	0.0000E-01	0.00000E-01				
3-C	0.00000E-01	0.00000F-01		· · · · · · · · · · · · · · · · · · ·	······································	
	2.88816E-08	3.57141E-03				
5-F ETHANE		8.39059E 01				
6-F_ETHYLENE	3.6d664E-04	4.55880E 01		······································		
7-G_HYDRDGEN	3.636295-04	4.496535 01	· · · · · · · · · · · · · · · · · · ·			
B-H_METHANE	1.204256-05	1.489156 00		· · · · · · · · · · · · · · · · · · ·		
	0.0000E=01	0.00000E-01				
9-1 PRHPANE 10-J PROPENS	0.00000E-01	0.00000E=01				
11-K WATER	5.69253E-04	7.039226 01		······		
		0.00000E-01				
12-1 CARBON 13-M CARBON MONOXIDE	9.16776E-09 3.20634E-10	4.03907E-05	· · · · · · · · · · · · · · · · · · ·			
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REACTOR JS 400,00. FEIL LOUK. AND .0,125 FIET IN RADIUS
<pre>INITIAL REACTOR LUREAURICUL 9.81156-01/FFT  REDUCTION REDUCT</pre>
FUnction       RE20(17)10       RE20(17)10         FUnction       Re20(17)10       Re20(17)10         Re20(17)10       Re20(17)10       Re20(17)10         Re20(17)110       Re20(17)10       Re20(17)10
RED(CT)15       0,119.01 (22.032.71, 1)         REJCT10       0,609.01 (2.032.71, 2)         REJCT10       0,105121.00         REJCT11       0,10522.00         REJCT11       0,27595-01         REJCT11       1,25000E-01         VUL=       0,00000E-01         REJCT11       1,25000E-01         VUL=       0,00000E-01         RESCUEL       1,22000E-01         VUL=       0,00000E-01         RESCUEL       1,22000E-01         VUL=
FUNCTION RESC(1,1)
REJC(T-1)=
#PurcTion: Priorite: 0.1%512L-06(.832.717.3)         PurcTion: Pre2(17.1)         PurcTion: Pre2(10.1)         PurcTion: Pre2(10.1)         Pre2(10.1)     <
<pre>RESC(7.1)= 0.1x612L 06( d32.71, 3) RESC(7.1)= 0.1x6321+-08( d32.71, 4) RESC(7.1)= 0.52x49E-01( d32.71, 5) RESC(7.1)= 0.2x59E-01( d32.71, 6) RESC(7.1)= 0.2x59E-01( d32.71, 6) RESC(7.1)= 0.2x59E-01( d32.71, 7) RESC(7.1)= 0.2x59E-01( d32.71, 7) RESC(7.1)= 0.2x59E-01( d32.71, 7) RESC(7.1)= 0.2x59E-01( d32.71, 7) RESC(7.1)= 0.2x59E-01( d32.71, 8) FUNCTION RESC(1,1) FUNCTION PRESC(1,1) FUNCTION PRESC(1,1) FUNCTION</pre>
PUNCTION FRESU(T,1) FUNCTION REC(T,1) FUNCTION RE(T,1) FUNCTION RE(T,1) FUNCT
RESCLIPIDE 0.1463/E-086.832.71, 41 RESCLIPIDE 0.2/599E-011.832.71, 51 RESCLIPIDE 0.2/599E-011.832.71, 61 FURCION RECCIPIDE 0.2/599E-011.832.71, 61 FURCION RECCIPIDE 0.5538LE 001.832.71, 71 FURCION RECCIPIDE 0.5538LE 001.832.71, 71 FURCION RECCIPIDE 0.5538LE 001.832.71, 81 FURCION PRECONSTRUCTION RECCIPIDE 0.5000000E-01 FURCION PRECONSTRUCTION RECCIPIDE 0.5000000E-01 FURCION PRECONSTRUCTION PRECONSTRUCTION PRECONSTRUCTION PRECONSTRUCTION RECCIPIDE 0.000000E-01 FURCION PRECONSTRUCTION PRECONSTRUCTOR PRECONSTR
FUICTION RECOTTIN FUICTION RECOTTIN FUICTION RECOTTIN FUICTION RECOTTIN RECOTTIN CONTINUE CONTINUE CONTINU
REAC(7,1):= .0.52409E.01(.832.71, 5).         #EQUALIAN REC(1,1).         #EVALUAN
FUNCTION REC(T,1) REQC(T,1) = . 0.2799pt-ul(.832.71, 6) FUNCTION REQC(T,1) REQC(T,1) = . 0.553ELE 00(.832.71, 7) REQC(T,1) = . 0.7939E-03(.832.71, 8) FUNCTION PREATES FUNCTION FUNCTION FUNCTION FUNCTION FUNCTION FUNCTION
REOC(7,1) F.       0.2/599E-01(_832.71, 6)         FUNCTILM RESC(7,1)       REOC(7,1)         REOC(7,1) =       0.5938E 00(_832.71, 8)         FUNCTILM RESC(7,1)
EUXCTILD RESC(T,I)         RESC(T,I) = 0.7593E 0.0 (B32.71, 7)         FUNCTION PRESC(T,I)         RESC(T,I) = 0.7993E-03 (B32.71, 8)         FUNCTION PRESC(T,I)         RESC(T,I) = 0.7993E-03 (B32.71, 8)         FUNCTION PRESC(T,I)         RAD         PAR         .0.4930E 0.0
RED2(17,1) =
FUNCTION       REQ(1,1).         REQC(1,1)=       0.79039E-03(.832.71, 8).         FUNCTION       PRk1(1)         PR=       0.04930E         PNOTION       PRK1(1)         PR=       0.04930E         PR=       0.04925E         PRESUBLT       VIS=         2.1604E=       1.4221E=02         PRESUBE       1.4221E=02         PRESUBE       1.9422E=02         PRESUBE       1.9422E=02         PRESUBE       1.9422E=02         PRESUBE       1.9422E=02         PRESUBE       1.9422E=03         PRESUBE       1.9422E=03         2.0.0000E=01       0.9000E=01         2.0.0000E=01       0.9000E=01         2.0.0000E=01       0.9000E=01         2.0000E=01       0.9000E=01
KE2C(I_J)=7_79239E-03(_832.71, 8)         FUNCTION_PRK(IS)         PR=6_04936E_03KADI(1)=1.25000E-01V0L=0.00000E-01         FUNCTION_PRK(IS)         PR=6_04925E_03KADI(1)=1.25000E-01V0L=0.00000E-01         FUNCTION_PRKSD(T)         KENU=335919E_05V15=2.16064E-05DEN=1.42616E-01         FRICTION_FRESD(T)         FEMECTION_FRESD(T)         V0L=0.0000E-01         FUNCTION_PRK(IS)         PR=6.02734E_00V15=2.19422E+02         FUNCTION_FRE(IS)         PR=6.02734E_00RADI(1)=1.25000E-01V0L=0.00000E-01         PR=6.02734E_00VELUCITY2.0550E_02FEFT/SEC.        0.0001E-010.0000E-010.0000E-01         PR=0.0000E-010.0000E-010.0000E-01         PR=0.0000E-010.0000E-010.0000E-01        0.0000E-010.0000E-010.0000E-01        0.0000E-010.0000E-010.0000E-010.0000E-01
FUICTION PRK(IS)         PR=
2R =
FUNCTION PRR(15)         2R#       .6.04925E.00       RAD1(1)#       1.25000E-01       VDL#       0.00000E-01         VUNCTION PRESD(T)       VIS#       2.16004E-05       DEN#       1.42616E-01         VENUE       3.35919E       05       VIS#       2.16004E-05       DEN#       1.42616E-01         VENUE       3.35919E       05       VIS#       2.16004E-05       DEN#       1.42616E-01         VENUE       3.35919E       05       VIS#       2.01632E       02       2.03568E       02         VENUE       AL277ERESSURE       D#       1.42616E-01       2.05504E       02       2.03568E       02         PUBCION PRK(1S)       PR#       -0.02734E       00       REDUCITY       2.0550E       0.0200E-01       9.0000E-01         PR#SUBEE       S.402734E       00       VELUCITY       2.0550E       0.2FEET/SEC       1       0.0000E-01       8.2632E-03         1       0.0000E-01       0.0000E-01       8.2632E-03       -0       -0       -0       -0       -0         2       0.0000E-01       0.0000E-01       0.0000E-01       -0.0000E-01       -0.0000E-01       -0.0000E-01       -0.0000E-01       -0.0000E-01       -0.0000E-01       -0.0000E-01
PR=6.04925E_UU       FAD1(1)=       1.25000E=01       VUL=       0.00000E=01         FUNCTION_PEESU(T)       CANU=       3.35919E_05       VIS=       2.16064E=05       DEN=       1.42616E=01         FRICTION_FRECOR=       1.41227E=02       VI.V2.VA=       2.01632E_02       2.05504E_02       2.0356BE_02         FUNCTION_PRECOR=       2.19422E=02       VI.V2.VA=       2.01632E_02       2.05504E_02       2.0356BE_02         FUNCTION_PRECON       FUNCTION_PRECON       FUNCTION_PRECON       FUNCTION       FUNCTION       FUNCTION         FUNCTION_PRECON       FUNCTION_PRECON       FUNCTION       FUNCTION       FUNCTION         FUNCTION_PRECON       FUNCTION       FUNCTION       FUNCTION       FUNCTION         FUNCTION_FRECON       FUNCTION       FUNCTION       FUNCTION       FUNCTION         FUNCTION_FRECON       FUNCTION       FUNCTION       FUNCTION       FUNCTION         PRESSURE_O       FUNCTION       FUNCTION       FUNCTION
FUNCTION_PRESD(T)         VERUE       3.35919E 05       VISE       2.16904E-05       DEN=       1.42616E-01         FRICTION_FACTORE       1.41227E=02       VI.V2.VAE       2.01632E 02       2.05504E 02       2.0356BE 02         FUECTION_PRK(IS)       EACTIVE SURE DE       2.19422E=02       VULE       0.00000E=01       PRESSURE IS       6.02734E 00       VELUCITY       2.0550E 02FEET/SEC         PRESSURE IS       6.02734E 00       VELUCITY       2.0550E 02FEET/SEC       1       0.0000E=01       0.0000E=01       0.0000E=01         0.0000E=01       0.0000E=01       0.0000E=07       0.0000E=01       0.0000E=01       0.0000E=01         2       0.0000E=01       0.0000E=01       0.0000E=01       0.0000E=01       0.0000E=01         4       0.0000E=01       0.0000E=01       0.0000E=01       0.0000E=01       0.0000E=01         5       3.591E=02       0.0000E=01       0.0000E=01       0.0000E=01       0.0000E=01         5       1.4395E=09       5.2686E=05       0.0000E=01       0.0000E=01       0.0000E=01         8       2.9602E=10       1.0711E=05       0.0000E=01       0.0000E=01       0.0000E=01         9       0.0000E=01       0.0000E=01       0.0000E=01       0.0000E=01 <td< td=""></td<>
kENU=       3.35919E       05       VIS=       2.16064E=05       DEN=       1.42616E=01         FRICTION       EACTOR=       1.41227E=02       VI.V2.VA=       2.01632E       02       2.03568E       02         TEMPERTURE=       B32.71PRESSURE       D=       2.19422E=02       2.00000E=01       0.00000E=01         PRE
FRICIION EACIOR:       1.41227E=02       V1.V2.VA=       2.01632E       02       2.03568E       02         EUDCTION PRK(IS)       PR=6.02734E       00       RADI(1)=       1.25000E=01       VUL=       0.00000E=01         PR=6.02734E       00       VELUCITY       2.0550E       02FEET/SEC.         1       0.0000E=01       0.0000E=01       3.5963E=07         2       0.0000E=01       0.0000E=01       8.2432E=03         3       0.0000E=01       0.0000E=01       0.0000E=01         4       0.0000E=01       0.0000E=01       0.0000E=01         5       3.5911E=02       0.0000E=01       0.0000E=01         6       1.4395E=09       5.2686E=05       0.0000E=01         7       1.2915E=09       4.0731E=05       0.0000E=01         8       2.9602E=10       1.0711E=05       0.0000E=01         9       0.0000E=01       0.0000E=01       0.0000E=01         9       0.0000E=01       0.0000E=01       0.0000E=01
TEMPERTURE=       842.710xESSURE_D=       2.19422E-02         FUDITION_PRK(IS)       PRE.       6.02734E_00       RADI(1)=       1.25000E-01       VUL=       0.0000E-01         PRESSURE_IS       6.02734E_00       VELUCITY       2.0550E_02FEET/SEC.       2.0000E-01       0.0000E-01         1       0.0000E-01       0.0000E-01       3.5963E-07       2.0000E-01       0.0000E-01         2       0.0000E-01       0.0000E-01       8.2432E-03       3.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01       0.0000E-01       0.0000E-01         4       0.0000E-01       0.0000E-01       0.0000E-01         5       3.5911E-03       1.2994E_02       0.0000E-01         6       1.4395E-09       5.2686E-05       0.0000E-01         7       1.2915E-09       4.0711E-05       0.0000E-01         8       2.9602E-1C       1.0711E-05       0.0000E-01         9       0.0000E-01       0.0000E-01       0.0000E-01         9       0.0000E-01       0.0000E-01       0.0000E-01         9       0.0000E-01       0.0000E-01       0.0000E-01         10       0.0000E-01       0.0000E-01       0.0000E-01
FUBCTION PRK(IS)         PR=
R=       6.02734E       00       RADI(1)=       1.25000E-01       VUL=       0.0000E-01         RESSURE IS       6.02734E       00       VELUCITY       2.0550E       02FEET/SEC.         1       0.0000E-01       0.0000E-01       3.5963E-07         2       0.0000E-01       0.0000E-01       8.2432E-08         3       0.0000E-01       0.0000E-01       0.0000E-01         4       0.0000E-01       0.0000E-01       0.0000E-01         5       3.5911E-03       1.2994E       02       0.0000E-01         6       1.4395E-09       5.2686E-05       0.0000E-01       0.0000E-01         7       1.2915E-09       4.0731E-05       0.0000E-01       0.0000E-01         8       2.9602E-10       1.0711E-05       0.0000E-01       0.0000E-01         9       0.0000E-01       0.0000E-01       0.0000E-01       0.0000E-01
PRESSURE_IS6.02734E_00VELUCITY2.0550E_02FEET/SEC.         10.0000E=010.0000E=013.5963E=07         20.0000E=010.0000E=010.0000E=01         30.0000E=010.0000E=010.0000E=01         40.0000E=010.0000E=010.0000E=01         53.5911E=031.2994E_020.0000E=01         61.4395E=095.2686E=050.0000E=01         71.2915E=094.6731E=050.0000E=01         82.9602E=100.0000E=01         90.0000E=010.0000E=01         00.0000E=010.0000E=01
1       0.0000E-01       0.0000E-01       3.5963E-07         2       0.0000E-01       0.0000E-01       8.2432E-08         3       0.0000E-01       0.0000E-01       0.0000E-01         4       0.0000E-01       0.0000E-01       0.0000E-01         5       3.5911E-03       1.2994E       02       0.0000E-01         6       1.4395E-09       5.2686E-05       0.0000E-01         7       1.2915E-09       4.6731E-05       0.0000E-01         8       2.9602E-10       0.0000E-01       0.0000E-01         9       0.0000E-01       0.0000E-01       0.0000E-01         10       0.9000E-01       0.9000E-01       0.9000E-01
2       0.0000E-01       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01       0.0000E-01         4       0.0000E-01       0.0000E-01       0.0000E-01         5       3.5911E-03       1.2994E       02       0.0000E-01         6       1.4395E-09       5.2086E-05       0.0000E-01         7       1.2915E-09       4.6731E-05       0.0000E-01         8       2.9602E-10       1.0711E-05       0.0000E-01         9       0.0000E-01       0.0000E-01         10       0.0000E-01       0.0000E-01
3       0.0000E=01       0.0000E=01       0.0000E=01         4       0.0000E=01       0.0000E=01       0.0000E=01         5       3.5911E=03       1.2994E_02       0.0000E=01         6       1.4395E=09       5.2066E=05       0.0000E=01         7       1.2915E=09       4.6731E=05       0.0000E=01         8       2.9602E=1C       1.0711E=05       0.0000E=01         9       0.0000E=01       0.0000E=01         10       0.0000E=01       0.0000E=01
4.       0.0000E=01       0.0000E=01         5.       3.5911E=03       1.2994E_02       0.0000E=01         6.       1.4395E=09       5.2086E=05       0.0000E=01         7.       1.2915E=09       4.6731E=05       0.0000E=01         8.       2.9602E=10       1.0711E=05       0.0000E=01         9.       0.00000E=01       0.00000E=01         10.       0.00000E=01       0.00000E=01
5       3.5911E-03       1.2994E       02       0.0000E-01         6       1.4395E-09       5.2086E-05       0.0000E-01         7       1.2915E-09       4.6731E+05       0.0000E-01         8       2.9602E-10       1.0711E-05       0.0000E-01         9       0.0000E-01       0.00000E-01       0.00000E-01         10       0.0000E-01       0.00000E-01       0.00000E-01
6       1.4395E-09       5.2086E-05       0.0000E-01         7       1.2915E-09       4.6731E+05       0.0000E-01         8       2.9602E-10       1.0711E+05       0.0000E-01         9       0.0000E-01       0.00000E-01       0.00000E-01         10       0.00000E-01       0.00000E-01       0.00000E-01
7       1.2915E-09       4.6721E-05       0.0000E-01         8       2.9602E-10       1.0711E-05       0.0000E-01         9       0.00000E-01       0.00000E-01         10       0.00000E-01       0.00000E-01
<u>     2.9602E=10    1.0711E=05    0.0000E=01     0.00000E=01    0.00000E=01     0.00000E=01    0.00000E=01     0.00000E=01     0.00000E=01     0.00000E=01 </u>
9 0,00000E-01 0.00000E-01 10 0.00000E-01 0.00000E-01
100.00000E-010.0000E-01
16
1. 1.93621E-03 7.50597E 01
2 0.00000E-01 0.00000E-01
3 0.00000E-01 5.00000E-01
DL CHANGED TO 1.90211E 00 71C= 3.28326E 02
I= 1 RA= 1.57703E-03 DXA(I)= 1.02033E-02 CF, CR= 1.24408E-03 8.25100E-08 REQC= 1.82748E 00
ATE= 1.26778E 00
ELOCITY OF GAS GREATER THAN SOUND

SYSTEM 4 820 TO 1110 DEG K REACTOR POSITION 3.90955E 02FEET TEMPERTURE 1109.35DFGRIE-K MULAR FLOW R PRESSURE IS 2.00000E 00 VELOCITY			
PRESSURE IS 2.0000E 00 VELOCITY	1.2705E 03FEET/SEC.		
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REACTOR IS 400.00 FEET LONG AND 0.125 FEET IN RADIUS	
REACTOR 15 400.00 FEET LONG AND 0.125 FEET IN RADIUS TOTAL MOLES / HOUR ARE 200.0PHUND MOLES AT PRESSURE 6.249A VELOCITY OF 1.95179E OZ AT TEMPERATURE 820.0D	56 K
INITIAL REACIDE INCREMENTION 1.96211E UDFEET	·
$\frac{FUNCTION REOC(T, I)}{REOC(T, I) = 0.11963E 02(832.71, I)}$	
FUNCTION REOC(1.1)	
REQC(T, 1) = 0.63841E - 02(-332.71, 2)	
FUNCTION REDC(J.I)	
REQC(T)1)= 0.140121 06( 832.71, 3)	
FUNCTION_REDC(T,1)O.148376-08(_832.71, 4)	
FUNCTION_REQC(T_1)	
REDC(T,1)= 0.52409E 01( B32.7), 5)	
REQC(T,1) = 0.275991 - 01(B32.71, 6)	
FUACTION REQU(T+1)	
REQC(T,1)= 0.55361E 00( 832.71, 7)	·
EUNCTINU REOC(T,1) REOC(T,1)= 0.79(39E-03(-832.71,-8)	
PR = 6.24929E  for  RADI(1) = 1.25000E-01  VOL = 0.00000E-01	
FUNCTION PRE(IS)	
PR= 6.24929E 00 PADI(1)= 1.25000E-01 VUL= 0.00000E-01	
FUNCTION_PRESD(T)	
RENU=         3.35919E         05         VIS=         2.16064E-05         DEN=         1.47348F-01	
$= 1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.97030E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.9708E^{-1.918E^{-1.918E^{-1.918E^{-1.918E^{-1.918E^{-1.918E^{-1.918E^{-1.918E^{-1.918E^{-1.918E^{-1.918E^{-1.918E^{-1.918E^{-1.918E^{-1.918E^{-1.918E^{-1.918E^$	
FUNCTION_PRR(IS)	
$PR = 6.22807E_{00} RAU(1) = 1.25000E-01 V01 = 0.00000E-01$	an a
PRESSURE IS 6.22807E 00 VELICITY 1.9888E 02EEET/SEC.	
<u>1 0.0000E-01 0.0000E-01 2.7462E-07</u>	
$\frac{2}{2} 0.000E - 01 0.0000E - 01 6.2946E - 08$	
<u>3</u> 0,000L-01 0.0000E-01 0.0000E-01	· · · · · · · · · · · · · · · · · · ·
<u>4. 0.0000E-01 0.0000E-01 0.0000E-01</u> <u>5. 3.7098E-03 1.2994E-02 0.0000E-01</u>	
$\frac{6}{1.1356E-09} \frac{1.2774E-05}{3.9774E-05} = 0.0000E-01$	
7 1.0188E-09 2.5664E-05 0.0000E-01	the second se
<u>B 2.3352E-10 H.1792E-06 U.0009E-01</u>	
9 0.00000E-01 0.00000E-01	
10 0.0000E-01 0.0000E-01	
11 2.00023E-03 7.00596E 01	
12.0.00000E-01 0.0000E-01 13.0.00000E-01 0.0000E-01	
DL_CHANGED_T/1 1.96839E_0071C=3.16314E_02	
I = 1  RA = 1.57878E - 03  0XA(1) = 1.01708E - 02  (F, CR = 1.46596E - 03  9.52185E - 08  RERC = 1.87819E  00	
RATE= 1.07857E 00	
DL CHANGED TO $9.77499E=01$ ZIC= $3.93076E_02$ $1 = 1 RA= 2.85336E=03 DXA(1)= 1.00605E=(2 CE:CE= 7.34717E=04 1.89908E=07 REQC= 1.51182E_00$	
1= 1 RA= 2.85336E-03 DXA(I)= 1.00605E-(2 CF, CR= 7.34717E-04 1.89908E-07 REQC= 1.51182E 00	
RATE= 3.83513E 00	
	0

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SYSTEM 4 820 TU 1110 DEG K				· 
SYSTEM 4 820 TO 1110 DEG K REACTOR POSITION 4.00895E 02FEFT TEMPERTURE 1109.95DEGREE-K MOLAK FLOW R PRESSURE IS 2.00000E 00 VELUCITY				
PRESSURE IS 2.00000E 00 VELUCITY	8.6904E 02FEET/SEC.	<u>rek nuok</u>		
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SYSTEM 4 820 TH 1110 DEG K	
TENPERTURE 870.85DEGREE-K HOL	AR FLOW RATE 2.00001E 02PUUND MOLES PER HOUR
CONVERSION DE ETHANE	TU CTHYLENE IS 0.00%
	LUCITY 2,1022E 02FEET/SEC.
ITERATION NUMBER- 1	
NO CONCENTRATION	UXA
<u>1 8.2987E-15 3.0717E-11</u>	
2 0.J000E-01 U.U000E-01	
3 0.0000E-01 0.0000E-01	
4	.5,1906E-05
-5 3.5105E-03 1,2994E 02	
62.1685E-088.0265E-04_	5.0715E-21
7 1.9939E-08 1.3987E-04	
B 3.3925E-09 1.2557E-04	0(0000=-0)
10 0.00000E-01 0.00000E-01	
12 8.61403E - 20 0.00000E - 01	
New concentration of the second concentration of the second	
_REACTOR_POSITION3.20320E_01EI	EI
TEMPERTURE 921.70DEGREE-K MOLI	AR FLOW RATE 2.00012E 02POUND MULES PER HOUR
CONVERSION DE LIHAUE	10 ETHYLENE IS 0.01%
PRESSURE IS 6.06850E 00 VEL	ICITY 2.2593F 02FFFT/SEC.
ITERATION NUMBER- 2	
NO CONCENTRATION THPH	DXA
	-3.9255E=05
-2 0.0000E-01 0.0000E-01	
	3.0970E-07
4 7.5629E-17 3.0553E-12	
5 3.2672E-03 1.2993E 02	
6 2.8862E-07 1.1478E-02	
7 2,7360E-07 1.08B0E-02	0.00000-01
<u>8 3.0051E-08 1.1951E-03</u>	0.0000E=01
9 0.00006-01 0.00006E-01	
10 0.00000E-01 0.00000E-01	
11 1.76173E-03 7.00598E 01	
12 8.89025E-17 0.00000E-01	
13 2.97463E-20 1.18294L-15	
12 6.9/4025-72 1.182941-15	
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REACTOR POSITION 4.80480E OIFEET	
TEMPERTURE 953.04DEGREE-K MULAK FLOW RATE 2.00080E 02POUND MOLES PER HOUR	
CONVERSION OF ETHAME TO ETHYLENE IS 0.06%	
PRESSURE IS 5.97103E 00 VELOCITY 2.3751E 02FEET/SEC.	
ITERATION NUMBER- 3 NO CONCENTRATION TAPH	
1 4.7405E-12 1.9814E-07 1.6108E-04	
2 0.0000E-01 0.0000E-01 1.1755E-05	
<u>3 0.0000E-01 0.0000E-01 1.1411E-06</u>	
<u>4 1.6094E-14 6.7268E-10 9.9896E-04</u>	
5 3.1058E-03 1.2985E 02 1.0422E-08	
6 1:8843E-06 7.8760E-02 5.7748E-15 7 1.8109E-06 7.5693E-02 0.0000E-01	
<u>7 1.8104-06 7.5693E-02 0.0005E-01</u> B 1.4677E-07 5.1348E-03 0.0000E-01	
9 0.00000E-01 0.00000E-01	
10 0.00000E-01 0.00000E-01	
11 1.67616E-03 7.00601E 01	
<u>12 9.46151E-15 0.00000E-01</u>	
<u>13 1.47276E-17 6.15583E-13</u>	
REACTOR POSITION 5.40640E 01FEET	
TEMPERIURE 965.05DEGREE-K MOLAR FLUW RATE 2.00201E 02POUND MOLES PER HOUR	
TEMPERIORE SUSSIDJULOREEM, ANDERN TEEM NATE	
CONVERSION OF ETHANE TO ETHYLENE IS 0.15%	
PRESSURE IS 5.87335E 00 VELUCITY 2.4465E 02FEET/SEC.	
ITERATION NUMBER- 4	
NO CONCENTRATION TAPH UXA	
<u>1 2.6617E-11 1.1458E-06 2.6817E-04</u> <u>2 0.0000E-01 1.7732E-05</u>	
3 0.0000E-01 0.0000E-01 1.7732E-03	
<u>4 2.1933E-13 9.4415E-09 1.4582E-03</u>	
5 3.0139E-03 1.2973E 02 4.0604E-08	
<u>6 4.6233E-06 1.9902E-01 6.8203E-14</u>	
7 4.4598E-06 1.9198E-01 0.0000E-01	
8 3.2718E-07 ).4084E-02 0.0000E-01	
10 0.00000E-01 0.00000E-01	
10 0.00000E-01 0.0000E-01 11 1.62757E-03 7.00606E 01	
$\frac{12}{12} \frac{7.75169E-14}{0.00000E-01} = 0.00000E-01$	
13 2.46628E-16 1.06164E-11	
	<b>}</b>
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SYSTEM 4 920 TO 1110 DEG K	
REACTOR PUSITION 3.00B00F DIFFET TEMPERINRE 977.06DEGREE-K MOLAR FLOW RATE 2.00400F 02POUND MULES PER HUUR	
TEAPERTORE 2/1.36DE6REE-K_MULAR_FLIW_RATE2.00400E_02P00N5_MULES_PER_NUOR	•
_CONVERSION DE ETHANE ID ETHYLEHE IS 0.31%	
PRESSURE IS 5.77415E OD VELUCITY 2.5220E 02FEET/SEC.	
_ITERATION	
NO CONCENTRATION TOPH OXA	an ann an an ann an ann an ann ann ann
1 9.6615E-11 4.2862E-06 4.4019E-04	The second se
-20.0000L-01U.0000E-012.6438E-05	
30.0000E-010.0000E-012.0845E-06	
4 1.4197E-12 0.2964E-0B 2.1056E-03	
<u>5 2,9198E-03 1.2953E 02 1.1243E-07</u>	
<u>6 8.9373E-06 4.9649E-01 4.4150E-13</u>	
<u>7                                    </u>	
<u>-8</u> <u>5.8534E+07</u> <u>2.5965E=02</u> <u>0.0000E-01</u>	
90.00000E-01	
10 - 1.57923E - 03 - 7.00612E - 01	
12 4.95178E-13 0.00003E-01	· · · · · · · · · · · · · · · · · · ·
13 1.84947E-15 8.20501E-11	
REACTOR POSITION 9.60959E OIFEET	and a second
TEMPERTURE 980.27DEGREE-K MOLAR FLOW RATE 2.00715E 02POUND MULES PER HOUR	
CONVERSION OF ETHANE TO ETHYLENE IS 0.55%	
PRESSURE IS 5.6749UE OD VELOCITY 2.5997E 02FEET/SEC.	
ITERATION HUMBER- 6	······································
<u>1 2.6650E-10 1.3099E-05 6.8970E-04</u>	
_1 _2.6650E=101.3099E=056.8970E=04 _20.0000E=010.0000E=013.7947E=05	
1         2.6650E-10         1.3099E-05         6.8970E-04           2         0.0000E-01         0.0000E-01         3.7947E-05           3         0.0000E-01         0.0000E-01         4.3638E-06	
1       2.6650E-10       1.3099E-05       6.8970E-04         2       0.0000E-01       0.0000E-01       3.7947E-05         3       0.0000E-01       4.3638E-06         4       6.5959E-12       0.0156E-07       2.9353E-03	
1       2.6650E-10       1.3099E-05       6.8970E-04         2       0.000E-01       0.000E-01       3.7947E-05         3       0.000E-01       4.3638E-06         4       6.5959E-12       3.0156E-07       2.9353E-03         5       2.8262E-03       1.2921E-02       2.6261E-07	
1       2.6650E-10       1.3099E-05       6.8970E-04         2       0.0000E-01       0.0000E-01       3.7947E-05         3       0.0000E-01       0.0000E-01       4.3638E-06         4       6.5959E-12       0.0156E-07       2.9353E-03         5       2.8262E-03       1.2921E       02       2.6261E-07         6       1.5513E-05       7.0925E-01       2.1729E-12	
1       2.6650E=10       1.3099E=05       6.8970E=04         2       0.000E=01       0.000E=01       3.7947E=05         3       0.000E=01       0.000E=01       4.3638E=06         4       6.5959E=12       0.0156E=07       2.9353E=03         5       2.8262E=03       1.2921E=02       2.6261E=07         6       1.5513E=05       7.0925E=01       2.1729E=12         7       1.5041E=05       6.8767E=01       0.0000E=01	
1       2.6650E=10       1.3099E=05       6.8970E=04         2       0.000E=01       0.000E=01       3.7947E=05         3       0.000E=01       0.0000E=01       4.3638E=06         4       6.5959E=12       0.0156E=07       2.9353E=03         5       2.8262E=03       1.2921E=02       2.6261E=07         6       1.5513E=05       7.0925E=01       2.1729E=12         7       1.5041E=05       6.8767E=01       0.0000E=01         8       9.4512E=07       4.3211E=02       0.0000E=01	
1       2.6650E=10       1.3099E=05       6.8970E=04         2       0.0000E=01       0.0000E=01       3.7947E=05         3       0.0000E=01       0.0000E=01       4.3638E=06         4       6.5959E=12       0.0156E=07       2.9353E=03         5       2.8262E=03       1.2921E       02       2.6261E=07         6       1.5513E=05       7.6925E=01       2.1729E=12         7       1.5041E=05       6.8767E=01       0.0000E=01         8       9.4512E=07       4.3211E=02       0.0000E=01         9       0.0000E=01       0.0000E=01	
1       2.8650E-10       1.3099E-05       6.8970E-04         2       0.000E-01       0.0000E-01       3.7947E-05         3       0.000E-01       0.0000E-01       4.3638E-06         4       6.5959E-12       0.0156E-07       2.9353E-03         5       2.8262E-03       1.2921E       02       2.6261E-07         6       1.5513E-05       1.0925E-01       2.1729E-12         7       1.5041E-05       6.8767E-01       0.0000E-01         8       9.4512E-07       4.3211E-02       0.0000E-01         9       0.02000E-01       0.0000E-01       0.0000E-01         9       0.02000E-01       0.0000E-01       0.0000E-01	
1       2.6550E-10       1.3099E-05       6.8970E-04         2       0.0000E-01       0.0000E-01       3.7947E-05         3       0.0000E-01       0.0000E-01       4.3638E-06         4       6.5959E-12       0.0156E-07       2.9353E-03         5       2.8262E-03       1.2921E       02       2.6261E-07         6       1.5513E-05       1.0925E-01       2.1729E-12         7       1.5041E-05       6.8707E-01       0.0000E-01         8       9.4512E-07       4.3211E-02       0.0000E-01         9       0.0000E-01       0.0000E-01       0.0000E-01         9       0.0000E-01       0.0000E-01       0.0000E-01         10       0.0000E-01       2.0000E-01       1.53244E-03       7.00623E-01	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
1       2.6550E-10       1.3099E-05       6.8970E-04         2       0.0000E-01       0.0000E-01       3.7947E-05         3       0.0000E-01       0.0000E-01       4.3638L-06         4       6.5959E-12       0.0156E-07       2.9353E-03         5       2.8262E-03       1.2921E       02       2.6261E-07         6       1.5513E-05       1.0925E-01       2.1729E-12         7       1.5041E-05       6.870FE-01       0.0000E-01         8       9.4512E-07       4.3211E-02       0.0000E-01         9       0.0000E-01       0.0000E-01       0.0000E-01         10       0.0000E-01       1.53244E-03       7.00623E       01         12       1.67859E-12       0.0000E-01       0.0000E-01       0.0000E-01	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
1       2.6550E-10       1.3099E-05       6.8970E-04         2       0.0000E-01       0.0000E-01       3.7947E-05         3       0.0000E-01       0.0000E-01       4.3638L-06         4       6.5959E-12       0.0156E-07       2.9353E-03         5       2.8262E-03       1.2921E       02       2.6261E-07         6       1.5513E-05       1.0925E-01       2.1729E-12         7       1.5041E-05       6.870FE-01       0.0000E-01         8       9.4512E-07       4.3211E-02       0.0000E-01         9       0.0000E-01       0.0000E-01       0.0000E-01         10       0.0000E-01       1.53244E-03       7.00623E       01         12       1.67859E-12       0.0000E-01       0.0000E-01       0.0000E-01	
1       2.6550E-10       1.3099E-05       6.8970E-04         2       0.0000E-01       0.0000E-01       3.7947E-05         3       0.0000E-01       0.0000E-01       4.3638L-06         4       6.5959E-12       0.0156E-07       2.9353E-03         5       2.8262E-03       1.2921E       02       2.6261E-07         6       1.5513E-05       1.0925E-01       2.1729E-12         7       1.5041E-05       6.870FE-01       0.0000E-01         8       9.4512E-07       4.3211E-02       0.0000E-01         9       0.0000E-01       0.0000E-01       0.0000E-01         10       0.0000E-01       1.53244E-03       7.00623E       01         12       1.67859E-12       0.0000E-01       0.0000E-01       0.0000E-01	
1       2.6550E-10       1.3099E-05       6.8970E-04         2       0.0000E-01       0.0000E-01       3.7947E-05         3       0.0000E-01       0.0000E-01       4.3638L-06         4       6.5959E-12       0.0156E-07       2.9353E-03         5       2.8262E-03       1.2921E       02       2.6261E-07         6       1.5513E-05       1.0925E-01       2.1729E-12         7       1.5041E-05       6.870FE-01       0.0000E-01         8       9.4512E-07       4.3211E-02       0.0000E-01         9       0.0000E-01       0.0000E-01       0.0000E-01         10       0.0000E-01       1.53244E-03       7.00623E       01         12       1.67859E-12       0.0000E-01       0.0000E-01       0.0000E-01	
1       2.8650E-10       1.3099E-05       6.8970E-04         2       0.0000E-01       0.0000E-01       3.7947E-05         3       0.0000E-01       0.0000E-01       4.3638E-06         4       6.5959E-12       0.0156E-07       2.9353E-03         5       2.8262E-03       1.2921E       02       2.6261E-07         6       1.5513E-05       7.0925E-01       2.1729E-12         7       1.5041E-05       6.8767E-01       0.0000E-01         8       9.4512E-07       4.3211E-02       0.0000E-01         9       0.0000E-01       0.0000E-01       0.0000E-01         10       0.0000E-01       1.53244E-03       7.00623E       01         12       1.67859E-12       0.0000E-01       0.0000E-01       0.0000E-01	
1       2.6650E=10       1.3099E=05       6.8970E=04         2       0.0000E=01       0.0000E=01       3.7947E=05         3       0.0000E=01       0.0000E=01       4.3638E=06         4       6.5959E=12       >.0156E=07       2.9353E=03         5       2.8262E=03       1.2921E       02       2.6261E=07         6       1.5513E=05       7.0925E=01       2.1729E=12         7       1.5041E=05       6.8767E=01       0.0000E=01         8       9.4512E=07       4.3211E=02       0.0000E=01         9       0.0000E=01       0.0000E=01       0.0000E=01         10       0.0000E=01       1.60000E=01       1.53244E=03       7.00623E=01         11       1.53244E=03       7.00623E=01       1.12       1.67359E=12       0.0000E=01	
1       2.6650E=10       1.3099E=05       6.8970E=04         2       0.0000E=01       0.0000E=01       3.7947E=05         3       0.0000E=01       0.0000E=01       4.3638E=06         4       6.5959E=12       >.0156E=07       2.9353E=03         5       2.8262E=03       1.2921E       02       2.6261E=07         6       1.5513E=05       7.0925E=01       2.1729E=12         7       1.5041E=05       6.8767E=01       0.0000E=01         8       9.4512E=07       4.3211E=02       0.0000E=01         9       0.0000E=01       0.0000E=01       0.0000E=01         10       0.0000E=01       1.60000E=01       1.53244E=03       7.00623E=01         11       1.53244E=03       7.00623E=01       1.12       1.67359E=12       0.0000E=01	
1       2.6650E=10       1.3099E=05       6.8970E=04         2       0.0000E=01       0.0000E=01       3.7947E=05         3       0.0000E=01       0.0000E=01       4.3638E=06         4       6.5959E=12       >.0156E=07       2.9353E=03         5       2.8262E=03       1.2921E       02       2.6261E=07         6       1.5513E=05       7.0925E=01       2.1729E=12         7       1.5041E=05       6.8767E=01       0.0000E=01         8       9.4512E=07       4.3211E=02       0.0000E=01         9       0.0000E=01       0.0000E=01       0.0000E=01         10       0.0000E=01       1.60000E=01       1.53244E=03       7.00623E=01         11       1.53244E=03       7.00602E=01       1.1       1.67859E=12       0.0000E=01	
1 2.6650E-10 1.3099E-05 6.6970E-04 2 0.0000E-01 0.0000E-01 3.7947E-05 3 0.000E-01 0.0000E-01 4.3568E-06 4 6.5959E-12 2.0156E-07 2.9353E-03 5 2.8262E-03 1.2221E 02 2.0261E-07 6 1.5513E-05 7.0025E-01 2.1729E-12 7 1.5041E-05 6.6767E-01 0.0000E-01 8 9.4512E-07 4.3211E-02 0.0000E-01 9 0.0200E-01 D.0.0000E-01 10 0.0000E-01 D.0.000E-01 11 1.53244E-03 7.0062E-01 11 1.53244E-03 7.0002E-01 13 9.97549E-15 4.56075E-10	
1 2.6505=10 1.3099E=05 6.8970E=04 2 0.4000E=01 0.4004E=01 3.7947E=05 3 0.400E=01 0.4004E=01 4.3538E=06 4 6.5957E=12 3.4054E=07 2.9353E=03 5 2.8262E=03 1.2921E=02 2.4264E=07 6 1.5513E=05 7.40925E=01 2.1729E=12 7 1.5041E=05 6.8707E=01 0.0000E=01 8 9.4512E=07 4.3211E=02 0.4000E=01 9 0.0000E=01 0.4000E=01 10 0.04000E=01 0.4000E=01 11 1.53246E=03 7.04633E=01 12 1.67959E=12 0.0000E=01 13 9.97549E=15 4.56075E=10	N

SYSTEM 4 820 TO 1110 DEG K	
EACTOR POSITION 1.10110E 02EE	EL
EMPERTURE 999.48DEGREE-K MOLA	AR FLUW RATE 2.01203E 02POUND MOLES PER HOUR
ONVERSION OF ETHANE	IN ETHYLENE IS 0.92% UCITY 2.6822E 02FEET/SFC.
RESSURE IS 5.5763BE DU VEL	UCITY 2.6822E 02FEET/SEC.
TERATION NUMBER- 7	
0_CONCENTRATION	DXA 1.0684E-03
2 0.0000E-01 0.0000E-01	5.3956E-05
<b>3</b> 0.0000E-01 0.0000E-01	<u>6.5221E-06</u>
4 2.5192E-11 1.188/E-06	4.0501E+03
5 2.7296E-03 1.2872E 02	5.5833E-07
6 2:5297E-05 1.1929E 00	9.17021-12
7 2.4530E-05 1.1591E 00	0.0008-01
B 1.4362E-06 6.7729E-02	U.UCOOE-01
9 0.0000E-01 0.00000E-01	
0 0.00000E-01 0.00000E-01	
1.48576E-03 7.00640E 01	
2 6.10983E-12 · 0.00000E-01	
3 4.43051E-14 2.08930E-09	
FACTOR PUSITION 1.28128E 02FE	
EMPERTURE 1008.050EURLE-K MOLA	AR FLUW RATE 2.01916E 02POUND MULES PER HOUR
**	
DAVERSION OF ETHANS	TO ETHYLENE IS 1.46%
RESSURE IS 5.48035E OO VEL	UCITY 2.7624E 02FEET/SEC.
TERATION NUMBER- 8	
TERATION NUMBER- 8 D CONCENTRATION TMPH	1XA 1 (7225-01
TERATION         NUMBER-         8           D         CONCENTRATION         TMPH           1         1.7934E-09         0.7081E-05	1.4723E-03
TERATION         NUMBER-         8           D         CÓNCENTRATION         TMPH           1         1.7934E-09         8.7081E-05           2         0.0000E-01         0.0000E-01	1.4723E-03 6.9730E-05
TERATION NUMBER-         8           D CONCENTRATION         TMPH           1         1.7934E-09         3.7081E-05           2         0.3000E-01         0.3000E-01           3         0.3000E-01         0.3000E-01	1.4723E-03 6.9730E-05 8.7733E-06
TERATION NUMBER-         8           D CONCENTRATION         TMPH           1         1.7934E-09         3.7081E-05           2         0.3000E-01         0.3000E-01           3         0.3000E-01         0.3000E-01           4         8.1931E-11         3.9806E-06	1.4723E-03 6.9730E-05 8.7733E-06 5.1308E-03
TERATION NUMBER-         8           D CONCENTRATION         TMPH           1         1.7934E-09         3.7081E-05           2         0.0000E-01         0.0000E-01           3         0.0000E-01         0.0000E-01           4         8.1931E-11         3.9806E-06           5         2.6362E-03         1.2800E	1.4723E-03 6.9730E-05 8.7733E-06 5.1308E-03 1.0212E-06
TERATION NUMBER-         8           D. CONCENTRATION         TMPH           1         1.7934E-09         3.7061E-05           2         0.0000E-01         0.0000E-01           3         0.0000E-01         0.0000E-01           4         8.1931E-11         3.9806E-06           5         2.6362E-03         1.2800E-02           6         3.9120E-05         1.8995E-00           7         3.8084E-05         1.8492E-00	1.4723E-03 6.9730E-05 8.7733E-06 5.1308E-03 1.0212E-06 3.2538E-11 0.(000E-01
TERATION         NUMBER-8           D. CONCENTRATION         TMPH           1         1.7934E-09         3.7061E-05           2         0.0000E-01         0.0000E-01           3         0.0000E-01         0.0000E-01           4         8.1931E-11         3.9806E-06           5         2.6362E-03         1.2800F           6         3.9120E-05         1.8995E         00           7         3.8084E-05         1.8492E         00           8         2.0801E-06         1.000E-01	1.4723E-03 6.9730E-05 8.7733E-06 5.1308E-03 1.0212E-06 3.2538E-11
TERATION NUMBER-         8           D CONCENTRATION         TMPH           1         1.7934E-09         3.7081E-05           2         0.0000E-01         0.0000E-01           3         0.0000E-01         0.0000E-01           4         8.1931E-11         3.9806E-06           5         2.6362E-03         1.2800E-02           6         3.9120E-05         1.8995E-00           7         3.8084E-05         1.8492E-00           8         2.0801E-06         1.000E-01           9         0.0000E-01         9.0000E-01	1.4723E-03 6.9730E-05 8.7733E-06 5.1308E-03 1.0212E-06 3.2538E-11 0.(000E-01
TERATION NUMBER-         8           D CONCENTRATION         TMPH           1         1.7934E-09         3.7081E-05           2         0.0000E-01         0.0000E-01           3         0.0000E-01         0.0000E-01           4         8.1931E-11         3.9806E-06           5         2.6362E-03         1.2800E           6         3.9120E-05         1.8995E           7         3.8084E-05         1.8492E           8         2.0801E-06         1.0100E-01           9         0.0000E-01         0.0000E-01	1.4723E-03 6.9730E-05 8.7733E-06 5.1308E-03 1.0212E-06 3.2538E-11 0.(000E-01
TERATION NUMBER-         8           D CONCENTRATION         TMPH           1         1.7934E-09         3.7081E-05           2         0.0000E-01         0.0000E-01           3         0.0000E-01         0.0000E-01           4         8.1931E-11         3.9806E-06           5         2.6362E-03         1.2800E           6         3.9120E-05         1.8995E           7         3.8084E-05         1.8492E           8         2.0801E-06         1.0100E-01           9         0.0000E-01         0.0000E-01           0         0.0000E-01         0.0000E-01           1         1.44302E-03         7.00665E	1.4723E-03 6.9730E-05 8.7733E-06 5.1308E-03 1.0212E-06 3.2538E-11 0.(000E-01
TERATION NUMBER-         8           D CONCENTRATION         TMPH           1         1.7934E-09         3.7081E-05           2         0.0000E-01         0.0000E-01           3         0.0000E-01         0.0000E-01           4         8.1931E-11         3.9806E-06           5         2.6362E-03         1.2800E-02           6         3.9120E-05         1.8995E-00           7         3.8084E-05         1.8492E-00           8         2.9801E-06         1.000E-01           9         0.0000E-01         0.0000E-01           0         0.0000E-01         0.0000E-01           1         1.44302E-03         7.00665E-01           2         1.83566E-11         0.0000E-01	1.4723E-03 6.9730E-05 8.7733E-06 5.1308E-03 1.0212E-06 3.2538E-11 0.(000E-01
TERATION NUMBER-         8           D CONCENTRATION         TMPH           1         1.7934E-09         3.7081E-05           2         0.0000E-01         0.0000E-01           3         0.0000E-01         0.0000E-01           4         8.1931E-11         3.9806E-06           5         2.6362E-03         1.2800E           6         3.9120E-05         1.8995E           7         3.8084E-05         1.8492E           8         2.0801E-06         1.0100E-01           9         0.0000E-01         0.0000E-01           0         0.0000E-01         0.0000E-01           1         1.44302E-03         7.00665E	1.4723E-03 6.9730E-05 8.7733E-06 5.1308E-03 1.0212E-06 3.2538E-11 0.(000E-01
TERATION NUMBER-         8           D CONCENTRATION         TMPH           1         1.7934E-09         3.7081E-05           2         0.0000E-01         0.0000E-01           3         0.0000E-01         0.0000E-01           4         8.1931E-11         3.9806E-06           5         2.6362E-03         1.2800E-02           6         3.9120E-05         1.8995E-00           7         3.8084E-05         1.8492E-00           8         2.9801E-06         1.000E-01           9         0.0000E-01         0.0000E-01           0         0.0000E-01         0.0000E-01           1         1.44302E-03         7.00665E-01           2         1.83566E-11         0.0000E-01	1.4723E-03 6.9730E-05 8.7733E-06 5.1308E-03 1.0212E-06 3.2538E-11 0.(000E-01
TERATION NUMBER-         8           D CONCENTRATION         TMPH           1         1.7934E-09         3.7081E-05           2         0.0000E-01         0.0000E-01           3         0.0000E-01         0.0000E-01           4         8.1931E-11         3.9806E-06           5         2.6362E-03         1.2800E-02           6         3.9120E-05         1.8995E-00           7         3.8084E-05         1.8492E-00           8         2.9801E-06         1.000E-01           9         0.0000E-01         0.0000E-01           0         0.0000E-01         0.0000E-01           1         1.44302E-03         7.00665E-01           2         1.83566E-11         0.0000E-01	1.4723E-03 6.9730E-05 8.7733E-06 5.1308E-03 1.0212E-06 3.2538E-11 0.(000E-01
TERATION NUMBER-       8         D. CONCENTRATION       TMPH         1       1.7934E-09       3.7081E-05         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       8.1931E-11       3.9806E-06         5       2.6362E-03       1.2800E-02         6       3.9120E-05       1.8995E-00         7       3.8084E-05       1.8492E-00         8       2.9801E-06       1.0100E-01         9       0.0000E-01       0.0000E-01         0       0.0000E-01       0.0000E-01         1       1.44302E-03       7.00665E-01         2       1.83566E-11       0.0000E-01	1.4723E-03 6.9730E-05 8.7733E-06 5.1308E-03 1.0212E-06 3.2538E-11 0.(000E-01
TERATION NUMBER-       8         D. CONCENTRATION       TMPH         1       1.7934E-09       3.7081E-05         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       8.1931E-11       3.9806E-06         5       2.6362E-03       1.2800E-02         6       3.9120E-05       1.8995E-00         7       3.8084E-05       1.8492E-00         8       2.9801E-06       1.0100E-01         9       0.0000E-01       0.0000E-01         0       0.0000E-01       0.0000E-01         1       1.44302E-03       7.00665E-01         2       1.83566E-11       0.0000E-01	1.4723E-03 6.9730E-05 8.7733E-06 5.1308E-03 1.0212E-06 3.2538E-11 0.(000E-01
TERATION NUMBER-       8         D. CONCENTRATION       TMPH         1       1.7934E-09       3.7081E-05         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       8.1931E-11       3.9806E-06         5       2.6362E-03       1.2800E-02         6       3.9120E-05       1.8995E-00         7       3.8084E-05       1.8492E-00         8       2.9801E-06       1.0100E-01         9       0.0000E-01       0.0000E-01         0       0.0000E-01       0.0000E-01         1       1.44302E-03       7.00665E-01         2       1.83566E-11       0.0000E-01	1.4723E-03 6.9730E-05 8.7733E-06 5.1308E-03 1.0212E-06 3.2538E-11 0.(000E-01
TERATION NUMBER-       8         D. CONCENTRATION       TMPH         1       1.7934E-09       3.7081E-05         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       8.1931E-11       3.9806E-06         5       2.6362E-03       1.2800E-02         6       3.9120E-05       1.8995E-00         7       3.8084E-05       1.8492E-00         8       2.9801E-06       1.0100E-01         9       0.0000E-01       0.0000E-01         0       0.0000E-01       0.0000E-01         1       1.44302E-03       7.00665E-01         2       1.83566E-11       0.0000E-01	1.4723E-03 6.9730E-05 8.7733E-06 5.1308E-03 1.0212E-06 3.2538E-11 0.(000E-01
TERATION NUMBER-       8         D. CONCENTRATION       TMPH         1       1.7934E-09       3.7081E-05         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       8.1931E-11       3.9806E-06         5       2.6362E-03       1.2800E-02         6       3.9120E-05       1.8995E-00         7       3.8084E-05       1.8492E-00         8       2.9801E-06       1.0100E-01         9       0.0000E-01       0.0000E-01         0       0.0000E-01       0.0000E-01         1       1.44302E-03       7.00665E-01         2       1.83566E-11       0.0000E-01	1.4723E-03 6.9730E-05 8.7733E-06 5.1308E-03 1.0212E-06 3.2538E-11 0.(000E-01
TERATION NUMBER-       8         D. CONCENTRATION       TMPH         1       1.7934E-09       3.7081E-05         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       8.1931E-11       3.9806E-06         5       2.6362E-03       1.2800E-02         6       3.9120E-05       1.8995E-00         7       3.8084E-05       1.8492E-00         8       2.9801E-06       1.0100E-01         9       0.0000E-01       0.0000E-01         0       0.0000E-01       0.0000E-01         1       1.44302E-03       7.00665E-01         2       1.83566E-11       0.0000E-01	1.4723E-03 6.9730E-05 8.7733E-06 5.1308E-03 1.0212E-06 3.2538E-11 0.(000E-01
TERATION NUMBER-       8         D. CONCENTRATION       TMPH         1       1.7934E-09       3.7081E-05         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       8.1931E-11       3.9806E-06         5       2.6362E-03       1.2800E-02         6       3.9120E-05       1.8995E-00         7       3.8084E-05       1.8492E-00         8       2.9801E-06       1.0100E-01         9       0.0000E-01       0.0000E-01         0       0.0000E-01       0.0000E-01         1       1.44302E-03       7.00665E-01         2       1.83566E-11       0.0000E-01	1.4723E-03 6.9730E-05 8.7733E-06 5.1308E-03 1.0212E-06 3.2538E-11 0.(000E-01
TERATION NUMBER-       8         D. CONCENTRATION       TMPH         1       1.7934E-09       3.7081E-05         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       8.1931E-11       3.9806E-06         5       2.6362E-03       1.2800E-02         6       3.9120E-05       1.8995E-00         7       3.8084E-05       1.8492E-00         8       2.9801E-06       1.0100E-01         9       0.0000E-01       0.0000E-01         0       0.0000E-01       0.0000E-01         1       1.44302E-03       7.00665E-01         2       1.83566E-11       0.0000E-01	1.4723E-03 6.9730E-05 8.7733E-06 5.1308E-03 1.0212E-06 3.2538E-11 0.(000E-01
TERATION NUMBER-       8         D. CONCENTRATION       TMPH         1       1.7934E-09       3.7081E-05         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       8.1931E-11       3.9806E-06         5       2.6362E-03       1.2800E-02         6       3.9120E-05       1.8995E-00         7       3.8084E-05       1.8492E-00         8       2.9801E-06       1.0100E-01         9       0.0000E-01       0.0000E-01         0       0.0000E-01       0.0000E-01         1       1.44302E-03       7.00665E-01         2       1.83566E-11       0.0000E-01	1.4723E-03 6.9730E-05 8.7733E-06 5.1308E-03 1.0212E-06 3.2538E-11 0.(000E-01
TERATION NUMBER-       8         D. CONCENTRATION       TMPH         1       1.7934E-09       3.7081E-05         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       8.1931E-11       3.9806E-06         5       2.6362E-03       1.2800E-02         6       3.9120E-05       1.8995E-00         7       3.8084E-05       1.8492E-00         8       2.9801E-06       1.0100E-01         9       0.0000E-01       0.0000E-01         0       0.0000E-01       0.0000E-01         1       1.44302E-03       7.00665E-01         2       1.83566E-11       0.0000E-01	1.4723E-03 6.9730E-05 8.7733E-06 5.1308E-03 1.0212E-06 3.2538E-11 0.(000E-01
TERATION NUMBER-       8         D. CONCENTRATION       TMPH         1       1.7934E-09       3.7081E-05         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       8.1931E-11       3.9806E-06         5       2.6362E-03       1.2800E-02         6       3.9120E-05       1.8995E-00         7       3.8084E-05       1.8492E-00         8       2.9801E-06       1.0100E-01         9       0.0000E-01       0.0000E-01         0       0.0000E-01       0.0000E-01         1       1.44302E-03       7.00665E-01         2       1.83566E-11       0.0000E-01	1.4723E-03 6.9730E-05 8.7733E-06 5.1308E-03 1.0212E-06 3.2538E-11 0.(000E-01
TERATION NUMBER-       8         D. CONCENTRATION       TMPH         1       1.7934E-09       3.7081E-05         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       8.1931E-11       3.9806E-06         5       2.6362E-03       1.2800E-02         6       3.9120E-05       1.8995E-00         7       3.8084E-05       1.8492E-00         8       2.9801E-06       1.0100E-01         9       0.0000E-01       0.0000E-01         0       0.0000E-01       0.0000E-01         1       1.44302E-03       7.00665E-01         2       1.83566E-11       0.0000E-01	1.4723E-03 6.9730E-05 8.7733E-06 5.1308E-03 1.0212E-06 3.2538E-11 0.000E-01 0.0000E-01 0.0000E-01

SYSTEM_4_820_TU_1110_DEG_K						·
REACTOR POSITION 1.44144E 02E	EET.				······································	
TEMPERTURE 1014.05DEGREE-K MOL	AR FLOW RATE	2.02803E 02PUUNA M	OLES PER HOUR			
CONVERSION OF ETHANE		15 2.	1.4 %			,
PRESSURE IS 5.3850BE DO VE		12 <u>1</u> 2 <u>1</u>	14%			
ITERATION NUMBER- 9	4.047				· · · · · · · · · · · · · · · · · · ·	
NO CONCENTRATION TAPH	0XA					
1 3.6310E-09 1.8124E-04						
2 0.0000E-01 0.0000E-01				······································		
30.0000E-010.0000E-01	1.0687E-05	·				
42.1354E-101.0659E-05_	5.9965E-03					
52.5455E-032.271GE_02_	1.5695E-06					
	<u>5.4914E-11</u>					
7 5.42558-05 Z.7097E 00	0.00000-01					
	0.0000E-01			· · · · · · · · · · · · · · · · · · ·		
9 0.0000E-01 0.0000E-01 0 0.0000E-01 0.0000E-01			· · · · · · · · · · · · · · · · · · ·			
-1 - 1.42381E = 03 - 7.00697E - 01						
2 4.34272E-11 - ).00000E-01			· · · · · · · · · · · · · · · · · · ·			
3 5.14555E-13 2.56834E-08						
EACTOR POSITION 1.60160E 02E	EET					
EMPERTURE 1020.020EGREE-K HOL	AR FLOW RATE	.03892E O2POUND M	ULES PER HOUR			
ONVERSION OF ETHANE	TO ETHYLENE	15 2.	97%		······································	
RESSURE IS 5.29087E 00 VE	LOCITY 2.924	VE 02FFET/SEC.				
TERATION HUMBER- 10						
TERATION NUMBER- 10 D. CUNCENTRATION INPH	DXA					
TERATION         DURBER- 10           D_CUNCENTRATIUN         THRH           1         6.63395-09         3.4073E-04	DXA					
TERATION_BURBER10           D_CUNCENTRATIUM	DXA 2.2509E-03 9./637E-05					
TERATION_BURGER=_10           D_CUNCENTRATIUM         TRRH           16.6339E=09         3.4073E=04           20.0000E=01         0.0000E=01           30.0000E=01         0.0000E=01	DXA 2.2509E-03 9.7637E-05 1.7950E-05		·			
TERATION_NUMBER10           D_CUNCENTRATIUN         TERH           1663396-09         3.4073E-04           20.0000E-01         0.0000E-01           30.0000E-01         0.0000E-01           4.7464L-10         2.4378E-05	DXA 2.2509E-03 9.7637E-05 1.7950E-05 6.9768E-03					
TERATION         AUKBER- 10           D_CUNCENTRATIUM         TRRH           1         0.63395-09         3.4073E-04           2         0.0000E-01         0.0000E-01           3         0.0000E-01         0.0000E-01           4.7464L-10         2.4378E-05           5         2.4533E-03         1.2601E	DXA 2.2509E-03 9.7637E-05 1.7950E-05 6.9768E-03 2.2386E-06		· · · · · · · · · · · · · · · · · · ·			
TERATION         AUKBER-         10           D_CUNCENTRATIUM         TRRH           1         6.63396-09         3.4073E-04           2         0.0000E-01         0.0000E-01           3         0.0000E-01         0.0000E-01           4.7464L-10         2.4378E-05           5         2.4533E-03         1.2601E           6         7.5113E-05         3.6579E         00	DXA 2.2509E-03 9.7637E-05 1.7950E-05 6.9768E-03 2.2386E-06 1.9654E-10					
TERATION         AUKBER- 10           D_CUNCENTRATIUM         TRRH           1         0.63395-09         3.4073E-04           2         0.0000E-01         0.0000E-01           3         0.0000E-01         0.0000E-01           4.7464L-10         2.4378E-05           5         2.4533E-03         1.2601E           6         7.5113E-05         3.6579E         00           7         7.3306E-05         3.7651E         00	DXA 2.2509E-03 9.7637E-05 1.7950E-05 6.9768E-03 2.2386E-06					
TERATION AUKBER- 10         Q-CUNCENTRATIUM       TKRH         1       0.63396-09       3.4073E-04         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       7464L-10       2.4378E-05         5       2.45336-03       1.2601E       02         6       7.5113E-05       3.6579E       00         7       7.3306E-05       3.7651E       02	DXA 2.2509E-03 9.7637E-05 1.7950E-05 6.9768E-03 2.2386E-06 1.9654E-10 0.0000E-01					
TERATION AURBER- 10         D_CUNCENTRATIUM         1       0.6339E-09         3.4073E-04         2       0.0000E-01         3       0.0000E-01         4.7464E-10       2.4378E-05         5       2.4533E-03         1.2601E       02         6       7.5113E-05         3.6579E       00         7       7.3306E-05         3.6428E-06       1.6710E-01         9       0.0000E-01         0.0000E-01       0.0000E-01	DXA 2.2509E-03 9.7637E-05 1.7950E-05 6.9768E-03 2.2386E-06 1.9654E-10 0.0000E-01					
TERATION AURBER- 10         D_CUNCENTRATIUM         1       0.63392-09         3.4073E-04         2       0.0000E-01         3.0000E-01       0.0000E-01         4.7464E-10       2.4378E-05         5       2.4533E-03         6       3.6579E         7       7.3306E-05         3.6428E-06       1.651E         9       0.0000E-01         0.0000E-01       1.0000E-01         1       1.36432E-03	DXA 2.2509E-03 9.7637E-05 1.7950E-05 6.9768E-03 2.2386E-06 1.9654E-10 0.0000E-01					
TERATION AURBER- 10         D_CUNCENTRATIUM       TNRH         1       6.6339E-09       3.4073E-04         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       4.7464E-10       2.4378E-05         5       2.4533E-03       1.2601E         6       7.5113E-05       3.6579E       00         7       7.3306E-05       3.7651E       00         8       3.6428E-06       1.6710E-01       9         9       0.0000E-01       0.0000E-01       1.36432E-03       7.00740E       01         1       1.36432E-03       7.00740E       01       2.42979E-11       0.0000E-01	DXA 2.2509E-03 9.7637E-05 1.7950E-05 6.9768E-03 2.2386E-06 1.9654E-10 0.0000E-01					
TERATION 0006EP.10         D_CUNCENTRATION         1       6.6339E-09         3.4073E-04         2       0.0000E-01         3       0.0000E-01         4.7464L-10       2.4378E-05         5       2.4533E-03         6       7.5113E-05         3.6428E-06       1.6710E-01         9       0.0000E-01         0.0000E-01       2.40378E-05         5       2.4533E-03         1.2601E       02         6       7.5113E-05         3.6428E-06       1.6710E-01         9       0.0000E-01         0.0000E-01       0.0000E-01         1.36432E-03       7.00740E         1       1.36432E-03         9.22979E-11       0.0000E-01	DXA 2.2509E-03 9.7637E-05 1.7950E-05 6.9768E-03 2.2386E-06 1.9654E-10 0.0000E-01					
TERATION 0006ER= 10         D_CUNCENTRATION       TNRH         1       6.6339E-09       3.4073E-04         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       4.7464L-10       2.4378E-05         5       2.4533E-03       1.2601E         6       7.5113E-05       3.6579E       00         7       7.3306E-05       3.7651E       00         8       3.6428E-06       1.6710E-01       9         9       0.0000E-01       0.0000E-01       1.36432E-03       7.00740E       01         1       1.36432E-03       7.00740E       01       2.922979E-11       0.0000E-01	DXA 2.2509E-03 9.7637E-05 1.7950E-05 6.9768E-03 2.2386E-06 1.9654E-10 0.0000E-01					
TERATION 0006EP.10         D_CUNCENTRATION         1       6.6339E-09         3.4073E-04         2       0.0000E-01         3       0.0000E-01         4.7464L-10       2.4378E-05         5       2.4533E-03         6       7.5113E-05         3.6428E-06       1.6710E-01         9       0.0000E-01         0.0000E-01       2.40378E-05         5       2.4533E-03         1.2601E       02         6       7.5113E-05         3.6428E-06       1.6710E-01         9       0.0000E-01         0.0000E-01       0.0000E-01         1.36432E-03       7.00740E         1       1.36432E-03         9.22979E-11       0.0000E-01	DXA 2.2509E-03 9.7637E-05 1.7950E-05 6.9768E-03 2.2386E-06 1.9654E-10 0.0000E-01					
TERATION 0006EP.10         D_CUNCENTRATION         1       6.6339E-09         3.4073E-04         2       0.0000E-01         3       0.0000E-01         4.7464L-10       2.4378E-05         5       2.4533E-03         6       7.5113E-05         3.6428E-06       1.6710E-01         9       0.0000E-01         0.0000E-01       2.40378E-05         5       2.4533E-03         1.2601E       02         6       7.5113E-05         3.6428E-06       1.6710E-01         9       0.0000E-01         0.0000E-01       0.0000E-01         1.36432E-03       7.00740E         1       1.36432E-03         9.22979E-11       0.0000E-01	DXA 2.2509E-03 9.7637E-05 1.7950E-05 6.9768E-03 2.2386E-06 1.9654E-10 0.0000E-01					
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TERATION_HUMBER=10         D_CUNCENTRATIONTNRH         16.6339E=093.4073E=04         20.000E=010.0000E=01         30.000E=010.0000E=01         44.7464L=102.4378E=05         52.4533E=031.2601E_02         67.5113E=053.6579E_00         77.3306E=053.7651E_02         83.6428E=061.6710E=01         90.0000E=010.0000E=01         00.0000E=010.0000E=01         136432E=037.00740E=01         29.22979E=110.0000E=01	DXA 2.2509E-03 9.7637E-05 1.7950E-05 6.9768E-03 2.2386E-06 1.9654E-10 0.0000E-01					
TERATION_MUMBER=10         D_CUNCENTRATION	DXA 2.2509E-03 9.7637E-05 1.7950E-05 6.9768E-03 2.2386E-06 1.9654E-10 0.0000E-01					
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TERATION AURBER- 10         D_CUNCENTRATIUM       TNRH         1       6.6339E-09       3.4073E-04         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       4.7464E-10       2.4378E-05         5       2.4533E-03       1.2601E         6       7.5113E-05       3.6579E       00         7       7.3306E-05       3.7651E       00         8       3.6428E-06       1.6710E-01       9         9       0.0000E-01       0.0000E-01       1.36432E-03       7.00740E       01         1       1.36432E-03       7.00740E       01       2.42979E-11       0.0000E-01	DXA 2.2509E-03 9.7637E-05 1.7950E-05 6.9768E-03 2.2386E-06 1.9654E-10 0.0000E-01					
TERATION 0006ER= 10         D_CUNCENTRATION       TNRH         1       6.6339E-09       3.4073E-04         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       4.7464L-10       2.4378E-05         5       2.4533E-03       1.2601E         6       7.5113E-05       3.6579E       00         7       7.3306E-05       3.7651E       00         8       3.6428E-06       1.6710E-01       9         9       0.0000E-01       0.0000E-01       1.36432E-03       7.00740E       01         1       1.36432E-03       7.00740E       01       2.922979E-11       0.0000E-01	DXA 2.2509E-03 9.7637E-05 1.7950E-05 6.9768E-03 2.2386E-06 1.9654E-10 0.0000E-01					
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TERATION AURBER- 10         D_CUNCENTRATIUM       TNRH         1       6.6339E-09       3.4073E-04         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       4.7464E-10       2.4378E-05         5       2.4533E-03       1.2601E         6       7.5113E-05       3.6579E       00         7       7.3306E-05       3.7651E       00         8       3.6428E-06       1.6710E-01       9         9       0.0000E-01       0.0000E-01       1.36432E-03       7.00740E       01         1       1.36432E-03       7.00740E       01       2.42979E-11       0.0000E-01	DXA 2.2509E-03 9.7637E-05 1.7950E-05 6.9768E-03 2.2386E-06 1.9654E-10 0.0000E-01					
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SYSTEM 4 920 TIL 1110 DEC K	
REACTOR PUSITION 1.76176E 02FEET	
TEMPERTURE 1022.02DEGREE-K NOLAR FLUW RATE 2.05093E 02POUND MOLES PER HOUR	
CONVERSION OF ETHANE TO ETHYLENE IS 3.89%	
CONVERSION OF ETHANE TO ETHYLENE IS 3.89%	۔ ان ان ا
PRESSURE IS 5.1954/F_00	
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<u>1 1.0851E-08 5.7239E-04 2.3724E-03</u>	
2 0.000E-01 0.0000E-01 1.0143E-04	
3 0.0000E-01 0.0000E-01 1.3570E-05	
<u>4 9.0445E-10 4.7656E-05 7.2127E-03</u>	HTTP://www.international.com/actional.com/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/action/
5 2.36B0E-03 1.24B0E 02 2.5838E-06	
<u>6 9:5789E-05 5.0483E 00 3.5991E-10</u>	
7 9.3564E-05 4.9310E 00 0.000E-01	
<u>8 4.5007E-06 2.3720E-01 0.0000E-01</u>	
9 0.00000F-01 0.0000F-01	
10 0.00000F-01 0.00000E-01	
11 1.32971E-03 7.00786E 01	
<u>12 1.56193E-10 · 0.00000E-01</u>	
13 2.85330E-12 1.50375E-07	1
REACTOR POSITION +.92192E OZFEET	
TEMPERTURE 1024.02DFGREE-K KOLAR FLOW RATE 2.06346E 02POUND MOLES PER HOUR	
CONVERSION OF ETHANF TO ETHYLENE IS 4.84%	
CONVERSION OF ETHAUF TO ETHYLENE IS 4.84% PRESSURE IS 5.09670E 00 VELUCITY 3.0861E 02FEET/SEC.	
ITERATION NUMBER- 12	
NO CONCENTRATION THPH DXA	
1 1.6171E-08 8.7549E+04 2.4990E+03	
2 0.0000E - 01 0.0000E - 01 1.0531E - 04	
<u>- 3 0.0005E-01 0.0005E-01 1.4212E-05</u>	
4 1.5077E-09 0.1627E-05 7.4527E-03	
5 2.2818E-03 1.2354E 02 3.0370E-06	
6 1.1618E-04 6.2901E 00 5.7657E-10	·
7 1.1356E-04 6.147RE 00 0.000E-01	
<u>8 5.3332F-06 2.6873F-01 0.0000E-01</u>	
9 0.00000F-01 3.00000F-01	
10 0.00000E-01 0.00000E-01	· · · · · · · · · · · · · · · · · · ·
11 1.29452E-03 7.00836E 01	•
12 2.40294E=10 0.00000E=01	
13 5-31767E-12 2-87892E-07	
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REACTOR PUSITION	2.08206E 02E1	<u>FET</u>				· · · · · · · · · · · · · · · · · · ·		
TEMPERIURE 1027.05	DEGREE-K HOL/	AR FLEW RATE	2.07673E 02POUND '	ADLES PER HOUR				
		·····		an a	4-14-84 P. Newsona			
CONVERSION OF ETHA PRESSURE IS 4.99	NE.	<u> </u>	15 5.	.95%	······································			
PRESSURE 15 4.99	509E_00VEI							
ITERATION NUMBER-	Тырн	υχα						
NO CUNCENTRATION	1.2629E-03	2,73445-03						
1 2.2656E-08 2 0.0000E-01	0.6000E-01	1.12756-04					······································	
2 0.0000E-01 3 0.0000E-01	2.0000E-01	1.5415E-05						
	1.2791E-04	7 92175-03						- and the second s
<u>5</u> 2.1923E-03		3.4112E-06						
<u>6 1.3640E-04</u>								and a second
7 1.3338E-04	7 6360E 60	0.000 = 01						
	3.4230E-01							
	0.00000E-01		· · · · · · · · · · · · · · · · · · ·					
10.00000E-01								
<u>11</u> .25738E=03								ant of the second second second second second second
<u>12</u> <u>3.57845E-10</u>		······································			•			
<u>13</u> 8.96314E-12	. 2.000000E-01							
REACTOR POSITION	1 2422/E COEL				,	a a construction de la construcción		· · · · · · · · · · · · · · · · · · ·
TEMPERIURE 1031.06	-4+444444 UAFE Religice_v - Mont		2 09153E 02POUND 4	INTES PER HOUR		······································		
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CONVERSION DE ETHA	NF.	ID ETHYLENE	15 6.	98%	3			
PRESSURE IS 4.89	112E 00 VEL	ICITY 3.2860	DE 02FFET/SEC.				• • • • • • • • • • • • • • • • • • •	
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	Тмрн	UXA						
<u>13.0832E-08</u>	1.7739E-03	3.0955E-03						
2 0.000E-01	0.0000E-01	1.24055-04						
	0.0000E-01	1.7254E-05		•		•		
4 3.3176F-09	1.9088E-04	8.6332E-03						
5 2.09826-03	1.2072E 02 .	3.8663E-06						
6 1.5759E-04	9.0669E 00_	1.3722E-09						
7 1.5419E-04	8.E710E_00	0.0000E-01						
<u>8 6.9599E-u6</u>	4.0043E-01	0.0000E-01					·	
9 0.0000E-01	0.0000E-01							
10 0.00000F-01	0.00000E-01		······································					
11 1.218345-03	7.00956E 01						·	
<u>125.30691E-10</u>	0.0000E-01			······				
13 1.44086E-11	8.20934E-07			······································				
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	CIUK PUSILIUN	2.40240E 02F	AK FLUW RATE		15 MOLES 510 1	10110		·	
	WERLORE 1032.1	JOUEGREE-K MUL	AK FLUK KATE						· · · · · · · · · · · · · · · · · · ·
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NO	CUNCENTRALIUM	ТИРН	<u>DXA</u>						
	4.1021E-08	2.4401E-03	3.4934E-03						
	0.0000E-01	U.0000E-01	1.3609E-04	······································			-		
	0.0000E-01	0.0000E-01	1.9252E-05						
	4.6180E-09 2.0016E-03	2.7470E-04 1.1906E 02	9.3818E-03 4.3252E-06	······································	4				
6	1:7985E-04	L.0693E 01	2.0756E-09						1999 (1997) - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 19
. 7	1.7606E-04	1.0473E 01	0.00006-01						······
8	7,7912E-06	4.6344E-01	0.00008-01						
9	0.000008-01	0.00000E-01		•					
10	0.00000E-31	0.00000E-01							
	1.17855E-03	7.01039E 01	······		···				
12		• 0.00000E-01							
13_	2.238845-11	1.33173E-06							· · · · · · · · · · · · · · · · · · ·
DEA	CTOR DOCTTION	2.56256E 02F	* (· <b>T</b>						
TEM	DEDTHDE 1020 0	<u>- 7.202261 9251</u>	AR FLUW RATE 2	1 1 2 4 3 7 E 0 3 D D H	MITLE DED U	11110			
1 [ [ ]	CRIOKE 1037.0	OULOKEC-K MILI	IN FLOW NATE	-12037E 02/00N	U AUGES CEN A				
CON	VERSION OF ETH	ARE	TO ETHYLENE	15	9.63%				
PRE	SSURE IS 4.6	7483E 00 VEI	UCITY 3.531	E O2FEET/SEC.					
ITE	RATICIN NUMBER-	16							
<u>ND</u>	CUNCENTRATION	TMPH	UXA						
	5.3503E-08	3.2965E-03	3.9289E-03						
2_	بغبيت كالمسكر فستجمأ المستهي والأخيطار معظاه مراجعة كالمهم ومعيون والم	<u> </u>	1.48816-04						
· <u> </u>	0.0000E-01	0.0000E-01	2.1410E-05						
4	6.2275E-09 1.9026E-03	<u>3.8370E-04</u> 1.1723E 02	<u>1.0163E-02</u> 4.7718E-06						
6	Z.1/300E-04	1.2508E 01	3.06436-09						
7	1.9862E-04	1.2250E 01	0.00008-01						
. 8	8.62515-06	<u>5.3143E-01</u>	0.00008-01				·····		
9	0.000008-01	0.00000E-01							
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_11_	1.13795E-03	7.01138E 01		·····					·
	1.08406E-09	0.0000E-01			·				
13	3.37619E-11	2.08022E-06		· · · · · · · · · · · · · · · · · · ·					
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SYSTEM 4 820 TO 1110 DEG K	
REACTOR POSITION 2.72271E 02FEET JEMPERTURE 1043.070EVREE-K_MOLAK FLOW RATE2.14660E_02POUND_MULES_PER_HUUR	
TEMPERTURE 1943.07DEGREE-K MULAK FLOW RATE 2.14660E 02POUND MULES PER HUUR	
CONVERSION OF ETHANE TO ETHYLENE 15 11.162	······································
CONVERSION OF ETHANE TO ETHYLEME 1S 11.162 PRESSURE IS 4.56083E OD VELUCITY 3.6751E 02FEET/SEC.	
NO CONCENTRATION TKPH DXA	
1 6.8525E-08 4.3832E-03 4.4019E-03	
<u>2 0.0000E-01 0.0000E-01 1.6214E-04</u>	
<u>4 8.1653E-09 5.2228E-04 1.0971E-02</u>	an ann an an Anna an an Anna an an Anna A
<u>5 1.8012E-03 1.1521E 02 5.1880E-06</u>	
6 2.2675E-04 1.4503E 01 4.4222E-09 7 2.2220E-04 1.4212E 01 0.0000E-01	
<u>8 9.4492E-06 6.0440E-01 0.0007E-01</u>	
9 0.0000E=01 0.0000E=01	
100.0U000E=010.0U000E=01	
111.09635E-037.01254E_01	
12 1.49835E-09 0.00000E-01	
13 4.954596-11 3.16908E-06	
12 4.73439ETIL 3.16908ET00	
REACTUR PDS1T104 2.88267E_02FEET	
TEMPERTURE 1050-16DEGREE-K MOLAR FLUW RATE 2.16989E 02POUND MOLES PER HOUR	
LEAPERTORE 1050.IADEGREE-KMULAR FLUW RATE 2.16989E 02PUOND MULES PLR HOOK	
CONVERSION OF ETHANE     ID     ETHYLENE     IS     12.93%       PRESSURE IS     4.44289E 00     VELUCITY     3.8524E 02FEET/SEC     0	
ITERATION NUMBER- 18	
DO CONCENTRATION THPH DXA	
<u>1 8.7041E-08 5.8119E-03 5.5058E-03</u>	
<u>2 0.0000E-01 0.0000E-01 1.9311E-04</u>	
<u>3 0.0000E-01 0.0000E-01 2.9095E-05</u>	
<u>4 1.6504E+08 7.0141E+04 1.2855E+02</u>	
5 1.69U7E-03 1.1289E 02 0.0656E-06	
<u>6 2.5153E-04 1.6795E 01 6.7468E-09</u>	
7 2.4663E-04 1.6468E 01 0.000E-01	
<u>8 1.0262E-05 6.E524E-01 0.0000E-01</u>	
9 0,0000E-01 0.00000E-01	
10 0.00000E-01 0.00000E-01	
<u>11 1.05945E-03 7.01409E 01</u>	19 - 19 - 19 - 19 - 19 - 19 - 19 - 19 -
12 2.23070E-09 0.00003E-01	
<u>13 7.13155E-11 4.76189E-06</u>	
	-
	Terretaria de la companya de la comp
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	يونانها دارو ارتباد دارونان مونان . ويوانها دارو ارتباد دارونان مونان .

SYSTEM 4 320 TH 1110 DEG K		
REACTOR POSITION 3.04303E 0		
(EACTUS RUSITIUR - 2+042035 0. Remotringt torn, 1906(Reelv - M	AR FLOW RATE 2.20093E 02POUND MOLES PER HOUR	
	AK FEDA RATE - ZIZVUZZE UZ OMBILINGEUZ LEN DOVO	
INVERSION OF ETHANE	IN ETHYLENE IS 15,27%	
RESSURE 15 4.32551E 00 '	LUCITY 4.0804E 02FEET/SEC.	
TERATION NUMBER- 19		
D CUNCENTRATION THPH	DXA	
1 1.1405E-07 0.0015E-03	7.5483E-03	
2 0.0200E-01 0.0000E-01	2.4737E-04	
3 0. 000E+01 0.0000E-01	3.68216-05	
4 1.3771E-08 9.6614E-04	1.6099E-02	
5 1.5654E-03 1.0982E 02	7./433E-06	
$\frac{6}{2} = \frac{23281E - 04}{2} = \frac{1.9841E}{2} = 0$	1,2037E-08	
7 2.7752E-04 1.9470E 01 8 1.1203E-05 7.6592E-01	0.0000E-01 0.0000E-01	
9 0.00000E-01 0.00000E-01	0.0000000	
0 0.00000E-01 0.00000E-01		
1 1.00015E-03 7.01664E 01	· · · · ·	
2 3.66031E-09 - 0.00000E-01		
3 1.07120E-10 7.51509E-06		an a
EACTOR POSITION 3.22219E 02		
EMPERIURE 1070.830FGREE-K MC	AR FLOW RATE 2.24668E 02POUND MOLES PER-HOUR	
· · · · · · · · · · · · · · · · · · ·		
INVERSION OF ETHANE	TO ETHYLENE IS 18,72%	
	LUCITY 4.3538E OZFEET/SEC.	
TERATION NUMBER- 20	LOCITY 4.3538E OZFEET/SEC.	
TERATION HUMBER- 2.1 D. CONCENTRATION TMPH	DXA 4,3538E 02FEET/SEC.	
TERATION UUMBER- 2.1 D. CONCENTRATIUN TMPH 1 1.5784E-07 1.1832E-02	LOCITY         4.3538E         OZFEET/SEC.           DXA	
TERATION         UMBER-2.1           D_CONCENTRATION         TMPH           1	LOCITY         4.3538E         OZFEET/SEC.           DXA	
TERATION         UUMBER-2.1           D_CONCENTRATION         TMPH           1	LOCITY         4.3538E_O2FEET/SEC.           DXA	
TERATION         UUMBER-2.1           D_CONCENTRATION         TMPH           1	LOCITY       4.3538E O2FEET/SEC.         DXA         5.0636E-03         1.5462E-04         2.5317E-05         9.6278E-03         4.7752E-06	
TERATION       NUMBER-20         D. CONCENTRATION       TMPH         1       1.5784E-07       1.1832E-02         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       1.8953E-08       1.4207E-02         5       1.4047E-03       1.0529E-02         6       3.2458E-04       2.4330E-01	LOCITY     4.3538E OZFEET/SEC.       DXA       5.0636E-03       1.5462E-04       2.5317E-05       9.6278E-03	
TERATION     NUMBER-2:       0. CONCENTRATION     TMPH       1. 1.5784E-07     1.1832E-02       2. 0.0002E-01     0.0000E-01       3. 0.0000E-01     0.0000E-01       4. 1.8953E-08     1.4207E-02       5. 1.4047E-03     1.0529E       6. 3.2458E-04     2.4330E       7. 3.1885E-04     2.3901E	U3CITY       4.3538E 02FEET/SEC.         DXA       5.0636E-03         1.5462E-04       2.5317E-05         9.6278E-03       4.7752E-06         5.9065E-09       0.0000E-01	
TERATION     NUMBER-2:       0. CONCENTRATION     TMPH       1. 1.5784E-07     1.1832E-02       2. 0.0000E-01     0.0000E-01       3. 0.0000E-01     0.0000E-01       4. 1.8953E-08     1.4207E-02       5. 1.4047E-03     1.0529E 02       6. 3.2458E-04     2.4330E 01       7. 3.1885E-04     2.3901E 01       8. 1.2335E-05     2.2465E-01	U3CITY       4.3538E 02FEET/SEC.         DXA         5.0636E-03         1.5462E-04         2.5317E-05         9.6278E-03         4.7752E-06         5.9065E-09	
TERATION       NUMBER-2:         D. CONCENTRATION       TMPH         1       1.5784E-07       1.1832E-02         2       0.0000E-01       0.0000E-01         3       0.5000E-01       0.0000E-01         4       1.8953E-08       1.4207E-02         5       1.4047E-03       1.0529E-02         6       3.2458E-04       2.4330E-01         7       3.1885E-04       2.3901E-01         8       1.2335E-05       9.2465E-01         9       0.0000E-01       0.0000E-01	U3CITY       4.3538E 02FEET/SEC.         DXA       5.0636E-03         1.5462E-04       2.5317E-05         9.6278E-03       4.7752E-06         5.9065E-09       0.0000E-01	
TERATION       NUMBER-2:         D. CONCENTRATION       TMPH         1       1.5784E-07       1.1832E-02         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       1.8953E-08       1.4207E-02         5       1.4047E-03       1.0529E       02         6       3.2458E-04       2.4330E       01         7       3.1885E-04       2.3901E       01         8       1.2335E-05       9.2465E-01       9.0000E-01       0.0000E-01         9       0.00000E-01       0.0000E-01       0.0000E-01       0.0000E-01	U3CITY       4.3538E 02FEET/SEC.         DXA       5.0636E-03         1.5462E-04       2.5317E-05         9.6278E-03       4.7752E-06         5.9065E-09       0.0000E-01	
TERATION       NUMBER-2:         D. CONCENTRATION       TMPH         1       1.5784E-07       1.1832E-02         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       1.8953E-08       1.4207E-02         5       1.4047E-03       1.0529E 02         6       3.2458E-04       2.4330E 01         7       3.1885E-04       2.3901E 01         8       1.2335E-05       9.2465E-01         9       0.00000E-01       0.00000E-01         0       0.00000E-01       0.00000E-01         1       9.36560E-04       7.02043E 01	U3CITY       4.3538E 02FEET/SEC.         DXA       5.0636E-03         1.5462E-04       2.5317E-05         9.6278E-03       4.7752E-06         5.9065E-09       0.0000E-01	
TERATION       NUMBER-2:         1       1.5784E-07       1.1832E-02         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       1.8953E-08       1.4207E-02         5       1.4047E-03       1.0529E 02         6       3.2458E-04       2.4330E 01         7       3.1885E-04       2.3901E 01         8       1.2335E-05       9.2465E-01         9       0.0000E-01       0.0000E-01         0       0.0000E-01       0.0000E-01         1       9.36560E-04       7.02043E 01         2       3.09688E-09       0.0000E-01	U3CITY       4.3538E 02FEET/SEC.         DXA       5.0636E-03         1.5462E-04       2.5317E-05         9.6278E-03       4.7752E-06         5.9065E-09       0.0000E-01	
TERATION       NUMBER-2:         D. CONCENTRATION       TMPH         1       1.5784E-07       1.1832E-02         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       1.8953E-08       1.4207E-02         5       1.4047E-03       1.0529E 02         6       3.2458E-04       2.4330E 01         7       3.1885E-04       2.3901E 01         8       1.2335E-05       9.2465E-01         9       0.0000E-01       0.0000E-01         0       0.0000E-01       0.0000E-01         1       9.36560E-04       7.02043E 01         2       3.09688E-09       0.0000E-01	U3CITY       4.3538E 02FEET/SEC.         DXA       5.0636E-03         1.5462E-04       2.5317E-05         9.6278E-03       4.7752E-06         5.9065E-09       0.0000E-01	
TERATION       NUMBER-2:         0. CONCENTRATION       TMPH         1. 1.5784E-07       1.1832E-02         2. 0.0000E-01       0.0000E-01         3. 0.0000E-01       0.0000E-01         4. 1.8953E-08       1.4207E-02         5. 1.4047E-03       1.0529E 02         6. 3.2458E-04       2.4330E 01         7. 3.1885E-04       2.3901E 01         9. 0.0000E-01       0.0000E-01         0. 0.0000E-01       0.0000E-01         1. 2335E-05       9.2465E-00         9. 0.0000E-01       0.0000E-01         0. 0.0000E-01       0.0000E-01         1. 9.36560E-04       7.02043E 01         2. 3.09688E-09       0.0000E-01	U3CITY       4.3538E 02FEET/SEC.         DXA       5.0636E-03         1.5462E-04       2.5317E-05         9.6278E-03       4.7752E-06         5.9065E-09       0.0000E-01	
TERATION       NUMBER-2:         D. CONCENTRATION       TMPH         1       1.5784E-07       1.1832E-02         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       1.8953E-08       1.4207E-02         5       1.4047E-03       1.0529E         6       3.2458E-04       2.4330E       01         7       3.1885E-04       2.3901E       01         8       1.2335E-05       9.2465E-01       9.0000E-01         9       0.0000E-01       0.0000E-01       0.0000E-01         1       9.36560E-04       7.02043E       01         2       3.09688E-09       0.0000E-01       0.0000E-01	U3CITY       4.3538E 02FEET/SEC.         DXA       5.0636E-03         1.5462E-04       2.5317E-05         9.6278E-03       4.7752E-06         5.9065E-09       0.0000E-01	
TERATION       NUMBER-2:         1       1.5784E-07       1.1832E-02         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       1.8953E-08       1.4207E-02         5       1.4047E-03       1.0529E 02         6       3.2458E-04       2.4330E 01         7       3.1885E-04       2.3901E 01         8       1.2335E-05       9.2465E-01         9       0.0000E-01       0.0000E-01         0       0.0000E-01       0.0000E-01         1       9.36560E-04       7.02043E 01         2       3.09688E-09       0.0000E-01	U3CITY       4.3538E 02FEET/SEC.         DXA       5.0636E-03         1.5462E-04       2.5317E-05         9.6278E-03       4.7752E-06         5.9065E-09       0.0000E-01	
TERATION       NUMBER-2:         1. CONCENTRATION       TMPH         1. 5784E-07       1.1832E-02         0. 0000E-01       0.0000E-01         3. 0.0000E-01       0.0000E-01         4. 1.8953E-08       1.4207E-02         5. 1.4047E-03       1.0529E         6. 3.2458E-04       2.4330E         7. 3.1885E-04       2.3901E         9. 0.0000E-01       0.0000E-01         1. 9.36560E-04       7.02043E         2. 3.0963BE-09       0.0000E-01	U3CITY       4.3538E 02FEET/SEC.         DXA       5.0636E-03         1.5462E-04       2.5317E-05         9.6278E-03       4.7752E-06         5.9065E-09       0.0000E-01	
TERATION       NUMBER-2:         D. CONCENTRATION       TMPH         1       1.5784E-07       1.1832E-02         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       1.8953E-08       1.4207E-02         5       1.4047E-03       1.0529E         6       3.2458E-04       2.4330E       01         7       3.1885E-04       2.3901E       01         8       1.2335E-05       9.2465E-01       9.0000E-01         9       0.0000E-01       0.0000E-01       0.0000E-01         1       9.36560E-04       7.02043E       01         2       3.09688E-09       0.0000E-01       0.0000E-01	U3CITY       4.3538E 02FEET/SEC.         DXA       5.0636E-03         1.5462E-04       2.5317E-05         9.6278E-03       4.7752E-06         5.9065E-09       0.0000E-01	
TERATION       NUMBER-2:         1       1.5784E-07       1.1832E-02         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       1.8953E-08       1.4207E-02         5       1.4047E-03       1.0529E 02         6       3.2458E-04       2.4330E 01         7       3.1885E-04       2.3901E 01         8       1.2335E-05       9.2465E-01         9       0.0000E-01       0.0000E-01         0       0.0000E-01       0.0000E-01         1       9.36560E-04       7.02043E 01         2       3.09688E-09       0.0000E-01	U3CITY       4.3538E 02FEET/SEC.         DXA       5.0636E-03         1.5462E-04       2.5317E-05         9.6278E-03       4.7752E-06         5.9065E-09       0.0000E-01	
TERATION       NUMBER-2:         0. CONCENTRATION       TMPH         1. 1.5784E-07       1.1832E-02         2. 0.0000E-01       0.0000E-01         3. 0.0000E-01       0.0000E-01         4. 1.8953E-08       1.4207E-02         5. 1.4047E-03       1.0529E 02         6. 3.2458E-04       2.4330E 01         7. 3.1885E-04       2.3901E 01         9. 0.0000E-01       0.0000E-01         0. 0.0000E-01       0.0000E-01         1. 2335E-05       9.2465E-00         9. 0.0000E-01       0.0000E-01         0. 0.0000E-01       0.0000E-01         1. 9.36560E-04       7.02043E 01         2. 3.09688E-09       0.0000E-01	U3CITY       4.3538E 02FEET/SEC.         DXA       5.0636E-03         1.5462E-04       2.5317E-05         9.6278E-03       4.7752E-06         5.9065E-09       0.0000E-01	
TERATION       NUMBER-2:         D. CONCENTRATION       TMPH         1       1.5784E-07       1.1832E-02         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       1.8953E-08       1.4207E-02         5       1.4047E-03       1.0529E 02         6       3.2458E-04       2.4330E 01         7       3.1885E-04       2.3901E 01         8       1.2335E-05       9.2465E-01         9       0.00000E-01       0.0000E-01         0       0.0000E-01       0.0000E-01         1       9.36560E-04       7.02043E 01         2       3.09688E-09       0.0000E-01	U3CITY       4.3538E 02FEET/SEC.         DXA       5.0636E-03         1.5462E-04       2.5317E-05         9.6278E-03       4.7752E-06         5.9065E-09       0.0000E-01	
TERATION       NUMBER-2:         D. CONCENTRATION       TMPH         1       1.5784E-07       1.1832E-02         2       0.0000E-01       0.0000E-01         3       0.0000E-01       0.0000E-01         4       1.8953E-08       1.4207E-02         5       1.4047E-03       1.0529E 02         6       3.2458E-04       2.4330E 01         7       3.1885E-04       2.3901E 01         8       1.2335E-05       9.2465E-01         9       0.00000E-01       0.0000E-01         0       0.0000E-01       0.0000E-01         1       9.36560E-04       7.02043E 01         2       3.09688E-09       0.0000E-01	U3CITY       4.3538E 02FEET/SEC.         DXA       5.0636E-03         1.5462E-04       2.5317E-05         9.6278E-03       4.7752E-06         5.9065E-09       0.0000E-01	
TERATION         CONCENTRATION         TMPH           1         1.5784E-07         1.1832E-02           2         0.0000E-01         0.0000E-01           3         0.0000E-01         0.0000E-01           4         1.8553E-08         1.4207E-02           5         1.4047E-03         1.0529E           6         3.2458E-04         2.4330E           7         3.1885E-04         2.3901E           9         0.0000E-01         0.0000E-01           0         0.0000E-01         0.0000E-01           1         2335E-05         0.2465E-00           9         0.0000E-01         0.0000E-01           0         0.0000E-01         0.0000E-01           1         9.36560E-04         7.02043E           2         3.09688E-09         0.0000E-01	U3CITY       4.3538E 02FEET/SEC.         DXA       5.0636E-03         1.5462E-04       2.5317E-05         9.6278E-03       4.7752E-06         5.9065E-09       0.0000E-01	
TERATION         CONCENTRATION         TMPH           1         1.5784E-07         1.1832E-02           2         0.0000E-01         0.0000E-01           3         0.0000E-01         0.0000E-01           4         1.8553E-08         1.4207E-02           5         1.4047E-03         1.0529E           6         3.2458E-04         2.4330E           7         3.1885E-04         2.3901E           9         0.0000E-01         0.0000E-01           0         0.0000E-01         0.0000E-01           1         2335E-05         0.2465E-00           9         0.0000E-01         0.0000E-01           0         0.0000E-01         0.0000E-01           1         9.36560E-04         7.02043E           2         3.09688E-09         0.0000E-01	U3CITY       4.3538E 02FEET/SEC.         DXA       5.0636E-03         1.5462E-04       2.5317E-05         9.6278E-03       4.7752E-06         5.9065E-09       0.0000E-01	N 2
TERATION         CONCENTRATION         TMPH           1         1.5784E-07         1.1832E-02           2         0.0000E-01         0.0000E-01           3         0.0000E-01         0.0000E-01           4         1.8553E-08         1.4207E-02           5         1.4047E-03         1.0529E           6         3.2458E-04         2.4330E           7         3.1885E-04         2.3901E           9         0.0000E-01         0.0000E-01           0         0.0000E-01         0.0000E-01           1         2335E-05         0.2465E-00           9         0.0000E-01         0.0000E-01           0         0.0000E-01         0.0000E-01           1         9.36560E-04         7.02043E           2         3.09688E-09         0.0000E-01	U3CITY       4.3538E 02FEET/SEC.         DXA       5.0636E-03         1.5462E-04       2.5317E-05         9.6278E-03       4.7752E-06         5.9065E-09       0.0000E-01	N 2
TERATION         CONCENTRATION         TMPH           1         1.5784E-07         1.1832E-02           2         0.0000E-01         0.0000E-01           3         0.0000E-01         0.0000E-01           4         1.8553E-08         1.4207E-02           5         1.4047E-03         1.0529E           6         3.2458E-04         2.4330E           7         3.1885E-04         2.3901E           9         0.0000E-01         0.0000E-01           0         0.0000E-01         0.0000E-01           1         2335E-05         0.2465E-00           9         0.0000E-01         0.0000E-01           0         0.0000E-01         0.0000E-01           1         9.36560E-04         7.02043E           2         3.09688E-09         0.0000E-01	U3CITY       4.3538E 02FEET/SEC.         DXA       5.0636E-03         1.5462E-04       2.5317E-05         9.6278E-03       4.7752E-06         5.9065E-09       0.0000E-01	
TERATION         CONCENTRATION         TMPH           1         1.5784E-07         1.1832E-02           2         0.0000E-01         0.0000E-01           3         0.0000E-01         0.0000E-01           4         1.8553E-08         1.4207E-02           5         1.4047E-03         1.0529E           6         3.2458E-04         2.4330E           7         3.1885E-04         2.3901E           9         0.0000E-01         0.0000E-01           0         0.0000E-01         0.0000E-01           1         2335E-05         0.2465E-00           9         0.0000E-01         0.0000E-01           0         0.0000E-01         0.0000E-01           1         9.36560E-04         7.02043E           2         3.09688E-09         0.0000E-01	U3CITY       4.3538E 02FEET/SEC.         DXA       5.0636E-03         1.5462E-04       2.5317E-05         9.6278E-03       4.7752E-06         5.9065E-09       0.0000E-01	2  t

an a		
SYSTEM 4 820 TO 1110 DEG K		
REACTOR POSITION 3.39933E 02EE	<u></u>	
TEMPERIURE 1077.47DEGREE-K MOLA	AR FLUW RATE 2.29837E 02POUND MOLES PER HOUR	
CONVERSION_DF_ETHANE	IO ETHYLENE 15_22.65%	
_PRESSURE_IS4.03925E_00VEL	_JCITY4.8009E_02FEE1/SEC.	
ITERATION_HUMBER=_21		****
_NO_CUNCENTRATIONTHPH	DXA	
	5.8760E-03	
_ 20.J000E-010000E-01	1.7063E-04	
	2.6677E-05	
	1.0690E-02	
<u>5 1.2508E-03 1.0014E 52</u>		
	8.9776E-09	
7 3.6147E-04 2.8941E 01		
<u>8</u> <u>1.3422E-05</u> <u>1.0746E_00</u> 9 <u>0.0000E-01</u> <u>9.0000E-01</u>	0.0000E-01	
10 0.00000E-01 0.00000E-01		
10 0.0000000000000000000000000000000000		
13 2.15374E-10 1.72435E-05		
<u>,                                    </u>		
REACIOR POSITION 3.57648E_02FE	ьт Г	
TEMPERIURE 1084 120FORFE-K MULA	$\mathbf{x}$ is the first of the second se	
e na an	R FLUW RATE 2.35529E 02POUND MULES PER HOUR	
CONVERSION OF ETHANE	ID_ETHYLENEIS_;6.96%	
RESSURE IS 3.35567E 00 VEL	<u>ÚCITY 5.2943E 02FET/SEC.</u>	
ITERATION NUMBER- 22		
ND CONCENTRATIUM TMPH	AX(I	
1 2.776BE-07 2.3973E-02	6.7141E-03	
2 0,0000E-01 0,0000E-01	1.6806E-04	
3 0.0000E-01 U.0000E-01	3.2432E-05	
4 3.2274E-0E 2.7863E-03	1.1615E-02	
5 1.0943E-03 9.4479E 01	5.1279E-96	
-64.0579E-043.5033E_01	1.3370E-08	
73,9945E-043,4487E_01	0+0009E-01	
<u>8 1.4279E-05 1.2327E 00</u>	0.0000E=01	
9 0.0000E-01 0.00000E-01		
LO 0.0000E-01 0.00000E-01		
11 8.13937E-04 7.02700E 01		
12 6.43945E-09 0.00000E-01		
13 2.83511E-10 2.44766E-05		
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<u>SYSTEM 4 P20 TU 1110 DEG K</u> <u>REACTOR POSITION 3.75362E</u>	
TEMPERTURE 1094.600F.REE_V	MOLAR FLOW RATE 2.41969E 02POUND MOLES PER HOUR
LEONER UNRE 1924 OVOCONLEAK	Thean From King 2.417076 CEIDONI MOSCI EN MONT
CONVERSION OF ETHANE	TO ETHYLENE IS 31.82%
PRESSURE IS 3,59973E 00	VELUCITY 6.3819F 02FEET/SEC.
ITERATION NUMBER- 23	
ND CONCENTRATION TEPH	
1 3.4799E-07 3.3243E-	
2 0,0000E-01 0.0000E+	01 2.1344E-04
3 0.0000E-01 0.0000E-	
4 3.85215-08 3.0799E-0	
<u>5 9.2233E-04 S.8111E</u>	
6 4.32851-04 4.1350E	
7 4.2656E-04 4.0749E	01 0.0000E-01
8 1.4672E-05 1.4017E (	
9 0.00000E-01 C.00000E-0	
10 0.0000E-01 0.00000E-0	
<u>11 7.30109E-04 7.03208E (</u> 12 8.95876E-09 0.00000E-0	
<u>12 8.958755-09 0.00006-(</u> <u>13 3.69494E-10 3.52980E-0</u>	
1.x 2+0.2+79L-1V 2.22900E-0	
REACTOR POSITION 3.93076E (	
	MULAR FLUW RATE 2.49184E 02POUND MOLES PER HOUR
	INCAK FEEN KATE Z. FYIDIG OF DONLY HOLES YEA HOOK
CONVERSION OF ETHANE	IN ETHYLENE IS 37.24%
	VELOCITY 7.8242E 02FEET/SEC.
ITERATION NUMBER- 24	
NO CONCENTRATION THPH	DXA
1 4.1291E-07 4.5540E-0	02 9.7528E-03
2 0.0000E-01 0.0000E-0	
3 0.0005E-01 0.0005E-0	
<u>4 4.1453E-08 4.5720E-0</u>	
5 7.3472E-04 H.1034E (	
6 4.3673E-04 4.8388E (	
7 4.3286E-04 4.7741E C	
<u>B 1.4304E-05 1.5777E (</u>	
9 0.0000F-01 0.0000F-(	
10 0.0000E-01 0.00000E-0	
<u>11 6.38240E-04 7.03931E (</u>	
<u>12</u> <u>1.16103E-08</u> <u>0.0000E-0</u> <u>13</u> <u>4.55670E-10</u> <u>5.01908E-0</u>	
13 4.55070E-10 5.01908E-0	
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		······				
SYSTEM 4 320 TO 1110	D_DEG_K					
FUNCTION REAC(T,1)		······································				
REQC(T.1)= 0.152251	01(1105.67.1)					
FUNCTION_RECC(1,1) REOC(T,1)= 0,45916E-				· · · · · · · · · · · · · · · · · · ·		
	-01(1105.07, 2)					
$\frac{FG(C(T, 1) = 0.341936}{REC((T, 1) = 0.341936}$	(12(1105 67. 2)					
REGC(T.I)= 0.12596E-	-08(1105.67, 4)					
FUNCTION REDC(T,1)						
REQUITALI =0.42331E	01(1105.67.5)			····		
FUNCTION RECC(1,1)					· · · · · · · · · · · · · · · · · · ·	
FUNCTION REQC(I,I)	01(1105.67.6)					
REUC(T+I)=0.24512E	00(1105.67, 7)					
FUNCTION_REQC(I+I) REQC(T+I)=0.22180E-			· · · · · · · · · · · · · · · · · · ·		an a	
KEQ((121)=U.2216.4E=	.02(1105.679.37					
FUNCTION PRR(15).						<u>ه این این وارد ادامه است این این می میں باری میں این این این این این این این این این این</u>
	RADI(1)= 1.25000E-01	VOL= 0,0000	10E-01			
FUNCTION PRESD(T)						
RENUE 5.49806E 05		<u>DEN= 1.08389E-</u> 7.82417E 02	4.36677E 02	6.09553E 02		
FRICTION FACTOR= 1. TEMPERTURE= 1105.67PRE	SSURE D= 3 11505E=01	1.07.4170 02	4.300772.02	0.079992 02		
	4.12906E-07	4,55404E-02		•		
2-B ISU BUTADE	0.00000E-01	0.00000E-01				
3-C N-BUTANE	0.00000E-01	0.0000E-01				
4-D ISD-BUTENE 5-E ETHANE	<u>4.14533E-08</u> 7.34717E-04	<u></u>				
6=F_ETHATE	<u> </u>	4.83884E 01	······································		• <u> </u>	
7-6 HYDEUGEL	4.32860E-04	4.77413E 01	-			
S-H_METHANE	1.43044E-05	1.57767E 00				
9-1 PROPANE	0.00000E-01	0.00000E=01	_			
10-J PRUPENE	0.00000E-01 6.38240E-04	0.00000E-01 7.03931E_01				
12-L CARBON	1.16103E-08	0.00000E-01				1. j.
13-M CARBON MUNDALDE	4.55070E-10	5.01908E-05				
CONVERSION OF ETHANE	TO ETHYLENE		.242			
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REACTOR RADIUS PROFILE AFTER 300.00 HOUPS

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0.126005	0.1220.00	0.124999	0.124999	0.124999	0.124999	0.124999	0.124998	0.124997	0.124996	
0.124995	0.124993		0.124989	0,124987	0.124984	0.124980	0.124976	0.124970	0.120964	• • • • • • • • • • • • • • • • • • •
0.124959	0.124953	124946	0.124939	0.124931	0.124522	0. 24913	0.124903	0.124893	0.124882	
0.124806	<u> 0.124853</u>	0.124836	0.124017	0.124797	0.124775	0.124752	0.124725	0.124697		
0+124633		0.124557	0.124515	0.124469	0.124419	0.124365	0.124307	0.124245	0.124566	
D.124062	0.123930	0.123779	0.127603	0 103600	0.123164	0.122890	0.122573	0.121509	0.124176	
0.120807	0.121009	120547	0.119450	J.119582	0.119022	1.1186.22	0.117778		0.121784	
0.114996	0.113567	0.110205	0.109350	0.109199	0.107485	0.105734	0.104208	0.117091	0.114303	
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REACTOR IS 400.00 FEET LONG AND 0.125 FEET IN RADIUS	An Annual Contract Contra
TOTAL MOLES / HOUR ARE 200.0POUND MOLES AT PRESSURE 6.2494 VELOCITY OF 1.95179E 02 AT TEMPERATURE 820.0DFG 4	and an and a second s
INITIAL REACTDE LUCKLALINT (DL 9.77439E-01FEET	
FUNCTION REDC(T,1)	
REOC(T, I) = 0.11963E O2(-832.71, 1)	
FUNCTION_REQC(T, I)	
REOC(1, 1) = 0.60841E - 02(-832.71, 2)	
EURCIIUN REOC(I,I)	
REQC(T,T)= 0.14012E 06( 832.71, 3)	
EVACTION REDC(T,1) = 0.14B37E-0B(.832.71, 4)	
FUICTION REAC(J)	
$REQC(T,1) = 0.52409 \pm 61(-832.71, 5)$	
EUNCTION REDC(J,1)	
REQC(T,1)= 0.27599E-01( 832.7), 6)	
EU3CTICN.REQC(T,1)	
REQC(7,1)=0.55381E_00(_B32.71, 7)	
EUACTION REQUILID	
REQC(T, I) = 0.79039E - 03(-832.71.8)	
$\frac{PR=0.24329E_001}{RAD1(1)=1.25000E-01}$ VOL= 0.00060E-01	
FUNCTION PRR(IS)	
PR= 6.24929E 00 RADI(1)= 1.25000E-01 VOL= 0.00000E-01	
EUNCTION PRESD(T)	
RE111= 3.35919E 05 VIS= 2.16064E-05 DEN= 1.47348E-01	
FRICTION FACION= 1.41227E-02 V1,V2,VA= 1.95179E 02 1.96831E 02 1.97030E 02	
TEMPERTURE= B32.71 MESSURE D= 2.12174E-02	
= FUNCTION PRK(15) $= -6.22807E OU RADI(1) = -1.25000E-01 VOL = -0.00000E-01$	
<u>PR= 6.22807E 00 RADI(1)= 1.25000E-01 VDL= 0.00000E-01</u> <u>PRESSURE IS 6.22807E 00 VELOCITY 1.9888E 02FEET/SEC.</u>	
1 0.0000E-01 0.0000E-01 3.7152E-07	
2 0.0000E-01 0.0000E-01 8.5157E-08	
3 0.0000E-01 0.0000E-01 0.0000E-01	
4 0.000E-01 2.000E-01 0.000E-01	
5 3.7098E-03 1.2994E 02 0.0000E-01	
<u>6 1.5362E-09 5.380RE-05 0.0000E-01</u>	
7 1.3733E-09 4.c276E-05 0.6000E-01	
8 3.1592E-10 1.1065E-05 0.0000E-01	
9 0.00000E-01 0.00000E-01	
10 0.00000E-01 0.00000E-01	· · · · · · · · · · · · · · · · · · ·
11 2.00023E-03 7.00597E-01	
12 0.00000E-01 0.0000E-01 13 0.00000E-01 0.0000E-01	
13 0.0000EP01	
DL_CHANGED_T0_1.983698_00Z1C=3.203188_02	-
1 = 1  RA = 1.619501-03  DXA(1) = 1.00923E-02  CF, CR = 1.42274E-03  9.93093E-08  REQC = 1.80110E  00	
RATE=1.13845E00	
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SYSTEM 4 820 TH 1110 DFG K	
SYSTEM 4 820 TO 1110 DEG K REACTOR POSITION 3.27680E OZFEET TEMPERTURE 1108.55DEGREE-K MOLAR FLOW RATE 2.48173E OZPOUND MOLES PER HOUR PRESSURE IS 2.00000E OO VELOCITY 1.4997E O3FEET/SEC.	
TEMPERIURE 1108.55DFGREE-K MOLAR FLOW RATE 2.48173E 02POUND MOLES PER HOUR PRESSURE IS 2.400000E 00 VELOCITY 1.4997E 03EEEI/SEC.	
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REACTOR IS 400.00 FEET LONG AND 0.125 FEET IN RADIUS TOTAL MOLES / HOUR ARE 200.0POUND NOLES AT PRESSURE 6.449A VELOCITY OF 1.89127E 02 AT TEMPERATURE 820.0DEG K	
INITIAL REACTOR INCREMENTION 1.93369E POFEET	
FUNCTION REQC(1,1)	
$REQC(I_{1}I) = 0.11903E 02(B32.71, 1)$	
REQUINING DESCRIPTION DESCRIPA	
FUNCTION REQC(T, 1)	
REQC(J,I)= 0.66841E-62(_832.71, 2)	
FUNCTION REDC(T,1). REJC(T,1)= 0.14012E.06(.832.71, 3)	
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- FUNCTION REQC(1)	And the set of the set
	an and a state of the state of
FUNCTION_REDC(T_1) REQC(T_1)= 0.553811 00( 832.71, 7)	
REUC(1)1)= 0,55361E 00( 832.71, 77.	
EUNCTION REAC(1,1)	
REQC(T:1)=0.79039E-03(8)	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1
FUNCTION_PRR(IS) PR= 6.44929E_00KADI(1)= 1.25000E-01VOL= 0.00000E-01	
FUNCTION PRR(15) PR= 6.44928E_00KADI(1)= 1.25000E-01VOL= 0.00000E-01	······································
PR = 6.44928E 00 RADI(1) = 1.25000E - 01 VOL = 0.00000E - 01	
FU9CTIDH PRESD(T) RENU= 3.35919E 05 VIS= 2.16064E-05 DEN= 1.52080E-01	
RENUE 3.35919E 05 VISE 2.16064E-05 DENE 1.52080E-01 FRICTION FACTORE 1.41227E-02 VIV2.VAE 1.89127E 02 1.92672E 02 1.90899E 02	
TEMPERIURE= 032.710RESSURE D= 2.05395E-02	
$\frac{FUNCTION PRR(1S)}{PR= 6.42874E_{OV}} = 1.25000E-01 \qquad V_{UL} = 0.00000E-01$	
PRESSURE IS 6.42874E 00 VELUCITY 1.9267E 02FEET/SEC.	
1 0.0000E-01 0.0000E-01 2.8361E-07	
2. 0. D000E-01 0. 0000E-01 6. 5007E-08	
<u>3 0.0000E-01 0.0000E-01 0.0000E-01</u>	
<u>4 0,0000E-01 0.0000E-01 0.0000E-01</u>	
<u>5 3.8286E-03 1.2924E 02 0.0000E-01</u>	
6 1.2103E-09 4.1076E-05 0.0000E-01	
7 1.0856E-09 3.6853E+05 0.0000E-01	
<u>9 0.00000E-01 0.00005E-01</u>	
10 0.00000E-01 0.00000E-01	
11 2.06424E-u3 1.00597E 01	
12 0.01000E-01 0.00000E-01	
13 0.00000E-01 0.00000E-01	
DL_CHANGED_TH85786E_0071C=3.16314E_02	
I= 1 RA= 1.68209E-03 DXA(I)= 1.07758E-02 CF.CR= 1.56629E-03 1.22712E-07 REQC= 1.87819E 00	
RATE= 1.07857E 00	
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SYSTEM 4 820 TO 1110 DEG K	
SYSTEM 4 820 TO 1110 DEG K REACIOR POSITION 4.01767E 02FEET TENPERTURE 1109.94DEGREE-K MOLAR FLOW RATE 2.52759E 02POUND MOLES PER HOUR PRESSURE IS 2.00000E 00 VELOCITY 1.0854E 03FEET/SEC.	
TENPERTURE 1109.94DEGREE-K MOLAR FLOW RATE 2.52758E 02POUND MOLES PER HUUR PRESSURE IS 2.00000E.00 VELOCITY 1.0854E.03EEET/SEC.	anna da a sua da a ana ana ana ana ana ana ana ana a
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SYSTEM 4 B20 TO 1110 DEG K	
REACTOR POSITIUN 1.60160E OIFEET TEMPERTURE 870.65DEGREE-K MOLAR FLOW RATE 2.00001E 02POUND MULES PER HOUR	
TESTERISKE ATV.520EDREEEN SHLAN FLOW SALE Z.OUGATE OZITOWS THELE IN MUSS	
CONVERSION OF ETHANE ID ETHYLENE IS 0.00%	
PRESSURE IS 6.36487E 00 VELOCITY 2.0352E 02FEET/SEC.	
ITERATION NUMBER- 1	
NO CONCENTRATION TMPH DXA	· ·
<u>1 9.1332E-16 3.2736E-11 3.1894E-06</u>	and an and a company of the second
2	
3 0.0000E-01 0.0000E-01 3.0467E-08	
4 6.4327E-20 2.3057E-15 5.3570E-05	
<u>53,6252E=031,2994E_024.9533E=12</u>	
631185-088.2861E=045.7584E=21	
72.1309E=081.6379E=040.0000E=01	
<u>8 3.6167E-09 1.2963E-04 0.0000E-01</u>	
9 0.00000E-01 0.00000E-01	
<u>10</u> 0.0000E-01 0.0000E-01	
<u>-11 1.95463E=03 7.00597E_01</u>	
<u>12</u> 9.78703E-2C <u>0.00000E-01</u>	
_131.12555E-234.03430E-19	
REACTOR POSITION 3.20320E OIFEET	
TEMPERTURE 921.70DEGREE-K MOLAR FLOW RATE 2.00012E 02POUND MOLES PER HOUR	
TEALXIVE ZELIUBINCLEK HOLAN LUG KALL ZEUWIZE UZIOND HOLE IN HON	
CONVERSION OF ETHANE ID ETHYLENE IS 0.01%	
PRESSURE 15 5.27463E 00 VELICITY 2.1851E 02FEET/SEC.	
ITERATION NUMBER- 2	
NG CONCENTRATION TEPH DXA	-
1 1.4073E-13 5.4143E-09 4.0567E-05	
20,0000E=010,0000E=013.6751E=06	
3 0.1600E-01 0.000DE-01 3.2005E-07	
<u>4</u> 9.0431E-17 3.4819E-12 3.6026E-04	
5 3.3772E-03 1.2993E 02 4.8093E-10	
<u>6 3.0823E-07 1.1858E-02 1.6275E-17</u>	
7 2,9213E-97 1,1241E-02 0,0000E-01	
<u>B3.2C91E-081.2345E-030.0000E-01</u>	
9 0.00000000000000000000000000000000000	
16 0.00000L-01 0.00000E-01	
11 1.821051-03 7.0059aE_01	
12 1.01370E-16 0.0000E-01	
<u>13 3.50217E=20 ).34736E=15</u>	
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	PERTINE 952 0	4.80430E 01F	<u>eet</u> A a clobe date	2.00082E 02PUUN					
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CON	VERSION DE ETH	LeiF	10 ETHYLENE	75	0.06%	······································			
	SSURE IS 5.1	6057E 00 VEI	JCITY 2.294	6E 02EEET/SEC.	0.000/0				
	RATION HUBER-	3	And the second						
	CONCENTRALION	Тррн	1.XA		17			1997 - Paris Managara, ang kanang sa kan	an a management and a second a second a second a second a s
		2.1185E-07	1.0664E-04						
	0.00001-01	0.0000E-01	1.2160E-05						
3	10-30600.0	J.0000F-01	1.1804E-06		······································				
4	1.9034E-14	1.68836-10	1.03346-03					an a	بالبريوني ومانية المانة المجروب المحتمر فمحاهم
5	3,2148E-03	1.2956E 02	1.1525E-08						e someener oo
6	2:0161E-06	8,1436E+02	6.6033E-15				· · · · · · · · · · · · · · · · · · ·		
7	1,9376E-06	1.6267E-02	0.0000E-01						
8	1.5703E-07	5.3430E-03	0.0000E-01						
9	0.000001-01	00000E-01					······································		
_10_	0.00000E-01	0.0000E-01							
	1.73447E-03	7.00601E 01	······································						
12	<u>1.08286E-14</u> <u>1.74198E-17</u>						······		
	1.741981-17	7.03633E-13							
READ	TOR POSITION	6.40640E 01FE	с <b>т</b>						د به دور بر بر در
TEM	FRIURE 965.05	DECREE-V NOLA	P FLOW PATE -	2.00208E 02POUN	NALES DED	Unlip			
	and the second	12 - 19 <u>- 19 - 19 - 19 - 19 - 19 - 19 - 1</u>			I HULES FER				
	ERSION DE ETHA		TO ETHYLENE	T S	0.16%	· · · · · · · · · · · · · · · · · · ·			
	SURE IS 6.08			RE O2FEET/SFC.			······································		Landanian and a second s
	ATION NUMBER-	4							
<u>NN</u> (	UNCENTRATION_	THPH	DXA				······································		
	2,9523E-11	1.2267E-06	2.7773E-04						
2	0.0000E-01	U.0000E-01	1.8364E-05	· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·			
	0.0000E-01 2.6033E-13	0.0000E-01	1.8914E-06		,		·		
5	3.1721E-03	<u>1.0817E-08</u> 1.2973E 02	<u>).5102E-03</u> 4.4994E-08	·····					
	4.9561E-06	2.0593E-01	7.82706-14						
7	4.7802E-06	1.9805E-01	0.0000E-01	·····					
8	3.50700-07	1.4572F-02	0.00006-01						
9.	0.000000-01	0.00000E-01							
	0.000005-01	0.0000E-01							a na anna an an anna ann an anna an anna ann an a
	1.68613E-03	7.00605E 01					anan manana mataka di shan dista ini mata a sha sha sa		
	8.904236-14	0.00000E-01							an and an and a second se
13_	2.92933E-16	1.21717E-11		· · · · · · · · · · · · · · · · · · ·					<i>دي</i>
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SYSTEM_4_B20_TU_1110_DEC_K	
TEMPERTURE 977.060EGRLE-K NOLAR FLUW RATE 2.00414E 02POUND NULES PER HOUR	
CONVERSION OF ETHANE TO ETHYLENE IS 0.32%	
PRESSURE IS 5.9918DE OU VELUCITY 2.4306E 02FEET/SEC.	
ND CUNCENTRATION JEPH DXA	
2 0.J000E-U1 2.7415E-05	
3	i ne stat mana
4 1+6914E=12 1+2341E=08 2+1834E=03	•
<u>5 3.0283E=03 1.2952E_02 1.2484E=07</u>	
6 9.0003E-06 9.1060E-01 5.0866E-13	
7 9.2862E-06 3.9717E-01 0.0000E-01 8 6.2869E-07 2.6889E-02 0.0000E-01	
9 0.00000E-01 0.00000E-01	
10 0.00000E-01 0.00000E-01	
<u>12 9.68457E-13 U.00000E-01</u>	
13 2.20700E-15 9.43916E-11	
PEACTOR PRETTION O ANDERE ALCERT	
REACTOR POSITION 7.60959E OIFEET. _TEMPERTURE 988.27DEGREE-K MOLAR FLOW RATE 2.00741F_02POUND MOLES PER HOUR	
LINE REPORT FOR THE PARTY FOR	
CONVERSION DE LIHANE TO ETHYLENE IS 0.57%	
PRESSURE 15 5.49744E 00 VELOCITY 2.5019E 02FEET/SEC.	
ITERATION NUMBER- 6	
ND_CONCENTRATIONUXA	
1 3.1966E-10 1.4070E-05 7.1614E-04 2 0.0000E-01 0.0000E-01 3.9402E-05	
<u>3 0.0000E-01 0.0000E-01 4.5311E-06</u>	
4 7.5895E-12 3.4726E-07 3.0478E-03	
<u>5 2.9350E-03 1.2919E 02 2.9218E-07</u>	
6 1.6702E-05 7.3513E-01 2.5143E-12	
7 1.6194E-05 7.1277E-01 0.0000E-01	
<u>B 1.0174E-06 4.4781E-02 0.000E-01</u>	
9.0.0000E-01 0.0000E-01 10.0.0000E-01 0.0000E-01	
10 0.0000E=01 0.0000E=01 11 1.59175E=03 7.00622E 01	
12 1.94454E-12 0.0000E-01	
13 1.19656L-14 5.26686E-10	
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<u> </u>	

SYSTEM 4 820 TO 1110 DEG	K	· · · · · · · · · · · · · · · · · · ·
EACTON POSITION 1.12112E	02FET	
EMPERTURE 999.480EGREE-K	HULAR FLOW RATE 2.01248E 02POUND MULES PER HOUR	
HVERSION OF ETHANE	19 ETHYLENE 15 0.95%	
	VELUCITY 2.5774E 02FEET/SEC.	
ERATION HUMBER- 7		
CONCENTRATION TAPH		
8.4507E-10 3.6309E-		
0.0000E-01 0.0000E- 0.0000E-01 0.0000E-		
<u>3.0256E-11 1.3716E-</u> 2.8335E-03 1.2867E		
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2.0529E-05 1.2026E 1.5498E-06 7.0255E-		
0.03005E-01 0.00000E-		
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ACTOR POSITION 1.28128E	02555T	
MPERTURE 1008.05DEGREE-K	MOLAR FLOW RATE 2.01989E 02POUND MOLES PER HOUR	
ALL LYVEL LYVELS AND A	LICENCE LEGENCE DE GENERAL EN SERVICE DE GENERAL EN S	
NVERSION OF ETHANE	TO ETHYLENE IS 1.52%	
WERSING OF BIDARC	VELUCITY 2.6501F 02FEET/SEC.	
ERATION HUHBER- 8		
EPATION NUMBER- 8 CONCENTRATION THPH		
EPATION NUMBER- 3 CONCENTRATION TMPH 2.0150E-09 9.3899E-	0XA -05 1.5334E-03	
EPATION NUMBER- 3 CONCENTRATION THPH 2.0150E-09 9.3899E- 0.0000E-01 0.0000E-	DXA -05 1.5334E-03 -01 7.2623E-05	
EPATION         NUMBER         3           CONCENTRATION         TMPH           2.0150E-09         9.3899E-           0.0000E-01         0.0000E-           0.0000E-01         0.0000E-	DXA           ~05         1.5334E-03           ~01         7.2623E-05           ~01         9.1373E-06	
EPATION NUMBER- 8 CONCENTRATION TMPH 2.0150E-09 9.3899E- 0.0000E-01 0.0000E- 0.0000E-01 0.0000E- 9.8853E-11 4.0070E-	I)XA           -05         1.5334E-03           -01         7.2623E-05           -01         9.1373E-06           -06         5.3637E-03	
EPATION HUMBER- 8 CUNCENTRATION TMPH 2.0150E-09 9.3899E- 0.0000E-01 0.0000E- 0.0000E-01 0.0000E- 9.8853E-11 4.0070E- 2.7452E-03 1.2792E	DXA           -05         1.5334E-03           -01         7.2623E-05           -01         9.1373E-06           -06         5.3637E-03           02         1.1400E-06	
EPATION         NUMBER-         a           CUNCENTRATION         TMPH           2.0150E-09         9.3899E-           0.0000E-01         0.0000E-           0.0000E-01         0.0000E-           9.8853E-11         4.0070E-           2.7452E-03         1.2792E           4.7334E-05         1.9728E	DXA           -05         1.5334E-03           -01         7.2623E-05           -01         9.1373E-06           -06         5.3637E-03           02         1.1400E-06           00         3.8020E-11	
EPATION         NUMBER-         a           CONCENTRATION         TMPH           2.0150E-09         9.3899E-           0.0000E-01         0.0000E-           0.0000E-01         0.0000E-           9.8853E-11         4.0070E-           2.7452E-03         1.2792E           4.7334E-05         1.9728E           4.1213E-05         1.9205E	DXA           -05         1.5334E-03           -01         7.2623E-05           -01         9.1373E-06           -06         5.3637E-03           02         1.1400E-06           00         3.8020E-11           00         0.000E-01	
EPATION NUMBER- 8 CUNCENTRATION TMPH 2.0150E-09 9.3899E- 0.0000E-01 0.0000E- 9.8803E-11 4.0070E- 2.7452E-03 1.2792E 4.2334E-05 1.9728E 4.1213E-05 1.9205E 2.2505E-06 1.0487E-	DXA           -05         1.5334E-03           -01         7.2623E-05           -01         9.1373E-06           -06         5.3637E-03           02         1.1400E-06           00         3.8020E-11           00         0.0000E-01	
EPATION         NUMBER         8           CONCENTRATION         TMPH           2.0150E-09         9.3899E-           0.0000E-01         0.0000E-           9.8853E-11         4.0070E-           2.7452E-03         1.2792E           4.7334E-05         1.9728E           4.1213E-05         1.9205E           2.2505E-06         1.0487E-           0.0000E-01         0.00002-	-05         1.5334E=03           -01         7.2623E=05           -01         9.1373E=06           -06         5.3637E=03           02         1.1400E=06           00         3.8020E=11           00         0.000E=01           -01         0.0000E=01	
EPATION NUMBER- 8 CUNCENTRATIUM THPH 2.0150E-09 9.3899E- 0.0000E-01 0.0000E- 9.8863E-11 4.0070E- 2.7452E-03 1.2792E 4.7334E-05 1.9728E 4.1213E-05 1.9205E 2.2505E-06 1.0487E- 0.00000E-01 0.00000E- 0.00000E-01 0.00000E-	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
EPATION         NUMBER         8           1         CUNCENTRATIUN         TMPH           2.0150E-09         9.3899E-           0.0000E-01         0.0000E-           1         0.0000E-           2.0150E-09         9.3899E-           0.0000E-01         0.0000E-           9.8863E-11         4.0070E-           2.7452E-03         1.2792E           4.7334E-05         1.9728E           4.1213E-05         1.9205E           2.2505E-06         1.0487E-           0.0000E-01         0.00000E-           0.0000E-01         0.00000E-           1.50357E-03         7.00664F	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
EPATION NUMBER- 8 CONCENTRATION TMPH 2.0150E-09 9.3899E- 0.0000E-01 0.0000E- 9.8853E-11 4.0070E- 2.7452E-03 1.2792E 4.7334E-05 1.9728E 4.1213E-05 1.9205E 2.2505E-06 1.0487E- 0.0000E-01 0.00000E- 0.0000E-01 0.00000E- 1.50357E-03 7.00664E 2.14778E-11 0.00000E-	//XA           -05         1.5334E-03           -01         7.2623E-05           -01         9.1373E-06           -06         5.3437E-03           02         1.1400E-06           03         3.8020E-11           00         0.0000E-01           -01         -00000E-01           -01         -01	
EPATION         NUMBER         8           1         CUNCENTRATIUN         TMPH           2.0150E-09         9.3899E-           0.0000E-01         0.0000E-           1         0.0000E-01         0.0000E-           9.8863E-11         4.0070E-           2.7452E-03         1.2792E           4.7334E-05         1.9728E           2.2505E-06         1.0487E-           0.0000E-01         0.00000E-           1.2505E-06         1.0487E-           0.0000E-01         0.00000E-           1.50357E-03         7.00664F           2.14778E-11         2.00000E-	//XA           -05         1.5334E-03           -01         7.2623E-05           -01         9.1373E-06           -06         5.3437E-03           02         1.1400E-06           03         3.8020E-11           00         0.0000E-01           -01         -00000E-01           -01         -01	
EPATION         NUMBER-         8           1         CUNCENTRATION         TMPH           2.0150E-09         9.3899E-           0.0000E-01         0.0000E-           3         0.0000E-01         0.0000E-           3         0.0000E-01         0.0000E-           4.0070E-         1.2792E         1.2792E           4.7334E-05         1.9728E         1.9728E           4.1213E-05         1.9205E         1.9205E           0.00000E-01         0.00000E-         0.00000E-           0.00000E-01         0.00000E-         1.9205E           1.50357E-03         7.00664F         2.14778E-11	//XA           -05         1.5334E-03           -01         7.2623E-05           -01         9.1373E-06           -06         5.3437E-03           02         1.1400E-06           03         3.8020E-11           00         0.0000E-01           -01         -00000E-01           -01         -01	
EPATION NUMBER- 8 CUNCENTRATION TMPH 2.0150E-09 9.3899E- 0.0000E-01 0.0000E- 9.8863E-11 4.0070E- 2.7452E-03 1.2792E 4.7334E-05 1.9728E 4.1213E-05 1.9205E 2.2505E-06 1.0487E- 0.0000E-01 0.00000E- 1.50357E-03 7.00664E 2.14778E-11 0.0000CE-	//XA           -05         1.5334E-03           -01         7.2623E-05           -01         9.1373E-06           -06         5.3437E-03           02         1.1400E-06           03         3.8020E-11           00         0.0000E-01           -01         -00000E-01           -01         -01	
EPATION NUMBER- 8 CUNCENTRATION TMPH 2.0150E-09 9.3899E- 0.0000E-01 0.0000E- 9.8863E-11 4.0070E- 2.7452E-03 1.2792E 4.7334E-05 1.9728E 4.1213E-05 1.9205E 2.2505E-06 1.0487E- 0.0000E-01 0.00000E- 1.50357E-03 7.00664E 2.14778E-11 0.0000CE-	//XA           -05         1.5334E-03           -01         7.2623E-05           -01         9.1373E-06           -06         5.3437E-03           02         1.1400E-06           03         3.8020E-11           00         0.0000E-01           -01         -00000E-01           -01         -01	
EPATION NUMBER- 8 CONCENTRATION TMPH 2.0150E-09 9.3899E- 0.0000E-01 0.0000E- 9.8853E-11 4.0070E- 2.7452E-03 1.2792E 4.7334E-05 1.9728E 4.1213E-05 1.9205E 2.2505E-06 1.0487E- 0.0000E-01 0.00000E- 0.0000E-01 0.00000E- 1.50357E-03 7.00664E 2.14778E-11 0.00000E-	//XA           -05         1.5334E-03           -01         7.2623E-05           -01         9.1373E-06           -06         5.3437E-03           02         1.1400E-06           03         3.8020E-11           00         0.0000E-01           -01         -0.0000E-01           -01         -01	
EPATION NUMBER- 8 CUNCENTRATION TMPH 2.0150E-09 9.3899E- 0.0000E-01 0.0000E- 9.8863E-11 4.0070E- 2.7452E-03 1.2792E 4.7334E-05 1.9728E 4.1213E-05 1.9205E 2.2505E-06 1.0487E- 0.0000E-01 0.00000E- 1.50357E-03 7.00664E 2.14778E-11 0.0000CE-	//XA           -05         1.5334E-03           -01         7.2623E-05           -01         9.1373E-06           -06         5.3437E-03           02         1.1400E-06           03         3.8020E-11           00         0.0000E-01           -01         -0.0000E-01           -01         -01	
EPATION NUMBER         8           1 CUNCENTRATION         TMPH           2.0150E-09         9.3899E-           0.0000E-01         0.0000E-           0.0000E-01         0.0000E-           2.7452E-03         1.2792E           4.7334E-05         1.9728E           4.1213E-05         1.9205E           0.0000E-01         0.0000E-           1.2505E-06         1.0487E-           0.0000E-01         0.0000E-           1.50357E-03         7.00664F           2.14778E-11         0.0000E-	//XA           -05         1.5334E-03           -01         7.2623E-05           -01         9.1373E-06           -06         5.3437E-03           02         1.1400E-06           03         3.8020E-11           00         0.0000E-01           -01         -0.0000E-01           -01         -01	
EPATION NUMBER- 8 CUNCENTRATION TMPH 2.0150E-09 9.3899E- 0.0000E-01 0.0000E- 9.8863E-11 4.0070E- 2.7452E-03 1.2792E 4.7334E-05 1.9728E 4.1213E-05 1.9205E 2.2505E-06 1.0487E- 0.0000E-01 0.00000E- 1.50357E-03 7.00664E 2.14778E-11 0.0000CE-	//XA           -05         1.5334E-03           -01         7.2623E-05           -01         9.1373E-06           -06         5.3437E-03           02         1.1400E-06           03         3.8020E-11           00         0.0000E-01           -01         -0.0000E-01           -01         -01	
EPATION NUMBER- 8 CUNCENTRATION TMPH 2.0150E-09 9.3899E- 0.0000E-01 0.0000E- 9.8863E-11 4.0070E- 2.7452E-03 1.2792E 4.7334E-05 1.9728E 4.1213E-05 1.9205E 2.2505E-06 1.0487E- 0.0000E-01 0.00000E- 1.50357E-03 7.00664E 2.14778E-11 0.0000CE-	//XA           -05         1.5334E-03           -01         7.2623E-05           -01         9.1373E-06           -06         5.3437E-03           02         1.1400E-06           03         3.8020E-11           00         0.0000E-01           -01         -0.0000E-01           -01         -01	
EPATION         NUMBER         8           1         CUNCENTRATION         TMPH           2.0150E-09         9.3899E-           0.0000E-01         0.0000E-           1         0.0000E-01           0.0000E-01         0.0000E-           2.7452E-03         1.2792E           4.7334E-05         1.9728E           4.1213E-05         1.9205E           0.0000E-01         0.0000E-           0.0000E-01         0.0000E-           1.50357E-03         7.00664F           2.14778E-11         0.0000E-	//XA           -05         1.5334E-03           -01         7.2623E-05           -01         9.1373E-06           -06         5.3437E-03           02         1.1400E-06           03         3.8020E-11           00         0.0000E-01           -01         -0.0000E-01           -01         -01	
EPATION NUMBER- 8 CUNCENTRATION TMPH 2.0150E-09 9.3899E- 0.0000E-01 0.0000E- 9.8863E-11 4.0070E- 2.7452E-03 1.2792E 4.7334E-05 1.9728E 4.1213E-05 1.9205E 2.2505E-06 1.0487E- 0.0000E-01 0.00000E- 1.50357E-03 7.00664E 2.14778E-11 0.0000CE-	//XA           -05         1.5334E-03           -01         7.2623E-05           -01         9.1373E-06           -06         5.3437E-03           02         1.1400E-06           03         3.8020E-11           00         0.0000E-01           -01         -0.0000E-01           -01         -01	
EPATION         NUMBER-         8           1         CUNCENTRATION         TMPH           2.0150E-09         9.3899E-           0.0000E-01         0.0000E-           3         0.0000E-01         0.0000E-           3         0.0000E-01         0.0000E-           4.0070E-         1.2792E         1.2792E           4.7334E-05         1.9728E         1.9728E           4.1213E-05         1.9205E         1.9205E           0.00000E-01         0.00000E-         0.00000E-           0.00000E-01         0.00000E-         1.9205E           1.50357E-03         7.00664F         2.14778E-11	//XA           -05         1.5334E-03           -01         7.2623E-05           -01         9.1373E-06           -06         5.3437E-03           02         1.1400E-06           03         3.8020E-11           00         0.0000E-01           -01         -0.0000E-01           -01         -01	
TEPATION         NUMBER         8           CUNCENTRATION         TMPH           2.0150E-09         9.3899E-           0.0000E-01         0.0000E-           3.0.0000E-01         0.0000E-           4.0070E-         1.2792E           4.2334E-05         1.9728E           4.1213E-05         1.9205E           3.0.0000E-01         0.0000E-           4.1213E-05         1.9205E           3.0.0000E-01         0.0000E-           1.9205E         1.9205E           2.2505E-06         1.0487E-           0.00000E-01         0.0000E-           0.00000E-01         0.0000E-           1.50357E-03         7.00664F           2.14773E-11         0.0000E-	//XA           -05         1.5334E-03           -01         7.2623E-05           -01         9.1373E-06           -06         5.3437E-03           02         1.1400E-06           03         3.8020E-11           00         0.0000E-01           -01         -0.0000E-01           -01         -01	
TEPATION         NUMBER         8           CUNCENTRATION         TMPH           2.0150E-09         9.3899E-           0.0000E-01         0.0000E-           3.0.0000E-01         0.0000E-           4.0070E-         1.2792E           4.2334E-05         1.9728E           4.1213E-05         1.9205E           3.0.0000E-01         0.0000E-           4.1213E-05         1.9205E           3.0.0000E-01         0.0000E-           1.9205E         1.9205E           2.2505E-06         1.0487E-           0.00000E-01         0.0000E-           0.00000E-01         0.0000E-           1.50357E-03         7.00664F           2.14773E-11         0.0000E-	//XA           -05         1.5334E-03           -01         7.2623E-05           -01         9.1373E-06           -06         5.3437E-03           02         1.1400E-06           03         3.8020E-11           00         0.0000E-01           -01         -0.0000E-01           -01         -01	
2.0150E-09       9.3899E-         0.0000E-01       0.0000E-         0.0000E-01       0.0000E-         4.9.8863E-11       4.0070E-         5.2.7452E-03       1.2792E         5.4.7334E-05       1.9728E         7.4.1213E-05       1.9205E         8.2.505E-06       1.0487E-         0.0000E-01       0.0000E-         0.0000E-01       0.0000E-         1.50357E-03       7.00664E         2.14773E-11       0.0000E-	//XA           -05         1.5334E-03           -01         7.2623E-05           -01         9.1373E-06           -06         5.3437E-03           02         1.1400E-06           03         3.8020E-11           00         0.0000E-01           -01         -0.0000E-01           -01         -01	
TEPATION         NUMBER         8           1         CUNCENTRATION         TMPH           1         2.0150E-09         9.3899E-           2         0.0000E-01         0.0000E-           3         0.0000E-01         0.0000E-           4         9.8853E-11         4.0070E-           5         2.7452E-03         1.2792E           5         4.7334E-05         1.9728E           7         4.1213E-05         1.9205E           3         2.2505E-06         1.0487E-           9         0.0000E-01         0.0000E-           1         5.057E-03         7.00664F           2         2.14773E-11         0.0000E-	//XA           -05         1.5334E-03           -01         7.2623E-05           -01         9.1373E-06           -06         5.3437E-03           02         1.1400E-06           03         3.8020E-11           00         0.0000E-01           -01         -0.0000E-01           -01         -01	

	a an
SYSTEM 4 B20 TH 1110 DEG K	
REACIDE PUSITION 1.44144E 02FFET	
TEMPERTURE 1014. USDEGREE-K HOLAK FLUW RATE 2.02913E 02POUND MULES PER HOUR	
CONVERSION DE ETHANE TO ETHYLENE IS 2.22%	
PRESSURE IS 5.02670E 00 VELUCITY 2.7204E 02FEFI/SEC.	
ITERATION NUMBER	
NO CUNCENTRATION TOPH UXA	
1. 4.0944E-09 1.9579E-04 1.9045E-03	
0.0000E-01 0.0000E-01 8.6287E-05	and an
3 0.0000E-01 0.0000E-01 i.1149E-05	
4 2.5851E-1) 1.2362E-05 0.2559E-03	
<u>2.6557E-031.2693E_021.7544E-06</u>	
6.0430E-05 2.8897E 00 9.9737E-11	
7 5.8912E-05 2.8171E 00 0.0000E-01	
83.0561E=061.4614E=010.0000E=01	
90.00000E-010.00000E-01	
10 0.0000E-01 0.0000E-01	
111.46533E-037.00696E_01	
<u>12</u> <u>5.10816E-11</u> <u>0.20000E-01</u>	
REACTOR PUSITIUN 1.60160E 02FEET	
TEMPERTURE 1020.020EGREE-K HOLAK ELUW RATE 2.04049E 02PUUND MOLES PER HOUR	
CONVERSION OF ETHANE TO ETHYLENE IS 3.09%	
PRESSURE IS 5.54052E.00 VELOCITY 2.7953E 02FEET/SEC.	
ITERATION NUMBER- 1)	
<u>NO CONCENTRATION TAPH UXA</u> 1 7,5090E-09 3.6876E-04 2.3525E-03	
2 0.0000E-01 0.0000E-01 1.0204E-04	
<u>3</u> 0.0000E-01 0.0000E-01 1.3534E-05	
<u>4 5.7689E-10 2.2331E-05 7.2916E-03</u>	
<u>5 2,5626E-03 1,2585E 02 2,5059E-06</u>	
6 8.1743E-05 4.0146E 00 2.3211E-10	
7 7.9784E-05 3.9152E 00 0.0000E-01	
<u>B 3.9633E-06 1.9464E-01 0.0000E-01</u>	مراجع المراجع ا
9 0.00000E-01 0.00000E-01	
10 0.9J000E-01 0.00000E-01	
11 1.42689E-03 7.00740E 01	
12 1.09174E-16 0.00000E-01	
13 1.61088E-12 7.91098E-08	
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SYSTEM 4 820 TO 1110 DEG K		
REACTOR PUSITION 1.70176E 02FEE	FLUW RATE 2.05303E 02POUND MOLES PER HOUR	
TEN ENGLE DECEMPERATE POLITICA	rear RATE 2.49503E (2) HONT HELES FER HOOK	
CONVERSION OF CTHANE	ID ETHYLENE IS 4.05%	
PRESSURE IS 5.45397E OO VELU	CITY 2.8639E 02FEE1/SEC.	
ITERATION NUMBER- 11		
ND CUNCENTRATION THPH	UXA	
1 1.2341E-08 0.2057E-04	2.4843E-03	
2 0.0000E-01 0.0000E-01	1.0621E-04	and the state of the second
	1.4210E-05	-
<u>4 1.1038E-09 5.5505E-05</u> <u>5 2.4776E-03 1.2458E 02</u>	7.5528E-03	
	3.0093E-06	
<u>6 1:2457E-04 5.2563E 00</u> 7 1.0214E-04 5.1362E 00	4.2741E-10 0.0000E-01	· · · · · · · · · · · · · · · · · · ·
	0.0000E-01	
9_0.0000E-01 0.0000E-01	0.0000E=01	
10 0.0000E-01 0.0000E-01		
<u>11 1.39366E-03 7.00786E 01</u>		
12 1.85826F-10 . G.00000F-01		
13 3.53178E-12 1.77592E-07		
REACTOR POSITION 1.92192E 02FEE	T	1
TEMPERTURE 1024. UZUEGRIE-K HOLAK	LOW RATE 2.06614E 02PDUND MULES PER HOUR	
CONVERSION OF FTHANE	IN ETHYLENE IS 5.05%	
PRESSURE IS 5.36481E DO VELU	CITY 2.9374E 02FEET/SEC.	
ITERATION NUMBER- 12		
ND CUNCENTRATION TMPH	() X A	
<u>1 1.3449E-08 9.5077E-04</u>	2.6223E-03	
<u>2 0.0000E-01 0.0000E-01</u>	1.1050E-04	
<u>3 0.0000E-01 0.0000E-01</u>	1.4913E-05	-
<u>4 1.8482E-09 9.5246E-05</u>	7.6203E-03	
5 2.3918E-03 1.2326E 02	3.4127E-06	والمحمد والمعادي والمعادية
6 1.2725E-04 0.5577E 00 7 1.2437E-04 6.4095E 00	6.8879E-10	
7 1.2437E-04 6.4095E 00 8 5.8388E-06 3.0090E-01	0.00002-01	
<u>9 0.00006-01 0.00008-01</u>		
10 0.00000E-01 0.00000E-01		
<u>11 1.35995E-03 7.00837E 01</u>		-
12 2.87622E-10 0.00000E-01		
13 6.62715E-12 3.41525E-07		
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		and the second of

SYSTEM 4 820 TH 1110 DEG K		
REACIDE PUSITION 2.08208E 02E		
TEMPERTURE 1027. JSUEGREE-K MOL	LAR FLOW RATE 2.08003E 02POUND MOLES PER HOUR	
En LIGARE LOZIEDDE ORFFAR PUL	AK TEUK KATE Z.USUUSE UZTUUTO MULES PEK HUOK	
CONVERSION OF ETHANE		
PRESSURE IS 5.2727EE 00 VE	IN ETHYLENE IS 6.11%	
ITERATION_NUMBER=_13	LJLITY	
NO_CONCENTRATION	UXA	
<u>1 2.5959E-08 1.3739E-03</u>		an a
<u> </u>	1.1857E-04	
4 2.8267E-09 1.4960E-04		
<u>5 2.3026E-03 1.2136E 02</u>		
<u>6 1.4991E-04 7.9337E 00</u>		
	0.0000E=01	
	0.0000E-01	•
9 0.00000E-01 0.00000E-01	0.00002-01	-
100.0U000E-010.00000E-01		
-11		and the second
12 4.31107E-10 0.00000E-01		
<u>13 1.12506E-11 5.95437E-07</u>		
	-	
REACTOR POSITION 2.24224E 02FF	EFT	
TEMPERTURE 1031.06DEGREE-K MOLA		
Commentation of the start of th	AN TEOM WATE 2.07557E 02FUOND HUEES FER HUOK	
CONVERSION DE ETHANE	TO ETHYLENE IS 7.29%	
PRESSURE IS 5.18002F 00 VEL	LUCITY 3.1125E 02FFET/SEC.	
ITERATION NUMBER- 14		·
10 CONCENTRATION TUPH	0XA	
1 3.5491E-08 1.9332E-03	3.2629E-03	-
2 0. J000E-01 U.0000E-01	1.3076E-04	
3 0.0000E-01 0.0000E-01	1.6187E-05	
4 4.1102E-09 2.2389E-04	9.0999E-03	
5 2.2086E-03 1.2030E 02	4.3747E-06	· · · · · · · · · · · · · · · · · · ·
6 1.7386E-04 9.4705E 00	1.0595E-09	Martin
7 1.7011E-04 9.2662E 00	0.000E-01	
8. 7.6752E-06 4.1807E-01	0.000E-01	
9 0.03000E-01 0.00000E-01		
10 0.01000E-01 0.00000E-01		
<u>11 1.28666E-03 7.00965E 01</u>		
12 6.43799E-10 0.00000E-01		
13 1.92278E-11 7.97838E-07		
12 1.0 2 4 1.9 5 1 1 1.2 2 4 7 4 0 2 6 5 T V 1		
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SYSTEM 4 820 TH 1110 DEG K		
REACTOR POSITION : 40240E 02F	AR FLUW RATE 2.11292F 02POUND MOLES PER HOUR	
		-
CONVERSION OF ETHANE		
PRESSURE IS 5.08547E 00 VEI	TO ETHYLENE IS 3.61% LUCITY 3.2148E 02FEET/SEC.	
	10(1) 3.2148E 02FEE//SEC.	
ND CONCENTRATION THPH	ί.ΧΑ	Nat maddata anna dh'adhar ninga gunagar a mar ingadaga
ND CONCENTRATION TMPH 1 4.7460E-08 2.6644E-03	3.6911E=03	e a se con economica a anecesia
2 0.0000E-01 0.0000E-01	3.0711C=05	t to an attack to a new construction
<u>3</u> 0.0000E-01 0.0000E-01	2.03426-05	
<u>4 5.7592E-09</u> 3.2337E-04	9.9128E-03	
<u>5 2.1119E-03 1.1856E 02</u>	4.91725-06	frank for a second second
<u>6 1.9925E-04 1.1166E 01</u>	2.5269E-09	
7 1.9506E-04 1.0951E 01	0.0000E-01	
<u>8 8.6273E-06 4.6433E-01</u>	0.0000E-01	an an an an a' ana an
9 0.00000E-01 0.0000E-01		
10 0.00006E-01 0.00006E-01		
<u>11 1.24876E-03 7.01043E 01</u>		
12 9.37767E-10 · 0.00000E-01		
13 2.85639E-11 1.60356E-06		
REACTOR POSITION 2.50256E 02FE	FFT	
TEMPERIURE 1039.06DEGREE-K MOLA		
CONVERSION OF ETHANE	TO ETHYLENE IS 10.07%	
	LUCITY 3.3276E 02FEET/SEC.	
ITERATION NUMBER- 15		
NO CONCENTRATION TAPH	UXA	
1 6.2241E-08 3.6067E-03	4.1615E-03	
2 0.0000E-01 0.0000E-01	1.5762E-04	
3 0.0000E-01 0.0000E-01	2.26785-05	And and a subscription of the subscription of
4 7.8247E-09 4.5343E-04	1.0765E-02	· · · · · · · · · · · · · · · · · · ·
5 2.0127E-03 1.1663E 02	5.4543E-06	······································
6 2.2592E-04 1.3091E 01	3.7564E-09	4.1
7 2.2128E-04 1.2823E 01	0.0000E-01	The second
<u>8 9.5937E-06 5.5593E-01</u>	0.00006-01	
9 0.00000E-01 0.00000E-01		
10 0.0000E-01 0.00000E-01		
11 1.20996E-03 7.0114BE 01		
12 1.33552E-09 0.00000E-01		and a second
<u>13 4.34688E-11 2.51893E-06</u>		and the second
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SYSTEM 4 B20 TO 1110 DEG K	
REACIDE POSITION 2.72271E 02FFFT TEMPERIURE 1043.07DEGREE-K MOLAR FLOW RATE 2.15354E 02POUND MOLES PER HOUR	
TEMPERIURE 1043.07DEGREE-K MOLAR FLUW RATE 2.15354E 02POUND MOLES PER HOUR	
CONVERSION OF ETHANE 10 ETHYLENE IS 11.69%	
CDIVERSION DF. ETHANE 10 ETHYLENE IS 11.69% PRESSURE IS 4.88917E 00 VELUCITY 3.4539E 02FEET/SEC.	
ITERATION NUMBER	
NO CUNCENTRATIUM THPH DXA	
1	
2 0.000E-01 0.000E-01 1.7217E-04	
3 0.0000F-01 0.0000E-01 2.5189E-05	te contractioner of the mean of a contract of the
<u>4</u> <u>1.0346E-08</u> <u>6.1996E-04</u> <u>1.1650E-02</u>	to be a set of the second second deal of the second second second
<u>5 1.9103E-03 1.1450E 02 5.9662E-06</u>	In the set of the set of the information processing and the set of the set
6 2.5360E-04 1.5126E 01 5.4509E-09	
72.4853E-041.4E92E_010.0000E-01	The particular second protocol and the second protocol and the
<u>8 1.0562E-05 1.3290E-01 0.0000E-01</u>	
9 0.00000E-01 9.00000E-01	
100.00000E-010.00000E-01	
-11_1.17030E=03_7.01208E_01	
12 1,86210E-09 · 0.00000E-01	
30:44141E+113.BD364E+00	
REACIDE POSITION2.88267E_02FEET	e e an maranga
TEMPERTORE TOSO, IBDEUREE-R INCLAR FLOW RATE 2.178TIE 02/DUND MOLES PIR HOOR	
CONVERSION OF ETHAME TO ETHYLENE IS 3.56%	· · · · · · · · · · · · · · · · · · ·
PRESSURE 15 4.78601E DO VELUCITY 3.6125E 02FEET/SEC.	
TTERATION NUMBER- 18	
NO CUNCENTRATION TMPH DXA	
1 1.0251E-07 0.3848E-03 5.8578E-03	
2.0.0000E-01 0.5000E-01 2.0545E-04	An and the second s
3 0,0000E-01 0.0000E-01 3.0956E-05	
4 1.3437E-08 8.3689E-04 1.3677E-02	nam af an fearing an
<u>5 1.7991E-03 1.1205E 02 7.0210E-06</u>	
<u>6. 2.8235E-04 1.7617E 01 8.3814E-09</u>	
7 2.7736E-04 1.7275E 01 0.0000E-01	
81.1532E=057.1827E=010.0000E=01	
9 0.00000E-01 0.00000E-01	
10 0.00000E-01 0.00000E-01	
<u>11</u> <u>1,12621E-03</u> <u>7,01427E_01</u>	
12 2.79472E-v9 0.0v003E-01	the and the property of the pr
13 9.36839E-11 5.83434E-05	
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and a series of a		يىسىي <mark>ىرىمىيىر</mark> بەرچەر يېچىنىمىيە بەرچە دەرچە يېزى _{قا} ر			and a second
	1997 - An ann an Anna a suite ann an an Anna 1997 - An Anna Anna Anna Anna Anna Anna Anna				
S	YSTEM 4 820 TE	1110 DEG K			
	ATOR POSTTING	3 043036 025	EET		
TEM	PERTURE 1060.1	90FGREE-K MOL	AR FLUW RATE	2.21083E 02POUND MOLES PER HOUR	
		· · · · · ·			
	VERSION OF ETH	AHE NO VE	LUCITY 2 224	EIS_16.03% SOE 02FEET/SEC.	
	RATION HUMBER-		<u>ulii 2.020</u>		
	CONCENTRATION	ТаРН	υχά		
	1.3523E-07	J.2065E-03	8.0298E-03		
2	0.0000E-01	0.0000E-01	2.6316E-04		
3	0'. U000E-01	0.0000E-01	4.17986-05		
4		1.1595E-03	1.7127E-02		
5	1.6705E-03	1.0881E 02	9.0023E-06 1.4987E-08		the contract water of the last sector of the sector sectors
67	3:1955E-04 3.1389E-04	2.0830E 01 2.0442E 01	0.0000E-01		
8	1.2660E-05	3.2449E-01	0.0000E-01		
9	0.00000E-01	0.00000E-01	<u>ordaose or</u>		
10	0.00000E-01	0.00000E-01			
11	1.07748E-03	7,01691E 01			
12		. 0.0000E-01		•	
13	1.42218E-10	9.26175E-06			
1) 5 4 6	TOR POSITION	3.21897E 02FE	- C T		
TEME	PERIURE 1070 7	1DEGREE-K HOLA		2.25766E O2POUND MOLES PER HOUR	
	ERIORE LOTO.I	IDEONLERN HUGH			
CON	ERSION OF ETH	AHF	TO ETHYLENE		
	SURE IS 4.5		UCITY 4.095	66E 02FEET/SEC.	
	ATION HUHBER-				
	ONCENTRATION	Тырн	DXA		
l	1.8683E-07 0.0000E-01	1.2914E-02 0.0000E-01	<u>5.0456E-03</u> 1.5420E-04		
2	0.0000E-01	0.0000E-01	2,52366-05		and a second
<u>· 2</u> 4	2.4579E-08	1.6990E-03	9.8039E-03		· · · ·
. 5	1.5070E-03_	1.0417E 02	5,1976E-06		
6	3,5787E-04	2.5428E 01	6.4445E-09		-
7	3.6141E-04	2,4981E 01	0.0000E-01	· · · · · · · · · · · · · · · · · · ·	
8	1.39866-05	9.6672E-01	0.0000E-01		
9	0.00000E-01	0.0000E-01			
10	0.00000E-01	0.00000E-01			
	1.015705-03	7.020746 01			
	3.65684E-09 2.20328E-10	0.00000E-01 1.52296E-05	······································		nak da di kati ya kana ya kati kati kati kati kati ya kati ya kati ya kati kati kati kati ya kati ya kati ya k
13	7.7.3786-10				
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SYSTEM 4 820 TU 1110 DEG K	
DEACTOR POSITION & 20604E 02EEET	
TEMPERTUKE 1076.98DEGREE-K MOLAR FLOW RATE 2.30835E 02POUND MULES PUR HOUR	
CONVERSION DE ETHANE 10 ETHYLENE 15 23.42%	
PRESSURE IS 4.44401E 00 VELUCITY 4.5644E 02FEET/SEC.	
ND. CONCENTRATION TEPH DXA	
1 2.4984E-07 1.8258E-02 5.6910E-03 2 0.0000E-01 0.0000E-01 1.6694E-04	
3 0.0000E-01 0.000E-01 2.8002E-05	
4 3.2721E-08 2.3913E-03 1.0470E-02	
<u>5 1.3561E-03 9.9104E_01 5.5810E-06</u>	
6 4.1643E-04 3.0433E 01 9.4038E-09	
7 4.0953E-04 2.9929E 01 0.0000E-01	
<u>B 1.5247E-05 1.1143E 00 0.0000E-01</u>	
9 0.00000E-01 0.00000E-01	
<u>10 0.00000E-01 0.00000E-01</u>	
<u>11 9.61034E-04 7.02341E 01</u>	
12 5.22236E=09 0.00000E=01 13 2.78560E=10 2.03577E=05	
REACTOR POSITION 3.55325E 02FEET	
TEMPERTURE 1083.250CGREE-K MOLAR FLOW RATE 2.36328E 02POUND MOLES PER HOUR	
CONVERSION OF ETHANE TO ETHYLENE IS 27.59%	
PRESSURE IS 4.28680E 00 VELUCITY 4.9482E 02FEET/SEC.	
ITERATION NUMBER- 22	
NO CONCENTRATION THPH DXA	
1 3.2220E-07 2.5122E-02 6.5513E-03 2 0.0000E-01 0.0000E-01 1.6454E-04	
2 0.0000E=01 0.0000E=01 1.6454E=04 3 0.0000E=01 0.0000E=01 3.1718E=05	
<u>4 4.1508E-08 3.2363E-03 1.1418E-02</u>	
<u>5 1.2009E-03 9.3632E 01 5.5842E-06</u>	
6 4.5975E-04 3.5846E 01 1.3770E-08	
7 4.52535-04 3.5257E 01 0.0000E-01	
<u>8 1.6259E=05 1.2677E 00 0.0000E=01</u>	
9 0.0000E-01 0.0000E-01	·
10 0.00000E-01 0.00000E-01	
11 9.01223E-04 7.0266BE 01	
12 7.34573E-09 0.00000E-01 13 3.56366E-10 2.78243E-05	
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SYSTEM 4 820 TO				
And a second	1110 DEG K			
REACTOR PUSITION	3.72044E 02FF	EET	.42223E 02POUND MOLES PER HOUR	
1ENPERIORE 1092.5	SUEGREERK MULA	AR FLUW RATE		
CONVERSION OF ETH	Δ13F	TO ETHYLE	IS_32.04%	
PRESSURE IS 4.0	1735E 00 VEL	UCITY 6.2	IS_32.04% E_02FEE1/SFC.	
ITEPATION NUMBER-	23	n bi Andrei ei en en en en interestationen en		
NO CONCENTRATION	THPH	DXA		
1 3.97446-07	3.3754E-02	7.2130E-03		
2 0.0000E-01	0,000E-01	1.9152E-04		
3 0.0000E-01	0.0000E-01	3.4107E-05		
4 4.9127E-08	4.1724E-03	1.16186-02		
5 1.0336E-03		4.87628-06		
6 4:9027E-04	4.1634E 01	1.8002E-08		n an
7 4,5310F-04	4.1030E 01	0.00008-01		
8 1.6771E-05 9 0.00000E-01	1.4243E 00	0.0000E-01		
A CONTRACTOR OF A CONTRACTOR O	0.00000E-01		, 	
10 0.0000E-01 11 8.27834E-04	0.0000E-01 7.03083E 01			and the second
12 9.22029E-09				
13 4.47570E-10	3.80124E-05			and a stand of the
REACTOR POSITION	3.88763E U2FF	ΕŢ		
EMPERIURE 1102.91	BDEGREE-K MOLA	R FLUW RATE	.48571E O2POUND MULES PER HOUR	na sense and an
	ر الله الله الله المحمد المحمد الله الله الله الله الله الله الله الل			•••••••••••••••••••••••••••••••••••••••
CONVERSION OF FINA	ANT	TO ETHYLEN	IS 56.81%	
PRESSURE IS 3.5	7742E 00 VEL	UCITY 7.91	<u>15 6.81%</u> E_02FEET/SEC.	
ITERATION NUMBER-	24			
30 0000000000000000	THPH	DXA		
O CONCENTRATION	and the second state of th			
1 4.5376E-07	4.4539E-02	8.3198E-03		
1 4.5376E-07 2 0.0005E-01	0.0000E-01	2.0692E-04		
1 4.5376E-07 2 0.0000E-01 3 0.0000E-01	0.0000E-01 0.0000E-01	2.0692E-04 3.8326E-05		
1 4.5376E-07 2 0.0000E-01 3 0.0000E-01 4 5.1302E-08	0.0000E-01 0.0000E-01 5.0355E-03	2.0692E-04 3.8326E-05 1.2282E-02		1
1 4.5376E-07 2 0.0000E-01 3 0.0000E-01 4 5.1302E-08 5 8.3038E-04	0.0000E-01 0.0000E-01 5.0355E-03 8.1554E-01	2.0692E-04 3.8326E-05 1.2282E-02 3.4764E-06	· · · · · · · · · · · · · · · · · · ·	1
1 4.5376E-07 2 0.0000E-01 3 0.0000E-01 4 5.1302E-08 5 8.3038E-04 6 4.8734E-04	0.0000E-01 0.0000E-01 5.0355E-03 8.1554E-01 4.7534E-01	2.0692E-04 3.8326E-05 1.2282E-02 3.4764E-06 2.1455E-08		
1 4.5376E-07 2 0.0000E-01 3 0.0000E-01 4 5.1302E-08 5 8.3038E-04 6 4.8734E-04 7 4.8071E-04	0.0000E-01 0.0000E-01 5.0355E-03 8.1554E 01 4.7534E 01 4.7184E 01	2.0692E-04 3.8326E-05 1.2282E-02 3.4764E-06 2.1455E-08 0.0000E-01		
1 4.5376E-07 2 0.0000E-01 3 0.0000E-01 4 5.1302E-08 5 8.3038E-04 6 4.8734E-04 7 4.8071E-04 8 1.6114E-05	0.0000E-01 0.0000E-01 5.0355E-03 8.1554E 01 4.7534E 01 4.7184F 01 1.5816E 00	2.0692E-04 3.8326E-05 1.2282E-02 3.4764E-06 2.1455E-08		
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1 4.5376E-07 2 0.0005E-01 3 0.0000E-01 4 5.1302E-08 5 8.3038E-04 6 4.8734E-04 7 4.8071E-04 8 1.6114E-05 9 0.00000E-01 0 0.00000E-01 1 7.16910E-04 2 1.11308E-08	0.0000E-01 0.0000E-01 5.0355E-03 8.1554E 01 4.7534E 01 1.5816E 00 0.0000E-01 0.0000E-01 7.03677E 01 0.0000E-01	2.0692E-04 3.8326E-05 1.2282E-02 3.4764E-06 2.1455E-08 0.0000E-01		
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1 4.5376E-07 2 0.0005E-01 3 0.0000E-01 4 5.1302E-08 5 8.3038E-04 6 4.8734E-04 7 4.8071E-04 8 1.6114E-05 9 0.00000E-01 0 0.00000E-01 1 7.16910E-04 2 1.11308E-08	0.0000E-01 0.0000E-01 5.0355E-03 8.1554E 01 4.7534E 01 1.5816E 00 0.0000E-01 0.0000E-01 7.03677E 01 0.0000E-01	2.0692E-04 3.8326E-05 1.2282E-02 3.4764E-06 2.1455E-08 0.0000E-01		
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1 4.5376E-07 2 0.0005E-01 3 0.0000E-01 4 5.1302E-08 5 8.3038E-04 6 4.8734E-04 7 4.8071E-04 8 1.6114E-05 9 0.00000E-01 0 0.00000E-01 1 7.16910E-04 2 1.11308E-08	0.0000E-01 0.0000E-01 5.0355E-03 8.1554E 01 4.7534E 01 1.5816E 00 0.0000E-01 0.0000E-01 7.03677E 01 0.0000E-01	2.0692E-04 3.8326E-05 1.2282E-02 3.4764E-06 2.1455E-08 0.0000E-01		
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1 4.5376E-07 2 0.0005E-01 3 0.0000E-01 4 5.1302E-08 5 8.3038E-04 6 4.8734E-04 7 4.8071E-04 8 1.6114E-05 9 0.00000E-01 0 0.00000E-01 1 7.16910E-04 2 1.11308E-08	0.0000E-01 0.0000E-01 5.0355E-03 8.1554E 01 4.7534E 01 1.5816E 00 0.0000E-01 0.0000E-01 7.03677E 01 0.0000E-01	2.0692E-04 3.8326E-05 1.2282E-02 3.4764E-06 2.1455E-08 0.0000E-01		
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$ \frac{1}{2} + \frac{5}{376E-07} \\ \frac{1}{2} + \frac{1}{302E-01} \\ \frac{1}{302E-08} \\ \frac{1}{302E-08} \\ \frac{1}{302E-08} \\ \frac{1}{302E-08} \\ \frac{1}{302E-04} \\ \frac{1}{302E-04} \\ \frac{1}{303E-04} \\ \frac{1}{302E-04} \\ \frac{1}{302E-01} \\ \frac{1}{302E-01} \\ \frac{1}{302E-01} \\ \frac{1}{302E-08} \\ \frac{1}{30$	0.0000E-01 0.0000E-01 5.0355E-03 8.1554E 01 4.7534E 01 1.5816E 00 0.0000E-01 0.0000E-01 7.03677E 01 0.0000E-01	2.0692E-04 3.8326E-05 1.2282E-02 3.4764E-06 2.1455E-08 0.0000E-01 0.0000E-01		N W 1

SYSTEM 4 820 TU 1110 DEG	К				
CHUCTION BEACLE IN					
FUNCTION REQC(T,1) REUC(T,1)= 0.154626 01(11)	02 04 11				
	02.98, 1)	· · · · · · · · · · · · · · · · · · ·			
FUNCTION REQC(1,1) REQC(7,1)= 2.452581-01(11)	2.2. (1.2				
FUNCTION REAC(I,I)				·	
REAC(T+1)= 0.303306 02(110				······································	
FUNCTION REOC(1,1)		······			
_REDC(T, I) =0.12614E-08(110	)2.98, 4)				
FUNCTION REDC(T,1)					······································
REQUIT: 1) = 0.42414E 01(110					
- FUNCTION REAC(I,I)					
REQC(T,1)=0.12937E.01(110					
FUNCTION_REQUITED					
_REQC(T,1)= 0.249600 00(110	)2,98, 7)				
FUNCTION RECC([,1) REGC(T,1)= 0.22003E-62(110					
REQC(T,I)= 0.22003E-02(110	02.98, 8)		· · · · · · · · · · · · · · · · · · ·		n an
FUNCTION PRR(IS) -		· · · · · · · · · · · · · · · · · · ·			
PR= 6.44929E_CUKADI(1	1 = 1.25000 = -01	VEL= 0.00000E	-()]		
EUNCTION PRESD(T)					
RENU= 5.53597E 05 VIS=	= 2.66074E-05	DEN= 1.13022F-01		·	
FRICTION FACTOR = 1.28635E	$= (12)$ $V_1 \cdot V_2 \cdot V_4 =$	7.91628E 02	5.15670E 02	6.53648E 02	ne se anno 1971 ann an Sanna ann ann an Sanna a
TEMPERIURE= 1102.94PRESSURE					
	4.53763E-07	4.45387E-02			
		0.00000E-01			
	0.00000E-01	0.0000E-01			
	5.13023E=08	5.03553E-03			
					***
	8.30876E-04	8.15538E 01			
6-F ETHYLERE	4.87339E-04	<u>4.78343E 01</u>		1	****
7-G HYDROGEN	4.80709E-04	4.71835E 01			
8-H METHANE	1.61135E-05	1.58161E 00			
9-I PROPARE	0.00000E=01	0.00000E-01			-
10-J_PROPENE	0.00000E-01	0.00000E-01			
11-K WATER	7.16910E-04	7.03677E 01	·		
_12-LCARBON	1.11308E-08				
13-M CARBON MOMOXIDE	<u>5.14560E-10</u>	5.05082E-05			
CONVERSION DE LIHANE	ID ETHYLENE	IS 36.8	1 %	·	
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					anne ann a seanna an ann abh fa le an agus an tarainn an a sa ann an Seanna an Seanna an Seanna an Seanna an S
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REACTOR BADIUS PROFILE AFTER 400.00 HOURS

0.125000					•			And a second state a second state of the secon		The summer sector sector sector and the support of the support
- ひょうえついいい	0.1256.22									•
- 195000 - 195000	0.172000	0.125000	0.175000	0,125000	0.125000	0.125000	0.125000	0.125000	0.125000	An Arrival States of the Arrival States and the supervision of the
11122000	_Q.125000_	6.125000	0.125000	0.125000		0.1250.10	0.125000	0.125000	0.125000	and in the second sections contained and the second second second
0.125000	0.125000	0.124999	0.124999	0.124999	0.124998	0.124998	0.124997	0.124995	0.124994	a and it with the second constraints for the second of the second constraints of the second second
0,124992	0.124/90	4-124988		0.124981	0.124977	0.124971	0.124965	0.124958	0.124949	
0.124941	0.124932	U.124922		0.124901		0.124875	0.124861	0.124846	Q.124830	
0.124810	0.124786	6.124764	0.124737	0.124708	0.124676	0.124641	0.124603	0.124562		
0.124468	0.124415	0.124357	C.124294	2.124227	1.124153	0.124075	0.123989	V+127702	0.124517	
		u.123209	0.122948	0.122647		0.124075		0.123898	0.123795	
0.119238		0.118428			0.122297	0.121891	0.121417	_0.119637_	0.120350	·
0.110509			Jellice.	0.117109	0.116308	0.115454	0.112760	0.113297	0.110358	
1.110207	0.104040	0.104896	0.100350	0.102426	0.100159	0.097921	0.095781	0.087396	0.087396	
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REACTOR IS 400.00 FEET LONG AND 0.125 FEET IN RADIUS	1946 S
IDIAL MOLES / HUR ARE 200.0POUND MOLES AT PRESSURE 6.449A VELOCITY OF 1.89127E 02 AT TEMPERATURE 820.0DF6 H	(
INITIAL REACTOR INCREMENT(DL 1.85786E OOFEET	Remain a successive device discussive payments, and the strength of the strength os
$\frac{1}{12131820(1.1)} = 0.11953102(832.71, 1)$	
REQC(T,1)=0.68841E=02(832.71,2)	
FUNCTION REOC(T, I)	
REQC(T+I)= 0.14012E_06(_B32.71,_3) EUGCTION_REQC(T+1)	
REQC(1,1) = 0.14637E + 0.00(532.71, 4)	
FUNCTION REAC(1,1)	
_ REQC(T, I) = 0.52409E 01( B32.71, 5)	
- FUNCTION REOC(T.1)	
REQC(T_1)=0.275991-01(832.71,_6) FUNCTION_REQC(T_1)	
FUNCTION REQC(1)1	
REQC(T,1) = 0.79039E-03(B32.71,B)	
FUNCTION PRR(IS)	
PR=6.44929E_00:RADI(1)=1.25000E-01VOL=0.00000E-01 FUNCTION_PRR(IS)	
PR = 6.44928E 00 RADI(1) = 1.25000E-01 VUL = 0.00000E-01	
FUNCTION_PRESD(T)	
RENU= 3.35919E 05 VIS= 2.16064E-05 DEN= 1.52080E-01	
ERICIIDN FACIDR = 1.41227E=02 VI.V2.VA= 1.89127E 02 1.92672E 02 1.90899E 02 TEMPERIURE = 832.71PRESSURE D= 2.05395E=02	
FUNCTION PRR(1S)	
PR=6.42374E_00RADI(1)=1.25000E=01V0L=0.00000E=01	
PRESSURE_15 6.42074E_00VELUCITY1.9267E_02FEET/SEC	
<u>1 0.0000E-01 0.0000E-01 3.8341E-07</u>	
2 0.0000E-01 0.0000E-01 8.7882E-08 3 0.0000E-01 0.0000E-01 0.0000E-01	· · · ·
4 0.0000E-01 0.0000E-01 0.0000E-01	
5 3.6266E-03 1.2994E 02 0.0000E-01	
<u>6 1.6361E-09 5.5530E-05 0.0000E-01</u>	
7 1,4679E-09 4.9P21E-05 0.0000E-01 8 3,3646E=10 1.1419E=05 0.0000E=01	
<u>8 3,3646E-10 1,1419E-05 0,0000E-01</u> <u>9 0,00000E-01 0,00000E-01</u>	ten kan na sana kan kan kan kan kan kan kan kan kan
10 0,0000E-01 0.0000E-01	
<u>11 2.06424E-03 7.06597E 01</u>	
<u>12 0.00000000000000000000000000000000000</u>	
13 0.00000E-01 0.00000E-01	an gha a' a dhanna annalla a' ann gagarainn ghagarainn dha ghar ga bain a' an
DL_CHANGED_TU	and a first the second s
I= 1 KA= 1.68480E-03 DXA(I)= 1.04803E-02 CF,CR= 1.56730E-03 1.20146E-07 REQC= 1.87819E 00	
RATE= 1.07857E OU	
AND ALTH BE FAC ADDIALE. TILLS COULD	
VELOCITY_DE_GAS_GREALER_THAN_SUUND	
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CVCTCH / ADA TO 111A DEC V	
SYSTEM 4 820 TO 1110 DEG K REACTOR POSITIUN 3.92662E 02FEET TEMPERTURE 1105.41DEGREE-K MOLAR FLOW RATE 2.47460E 02POUND MOLES PER HOUR PRESSURE IS 2.00000E 00 VELOCITY 1.3165E 03FEET/SEC.	
TEMPERTURE 1105.41DEGREE-K MOLAR FLUW RATE 2.47460E 02POUND MOLES PER HOUR	
PRESSURE IS 2. VOUDOE OO VELOCITY 1.3165E D3FEET/SEC.	
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	<u>N</u> 29
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REACTOR IS 400.00 FEET LUNG AND 0.125 FEET IN RADIUS	
REACTOR 1S 400.00 FEET LUNG AND 0.125 FEET IN RADIUS TOTAL MOLES / HOUR ARE 200.0POUND MOLES AT PRESSURE 6.649A VELOCITY OF 1.83438E 02 AT TEMPERATURE 820.0DEG K	
INITIAL REACTOR INCREMENT (DL 1.90880E OUFEET	
FUNCTION REQC(T,I) REQC(T,I)= 0.11963E_02(_B32.71, 1)	
EUNCTION REDC(T,I)	
REQC(T, 1) = 0.140124 06(832.71, 3)	······································
FUNCTION REDC(T)	
REQC(T+I)=0,14337E=08(_832,71,4)	
FUNCTION REQC(T,L)	
REQC(T,1) = 0.52459E G1(-832.71, 5)	
EUNCTION REDC(T,1) REQC(T,1)= 0.27599E-01(832.71,6)	
FUNCTION_REQC(T_1)	
REQC(T,1) = 0.55381E 00( 832.71, 7)	
EUNCTION REQC(T,I)	
REQC(T, I) = 0.79039E + 03(-832.71, -8)	
FUNCTIDH_PRR(IS)	
PR= 6.64929E 00- KADI(1)= 1.25000E-01 VDL= 0.00000E-01	
EUNCTION_PRR(IS)	
PR = 6.64728E CO RADI(1) = 1.25000E-01 VOL = 0.00000E-01	
RENUE 3.35912F 05 VISE 2.16064E-05 DENE 1.56811E-01 FRICTION FACTORE 1.41227E-02 VI.V22VAE 1.83438F 02 1.86841E 02 1.85140E 02	
TEMPERTURE= 832.71PKESSURE D= 1.99041E-02	
FUNCTION PRR(IS)	
PR= 6.62937E 0. RADI(1)= 1.25000E-01 VOL= 0.00000E-01	
<u>1 0.0000E-01 0.0000E-01 2.9324E-07</u>	
20.000E-010.000E-016.7213E-08	
3 0.0000E-01 0.0000E-01 0.0000E-01	
4 0.0000E-01 0.0000E-01	
5 3.9473E-03 1.2994E_02 0.0000E-01	
<u>6 1.2901E-09 4.2470E-05 0.0000E-01</u>	
7 1.1575E-09 3.8103E-05 0.0000E-01 8 2.6531E-10 8.7337E-06 0.0000E-01	·
9 0.00000E-01 0.00000E-01	·
10 0.00000E-01 0.00000E-01	
11 2.12826E-03 7.00596E 01	
12 0.0000CE-01 0.0000JE-01	
13 0.06000E-01 0.0000E-01	
DL_CHANGED_TU1.95486E_0071C=3.12310E_02	
I= 1 RA= 1.67718E-03 DXA(I)= 1.02411E-02 CF, CR= 1.69749E-03 1.43398E-07 REQC= 1.90323E 00	
RATE= 9.88194E-01	
VELDCITY OF GAS GREATER THAN SOUND	
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SYSTEM 4 B20 TO 1110 DEG K REACTOR_POSITION	
EACIDE_POSITION	
EMPERIURE 1100.69DEGREE-K MULAR FLUW RATE 2.55264E 02POUND MULES PER HOUR	
RESSURE IS 2.02000E 00 VELUCITY 1.2425E 03FEET/SEC.	
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REACTOR IS 400.00 FEET LONG AND 0.125 FEET IN RADIUS TOTAL MOLES / HOUR ARE 200.0POUND MOLES AT PRESSURE 6.849A VELOCITY OF 1.78082E 02 AT TEMPERATURE 820.0DEG K	
TOTAL HOLES / HOUR ARE 200.0POUND MOLES AT PRESSURE 6.849A VELOCITY OF 1.78082E 02 AT TEMPERATURE 820.0DEG K	
INITIAL REACTOR INCREMENTIOL 1.95486E OOFEET FUNCTION REAC(T,1)	
REQC(T, I) = 0.11963E 02(832.71, 1)	
FUNCTION REQUIT, 1)	and a second
REQC(T/I)=0.658416-02(_832.71, 2) FUNCTION_REDC(T/I)	
FUNCTION REAC(T,1)	
REQC([,1]= 0.14837E-08( 832.71, 4)	
FUNCTION REQC(1,1) REQC(1,1)= 0,52409E 01( 832.71, 5)	Construction of the second
LEUNCTION REDC(T-1)	
REJC(T,1) = 0.27593E-01(-832.71,-6)	
FUNCTION REQUIDED	
$\frac{REQC(T,1)=0.55381E_{00}(B32.71,7)}{EUNCTIUN_REOC(T,1)}$	
FUNCTIUN REQC(T.1) REQC(T.1)= 0.79039E-03(_032.71, 8)	
PR= 6.84928E_00: KADI(1)= 1.25000E-01 V0L= 0.00000E-01	
	The state of strong production of product of the state of
FUNCTION PRR(IS) PR= 6.84928E.0J RADI(1)= 1.25000E-01 VDL= 0.00000E-01	, and a state of the second
FUNCTION_PRESD(T)	and the second s
REHU=       3.35918E       05       VIS=       2.16064E-05       DEN=       1.61542E-01         FRICIIDU FACTOR=       1.41227E=02       VI.V2.VA=       1.78082E       02       1.79718E       02	a company of the second second second
	antanan mammuna antanan kanan ka
FUNCTION PRK(IS)	
PR=0.32997E_CORADI(1)=1.25000E-01VUL=C.00000E-01	
PRESSURE IS 6.32977F DO VELUCITY 1.8135F 02FEEI/SEC. 1 0.6000E+01 0.0000E+01 3.0143E+07	
$\frac{1}{2} = 0.0000E+01 = 0.0000E+01 = 3.0143E+07$	
30.5000E=010.0000E=010.0000E=01	
4 0.0000E-01 0.0000E-01 0.0000E-01	
<u>5.4.0660E-03 1.2994E-02 0.0000E-01</u> <u>6.1.3661E-09 4.3656E-05 0.0000E-01</u>	
7 1.2256E-09 3.9167E-05 0.0000E-01	unanteren er en er handelikken after angenen sindere aftere, som att ser er er er er
<u>BB092E-10B.9776E-06B000E-01</u>	·
9 0.00000E-01 0.00000E-01	
10 0.0000E-01 0.0000E-01 11 2.19227E-03 7.00596E-01	
12 0.00000E-01 0.00000E-01	
13_0.00000E-01_0.00000E-01	and the second s
DL_CHANGED_TH	
I= 1 KAF1.049026-03UXAT171.050006-02C.90K91.02051C.05TR05071C.07CR051.720574C.07	
RATE= 9.02414E-01	
VELOCITY OF GAS GREATER THAN SOUND	· · · · · · · · · · · · · · · · · · ·
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SYSTEM 4 820 TO 1110 DEG K REACTOR POSITION 4.00781E 02FEET TEMPERTURE 1109.38DE_REE-K PULAR FLOW RATE 2.58703E 02POUND MOLES PUR HOUR PRESSURE IS 2.00000E 00 VELOCITY 1.0528E 03FEET/SEC.	
REACTOR POSITION 4.00781E 02FFET	
PRESSURE IS 2 ADDRESSURE TO LAR FLOW RALE 2,58703E 02POUND MOLES PER HOUR	
TRESSORE 15 2.000000 00 VELUCION 1.0028E 03FEET/SEC.	
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SYSTEM 4 B20 TH 1110 DEG K	
REACTOR PUSITION 1.60160E OIFFET	
TEMPERTURE 870.85DEGREE-K HOLAR FLUW RATE 2.00001E 02POUND MOLES PER HOUR	
	L = L = L = L = L = L = L = L = L
CONVERSION DE ETHANE 10 ETHYLENE IS 0.00%	
PRESSURE IS 6.9723UE DO VELUCITY 1.8579E 02FEET/SEC.	
ITERATION NUMBER- 1	
NO CONCENTRATION THPH DXA	
<u>1</u> 1.1964E-15 3.9170E-11 3.4898E-06	
2 0.0000E-01 0.0000E-01 5.3779E-07	
3 Q.UQODE-01 U.UODDE-01 3.3337E-08	analy an end water a second
4 1.00B2E-19 2.3006E-15 5.8638E-05	
5	
6 2.7684E+08 5.0634E-04 8.2379E-21	
72.5518E-088.3545E-040.0000E-01	
8 4.3308E-09 1.4179E-04 0.0000E-01	
9 0.00000E-01 0.00000E-01	
10 0.00000E-01 0.00000E-01	
<u>11 2.13994E-03 7.00595E 01</u>	
121.40296E-190.0000E-01	وروار والمتحم مستعمل والمتعاور والمروح و
13 1.76287E-23 5.77147E-19	
	19 Mar 19 19
REACIDE POSITIUN 3.20320E OIFEET TEMPERTURE 921.70DEGREE-K NOLAR FLUW RATE 2.00013E 02POUND MOLLS PER HOUR	•
TEMPERTURE 921.70DEGREE-K NOLAR FLOW RATE 2.00013E 02PDUND MOLLS PER HOUR	
CONVERSION OF ETHANE IN ETHYLENE IS 0.01%	
PRESSURE IS 6.89031E 00 VELUCITY 1.9899E_02FEET/SEC.	
ITERATION HUMBER- 2	
ND CONCENTRATILN TMPH DXA	
<u>1 1.8555E-13 0.5050E-09 4.4491E-05</u>	
<u>2 0.0000F-01 0.0000E-01 4.2499E-06</u>	
<u>3 0.0000E-01 0.0000E-01 3.5101E-07</u>	
4 1.4329E-16 5.0235E-12 3.9511E-04	
<u>5 3.7062E-03 1.2993E 02 6.3352E-10</u>	
<u>6 3.7074E-07 1.2997E-02 2.3479E-17</u>	
7 3.5145E-07 1.2321E-02 0.0000E-01	
83.8594E=u81.3530E=030.0000E=01	
9_0.05000E-0100000E-01	
10 0.00000E-01 0.00000E-01	
11 1.99844E-03 7.00594E 01	· · ·
12 1.46581E-16 0.00000E-01	na n
<u>13 5.54244E-20 1.94302E-15</u>	
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SYSTEM 4 820 TO 11	LO DEG K			
EACTOR POSITION 4.	BOABOE DIFE	EL BATE	2.00090E 02POUND MOLES PER HOUR	
DECKIONE JUDICY	INCERK HULA	R FLUM GATE	COUDAGE OFFICIAL HIGTER STORE	
NVERSION OF ETHAND		IN ETHYLEN	IS 0,07%	
LESSURE IS 6.30564	F OD VEL	OFITY 2.08	DE 02FFET/SEC.	
ERATION NUMBER- 3		<u></u>		
CUNCENTRATION	TIPH	UXA		an ann an fhrein air an 198 a - Annaichtean ann an Fahranna an fhe bail an ann an fhe bail an anna an Annaichtean an an Annaichtean
6.9608E-12 Z	.5553E-07	1.8324E+04		
0.0000E-01 U	01000E-01	1.3371E-05		
0.0000E-01 J	0.000CE-01	1.2980E-06		
3.04536-14 1	.1179E-09	1.1303E-03		
	.2965E 02	1.5273E-08		
	.9441E-02	9.61526-15		
	5959E-02	0.0000E-01		
1,8974E-07 6	.9651E-03	0.0000E-01		
0.00000E-01 0.	00000E-01			
0.00000E-01 0. 1.90849E-03 7.	00000E-01		······································	
<u>1.90849E-03 7.</u> <u>1.58015E-14 0.</u>	00595E 01 00000E-01			
	02360E-12			
	MCDOUE-16			
ACTOR POSITION 6.	40640E 01FE	FT	9	
MPERTURE 965.0501	REE-K MOLA	R FLOW RATE	.00228E 02POUND MOLES PER HOUR	an ( ) gereiningen waarden van de staar de staar gebeerden van de staar gereiningen de staar van de staar
NVERSION OF ETHANE	·	TO ETHYLEN	15 0.17%	
ESSURE IS 6.72199	E OO VELI	UCITY 2.13	E Q2FEET/SEC.	
ERATION NUMBER- 4				
	ТИРН	UXA		
	.4847E-06	3.0624E-04 2.0249E-05		
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0.0000E-01 0	.0000E-01	2.0855E-06		
0.0000E-01 0 4.2002E-13 1	.0000E-01 .5816E-08	2.0855E-06 1.6652E-03		
0.0000E-01 0 4.2002E-13 1 3.4445E-03 1	.0000E-01 .5816E-08 .2971E_02	2.0855E-06 1.6652E-03 5.9907E-08		
0.0000E-01 0 4.2002E-13 1 3.4445E-03 1 6.0167E-06 2	.0000E-01 .5816E-08 .2971E 02 .2657E-01	2.0855E-06 1.6652E-03 5.9907E-08 1.1497E-13		
0.0000E-01 0 4.2002E-13 1 3.4445E-03 1 6.0167E-06 2 5.8040E-66 2	.0000E-01 .5816E-08 .2971E_02	2.0855E-06 1.6652E-03 5.9907E-08		
0.0000E-01 0 4.2002E-13 1 3.4445E-03 1 6.0167E-06 2 5.8040E-06 2 4.2566E-07 1	.0000E-01 .5816E-08 .2971E 02 .2657E-01 .1856E-01	2.0855E-06 1.6652E-03 5.9907E-08 1.1497E-13 0.0000E-01		
0.0000E-01 0 4.2002E-13 1 3.4445E-03 1 6.0167E-06 2 5.8040E-06 2 4.2566E-07 1 0.00000E-01 0.	.0000E-01 .5816E-08 .2971E 02 .2657E-01 .1856E-01 .6029E-02 .0000E-01 .0000E-01	2.0855E-06 1.6652E-03 5.9907E-08 1.1497E-13 0.0000E-01		
0.0000E-01 0 4.2002E-13 1 3.4445E-03 1 6.0167E-06 2 5.8040E-06 2 4.2566E-07 1 0.00000E-01 0. 0.00000E-01 0. 1.86052E-03 7.	.0000E-01 .5816E-08 .2971E 02 .2657E-01 .1856E-01 .6029E-02 .0000E-01 .0000E-01 .00598E 01	2.0855E-06 1.6652E-03 5.9907E-08 1.1497E-13 0.0000E-01		
0.0000E-01 0 4.2002E-13 1 3.4445E-03 1 6.0167E-06 2 5.8040E-06 2 4.2566E-07 1 0.00000E-01 0 0.00000E-01 0 1.86052E-03 7 1.31097E-13 0	.0000E-01 .5816E-08 .2971E 02 .2657E-01 .1856E-01 .6029E-02 .0000E-01 .0000E-01 .00598E 01 .00000E-01	2.0855E-06 1.6652E-03 5.9907E-08 1.1497E-13 0.0000E-01		
0.0000E-01 0 4.2002E-13 1 3.4445E-03 1 6.0167E-06 2 5.8040E-06 2 4.2566E-07 1 0.00000E-01 0. 0.00000E-01 0. 1.86052E-03 7. 1.31097E-13 0.	.0000E-01 .5816E-08 .2971E 02 .2657E-01 .1856E-01 .6029E-02 .0000E-01 .0000E-01 .00598E 01	2.0855E-06 1.6652E-03 5.9907E-08 1.1497E-13 0.0000E-01		
0.0000E-01 0 4.2002E-13 1 3.4445E-03 1 6.0167E-06 2 5.8040E-06 2 4.2566E-07 1 0.00000E-01 0. 0.00000E-01 0. 1.86052E-03 7. 1.31097E-13 0.	.0000E-01 .5816E-08 .2971E 02 .2657E-01 .1856E-01 .6029E-02 .0000E-01 .0000E-01 .00598E 01 .00000E-01	2.0855E-06 1.6652E-03 5.9907E-08 1.1497E-13 0.0000E-01		
0.0000E-01 0 4.2002E-13 1 3.4445E-03 1 6.0167E-06 2 5.8040E-06 2 4.2566E-07 1 0.00000E-01 0. 0.00000E-01 0. 1.86052E-03 7. 1.31097E-13 0.	.0000E-01 .5816E-08 .2971E 02 .2657E-01 .1856E-01 .6029E-02 .0000E-01 .0000E-01 .00598E 01 .00000E-01	2.0855E-06 1.6652E-03 5.9907E-08 1.1497E-13 0.0000E-01		
0.0000E-01 0 4.2002E-13 1 3.4445E-03 1 6.0167E-06 2 5.8040E-06 2 4.2566E-07 1 0.00000E-01 0. 0.00000E-01 0. 1.86052E-03 7. 1.31097E-13 0.	.0000E-01 .5816E-08 .2971E 02 .2657E-01 .1856E-01 .6029E-02 .0000E-01 .0000E-01 .00598E 01 .00000E-01	2.0855E-06 1.6652E-03 5.9907E-08 1.1497E-13 0.0000E-01		
0.0000E-01 0 4.2002E-13 1 3.4445E-03 1 6.0167E-06 2 5.8040E-06 2 4.2566E-07 1 0.00000E-01 0 0.00000E-01 0 1.86052E-03 7 1.31097E-13 0	.0000E-01 .5816E-08 .2971E 02 .2657E-01 .1856E-01 .6029E-02 .0000E-01 .0000E-01 .00598E 01 .00000E-01	2.0855E-06 1.6652E-03 5.9907E-08 1.1497E-13 0.0000E-01		
0.0000E-01 0 4.2002E-13 1 3.4445E-03 1 6.0167E-06 2 5.8040E-06 2 4.2566E-07 1 0.00000E-01 0. 0.00000E-01 0. 1.86052E-03 7. 1.31097E-13 0.	.0000E-01 .5816E-08 .2971E 02 .2657E-01 .1856E-01 .6029E-02 .0000E-01 .0000E-01 .00598E 01 .00000E-01	2.0855E-06 1.6652E-03 5.9907E-08 1.1497E-13 0.0000E-01		
0.0000E-01 0 4.2002E-13 1 3.4445E-03 1 6.0167E-06 2 5.8040E-06 2 4.2566E-07 1 0.00000E-01 0. 0.00000E-01 0. 1.86052E-03 7. 1.31097E-13 0.	.0000E-01 .5816E-08 .2971E 02 .2657E-01 .1856E-01 .6029E-02 .0000E-01 .0000E-01 .00598E 01 .00000E-01	2.0855E-06 1.6652E-03 5.9907E-08 1.1497E-13 0.0000E-01		
0.0000E-01 0 4.2002E-13 1 3.4445E-03 1 6.0167E-06 2 5.8040E-06 2 4.2566E-07 1 0.00000E-01 0. 0.00000E-01 0. 1.86052E-03 7. 1.31097E-13 0.	.0000E-01 .5816E-08 .2971E 02 .2657E-01 .1856E-01 .6029E-02 .0000E-01 .0000E-01 .00598E 01 .00000E-01	2.0855E-06 1.6652E-03 5.9907E-08 1.1497E-13 0.0000E-01		
0.0000E-01 0 4.2002E-13 1 3.4445E-03 1 6.0167E-06 2 5.8040E-06 2 4.2566E-07 1 0.00000E-01 0. 0.00000E-01 0. 1.86052E-03 7. 1.31097E-13 0.	.0000E-01 .5816E-08 .2971E 02 .2657E-01 .1856E-01 .6029E-02 .0000E-01 .0000E-01 .00598E 01 .00000E-01	2.0855E-06 1.6652E-03 5.9907E-08 1.1497E-13 0.0000E-01		
0.0000E-01 0 4.2002E-13 1 3.4445E-03 1 6.0167E-06 2 5.8040E-06 2 4.2566E-07 1 0.00000E-01 0. 0.00000E-01 0. 1.86052E-03 7. 1.31097E-13 0.	.0000E-01 .5816E-08 .2971E 02 .2657E-01 .1856E-01 .6029E-02 .0000E-01 .0000E-01 .00598E 01 .00000E-01	2.0855E-06 1.6652E-03 5.9907E-08 1.1497E-13 0.0000E-01		
0.0000E-01 0 4.2002E-13 1 3.4445E-03 1 6.0167E-06 2 5.8040E-06 2 4.2566E-07 1 0.00000E-01 0. 0.00000E-01 0. 1.86052E-03 7. 1.31097E-13 0.	.0000E-01 .5816E-08 .2971E 02 .2657E-01 .1856E-01 .6029E-02 .0000E-01 .0000E-01 .00598E 01 .00000E-01	2.0855E-06 1.6652E-03 5.9907E-08 1.1497E-13 0.0000E-01		
0.0000E-01 0 4.2002E-13 1 3.4445E-03 1 6.0167E-06 2 5.8040E-06 2 4.2566E-07 1 0.00000E-01 0. 0.00000E-01 0. 1.86052E-03 7. 1.31097E-13 0.	.0000E-01 .5816E-08 .2971E 02 .2657E-01 .1856E-01 .6029E-02 .0000E-01 .0000E-01 .00598E 01 .00000E-01	2.0855E-06 1.6652E-03 5.9907E-08 1.1497E-13 0.0000E-01		
0.0000E-01 0 4.2002E-13 1 3.4445E-03 1 6.0167E-06 2 5.8040E-06 2 4.2566E-07 1 0.00000E-01 0. 0.00000E-01 0. 1.86052E-03 7. 1.31097E-13 0.	.0000E-01 .5816E-08 .2971E 02 .2657E-01 .1856E-01 .6029E-02 .0000E-01 .0000E-01 .00598E 01 .00000E-01	2.0855E-06 1.6652E-03 5.9907E-08 1.1497E-13 0.0000E-01		
0.0000E-01         0           4.2002E-13         1           3.4445E-03         1           6.0167E-06         2           5.8040E-06         2           4.2566E-07         1           0.0000E-01         0           0.0000E-01         0           1.86052E-03         7           1.31097E-13         0	.0000E-01 .5816E-08 .2971E 02 .2657E-01 .1856E-01 .6029E-02 .0000E-01 .0000E-01 .00598E 01 .00000E-01	2.0855E-06 1.6652E-03 5.9907E-08 1.1497E-13 0.0000E-01		
0.0000E-01 0 4.2002E-13 1 3.4445E-03 1 6.0167E-06 2 5.8040E-06 2 4.2566E-07 1 0.00000E-01 0. 0.00000E-01 0. 1.86052E-03 7. 1.31097E-13 0.	.0000E-01 .5816E-08 .2971E 02 .2657E-01 .1856E-01 .6029E-02 .0000E-01 .0000E-01 .00598E 01 .00000E-01	2.0855E-06 1.6652E-03 5.9907E-08 1.1497E-13 0.0000E-01		

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SYSTEM 4 820 TO LITO DEG K	•
REACTOR PUSITION R. OCBODE DIFEET	
TEMPERTURE 977.06DEGREE-K HOLAR FLOW RATE 2.00456E 02POUND MOLES PER HOUR	
CONVERSION OF ETHANE IN ETHYLENE IS 0.35%	مد چرون دونو محمد مد و در د
PRESSURE IS 6.63843E 00 VELUCITY 2.1943E 02FEET/SEC.	
ITERATION NUMBER- 5 NO_CUNCENTRATIONDXA	
NO CUNCENTRATION THPH DXA	
<u>1 1.4449Ľ-10 5.5835E-06 5.0481E-04</u>	
2 0,0000E-01 0.0000E-01 3.0319E-05	· · · · · · · · · · · · · · · · · · ·
3 0.0000E-01 0.0000E-01 3.3080E-06	
<u>4</u> 2.7526E-12 1.0637E-07 2.4147E-03	
<u>5 3.3506E-03 1.2948E 02 1.6694E-07</u>	
<u>6 1.1713E-05 4.5262E-01 7.5433E-13</u>	
71.1330E-054.3782E-010.0000E-01	
<u>8 7.6634E-07 2.9633E-02 0.0000E-01</u>	
9 0.00000E-01 0.00000E-01	
10 0.00000E-01 0.00000E-01	
<u>_111.81304E-037.00604E_01</u>	
12 6.96450E-13 0.00000E-01	
13 3.60951E-15 1.39481E-10	
REACTOR PUSITION 9.60959E DIFEET	
TEMPERTURE 988.27DEGREE-K MOLAK FLOW RATE 2.00818E 02POUND MOLES PER HOUR	
<u>ITERATION NUMBER- 6</u>	
<u>1 4.3298E-10 1.7163E-05 7.9455E-04</u>	
<u>2 0.0000E-01 0.0000E-01 4.3716E-05</u>	
<u>3 0.0000E-01 0.0000E-01 5.0272E-06</u>	
4 1.2953E-11 5.1343E-07 3.3815E-03	
5 3.2571E-03 1.2911E 02 3.9223E-07	
6 2.0488E-05 8.1211E-01 3.7674E-12	
<u>7 1.9865E-05 7.8742E-01 0.0000E-01</u>	
<u>R 1.2476E-06 4.9451E-02 0.0000E-01</u>	
9 0.00000E-01 0.00000E-01	
10_0.00000E-01	
<u>11 1.76750E-03 7.00614E 01</u>	
12 2.92157E-12 0.00000E-01	
13 1.78156E-14 7.85465E-10	
· · · · · · · · · · · · · · · · · · ·	پورو در در میرود. همیشند. منطقه
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	Constraint Constraints and Constraints

SYSTEM 4 820 TU 1110 DEC K	
EACTOR POSITION J.12112E 02F	AR FLUW RATE 2.01381E O2POUND MOLES PER HOUR
ONVERSION OF ETHANE	TO ETHYLENE IS 1.05%
RESSURE IS 6.47863E 00 VEL	TO ETHYLENE IS 1.05% LUCITY 2.3107E 02FEET/SEC.
TERATION NUMBER - 7	
O CONCENTRATION THPH	θχν
1 1.15386-09 4.09346-05	1.2369E-03
2 0.0000E-01 0.0000E-01	6.2466E-05
3 0.0000E-01 0.0000E-01	7.5622E-06
4 5.0110E-11 2.0385E-06	4.6957E-03
5 3.1598E-03 1.2854E 02	<u>8.3804E-07</u>
6 3.3639E-05 1.3704E 00	1.6153E-11
7 <u>3.2736É-05</u> 1.3317 <u>E</u> 00 81.9114E-067.7753E-02	0.0000E-01
8 1.9114E-06 7.7753E-02 9 0.00000E-01 0.00000E-01	0.0000E-01
0 0.00000E-01 0.00000E-01	
1 1.72232E-03 7.00631E 01	
2 1.08076E-11 · 0.00000E-01	
3 8.97258E-14 3.65000E-09	
ternen ander aller ander to state and aller and and and and all the ternet and all the ternet and and the secon	
EACTOR POSITION 1.28128E 02FE	ie T
EMPERTURE 1008.050FGRIE-K MALA	AR FLOW RATE 2.02206E 02POUND MOLES PER HOUR
INVERSION OF ETHANE	TO ETHYLENE IS 1.69%
RESSURE IS 6.40617E OU VEL	UCITY 2.3667E 02FEET/SEC.
TERATION NUMBER- 9	
CONCENTRATION TMPH	DXA
2.7740E-09 1.1556E-04	1.7136E-03
0.0000E-01 0.0000E-01	E.1157E-05
<u>3 0.0000E-01 0.0000E-01</u> 4 1.6513E-10 6.8787E-06	1.0211E-05 5.9716E-03
<u>5 3.0655E-03 1.2770E 02</u>	1.5385E=06
5.7562E-05 2.1696E.00	5.8296E-11
7 5 1172F-05 2 1217F 00 -	0 6000E=01
To To A. C. I. In M. Market and M. L. Market and Market a	0.000E-01 0.000E-01
2.7925E-06 1.1633E-01	0.0000E-01 0.0000E-01
2.7925E-06         1.1633E-01           9         0.00000E-01         0.00000E-01	
2.7925E-06         1.1633E-01           0.00000E-01         0.00000E-01           0.00000E-01         0.00000E-01	
2.7925E-06         1.1633E-01           0.00000E-01         0.00000E-01           0.00000E-01         0.0000E-01           1.68195E-03         7.00657E	
2.7925E-06         1.1633E-01           0.00000E-01         0.00000E-01           0.00000E-01         0.00000E-01           1.68195E-03         7.00657E           3.30319E-11         0.90000E-01	
2.7925E-06         1.1633E-01           0.00000E-01         0.00000E-01           0.00000E-01         0.00000E-01           1.68195E-03         7.00657E 01           3.30319E-11         0.00000E-01	
2.7925E-06         1.1633E-01           0.00000E-01         0.00000E-01           0.00000E-01         0.0000E-01           1.68195E-03         7.00657E           3.30319E-11         0.90000E-01	
2.7925E-06         1.1633E-01           0.00000E-01         0.00000E-01           0.00000E-01         0.0000E-01           1.68195E-03         7.00657E           3.30319E-11         0.00000E-01	
2.7925E-06         1.1633E-01           0.00000E-01         0.00000E-01           0.00000E-01         0.0000E-01           1.68195E-03         7.00657E           3.30319E-11         0.00000E-01	
2.7925E-06         1.1633E-01           0.00000E-01         0.00000E-01           0.00000E-01         0.0000E-01           1.68195E-03         7.00657E           3.30319E-11         0.00000E-01	
2.7925E-06         1.1633E-01           0.00000E-01         0.00000E-01           0.00000E-01         0.0000E-01           1.68195E-03         7.00657E           3.30319E-11         0.90000E-01	
2.7925E-06         1.1633E-01           0.00000E-01         0.00000E-01           0.00000E-01         0.0000E-01           1.68195E-03         7.00657E           3.30319E-11         0.90000E-01	
2.7925E-06         1.1633E-01           0.00000E-01         0.00000E-01           0.00000E-01         0.00000E-01           1.68195E-03         7.00657E           2.30319E-11         0.00000E-01	
2.7925E-06         1.1633E-01           9         0.00000E-01         0.00000E-01           0         0.00000E-01         0.00000E-01           1         1.68195E-03         7.00657E           2         3.30319E-11         0.00000E-01	
2.7925E-06         1.1633E-01           9         0.00000E-01         0.00000E-01           0         0.00000E-01         0.00000E-01           1         1.68195E-03         7.00657E           2         3.30319E-11         0.00000E-01	
2.7925E-06         1.1633E-01           9         0.00000E-01         0.00000E-01           0         0.00000E-01         0.00000E-01           1         1.68195E-03         7.00657E           2         3.30319E-11         0.00000E-01	
2.7925E-06         1.1633E-01           9         0.00000E-01         0.00000E-01           0         0.00000E-01         0.00000E-01           1         1.68195E-03         7.00657E           2         3.30319E-11         0.00000E-01	
2.7925E-06         1.1633E-01           9         0.00000E-01         0.00000E-01           0         0.00000E-01         0.00000E-01           1         1.68195E-03         7.00657E           2         3.30319E-11         0.00000E-01	
2.7925E-06         1.1633E-01           9         0.00000E-01         0.00000E-01           0         0.00000E-01         0.00000E-01           1         1.68195E-03         7.00657E           2         3.30319E-11         0.00000E-01	
2.7925E-06         1.1633E-01           9         0.00000E-01         0.00000E-01           0         0.00000E-01         0.00000E-01           1         1.68195E-03         7.00657E           2         3.30319E-11         0.00000E-01	
2.7925E-06         1.1633E-01           9         0.00000E-01         0.00000E-01           0         0.00000E-01         0.00000E-01           1         1.68195E-03         7.00657E           2         3.30319E-11         0.00000E-01	

SYSTEM 4 820 TU 1110 DEG K	· · · · · · · · · · · · · · · · · · ·
REACTOR POSITION 1.44144E OZEEET TEMPERTURE 1014.05DEGREE-K. MOLAK FLOW RATE 2.03239E 02POUND MOLES PER HOUR	
TEMPERTORE TOTA.DSDEGREE-K DULAR FLUW RATE Z.032376 02P0030 DUCCS FLR DOK	
CONVERSION OF ETHAME TO ETHYLENE IS 2.47%	
PRESSURE IS 6.33739E OD VELUCITY 2.4194E 02FEET/SEC.	
_ ITERATION NUMBER- 9	
ND CUNCENTRATION TAPH UXA	
1 5.6B35E-09 2.4195E-04 2.1368E-03	
2 0.0000E-01 0.0000E-01 9.6812E-05	
3 0.0000E-01 0.0000E-01 1.2509E-05	
44.3512E-101.0523E-057.0189E-03	
<u>5 2.9753E-03 1.2666E 02 2.3708E-06</u>	
6 7.5510E-05 3.2145E 00 1.5479E-10	
7. 7.3615E-05 3.1338E 00 0.0000E-01 8. 3.8161E-06 1.5245E-01 0.0000E-01	
83.8161E=061.6245E=010.0000E=01	
10 0.00000E-01 0.0000E-01	
<u>-11-1.64595E=03.7.00691E-01</u>	
$\frac{12}{12} \overline{7.95297E-11} \cdot 0.0000E-01$	
13 1.08631E-12 4.62450E-08	
REACTOR POSITION 1.60160E 02FEET	
TEMPERTURE 1020.02DEGREE-K NULAK FLOW RATE 2.04510E 02POUND MOLES PER HOUR	
CONVERSION DE ETHAUE TO ETHYLENE 15 3.44%	
PRESSURE IS 6.27299E 00 VELUCITY 2.4751E 02FEET/SEC.	
ITERATION NUMBER- 10	
NO_CONCENTRATIONTAPHOXA	
1 1.0513E-08 4.5759E-04 2.6507E-03	
20,0000E-01 0.0000E-01 1.1498E-04	······································
<u>3 0.0000E-01 0.0000E-01 1.5250E-05</u>	No. 199 1997
<u>4 9.7650E-10 4.2589E-05 8.2159E-03</u>	
<u>5 2.8805E-03 1.2537E 02 3.3916E-06</u>	
6 1.0283E-04 4.4759E 00 3.6476E-10	
7 1.0037E-04 4.3635E 00 0.0000E-01 8 4-9818E-06 2.1633E-01 0.0000E-01	
90.000005=010.00000E=01	an na mara a fa an a dhala a dhalan a dhalan an anna an an anna an an an an an an
<u>10 0.00000E-01 0.00000E-01</u>	
11 1.60995E-03 7.00737E-01	
12 1.72163E-10 0.00005E-01	n a sub-sub-sub-sub-sub-sub-sub-sub-sub-sub-
13 2.82668E-12 1.23032E-07	
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SYSTEM 4 820 TU 1110 DEG K	
REACTOR POSITION 1.76176E 02FEET	
TEMPERTURE 1022.02DEGREE-K MOLAR FLOW RATE 2.05920E 02POUND MOLES PER HOUR	
CONVERSION OF ETHANE TO ETHYLENE IS 4.52% PRESSURE IS 6.20992E 00 VELUCITY 2.5238E 02FEET/SEC.	-
PRESSURE IS6.20992E_00VELUCITY2.5238E_02FEET/SEC	
1 1.7429E-08 7.7299E-04 2.8120E-03	
2 0.0000E-01 0.0000E-01 1.2022E-04	· · · · · · · · · · · · · · · · · · ·
<u>3 0.0000E-01 0.0000E-01 1.6084E-05</u>	
4 1.8872E-09 8.3702E-05 8.5491E-03	<u>-</u>
<u>5 2.7947E-03 1.2395E 02 4.0811E-06</u> <u>6 1:3246E-04 5.5747E 00 6.0041E-10</u>	· · · · · · · · · · · · · · · ·
<u>7 1.2939E-04 5.7387E 00 0.000E-01</u>	
<u>8 6.2164E-06 2.7571E-01 0.0000E-01</u>	
<u>9 0.00000E-01 0.00000E-01</u>	· · · · · · · · · · · · · · · · · · ·
10 0.00000E-01 0.00000E-01	• · · · · · · · · · · · · · · · · · · ·
<u>11 1.58007E-03 7.00786E 01</u>	
<u>12 2.96924E-10 C.00000E-01</u> <u>13 6.29374E-12 2.79138E-07</u>	
13 0.293/45-12 (.191385-0/	
REACTOR POSITION 1.92192E 02FEET	
TEMPERTURE 1024.02DEGREE-K HOLAR FLOW RATE 2.07398E 02POUND MULES PER HOUR	
CONVERSION OF ETHANE TO ETHYLENE IS 5.65% PRESSURE IS 6.14582E 00 VELUCITY 2.5755E 02FEET/SEC.	-
PRESSURE IS 6.14582E OO VELUCITY 2.5755E 02FEET/SEC.	
NO CUNCENTRATION TMPH DXA	warne war oan an orong a marin borne an
<u>1 2.6286E-08 1.1886E-03 2.9827E-03</u>	•
2 0,0000E-01 0,0000E-01 1,2569E-04	
<u>3 0.0000E-01 0.0000E-01 1.6962E-05</u>	
<u>4 3.1871E-09 1.4412E-04 8.8951E-03</u>	
<u>5 2.7082E-03 1.2246E 02 4.6434E-06</u> 6 1.6235E-04 7.3411E 00 1.1112E-09	
<u>6 1,6235E-04 7.3411E 00 1.1112E-09</u> 7 1.5869E-04 7.1757E 00 0.0000E-01	÷
<u>8 7.4432E-06 3.3657E-01 0.0000E-01</u>	
9 0.00000E-01 0.0000E-01	
<u>10 0.00000E-01 0.00000E-01</u>	
<u>11 1.54991E-03 7.00840E 01</u>	
<u>12 4.65914E-10 0.00000E-01</u>	
<u>13 1.19953E-11 5.42403E-07</u>	
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SYSTEM 4 820 TO 1110 DEG K	
NEACTOR DECITION - R OPPORT OFFICE	
TEMPERTURE 1027.05DEGREE-K_MOLAR_FLOW_RATE2.08970E_02POUND_MOLES_PER_HOUR	
TEBPER WALLINZT, SJULWEERK _ HILAN I ROW WALL _ 2.007/01 OFFORM TWOLZ _ DA WOW	
ITERATION_NUMBER13	
	anna an th' faile air bhair an airt anna an tair ann an tair ann an tair an tair an tair an tair an tair an tai
ND_CONCENTRATION	
<u>2</u> 0.0000E-01 0.0000E-01 1.3557E-04	
3	
<u>4.9223E-09</u> <u>2.2729E-04</u> <u>9.5252E-03</u> <u>5.2.6177E-03</u> <u>1.2087E 02</u> <u>5.2595E-06</u>	
<u>8.6660E-06 4.0015E-01 0.0009E-01</u>	
9_0.00000E-01	
10 0.00000E-01 0.00000E-01	י אין דיין קאראיאיז עניין איזייער אווייין די אוויייי י
11_1-51790E-03_7.00902E_01	
12 7.08551E-10 · 0.00000E-01	
REACTOR POSITIUN2.24224E OZFEET	
REACIDE POSITION 2.24224E 02FEET	
	· · · · · · · · · · ·
CONVERSION_DF_ETHANE	
CONVERSION OF ETHANE TO ETHYLENE 15 8.19%	
PRESSURE IS 6.01734E 00 VELUCITY 2.6988E 02FEET/SEC.	
ITERATION NUMBER- 14	
NO CONCENTRATION TMPHDXA	
1 5.1560E-08 2.4353E-03 3.7512E-03	
0.0000E=010.0000E=011.5033E=04	
<u>3 0.0005E-01 0.0000E-01 2.0909E-05</u>	
4 7.2408E-09 3.4200E-04 1.0462E-02	-
<u>5 2.5216E-03 1.1910E 02 6.0303E-06</u>	
6 2.2540E-04 1.0646E 01 2.7551E-09	
7 2.2057E-04 1.0418E 01 0.0000E-01	
<u>8 9.9409E-06 4.6953E-01 0.0000E-01</u>	
9 0.00000E-01 0.00000E-01	
10 0.00000E-01 0.00000E-01	
11 1.48412E-03 7.00978E 01	· · · · · · · · · · · · · · · · · · ·
12 1.07476E-09 0.00000E-01	
13 3.41359E-11 1.61230E-06	
	· · · · · · · · · · · · · · · · · · ·
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√ <u>Г</u> 503 <u>Е QO VĘ</u> L 15 - ТыРн	AR FLOW RATE	2,12711E 02PDUND MULES PER HOUR
2.40240E 02FE DEGREE-K MULA VE 503E 00 VEL 15 ThPH	AR FLOW RATE	JE IS 9.70%
DEGREE-KHULA <u>VE</u> 503E_QOVEL 15 ThPH	AR FLOW RATE	JE IS 9.70%
√ <u>Г</u> 503 <u>Е QO VĘ</u> L 15 - ТыРн	TO ETHYLENE	JE IS 9.70%
<u>503E QO VEL</u> 15 - Тырн	ID ETHYLEN UCITY 2.770	EIS 9,70%
<u>503E QO VEL</u> 15 - Тырн	UCITY 2.77	
<u>15</u> . Тмрн	WIT Mart of a second se	UIE UZFEEI/SEC.
Тмрн		
"	DXA	
3.3703E-03	4.2684E-03	
0.0000E-01	1.6628E-04	
U,0000E-01	2.3523E-05	
4.9722E-04	1.1463E-02	
1.1711E 02	6.8421E-06	
	0.00002-01	
		2.14917E 02POUND MOLES PER HOUR
		E IS 11.38%
	DCITY 2.84P	87E O2FEET/SEC.
· · · ·		
		N In
		U. U.
and the second		
	1.2603E 01 1.2339E 01 5.4512E-01 0.00000E-01 0.00000E-01 7.01070E 01 0.00000E-01 2.63663E-06 2.56256E 02FE 2EGREE-K MOLA	1.2603E       01       4.2615E-09         1.2339E       0.0000E-01         5.4512E-01       0.0000E-01         0.0000E-01       0.0000E-01         7.01070E       01         0.0000E-01       0.0000E-01         2.63663E-06       0.0000E-01         2.56256E       02FEET         0EGREE-K       MDLAR         0.0000E-01       2.848         6       0.0000E-01         1.8340E-03       0.8420E-03         0.0000E-01       1.8340E-04         0.0000E-01       1.8340E-04         0.0000E-01       2.6387E-05         7.0294E-04       1.2526E-02         1.4483E       01       0.0000E-01         0.4483E       01       0.0000E-01         0.0000E-01       0.0000E-01       0.0000E-01         0.0000E-01       0.4483E-09       0.0000E-01         0.0000E-01       0.0000E-01       0.0000E-01         0.0000E-01       0.0000E-01       0.0000E-01         0.0000E-01       0.0000E-01       0.0000E-01

	an a
SYSTEM 4 820 TU 1110 DEG K	n en
REACTOR POSITION 2.72271E 02FEFT	
TEMPERTURE 1043.07DEGREE-K MOLAR FLUW RATE 2.17364E 02POUND MOLES PER HOUR	
CONVERSION OF ETHANETOETHYLENEIS_13.24% PRESSURE ISS.83301E_00VELUCITY2.9365E_02FEET/SEC	
ND CONCENTRATION TMPH DXA	
1 1.2070E-07 6.1326E-03 5.4736E-03	· · · · · · · · · · · · · · · · · · ·
2 0.0000E-01 0.0000E-01 2.0163E-04	<ul> <li>(i) (1, 1) (1, 1) (1, 1) (2) (2000) (1, 1) (1, 1) (2000) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2, 2) (2</li></ul>
3 0.0000E-01 0.000E-01 2.9499E-05	·
4 1.9093E-08 9.7004E-04 1.3643E-02	-
5 2.2132E-03 1.1245E 02 8.4988E-06	
6 3.3858E-04 1.7202E 01 9.5222E-09	
7 3.3187E-04 1.6861E 01 0.0000E-01	-
8 1.4083E-05 7.1552E-01 0.0000E-01 9 0.00000E-01 0.00000E-01	
<u>10</u> 0.00000E-01 0.00000E-01	
12 3,28047E-09 0,00000E-01	
131.28376E-106.52233E-06	
REACTOR POSITION 2.88287E 02FEET	-
TEMPERTURE 1050.18DEGREE-K MOLAR FLOW RATE 2.20192E 02POUND MOLES PER HOUR	
CONVERSION OF ETHANE TO ETHYLENE IS 15.38% PRESSURE IS 5.77399E 00 VELOCITY 3.0508E 02FEET/SEC.	in their family fractionally operation and states or and a constant of the second states
	an a
NO CONCENTRATION TUPH OXA	
1 1.5545E-07 8.1859E-03 6.9023E-03	•
2 0.000E-01 0.000E-01 2.4210E-04	
<u>3</u> 0.0000E-01 0.0000E-01 3.6477E-05	
<u>4 2.5295E-08 1.3236E-03 1.6117E-02</u>	
<u>5 2.0949E-03 1.0962E 02 1.0142E-05</u>	
<u>6 3.8204E-04 1.9991E 01 1.4874E-08</u>	
7 3.7470E-04 1.9607E 01 0.0000E-01	
8 1.5554E-05 B.1390E-01 0.0000E-01	
9 0.00000E-01 0.0000E-01 10 0.0000E-01 0.00000E-01	
11 1.34060E-03 7.01496E 01 12 5.02311E-09 0.00000E-01	
12 1,91260E-10 1,00081E-05	
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	(6) (10) and (10) approximately approximate approximately approximately approximate
SYSTEM 4 820 TO 1110 DEG K	
REACTOR POSITION 3.04303E 02FEET TEMPERTURE 1060.19DEGREE-K HOLAK FLOW RATE 2.23958E 02POUND MOLES PER HOUR	
	anta any ana amin'ny soratra amin'ny soratra amin'ny soratra amin'ny soratra amin'ny soratra amin'ny soratra a
PRESSURE IS 5 72523E 00 VELOCITY 3 2156E 02EEET/SEC.	-
ITERATION NUMBER- 19	
ND CONCENTRATION TMPH DXA	
NO CONCENTRATION TMPH DXA 1 2.0956E-07 1.1348E-02 9.5013E-03	•••••
<u>2 0.0000E-01 0.0000E-01 3.1140E-04</u>	
3 0.0000E-01 0.0000E-01 4.8869E-05	· · · · · · · · · · · · · · · ·
<u>4 3.4310E-08 1.8580E-03 2.0267E-02</u>	
<u>5 1.9551E-03 1.0588E 02 1.3171E-05</u>	en e
6 4:3752E-04 2.3693E 01 2.6969E-08	
7 4.2947E-04 2.3258E 01 0.0000E-01	
<u>8 1.7290E-05 9.3634E-01 0.0000E-01</u> 9 0.00000E-01 0.00000E-01	. <u></u> •
<u>10 0.00000E-01 0.00000E-01</u> <u>11 1.29593E-03 7.01800E_01</u>	
12 8.45911E-09 0.00000E-01	
<u>13 2.98219E-10 1.61498E-05</u>	
8	· · · · · · ·
_REACTOR_POSITION3.21870E_02FEET	
TEMPERTURE 1070, 70DEGREE-K MOLAR FLUW RATE 2,29218E_02POUND MULES PER HOUR	
	الم الم المراجع الم
CONVERSION OF ETHANE TO ETHYLENE IS 22.23%	
PRESSURE IS 5,67926E DO VELUCITY 3,4250E 02FEET/SEC.	
NO CONCENTRATION TMPH DXA	reger to commentation and a statistic to compare the construction of the second
<u>1 2.9326E-07 1.6602E-02 6.3187E-03</u> 2 0.0000E-01 1.9313E-04	
<u>3 0.0000E-01 0.0000E-01 3.1607E-05</u>	
<u>4 4.8423E-08 2.7413E-03 1.2279E-02</u>	al constant descent and the first of the second
5 1.7772E-03 1.0061E 02 8.2298E-06	
6 5.1035E-04 2.8892E 01 1.2903E-08	
7 5.0152E-04 2.8393E 01 0.000E-01	and an an of a final second
8 1.9388E-05 1.0976E-00 0.0000E-01	······································
9 0.00000E-01 0.00000E-01	
10 0.00000E-01 0.00000E-01	
<u>11 1.24011E-03 7.02062E 01</u>	
12 7.18618E-09 0.00000E-01	
<u>13</u> 4.04671E-10 2.29096E-05	
	The second state of the second
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SYSTEM 4 820 TO 1110 DEG K
REACTOR POSITION 3.39437E 02FEET
TEMPERIURE 1077.29DEGREE-K MOLAR FLUW RATE 2.35281E 02POUND MOLES PER HOUR
CONVERSION OF ETHANE TO ETHYLENE IS 26,84%
PRESSURE IS 5.60907E 00 VELUCITY 3.8285E 02FLET/SEC.
ITERATION NUMBER- 21
HO CONCENTRATION THPH . DXA
1 4.0450E-07 2.3918E-02 7.1725E-03
2 0.0000E-01 2.1000E-04
3 0.0000E-01 0.0000E-01 3.5268E-05
4 6.7312E-08 3.9801E-03 1.3162E-02
51.5990E-039.4543E_018.7405E-06
<u>5.8984E-04</u> <u>3.4877E_01</u> <u>1.9335E-08</u>
7 5.8031E-04 3.4313E 01 0.000E-01
R 2.15455+05 3.27405 00 0.00005-01
9 0.00000E-01 0.00000E-01
10
121.06248E-080.00000E-01
13 5.61066E-10 3.31753E-05
REACTOR POSITION 3.57004E 02FEET
TEMPERTURE 1083.88DEGREE-K MOLAR FLOW RATE 2.41850E 02POUND MOLES PER HOUR
CONVERSION_OF_ETHANEIS_31.82%
PRESSURE IS 5.51037E DO VELOCITY 4.2278E 02FEET/SEC.
ITERATION_NUMBER22
ND CONCENTRATION TMPH OXA
1 5.3640E-07 3.340BE-02 8.2057E-03
2 0.0000E-01 0.0000E-01 2.3026E-04
<u>3</u> 0.0000E-01 0.0000E-01 3.9672E-05
<u>4 8,8754E-08 5.5278E-03 1.4228E-02</u>
<u>5 1.4129E-03 5.7999E 01 8.7097E-06</u>
<u>6 6,6386E-04 4.1347E 01 2.725E-08</u>
7 6.5338E-04 4.0725E 01 0.0000E-01
<u>8 2.3393E-05 1.4570E 00 0.0000E-01</u>
9 0.00000E-01 0.00000E-01
10 0.00000E-01 0.00000E-01
11 1,12845E-03 7.02827E 01
12 1.52332E-08 0.00000E-01
<u>13</u> 7.91082E-10 4.86477E-05
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SYSTEM 4 B20 TO 1110 DEG K	
REACTOR POSITION 3.74571E 02FEET TEMPERTURE 1094.11DECREE-K MOLAR FLOW RATE 2.48852E 02POUND MOLES PEP HOUR	
CONVERSION OF ETHANE TO ETHYLENE IS 37.11%	
PRESSURE IS 5.30644F OD VELUCITY 5.1023E 02FEET/SEC.	
	kan na gang na gang na
2 0.0000E-01 0.0000E-01 2.5778E-04	
<u>3 0.0000E-01 0.0000E-01 4.6184E-05</u>	
4 1.0837E-07 7.2670E-03 1.5587E-02	
<u>5 1.2087E-03 8.1055E 01 8.6063E-06</u> <u>6 7.1906E-04 4.8218E 01 3.6467E-08</u>	
7 7.0906E-04 4.7548E 01 0.0000E-01	
8 2.4479E-05 1.6415E 00 0.0000E-01	
9 0.00000E-01 0.00000E-01	
10 0.00000E-01 0.00000E-01	
<u>11 1.04891E-03 7.03372E 01</u>	
12 2.10537E-08 · 0.00000E-01	
<u>13 1.03821E-09 6.96199E-05</u>	
REACTOR POSITION 3.9108BE 02FEET	
TEMPERTURE 1104.43DEGREE-K MOLAR FLOW RATE 2.55397E 02POUND MOLES PER HOUR	
CONVERSION OF ETHANE TO ETHYLENE IS 42.05%	
PRESSURE IS 4.82639E 00 VELUCITY 6.8434E 02FEET/SEC.	
ITERATION NUMBER- 24	······································
<u>ND_CONCENTRATION</u>	
<u>2 0.0000E-01 0.0000E-01 1.2646E-04</u> <u>3 0.0000E-01 0.0000E-01 2.3550E-05</u>	
4 1.1280E-07 8.6080E-03 7.4838E-03	
5 9.7730E-04 7.4577E 01 2.4433E-06	
<u>6 7.1596E-04 5.4635E 01 9.7332E-09</u>	
7 7. U676E-04 5.3932E 01 0.0000E-01	
<u>B 2.3631E-05 1.6032E 00 0.0000E-01</u>	
9 0.00000E-01 9.00000E-01	
10 0.0000E-01 0.00000E-01 11 9.22339E-04 7.03829E 01	1
<u>11 9.22339E-04 7.03829E 01</u> <u>12 1.14613E-08 0.00000E-01</u>	
13 1.10873E-09 8.46060E-05	
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SYSTEM 4 820 TO 1110 D	EG_K		
FUNCTION REQC(T, L)			
REQC(T, I) = 0.15334E 01			
FUNCTION REQC(TJI)	(1) (2 2)		
REQC(TAI)=0,45611E-01	(1104.43, 2)		· · · · · · · · · · · · · · · · · · ·
_FUNCTION_REQC(T,I) _REQC(T,I)=0,35104E_020			
_FUNCTION REQC(T,I)			
$= REQC(T_JI) = 0.12604E-08($	(1104.43, 4)		
KEULIJIJE <u>UIAZODJE UIA</u>	1104.439.51		
FUNCTION REQC(T,1)			
REQC(T,I)= 0.13140E 01(			
_EUNCTION_REQC(T,1) REQC(T,1)=0.24880E_00(			
REQC(1,1) = 0.24880E 00(	1104.43, 7)		
EUNCTION REQC(T, 1)		· · · · · · · · · · · · · · · · · · ·	
_REQC(T,I)= 0.22098E-020	1104.43, 8)		
FUNCTION PRR(IS).			
PR=7.04928E.00RAD	)I(1)= 1.25000E-01	VDL=0.0000	0E-01
_FUNCTION PRESD(T)		···· ··· ··· ··· ··· ··· ··· ··· ··· ·	
	IS=2.68339E-05,	DEN= 1.25325E-	01
FRICTION FACTOR= 1.295	72E-02 V1+V2+VA	=6.84337E 02	6.18705E 02 6.51521E 02
TEMPERIURE=_1104.43PRESSU	IRE_D=2.32607E-02		
1-A ACETYLENE		5.84813E-02	
2-B ISU BUTANE		0.00000E-01	
3-C N-BUTANE	0.00000E-01	0.0000001	
4-D_ISD-BUTENE	1.12804E-07	8.60799E-03	
5-E ETHANE	9.77296E-04	7.45766F 01	
	7_15964E-04	5.46346E 01	
7-G HYDROGEN	7.06757E-04	5.39320E 01	
8-H METHANE	2.30308E-05	1.80324E 00	
9-1 PROFAME	0.00000E-01	0.00000F-01	
10-J PRUPENE	0.00000E-01	0.00000E-01	
11-K WATER	9.22339E-04	7.03829E 01	
12-L CARBON	1.14618E-08	0.00000E-01	
	1.10873E-09	8.46060E-05	
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CONVERSION OF ETHANE	TO ETHYLE	NE IS 42	.05%
an da da a 19 k 1 - a su any panala a con a antanan ana 1 - an ana ana a ta 1 - Angara na sa sa sa sa sa sa sa A			
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REACTOR RADIUS PROFILE AFTER 500.00 HOURS

0.125000 0.125 0.125000 0.1250 0.124999 0.1249 0.124989 0.1249 0.124916 0.1249 0.124926 0.1249 0.124727 0.1240 0.124226 0.1241 0.122968 0.1226 0.1154 0.102843 0.09990	99         0.124999           86         0.124983           24         0.124890           95         0.124660           47         0.124061           77         0.122340           28         0.115245	0.125000 0.125000 0.124979 0.124978 0.124875 0.124621 0.123968 0.121948 0.113659 0.090840	0.124998 0.124973 0.124858 0.124858 0.124578 0.123863 0.121494 0.121494 0.110891	0.125000 0.125000 0.124998 0.124967 0.124967 0.124871 0.124532 1.123758 0.120263	0.125000 0.125009 0.124997 0.124960 0.124822 0.12481 0.123641	0.125000 0.125000 0.124996 0.124951 0.124951 0.124425	0.125000 0.125000 0.124994 0.124940 0.124940 0.124780 0.124364	0.125000 0.125000 0.124992 0.124928 0.124756 0.124298		
0.124999 0.1249 0.124989 0.1249 0.124916 0.1249 0.124727 0.1249 0.124226 0.1241 0.124226 0.1241	99         0.124999           86         0.124983           24         0.124983           95         0.12460           47         0.124061           77         0.122340           28         0.115245	0.124979 0.124978 0.124875 0.124621 0.123968 0.121948 0.121948 0.113659	0.124998 0.124973 0.124858 0.124858 0.124578 0.123863 0.121494 0.121494 0.110891	0.125000 0.124998 0.124967 0.124967 0.1248(1) 0.124532 0.123758 0.120263	0.125000 0.124997 0.124960 0.124822 0.12481 0.124481 0.123641	0.125000 0.124996 0.124951 0.124801 0.124425	0.125000 0.124994 0.124940 0.124780	0.125000 0.124992 0.124928 0.124756		
0.124999 0.1249 0.124989 0.1249 0.124916 0.1249 0.124727 0.1249 0.124226 0.1241 0.124226 0.1241	99         0.124999           86         0.124983           24         0.124983           95         0.12460           47         0.124061           77         0.122340           28         0.115245	0.124979 0.124978 0.124875 0.124621 0.123968 0.121948 0.121948 0.113659	0.124998 0.124973 0.124858 0.124858 0.124578 0.123863 0.121494 0.121494 0.110891	0.125000 0.124998 0.124967 0.124967 0.1248(1) 0.124532 0.123758 0.120263	0.125000 0.124997 0.124960 0.124822 0.12481 0.124481 0.123641	0.125000 0.124996 0.124951 0.124801 0.124425	0.125000 0.124994 0.124940 0.124780	0.125000 0.124992 0.124928 0.124756		
0.124999 0.1249 0.124989 0.1249 0.124916 0.1249 0.124727 0.1249 0.124226 0.1241 0.124226 0.1241	99         0.124999           86         0.124983           24         0.124983           95         0.12460           47         0.124061           77         0.122340           28         0.115245	0.124979 0.124978 0.124875 0.124621 0.123968 0.121948 0.121948 0.113659	0.124998 0.124973 0.124858 0.124858 0.124578 0.123863 0.121494 0.121494 0.110891	0.124967 0.1248(1 0.124532 1.123758 0.120263	0.124960 0.124822 0.124481 0.123641	0.124951 0.124801 0.124425	0.124994 0.124940 0.124780	0.124992 0.124928 0.124756		
0.124916 0.1249 0.124727 0.1246 0.124226 0.1241 0.122968 0.1226	04         0.124890           95         0.124660           47         0.124061           77         0.122340           28         0.115245	0.124875 0.124621 0.123968 0.121948 0.113659	C.124858 O.124578 O.123863 O.121494 O.110891	0.124871 0.124532 1.123758 0.120263	0.124822 0.124481 0.123641	0.124801	0.124780	0.124756		
0.124727 0.1240 0.124226 0.1241 0.122968 0.1226	95         0.124660           47         0.124061           77         0.122340           28         0.115245	0.124621 0.123968 0.121948 0.113659	0.124578 0.123863 0.121494 0.110891	0.124532 1.123758 0.120263	0.124481 0.123641	0.124425	0.124780	_0.124756 0.124298		
0.124226 0.1241	47 0.124061 77 0.122340 28 0.115245	0.123968 0.121948 0.113659	0,123863 0.121494 0.110891	1.123758 0.120263	0.123641		0.124354	0.124298		
0.122968 0.1226	77 0.122340 28 0.115245	0.121948 0.113659	0.121494 0.110891	0.120263			0.123375			
0.116638 0.1154 0.102843 0.0999	28 0.115245	0.113659	0.110891		0.120350	0.123513	0.123375	0.123220		
0,102843 0,0999				0.111625	0.110172	0.107261	0.106971	0.103696		teres in the second
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REACTOR IS 400.00 FEET LONG AND 0.125 FEET IN RADIUS	, dietementyde signicianig kannake v ist torttaan oor oo
TOTAL MOLES / HOUR ARE 200, OPDUND MULES AT PRESSURE 7.049A VELOCITY OF 1.73029E OZ AT TEMPERATURE 820, ODEG K	
INITIAL REACTOR INCREMENT(DL 9.69399E-01FEET	
FUNCTION_REQC(T,1)	
EUNCTION REQC(1)1	
REQC(T, I) = 0.58841E - 02(832.71, 2)	
FUNCTION REOC(T, I)	
REQC(T, 1) = 0.14012E 06( 832.71, 3)	
FUNCTION_REQC(T,I)	
FUNCTION REQC(T,1)	
REQC(T, 1) = 0.52409E 01(-832.71, 5)	
$REQC(T_{1}) = 0.27599E-01(-832.71.6)$	
EUNCTION REOC(T,I)	
REQC(J)]=0.55381E_00(_832.71, 7) FUNCTION_REQC(T)]	
FUNCTION PRR(IS)	
PR= 7.04928E 00' RADI(1)= 1.25000E-01 VOL= 0.00000E-01	
FUNCTION PRR(IS)	
PR = 7.04928E  ou RADI(1) = 1.25000E-01  VDL = 0.00000E-01	
EUNCTION PRESD(T) RENU= 3.35918E 05 VIS= 2.16064E-05 DEN= 1.66272E-01	
	······································
FUNCTION PER(IS)	
$PR = 7.03053E_{00} RADI(1) = 1.25000E - 01 VOL = 0.00000E - 01$	
PRESSURE IS 7.03053E 00 VELUCITY 1.7618E_02FEET/SEC. 1 0.0000E-01 0.0000E-01 4.1908E-07	
2 0.0000E-01 0.0000E-01 9.6058E-08	
3 0,0000E-01 0.0000E-01	· · · · · · · · · · · · · · · · · · ·
4 0.0000E-01 0.0000E-01 0.0000E-01	
5 4.1847E-03 1.2994E 02 0.000E-01	
6. 1,9547E-09 0.0696E-05 0.0000E-01 7 1,7538E-09 5,4456E-05 0,000E-01	
7 1.7538E+09 5.4456E-05 0.000E-01 8 4.0198E-10 1.2482E-05 0.0000E-01	1.1
9_0.00000E-01_0.00000E-01	
100.0000E-010.0000CE-01	
11 2,25628E-03 7,00596E 01	
12 0.00000E-01 0.00000E-01	
13 0.00000E-01 0.00000E-01	
-	
DL_CHANGED_T	alağını bir ak birinin yaşırı alan sonan karalışı daşırdı.
RATE= 9.02414E-01	
T PT P(1) - f(12) = GC AMhT 1104.99 3.62 0.00 0.00 0.00 0.00 1.13 0.73 0.72 0.02	
0,00 0,00 1,01 0,00 9,00 1,31 20,61 -500,64	
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SYSTEM 4 820 TU 1110 DEG K REACTOR POSITIUN 3.91989E 02FEET TEMPERTURE 1104.99DEGREE-K MULAR FLOW RATE 2.51592E 02POUND MULES PER HOUR PRESSURE IS 5.00000E-01 VELUCITY 1.1055E 03FEET/SEC.	
TEMPERTURE 1104.99DEGREE-K MDLAR FLOW RATE 2.51592E 02POUND MOLES PER HOUR	
PRESSURE IS 5,00000E-01 VELUCITY 1.1055E 03FEFT/SEC.	
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REACTOR IS 400.00 FEET LONG AND 0.125 FEET IN RADIUS TOTAL MOLES / HOUR ARE 200.0POUND MULES AT PRESSURE 7.249A VELOCITY OF 1.68256E 02 AT TEMPERATURE 820.0DEG	
INITIAL REACTOR INCREMENTIOL 1.85975E OFFET FUNCTION REACTOR INCREMENTIOL 1.85975E OFFET	
RE2C(T,1)=0.11963E_02(832.71,)	
FUNCTION_REQC(T_1)	
FUNCTION REQC(T, I) REQC(T, I) = 0.14837E+08(_832.71.4)	
FUNCTION_REQC(T/I)	
REQC(T,I)=0.52409E_01(832,71, 5)	
REGC(T,1)= 0.27599E-01( B32.71, 6) FUNCTION_REGC(T,1)	n an
REQC(T)I)= 0.55381E_00(832.71; 7) FUNCTION_REQC(T,I)	
REQC(T,I) = 0.79039E-03(.832.71, 8)	
FUNCTION_PRR(IS) 	
FUNCTION_PRR(IS)	
FUNCTION_PRESD(T) RENU=3.35915E_05VIS=2.16054E-05DEN=1.71002E-01	
FRICTION_FACTOR=1.41227E=02V1.V2.VA=1.68256E_021.71295E_021.69775E_02	· · · · · · · · · · · · · · · · · · ·
IEMPERTURE=832.71PRESSURE_D=1.82164E-02 FUNCTION_PRR(1S)	
PR= 7.23105E 00 RADI(1)= 1.25000E-01 VOL= 0.00000E-01 PRESSURE IS 7.23105E 00 VELUCITY 1.7129E 02FEET/SEC.	
1 0.0000E-01 0.0000E-01 3.1982E-07 2 0.0000E-01 0.0000E-01 7.3306E-08	
<u>3 0.0000E-01 0.0000E-01 0.0000E-01</u>	
5 4.3035E-03 1.2994E 02 0.0000E-01	
6 1.5341E-09 4.6320E-05 0.0000E-01 7 1.3763E-09 4.1557E-05 0.0000E-01	
8 3.1547E-10 9.5254E-06 0.0000E-01 9 0.00000E-01 0.00000E-01	
10 0.00005E-01 0.0000E-01	
11 2-32030E-03 7-00596E 01 12 0-00000E-01 0-0000E-01	
13_0.00000E-01_0.00000E-01	
DL CHANGED TO 1.90289E 00 ZIC= 3.04302E 02 I= 1 KA= 1.67941E-03 DXA(I)= 1.05208E-02 CF,CR= 2.03923E-03 2.21298E-07 REQC= 1.96590E 00	
RATE=8.23729E-01	
VELOCITY OF GAS_GREALER_THAN SOUND	
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<u><u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u></u></u>	PRESSURE IS 2 GADAVE OD VELICITY 1 6800E OBELET/SEC	
	73633036 13 2.300000, 00 VEENCITE 1.00000E 00 EET/SEC.	
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REACTOR IS 400.00 FEET LONG AND 0.125 FEET IN RADIUS	nga: 1 alama y 1, ya ara
TOTAL MOLES / HOUR ARE 200. OFDUND MOLES AT PRESSURE 7.449A VELOCITY OF 1.63738E 02 AT TEMPERATURE 820. ODEG K	
INITIAL REACTOR INCREMENTIOL 1.90289E OOFEET	
FUNCTION REQC(T,L)	
REQ((T, I)=0.11963E_02(832.71,	
FUNCTION REQC(T,1)	
REQC(T,1)= 0.66041E=02( 832.71, 2)	An
- FUNCTION RESC(I.I.)	
REQC(T,1)= 0.14012E_06(.832.71, 3)	
FUNCTION REDC(T)1)	
REQC(T,I)= 0.14637E-08(-832.71, 4)	
FUNCTION REGC(T,1)	
REQC(TJI)= 0,52409E_01(_832,71,5)	
FUNCTION REAC(T,1)	
REQC(T,1)=0.27599E-01(_832.71, 6)	
REQC(T,I)= 0.55381E_00(_832.71, 7) FUNCTION_REQC(T,I)= 0.79039E=03(_832.71, 8) REQC(T,I)= 0.79039E=03(_832.71, 8)	
FUNCTION REPC(T,1)	
REDC([,1]= 0.79039E=03( B32 71. B)	rat f. Nevador -
FUNCTION_PRR(IS)	
FUNCTION_PRR(IS) PR=7.44928E_00'RADI(1)=_1.25000E-01VOL=_0.00000E-01	
FUETION DOM/10	
FUNCTION_PRR(15) PR=7.44927E_00RADI(1)=1.25000E-01VDL=_0.00000E-01	
$PR = -7.44927E_{00} RADI(1) = -1.25000E - 01 VUL = -0.00000E - 01$	
FUNCTION_PRESD(T) KENU= 3.35917E 05 VIS= 2.16064E-05 DEN= 1.75731E-01 FRICTION_FACTUR=41227E=02 V1.V2.VA= 1.63/3BE 02 1.66673E 02 1.65206E 02	
<u>KENU= 3,35917E 05 VIS= 2.16064E-05 DEN= 1.75731E-01</u>	
FRICIION FACTOR=1.41227E=02V1.V2.VA=1.63/38E_021.66673E_021.65206E_02	
TEMPERIURE= 832.71PRESSURE D= 1.77163E-02	
FUNCTION PRR(1S)	
PR = 7.43155E 00 RAUI(1) = 1.25000E-01 VUL = 0.00000E-01	
PRESSUKE IS 7.43155E 00 VELOCITY 1.6667E 02EEET/SEC.	****
<u>1 0.0000E-01 0.0000E-01 3.2832E-07</u>	1
<u>2</u> 0.0000E-01 0.0000E-01 7.5254E-08	
3 0.0000E=01 0.0000E=01 0.0000E=01	
4 0.0000E-01 0.0000E-01 0.0000E-01	
5 <u>4.4222E-03</u> 1.2994E 02 0.0000E-01	3
5 1.5183E-09 4.7551E-05 0.0000E-01	
7 1.4519E-09 4.2662E-05 0.0000E-01	
<u>B 3.3279E-10 9.7785E-06 0.0000E-01</u>	
<u>9 0.00000E-01 0.00000E-01</u>	participant de la companya de la
10 0.00000E-01 0.00000E-01	
<u>11 2.38431E-03 7.00596E 01</u>	
12 0.00000E-01 0.00000E-01	
13 0.00000E-01 0.00000E-01	
DL CHANGED TO 1.98252E 00 ZIC= 3.00299E 02	
$1 = 1  RA = 1.62353^{\circ} - 03  DXA(1) = 1.00983E - 02  CF, CR = 2.16064E - 03  2.44135E - 07  REQC = 1.99667E  00$	
1= 1. KAF1.020007-00DAALTYF1.000001-02CT2CKF2.1000040-052.9941552001KCK6F1.22007C_VC	
RATE= 7.51563E-01	· · •
VELOCITY OF GAS GREATER THAN SOUND	
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SYSTEN 4 820 TO 1110 DEG K	
SYSTEM 4 820 TO 1110 DEG K REACTOR POSITIUN 3.93472E 02FEET TEMPERIURE 1105.92DEGREE-K MOLAR FLOW RATE 2.56811E 02POUND MOLES PER HOUR PRESSURE IS 2.00000E 00 VELUCITY 1.2836F 03FEET/SEC.	
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REACTOR IS 400.00 FEET LUNG AND 0.125 FEET IN RADIUS	······································
TOTAL MOLES / HOUE ARE 200.0POUND HULES AT PRESSURE 7.649A VELOCITY DE 1.59457E OZ AT TEMPERATUPE 820.0DEG K	annadatu salayada na muu na malaya muu nun aya ayaa ayaa ayaa ayaa ayaa ayaa
INITIAL REACTOR INCREMENT (UL 1.93252E OOFFET	
FUNCTION REAC(T.1)	
$REQC(T, I) = 0.11963E_02(_832.71, 1)$	
FUNCTION_REQC(I.I)	
REQC(T,I)= 0.608410-02(.832.71, 2)	
-FUNCTION_REOC(T_1)	and a second
$REQC(T,I) = 0.14012L \ 06(B32.71, 3)$	
FUNCTION REPC(T,1)	1 million of the last is a distributed with a substrain the statement of the distributed with the statement of the stateme
REQC(T, I) = 0.14837E - 08(.532.71, 4)	
FUNCTION RECC(1)	
RE2C(1,1)= 0.524095 01( 832.71, 5)	And a second second a support of the second s
FUNCTION REQC(1,1)	
REDC(T,1)= 0.27599E-01(_832.71, 6)	
FUNCTION REQC(1,1)	
REQC(T, I) = 0.55361E  OO(832.71, 7)	
EUNCTION REQC(T,1)	
$REQC(T_{J}I) = 0.79039E - 03(.832.71, 8)$	
FUNCTION_PRR(1S)	
PR = 7.64927E  OU + RADI(1) = 1.25000E-01  VDL = 0.00000E-01	
FUNCTION PRR(IS)	
PR = 7.64927E  (i) RADI(1) = 1.25000E-01 VOL = 0.00000E-01	
FUNCTION_PRESD(T)	
RENU= 3.35917E 05 VIS= 2.16064E-05 DEN= 1.80461E-01	
FRICTION FACTOR = 1.41227E-02 V1.V2.VA= 1.59457E 02 1.62295E 02 1.60876E 02	PRE- for a constraint, since a second strength rest and second strength rest and second strength rest.
TEMPERTURE = B32.71PRESSURE D= 1.72432E-02	
FUNCTION PRR(IS)	
$PR = 7.63202E_{0} RADI(1) = 1.25000E-01 VOL = 0.00000E-01$	
PRESSURE IS 7.63202E.00 VELUCITY 1.6230E 02FEET/SEC.	
1 0.0000E-01 0.0000E-01 3.3718E-07	
<u>2 0.0000E-01 0.0000E-01 7.7286E-08</u>	
3 0.0000E-01 0.0000E-01 0.0000E-01	
4 0.0000E-01 0.0000E-01	· · · · · · · · · · · · · · · · · · ·
5 4.5409E-03 1.2994E 02 0.0000E-01	
6 1.7066E-09 4.6835E-05 0.0000E-01	
7 1.5311E-02 9.3613E-05 0.000E-01	
8 3.5095E-10 i.0043E-05 0.0000E-01	1. J. I.
9 0.0000E-() 0.0000CE-01	
10 0.00000E-01 0.00000E-01	
<u>11 2,44832E-03 7.00596E 01</u>	
12 0.00000E-01 0.0000E-01	,
13 0.00000E-01 0.00000E-01	
DI CHANCED TO 1 80570E 00 71C= 3.00299E 02	
DL_CHANGED_TD1.89579E_0DZIC=_3.00299E_02	
RATE= 7.51583E-01	
VELOCITY OF GAS GREATER THAN SOUND	
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SYSTEM 4 820 TU 1110 DEC K	
SYSTEM 4. 820 TH 1110 DEG.K REACTOR POSITION 3.90982E 02FEET TEMPERTURE 1108.11DEGRIE-K MOLAR FLOW RATE 2.59804E 02PDUND MOLES PER HOUR PRESSURE IS 2.00000E 00 VELUCITY 1.5530E 03FLET/SEC.	
PRESSURE IS 2.000 DUE 00 VELUCITY 1.5530E 03FLET/SEC.	
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REACTOR IS 400.00 FEET LUNG AND 0.125 FEET IN RADIUS TOTAL MOLES / HOUR ARE 200.0P/UND MULES AT PRESSURE 7.549A VELOCITY OF 1.55394E 02 AT TEMPERATURE 820.00EG K INITIAL REACTOR INCREMENT(DL 1.89579E OUFFET	-
INITIAL REACTOR INCREMENTION INDERS AT ARCSING FILTER FLATTER F	
REQC(T,I) = 0.11963E 02( B32.71, 1)	
FUICIIUN BEQC(1,1) REJC(T,1)= 0.60841E-02(_932,71, 2)	
FUNCIICN REOC(I,I)	
REQC(T,I)= 0,14012E_06(_832.71,_3)	<ol> <li>Martinezza construction and according to an experimental sector of the se</li></ol>
$REQC(I_{J}I) = 0.14837E - 0.81832.71, 4)$	
FUNCTION_REQC(1)1) REQC(T)1)= 0.52409E_01(_B32.71, 5)	
FUNCTION_REQC(T	
REQC(T+1)=0.27599E-01(_B32.71+_6) FUNCTION_REQC(T+1)	el una meneral la devel per response suar era conseguraria
$REQC(T_{1}) = 0.55361E(00(-832.71, 7))$	
FUNCTION REQC([,1) REQC(J,1)= 0.79039E-03(.832.71,.8)	
FUNCTION PRR(IS)	
<u>PR= 7.84927E_00 PADI(1)= 1.25000E-01 VDL= 0.00000E-01</u> FUNCTION_PRR(IS)	
PR = 7.84927E  OD RADI(1) = 1.25000E-01  VOL = 0.00000E-01	
FUNCTION PRESD(T)	
RENUE       3.35917E       05       VISE       2.16064E-05       DEN=       1.65190E-01	
	-
FUNCTION PER(IS) PR= 7.83247E 00 RADI(1)= 1.25000E-01 VOL= 0.00000E-01	
PRESSURE IS 7.63247E 00 VELOCITY 1.5814E 02FEET/SEC.	
<u>1 0.0000E-01 0.0000E-01 3.4531E-07</u>	-
2 0.0000E=01 0.0000E=01 7.9150E=08 3 0.0000E=01 0.0000E=01 0.0000E=01	
4 0.6000F-01 0.0000E-01 0.0000E-01	
<u>5 4.6596E-03 1.2994E 02 0.0000E-01</u> 6 1.7934E-09 5.0012E-05 0.0000E-01	1998-1998
7 1.6090F-09 4.4870E-05 0.0000E-01	
8 3.6881E-10 1.0295E-05 0.0000E-01	
9 0.00000E-01 0.00000E-01 10 0.00000E-01 0.0000E-01	
<u>11 2.51234E-03 7.00596E 01</u>	
12 0.00000E-01 0.00000E-01 13 0.00000E-01 0.00000E-01	
DL_CHANGED_TU1.92601E_00ZIC=2.96295E_02 I=_1RA=1.61700E-03DXA(1)=1.03945E-02CF.CR=2.35965E-033.08253E-07REQC=2.02796E_00	
I= 1 KA= 1.01/000-03 DAALIJE 1.02742CE02 CFJCE 2.22905CE05 D.00655CE07 KENCE 2.02170F UV	
RATE= 6.85453E-01	· · · · · · · · · · · · · · · · · · ·
DL_CHANGED_TU9.53695E=01ZIC=3.65625E_02	
I = 1  RA = 3.30363E - 03  DXA(I) = 1.00976E - 02  CF, CR = 1.53235E - 03  9.03224E - 07  REQC = 1.67012E  00	
RATE= 2.15805E CO	
VELOCITY OF GAS GREATER THAN SOUND	2
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SYSTER 4 820 TU 1110 DEG K	
SYSTEM 4 820 TU 1110 DEG K REACIDE POSITION 3.90138E 02FELT TEMPERTURE 1107.50DEGREE-K MOLAR FLOW RATE 2.01283E 02POUND MOLES PER HOUR PRESSURE IS 2.0000E 00 VELUCITY 1.2499E 03FEET/SEC.	
PRESSURE IS 2.0 YOBUE OO VELUCITY 1.2499E 03FEET/SEC.	
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REACTOR IS 400.00 FEET LONG AND 0.125 FEET IN RADIUS	
TOTAL BOLES / HUR ARE 200.0PUULD MOLES AT PRESSURE 8,049A VELUCILY DE 1,51533E 02 AT TEMPERATURE 820.0DEG &	
INITIAL REACTOR INCREMENT(DL 9.53695E-01FEET	
FUNCTION REQC(T,1) REQC(T,J)= 0.11963E 02( 832.71, 1)	
REQC(1/1)=0.11963E_02(_832.71,_1) EUNCTION REQC(T.1)	
EUNCTION REQC(T,I) REQC(T,I)= 0.665841E=02( 832.71, 2)	
FUNCTION REDC(T,1)	
REQC(T+1)= 0,14012(.06(.832,71,.3)	
FUNCTION REQC(T/1) REQC(T/1)= 0.1483/E-08( 832.71, 4)	
FUNCTION REDC(T)T	
REQC(T,1)= 0.52409E 01( 832.71, 5)	
REQC(T, 1) = 0.2/599E-01( 832.71, 6)	
EUNCTION REDC(1)	
REQC(T>1)= 0.55381E 00( 832.71+ 7) FUICTION REQC(T>1)	
REQC(T)1)= 0.79039E=03(_832.71, 8)	
- ALACTICA PAR(IS)	
FUNCTION PRR(IS)         PR=       \$,04927E         PR=       \$,04927E         PR=       \$,04926E         PR=       \$,04926E         PR=       \$,04926E         PR=       \$,04926E	
FUNCTION PRR(IS).	
PR= 8.04926E_00RADI(1)= 1.25000E-010.00000E-01	
FUNCTION PRESD(T)	
RENU= 3.35917E 05 VIS= 2.16064E-05 DEN= 1.89918E-01 FRICTION FACTUR= 1.41227E-02 V1.V2.VA= 1.51533E 02 1.54196E_02 1.52865E_02	
FRICTION FACTORE 1.41227E-02 V1.V2.VA= 1.51533E 02 1.54196E_02 1.52865E_02	· · · · · · · · · · · · · · · · · · ·
TEMPERIURE= 832.71PRESSURE D= 1.63696E-02	
FUNCTION_PRR(IS)	
PRESSURE IS 8.03239E 00 VELUCITY 1.5420E 02FEET/SEC.	
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3 0.0000E-01 0.0000E-01	Mante and descriptions of the over-
40.0000E=010.0000E=010.0000E=01	
<u>5 4.7794E-03 1.2994E 02 0.00000-01</u>	
6 1.5869E-09 5.1311E-05 0.0000E-01	
7 1.6927E-09 4.6035E-05 0.0000E-01	
<u>8 3.8803E-10 1.0552E-05 0.0002E-01</u>	
9 0.00000E-01 0.00000E-01 10 0.00000E-01 0.00000E-01	
11 2.57635E-03 7.00596E 01	
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κε συλύσεια. Το το αριτρέε από τη 710- το Ολαδιέε Οπ	
DL_CH4NGED_TD1.85175E_00ZIC=2.96295E_02 1= 1RA=1.66921E=03DXA(I)=1.03)14E=02CF,CR=2.43591E=033.54529E=07RE4C=2.02796E_00	
RATE= 6.35453E-01	
DL_CHANGEDIU	
I= 1 RA= 3.537585-03 0XA(I)= 1.02503E-02 CF, CR= 1.54420E-03 1.10122E-06 REQC= 1.65298E 00	
RATE=2.29359E_00	
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SYSTEM 4 820 TULIIO DEG K REACTOR PUSITION 3.99210E 02FEET TEMPERTURE 1109.5106GREE-K MOLAR FLOW RATE 2.64115E 02POUND MOLES PER HOUR PRESSURE IS 2.00000E 00 VELUCITY 1.2390E 03FEET/SEC.	
TEMPERTURE 1109.510/GREE-K MOLAR FLOW RATE 2.64115E 02POUND MOLES PER HOUR	
PRESSURE IS 2.00000E DO VELUCITY 1.2390E 03FEET/SEC.	
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REACTOR PRODUCT (E) REA	ACTANT(R) TEMPERATURE	(T) PRESSURE(P) AFT	TER O.HOURS	OF RUN	العيوم الأعلام العيوم المراجع المراجع المراجع المراجع	• • • • • • • • • • • • • • • • • • •
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SYSTEM 1 820 TO 1050 DI	EC V	er en fra sjók e klaster – in sin a se eksektelje jegenerejskih dere s og se <del>andre i jege ga sjók for an</del> andre e	<b></b>			
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UNCTION REOC(T,I)				ـــــــــــــــــــــــــــــــــــــ	1997 - 2019 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -	
	1(1048.65. 1)					
UNCTION REQC(T,1) EQC(T,1)= 0.33349E=01	1(1048.65, 2)					······
UNCTION REQC(T,I)						
EQC(T,I)= 0.13617E 0:	3(1048.65.3)					
UNCTION REQC(T,1)	8(1048.65, 4)	· · · · · · · · · · · · · · · · · · ·	-			
EQC(T)]= 0.13002E=08	8(1048.65, 4)		Name and a state of the state o	te in the second constraint constraint and an and a second second		
UNCTION REQC(T,I) EQC(T,I) = 0.44133E 01	1(1048.65, 5)			naar bila ta' oo i latan a gaalaha ahaana ka ahaa ahaa ahaa	······································	
UNCTION REQC(T,I)			and the second secon			
EQC(T+1)= 0.70039E. 00	0(1048.65, 6)			· · · · · · · · · · · · · · · · · · ·		
UNCTION REQC(T, I)	0(1048.65, 7)			n an an anna an an an an an an an an an	an ayaa ahaan ahii ahiin dadah ahii kanganamaya dagaalaa kata kata yaa ahaadada yaa mayaada	
EQC(T,I)= 0.28340E 00 JNCTION_REQC(T,I)	0(1048.65, 7)					
EQC(T/I)= 0.18575E-02	2(1048.65. 8)			·		•,
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UNCTION PRR(IS)						
R= 5.84930E 00	ADI(1)= 1.25000E-01	VOL . 0,0000	)OE-01			
UNCTION PRESD(T) ENU - 5.94496E 05						·····
RICTION FACTOR= 1.20	VISR 2.580546-05 5997E+02 V12V22VA	DEN= 1.05844F-	•01 • 903725 02	5.79768F	02	
EMPERTURE= 1048.65PRESS	SURF D = 4.11471F=01	- 0.001356 02	C+77512C 04			
L=A ALEIYLENE	1.009585-08	1.53804E-03		a mention of the second state of the second st		
2-B ISD BUTANE	0.00000E-01	0,00000E-01				
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S-E_ETHANE	<u>5.11583E-10</u>	7.35651E-05 1.21340E 02	······································			
S-F ETHYLENE	5.93251E-05	8,53086E 00		ang a sa mang na sang mananang ng panggan na sang baharing na sang baharing na sang baharing na sang b		
-G HYDROGEN	5.80189E-05	0.343032 00				
I-H METHANE	2.602161-00	3.828158.01			· · · · · · · · · · · · · · · · · · ·	
-I_PRUPANE	0.00000E-01	0.00000E-01		-		
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NCTION REQC(T, I)	n an			•	an a
OC(T,I)= 0.21468E 01	(1048.65.1)				
NCIION REOC(T.I)					······································
NETTON DEACLE IN	(1048.65, 2)		an a		
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<b>System 1</b> 820 - 1050 ^o K			
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SYSTEM 2 820 TO 109	Al DE Cur Kennelis in Samanan sun in eine sin eine heine series in seine Samanan sun in die Steine stade in die	n an
REACTOR PRODUCT (E)	REACTANT(R) TEMPERATURE(T) PRESSURE(P) AFTER 0.HOURS OF RUN	
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SYSTEM 2 820 TO 1090	DEG K	
		a a cara a c
FUNCTION REQC(T,1) REQC(T,1)* 0.168966	.01(1087.75, 1)	
_ FUNCTION REOC(T,I)		
	-01(1087.75, 2)	
FUNCTION_REQC(T,I) REQC(T,I)+0.51980E	02(1087.75, 3)	
FUNCTION REQC(T,I)		
_REQC(T,I)= 0,127216	=08(1087,75, 4)	
FUNCTION RECC(TJI)	01(1087.75, 5)	· · · · · · · · · · · · · · · · · · ·
_REQC(T,1)= 0.10960E	01(1087,75,6)	
FUNCTION REQC(T,I) REQC(T,I)= 0,25831E	.00(1087.75, 7)	
FUNCTION REOC(T,I)		
REQC(T,1)= 0.21013E	-02(1087.75, 8)	
FUNCTION PRR(IS)		······································
PR= 5.85000E 00	RADI(1)= 1.25000E-01 VDL= 0.00000E-01	
FUNCTION PRESD(T)		
_RENU=6.23836E.05	VIS= 2,65284E=05 DEN= 1,01286E-01 •25911E=02 V1,V2,VA= 9,66857E 02 3.40258E 02 6.53570E	A 2
FRICTION FACTOR	•23911E=02 V1/V2/VA= 9.66857E 02 3.40258E 02 0.55570E ESSURE D= 4.95925E=01	V2
	7.35133E-98 1.17724E-02	
	0.00000E-01 0.00000E-01	- Barris Production in and the August Stream and a statistic complementary different programming with the Second Stream and a statistical statistica
3-C N-BUTANE	0.00000E-01 0.00000E-01 4.59769E-09 7.36270E-04	* 17* 18* ******************************
	6,58048E-04 1,05379E 02	
	1.52962E-04 2.44952E 01	· · · · · · · · · · · · · · · · · · ·
	<u>1,50389E-04</u> <u>2,40831E 01</u> <u>5,52751E-06</u> <u>8,85169E-01</u>	
	0,00000E-01 0,00000E-01	
10-J_PROPENE	0,00000E-01 0.00000E-01	
11-K WATER		
12-L CARBON 13-M CARBON MONDXIDE		
CONVERSION OF ETHANE	TO ETHYLENE IS 18.85%	
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SYSTEM 2.820 TO 1090 D						
FUNCTION REQUITAL				· · · · · · · · · · · · · · · · · · ·		
REQC(T.I.) . 0.16896E 0 FUNCTION REQC(T.I)					· · · · · · · · · · · · · · · · · · ·	
REQC(T.I)=0.41663E=0	1(1087.75, 2)					
FUNCTION REOC(T, I)						
REQC(T,I) = 0.51980E 0 FUNCTION REQC(T,I)	2(1087-75-3)	<u></u>				
REQC(T,I)=0.12721E=0	8(1087.75. 4)		······································			
FUNCTION REQC(T.1) REQC(T.1) = 0.42883E 0	1(1087.75.5)					
FUNCTION REQC(T,1) REQC(T,1) = 0.10960E_0	1/1007 75. 6)					
FUNCTION REQC(T,I)			······································			<del>.</del>
REQC(T.I) =0.25831E_0	0(1087.75.7)					
FUNCTION_REQC(T,I) REQC(T,I)=0.21013E=0	2/1047 75. 01				<u></u>	
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FUNCTION PRR(15)						
PR= 5.97498E_00R	AD1(1)=1.25001E=01	VOL # 0.0000	0E-01			-
FUNCTION PRESD(T) RENU= 6.66289E 05	WIS- 2 452845-08		 ^ ]			
FRICTION FACTOR	4454F=02 V12V22VA	= 1.08865E 03		7,40590E 02		
TEMPERTURE - 1087.75PRES	SURE D= 6.17736E-01					
	8.06998E=08	1.22797E-02				
2-B ISD BUTANE	0.00000E-01	0.00000E~01 0.00000E=01		······		
	5,53991E-09	8.42979E-04				
4-D_ISO-BUTENE	6.89104E-04	1.04857E 02	······			
5-E ETHANE						
5-E ETHANE	1.64378E=04	2,50125E 01 2,45910E 01	**************************************			
5-E ETHANE 6-F ETHYLENE 7-G HYDRDGEN		2.45910E 01 9.07318E-01				
5-EETHANE 6-F_ETHYLENE 7-G_HYDRDGEN 8-H_METHANE 9-I_PROPANE	1.61608E-04 5.96274E-06 0.00000E-01	2.45910E 01 9.07318E-01 0.00000E-01				
5-E         ETHANE           6-F         ETHYLENE           7-G         HYDROGEN           8-H         METHANE           9-I         PROPANE           10-J         PROPENE	1.61608E-04 5.96274E-06 0.00000E-01 0.00000E-01	2.45910E_01 9.07318E-01 0.00000E-01 0.00000E=01				
5-E         ETHANE           6-F         ETHYLENE           7-G         HYDROGEN           8-H         METHANE           9-I         PROPANE           10-J         PROPENE           11-K         WATER	1.61608E-04 5.96274E-06 0.00000E-01 0.00000E-01 4.62250E-04	2.45910E 01 9.07318E-01 0.00000E-01 0.00000E=01 7.03381E 01 0.00000E=01				
5-E       ETHANE         6-F       ETHYLENE         7-G       HYDROGEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-K       WATER         12-L       CARBON         MONDXIDE	1.61608E=04 5.96274E=06 0.00000E=01 0.00000E=01 4.62250E=04 2.36740E=09 5.76037E=11	2.45910E_01 9.07318E-01 0.00000E-01 0.00000E=01				
5-E         ETHANE           6-F         ETHYLENE           7-G         HYDROGEN           8-H         METHANE           9-I         PROPANE           10-J         PROPENE	1.61608E-04 5.96274E-06 0.00000E-01 0.00000E-01 4.62250E-04 2.36740E-09 5.76037E-11	2.45910E 01 9.07318E-01 0.00000E-01 0.00000E=01 7.03381E 01 0.00000E=01 8.76524E=06	.25%			
5-E       ETHANE         6-F       ETHYLENE         7-G       HYDRDGEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-K       WATER         12-L       CARBON         MONOXIDE	1.61608E-04 5.96274E-06 0.00000E-01 0.00000E-01 4.62250E-04 2.36740E-09 5.76037E-11	2.45910E 01 9.07318E-01 0.00000E-01 0.00000E=01 7.03381E 01 0.00000E=01 8.76524E=06	.25%			
5-E       ETHANE         6-F       ETHYLENE         7-G       HYDRDGEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-K       WATER         12-L       CARBON         MONOXIDE	1.61608E-04 5.96274E-06 0.00000E-01 0.00000E-01 4.62250E-04 2.36740E-09 5.76037E-11	2.45910E 01 9.07318E-01 0.00000E-01 0.00000E=01 7.03381E 01 0.00000E=01 8.76524E=06	.25%			
5-E       ETHANE         6-F       ETHYLENE         7-G       HYDRDGEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-K       WATER         12-L       CARBON         MONOXIDE	1.61608E-04 5.96274E-06 0.00000E-01 0.00000E-01 4.62250E-04 2.36740E-09 5.76037E-11	2.45910E 01 9.07318E-01 0.00000E-01 0.00000E=01 7.03381E 01 0.00000E=01 8.76524E=06	•25%			
5-E       ETHANE         6-F       ETHYLENE         7-G       HYDROGEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-K       WATER         12-L       CARBON         MONOXIDE	1.61608E-04 5.96274E-06 0.00000E-01 0.00000E-01 4.62250E-04 2.36740E-09 5.76037E-11	2.45910E 01 9.07318E-01 0.00000E-01 0.00000E=01 7.03381E 01 0.00000E=01 8.76524E=06	+25x			
5-E       ETHANE         6-F       ETHYLENE         7-G       HYDROGEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-K       WATER         12-L       CARBON         MONOXIDE	1.61608E-04 5.96274E-06 0.00000E-01 0.00000E-01 4.62250E-04 2.36740E-09 5.76037E-11	2.45910E 01 9.07318E-01 0.00000E-01 0.00000E=01 7.03381E 01 0.00000E=01 8.76524E=06	+25x			
5-E       ETHANE         6-F       ETHYLENE         7-G       HYDROGEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-K       WATER         12-L       CARBON         MONOXIDE	1.61608E-04 5.96274E-06 0.00000E-01 0.00000E-01 4.62250E-04 2.36740E-09 5.76037E-11	2.45910E 01 9.07318E-01 0.00000E-01 0.00000E=01 7.03381E 01 0.00000E=01 8.76524E=06	-25x			
5-E       ETHANE         6-F       ETHYLENE         7-G       HYDROGEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-K       WATER         12-L       CARBON         MONOXIDE	1.61608E-04 5.96274E-06 0.00000E-01 0.00000E-01 4.62250E-04 2.36740E-09 5.76037E-11	2.45910E 01 9.07318E-01 0.00000E-01 0.00000E=01 7.03381E 01 0.00000E=01 8.76524E=06	.25%			
5-E       ETHANE         6-F       ETHYLENE         7-G       HYDROGEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-K       WATER         12-L       CARBON         MONOXIDE	1.61608E-04 5.96274E-06 0.00000E-01 0.00000E-01 4.62250E-04 2.36740E-09 5.76037E-11	2.45910E 01 9.07318E-01 0.00000E-01 0.00000E=01 7.03381E 01 0.00000E=01 8.76524E=06	.25%			
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5-E       ETHANE         6-F       ETHYLENE         7-G       HYDRDGEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-K       WATER         12-L       CARBON         MONOXIDE	1.61608E-04 5.96274E-06 0.00000E-01 0.00000E-01 4.62250E-04 2.36740E-09 5.76037E-11	2.45910E 01 9.07318E-01 0.00000E-01 0.00000E=01 7.03381E 01 0.00000E=01 8.76524E=06	.25%			

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0	SYSTEM 2 820 TO 1090 DEG K	·
et		
<b>9</b> ¹¹ :	REQC(T,I)=0.16896E_01(1087.75, 1)	
31	FUNCTION_REQC(T.I)	
	$= REQC(T_2I) = 0.41663E = 01(1087.75.2)$	
0	EUNCTION REOC(T.I)	
	REQC(T,1) = 0.51980F_02(1087.75, 3)	
NAL.	REQC(T,1)=0.51980E_02(1087.75.3)	
0		
-	REQC(T/I)=0,42883E_01(1087.75.5)	
	FUNCTION REQC(T_1)	
	KEQC(T)] = 0.10960E_01(1087.75.6)	
	FUNCTION. REQC(T,1)	· · · · ·
0	REQC(T/I)= 0.25831E_00(1087.73, 7)	
	FUNCTION_REQC(T,1)	
<b>W</b> .	FUNCTION PRR(IS)	
		· •
	RENU=7.33016E_05VIS=2.65284E=05DEN=1.32648E=01	· · · · · · · · · · · · · · · · · · ·
	FRICTION FACTOR 1.22395E 02 V1.V2.VA= 1.17383E 03 6.37380E 02 9.05613E 02	
	TEMPERTURE 1087.75PRESSURE D= 4.77038E=01	
· .	1-A ACETYLENE2,93942E=072,23858E=02	İ
		i
0	3-C N-BUTANE 0,00000E-01 0.00000E-01	{
	4-0_ISD-BUTENE4.55975E-083.47258E-03	
	5-E ETHANE 1.25894E-03 9.58775E 01	
0	6-F ETHYLENE 4.43229E-04 3.37551E_01	
	7-G HYDROGEN4.35964E=043.32018E_01	
	8-H METHANE 1.62951E-05 1.24099E 00	
0	9-1 PRDPANE 0.00000E-01 0.00000E-01	, ,
	10-J _PROPENE0.00000E=010.00000F=01	
No.	11-K WATER9,23845E-047.03574E_01	
	12-L CARBON 8,72880E-09 0,00000E-01	
6	13-MCARBON_MONOXIDE4,41284E-103,36069E=05	
<b>a</b> 7	CONVERSION OF ETHANE TO ETHYLENE IS 25.98%	
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NVERSION_OFEthane_to_Ethylene		
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* 234 5 6 7 8	+ 8 7 6 5 432 *	
* 2 345 6 7 8	+ 8 7 6 543 2 *	
* 2345 67 8	+8 76 5432 *	<u> </u>
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SYSTEM 3 820 TO 1100	DEC K				
FUNCTION REQC(T.I)					
	01(1099,33, 1)				
REQC(T,I)= 0.44379E-	01(1099.33, 2)				
FUNCTION REQC(T, 1) REQC(T, 1) = 0,39589E					
FUNCTION REQC(T,1)	02(1099,33, 3)	· · · · · · · · · · · · · · · · · · ·			· · · · · · · · · · · · · · · · · · ·
REQC(T,I)=0.12639E=	08(1099.33.4)				
FUNCTION REQC(T,I) REQC(T,I) . 0.42525E					······································
FUNCTION REQC(T,I)	01(1099.33) 5)				······································
REQC(T.1) = 0.12439E					
FUNCTION REQC(T,1) REQC(T,1)=0.25164E_					·····
FUNCTION_REAC(T.I)	00.1099.331.71				
FUNCTION_REQC(T,I) REQC(T,I)=0.21764E=	02(1099.33.8)	· · · · · · · · · · · · · · · · · · ·			
FUNCTION DOD (TO)					
FUNCTION PRR(IS)	RADI(1) = 1.25001E=01	V01= 0.00000	DF-01		
FUNCTION PRESD(T)					
RENU= 6.44918E 05		DEN= 9.91257E-(	2	6.95909E 02	
TEMPERTURE 1099.33PR	25172E=02 V1, V2, VA	= 1.02508E 03	3.00/4/2 02	0.93909E 02	
1-A ACETYLENE	1.26812E-07	2.21844E-02			·
2-B ISD BUTANE	0.0D000E-01	0.00000E-01			
3-C N-BUTANE	0.00000E-01 8.05898E-09	0.00000E=01 1.40983E=03			· · · · · · · · · · · · · · · · · · ·
	5.48245E-04	9.59096E 01			
5-E ETHANE					
5-E ETHANE	<u>1.93515E-04</u>	3.38533E 01		•	
5-E ETHANE 6-F ETHYLENE 7-G HYDROGEN	<u>1.93515E-04</u> <u>1.90571E-04</u>	3.333835 01			
5-E ETHANE 6-F ETHYLENE 7-G HYDROGEN 8-H METHANE	1.93515E-04 1.90571E-04 6.58295E-06			·	
5-E ETHANE 6-F ETHYLENE 7-G HYDROGEN 8-H METHANE 9-I PROPANE	1.93515E-04 1.90571E-04 6.58295E-06 0.00000E-01 0.00000E-01	3.33383E 01 1.15162E 00 0.00000E=01 0.00000E=01			
5-E ETHANE 6-F ETHYLENE 7-G HYDRDGEN 8-H METHANE 9-I PROPANE 10-J PROPENE 11-K WATER	1.93515E-04 1.90571E-04 6.58295E-06 0.0000E-01 0.0000E-01 4.02325E-04	3.33383E 01 1.15162E 00 0.00000E=01 0.00000E=01 7.03824E 01			
5-E ETHANE 6-F ETHYLENE 7-G HYDROGEN 8-H METHANE 9-I PROPANE 10-J PROPENE 11-K WATER 12-1 CARBON	1.93515E-04 1.90571E-04 6.58295E-06 0.00000E-01 0.00000E-01 4.02325E-04 2.29484E-09	3.33383E 01 1.15162E 00 0.00000E=01 0.00000E=01 7.03824E 01 0.00000E=01			
5-E       ETHANE         6-F       ETHYLENE         7-C       HYDROGEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-X       WATER         12-L       CARBON         13-M       CARBON	1.93515E=04 1.90571E=04 6.58295E=06 0.00000E=01 0.00000E=01 4.02325E=04 2.29484E=09 9.67245E=11	3.33383E 01 1.15162E 00 0.00000E=01 7.03824E 01 0.00000E=01 1.69209E=05			
5-E ETHANE 6-F ETHYLENE 7-G HYDROGEN 8-H METHANE 9-I PROPANE 10-J PROPENE 11-K WATER 12-L CARBON 13-M CARBON MONOXIDE	1.93515E-04 1.90571E-04 6.58295E-06 0.00000E-01 0.00000E-01 4.02325E-04 2.29484E-09	3.33383E 01 1.15162E 00 0.00000E=01 7.03824E 01 0.00000E=01 1.69209E=05	.05%		
5-E ETHANE 6-F ETHYLENE 7-C HYDROGEN 8-H METHANE 9-I PROPANE 10-J PROPENE 11-K WATER 12-L CARBON 13-M CARBON MONOXIDE	1.93515E=04 1.90571E=04 6.58295E=06 0.00000E=01 0.00000E=01 4.02325E=04 2.29484E=09 9.67245E=11	3.33383E 01 1.15162E 00 0.00000E=01 7.03824E 01 0.00000E=01 1.69209E=05	.05%		
5-E       ETHANE         6-F       ETHYLENE         7-C       HYDROGEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-K       WATER         12-L       CARBON         13-M       CARBON	1.93515E=04 1.90571E=04 6.58295E=06 0.00000E=01 0.00000E=01 4.02325E=04 2.29484E=09 9.67245E=11	3.33383E 01 1.15162E 00 0.00000E=01 7.03824E 01 0.00000E=01 1.69209E=05	.05%		
5-E       ETHANE         6-F       ETHYLENE         7-C       HYDROGEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-K       WATER         12-L       CARBON         13-M       CARBON	1.93515E=04 1.90571E=04 6.58295E=06 0.00000E=01 0.00000E=01 4.02325E=04 2.29484E=09 9.67245E=11	3.33383E 01 1.15162E 00 0.00000E=01 7.03824E 01 0.00000E=01 1.69209E=05	.05%		
5-E       ETHANE         6-F       ETHYLENE         7-C       HYDROGEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-K       WATER         12-L       CARBON         13-M       CARBON	1.93515E=04 1.90571E=04 6.58295E=06 0.00000E=01 0.00000E=01 4.02325E=04 2.29484E=09 9.67245E=11	3.33383E 01 1.15162E 00 0.00000E=01 7.03824E 01 0.00000E=01 1.69209E=05	.05%		
5-E       ETHANE         6-F       ETHYLENE         7-C       HYDROGEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-K       WATER         12-L       CARBON         13-M       CARBON	1.93515E=04 1.90571E=04 6.58295E=06 0.00000E=01 0.00000E=01 4.02325E=04 2.29484E=09 9.67245E=11	3.33383E 01 1.15162E 00 0.00000E=01 7.03824E 01 0.00000E=01 1.69209E=05	•.05%		
5-E       ETHANE         6-F       ETHYLENE         7-C       HYDROGEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-X       WATER         12-L       CARBON         13-M       CARBON	1.93515E=04 1.90571E=04 6.58295E=06 0.00000E=01 0.00000E=01 4.02325E=04 2.29484E=09 9.67245E=11	3.33383E 01 1.15162E 00 0.00000E=01 7.03824E 01 0.00000E=01 1.69209E=05	•05%		
5-E ETHANE 6-F ETHYLENE 7-C HYDROGEN 8-H METHANE 9-I PROPANE 10-J PROPENE 11-K WATER 12-L CARBON 13-M CARBON MONOXIDE	1.93515E=04 1.90571E=04 6.58295E=06 0.00000E=01 0.00000E=01 4.02325E=04 2.29484E=09 9.67245E=11	3.33383E 01 1.15162E 00 0.00000E=01 7.03824E 01 0.00000E=01 1.69209E=05	.05%		
5-E ETHANE 6-F ETHYLENE 7-C HYDROGEN 8-H METHANE 9-I PROPANE 10-J PROPENE 11-K WATER 12-L CARBON 13-M CARBON MONOXIDE	1.93515E=04 1.90571E=04 6.58295E=06 0.00000E=01 0.00000E=01 4.02325E=04 2.29484E=09 9.67245E=11	3.33383E 01 1.15162E 00 0.00000E=01 7.03824E 01 0.00000E=01 1.69209E=05	.05%		
5-E ETHANE 6-F ETHYLENE 7-C HYDROGEN 8-H METHANE 9-I PROPANE 10-J PROPENE 11-K WATER 12-L CARBON 13-M CARBON MONOXIDE	1.93515E=04 1.90571E=04 6.58295E=06 0.00000E=01 0.00000E=01 4.02325E=04 2.29484E=09 9.67245E=11	3.33383E 01 1.15162E 00 0.00000E=01 7.03824E 01 0.00000E=01 1.69209E=05	.05%		
5-E ETHANE 6-F ETHYLENE 7-G HYDROGEN 8-H METHANE 9-I PROPANE 10-J PROPENE 11-K WATER 12-L CARBON 13-M CARBON MONOXIDE	1.93515E=04 1.90571E=04 6.58295E=06 0.00000E=01 0.00000E=01 4.02325E=04 2.29484E=09 9.67245E=11	3.33383E 01 1.15162E 00 0.00000E=01 7.03824E 01 0.00000E=01 1.69209E=05	.05%		
5-E ETHANE 6-F ETHYLENE 7-G HYDROGEN 8-H METHANE 9-I PROPANE 10-J PROPENE 11-K WATER 12-L CARBON 13-M CARBON MONOXIDE	1.93515E=04 1.90571E=04 6.58295E=06 0.00000E=01 0.00000E=01 4.02325E=04 2.29484E=09 9.67245E=11	3.33383E 01 1.15162E 00 0.00000E=01 7.03824E 01 0.00000E=01 1.69209E=05	.05%		

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FUNCTION REQC(TI)		······································			
SEQC(T.1)=0.15783E_01	(1099.41.1)				
FUNCTION_REQC(T.1) REQC(T.1)=0.44397E=01					
FUNCTION_REQC(T_1)	(1099,41, 2)				
REOC(T+I)=0+39522E_02					
FUNCTION REQC(T.I) REQC(T.I)=0.12639E=08	(1009 41. 4)				
FUNCTION_REOC(T.I)					· · · · · · · · · · · · · · · · · · ·
$REQC(T_{J}I) = 0.42523E_{01}$			······································		
FUNCTION REQC(T <u>.I)</u> REQC(T.I) = 0.12448 <u>E 01</u>	(1099,41, 6)				
FUNCTION REQC(T,1)					
REQC(T,I)= 0.25160E_00 FUNCTION_REQC(T,I)				· · · · · · · · · · · · · · · · · · ·	
REQC(T)1)= 0.21769E=02	(1099.41, 8)				
FUNCTION PRR(IS)					
PR=	DI(1)= 1.25001E=0	VOL= 0.0000	0E-01		
UNCTION_PRESD(T)			· · ·		
ENU= 5.98597E 05 RICTION FACTOR= 1.26		DEN= 1.09679F=	4.44542E 02	6.76144E 0Z	<u> </u>
TEMPERTURE = 1099.41PRESS	URE D= 4.37916E-0				
	2,52607E=07	2,93898E=02	······		·
	0.00000E-01	0.00000E-01		· ·	
4-D_ISD-BUTENE	2.41362E+08	2,80815E-03			
5-E ETHANE	7.79315E-04 3.34410E=04	9.06699E 01 3.89072E 01			
7-G HYDROGEN	3.29452E-04	.3.83304E 01			······································
8-H METHANE	1.13902E-05	1.32521E 00			
9-1 PROPANE	0.00000E=01	0.00000E=01			
11-K WATER	6.04735E=04	7,03585F 01			
2-1 CARBON	4.98£83E-09	0.00000E=01		······································	
13-M CARBON MONOXIDE	2.40065E+10	2.86985E-05		ويسترجع والمراجع	
CONVERSION OF ETHANE	TO ETHYLI	NEIS_29	.94%		······································
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······································	· E · · · ·	·····				РТ	R	*	(P) (P)
		······				<u>PT</u>	R	*	
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					<u>Р.</u>	R	T	*	<u> </u>
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	E					······································			×
**	EE.	·····		`	<u>PR</u>	· · · · · · · · · · · · · · · · · · ·		<u>T</u> *	
			P	R				T *	29

		DEG K			aanse jire armadardige digter gebreiden	and the second
SYSTEM 3.420.T0.1100_DEG.K.         FUNCTION REG(T/1)         FUNCTION REG(T/1) </th <th>REACTOR PRODUCT (E)</th> <th>REACTANT(R) TEMPERATURE(T) P</th> <th>RESSURE(P) AFTER 1200.</th> <th>HOURS OF RUN</th> <th>en lange ogeneriste af nære skrive enserer sælig gerige og en som</th> <th>ادىيە ئېسىرىڭ سېرىكى ۋرىنى ئەيمر ∫ىرىنى، </th>	REACTOR PRODUCT (E)	REACTANT(R) TEMPERATURE(T) P	RESSURE(P) AFTER 1200.	HOURS OF RUN	en lange ogeneriste af nære skrive enserer sælig gerige og en som	ادىيە ئېسىرىڭ سېرىكى ۋرىنى ئەيمر ∫ىرىنى، 
SYSTEM 3 420 TO 1100-060 K         FUNCTION REGG(T,1)         REG(T,1)         REG(T,1)         O(T)         O(T)         O(T)         O(T)         O(T)         SYSTEM 3 (2007)						
SYSTEM 3 820-TO-1100_DEG K. FUNCTION REGCT7.1) FEOCT7.1)* 0.158356_01(1098,84-1) FUNCTION REGCT7.1)* FUNCTION						· · · · · · · · · · · · · · · · · · ·
FUNCTION.REGC(T,1)       REGC(T,1)       REGC(T	al ta contra de la c					
FUNCTION. REGG(T,1)       CG:4526E-0141098.64.11         REGG(T,1)       CG:4526E-0141098.64.21         FUNCTION. REGG(T,1)       CG:4526E-021098.64.21         FUNCTION. REGG(T,1)       CG:4526E-021098.64.21         FUNCTION. REGG(T,1)       CG:4526E-021098.64.23         FUNCTION. REGG(T,1)       CG:4526E-021         FUNCTION. REGG(T,1)       CG:4526E-02         FUNCTION. REGG(T,1)       CG:4526E-021	SYSTEM 3 820 TO 1100	DEG K				
REGC(Tr1)=.0,158355-014(098,86.2) REGC(Tr1)=.0,4004582E-014(098,86.2) FUNCTION.REGC(Tr1)=.0,4004582E-031(098,86.4) FUNCTION.REGC(Tr1)=.0,12042E-031(098,86.4) FUNCTION.REGC(Tr1)=.0,12042E-031(098,86.4) FUNCTION.REGC(Tr1)=.0,12042E-031(098,86.4) FUNCTION.REGC(Tr1)=.0,12042E-031(098,86.4) FUNCTION.REGC(Tr1)=.0,12042E-031(098,86.4) FUNCTION.REGC(Tr1)=.0,21373E-011(098,86.4) FUNCTION.REGC(Tr1)=.0,21373E-011(098,86.4) FUNCTION.REGC(Tr1)=.0,21373E-011(098,86.4) FUNCTION.REGC(Tr1)=.0,21373E-021(098,86.4) FUNCTION.REGC(Tr1)=.0,21373E-021(098,86.4) FUNCTION.REGC(Tr1)=.0,21373E-021(098,86.4) FUNCTION.REGC(Tr1)=.0,21373E-021(098,86.4) FUNCTION.REGC(Tr1)=.0,21373E-021(098,86.4) FUNCTION.REG(Tr1)=.0,21373E-021(098,86.4) FUNCTION.REG(Tr1)=.0,21373E-021(098,86.4) FUNCTION.REG(Tr1)=.0,21373E-021(098,86.4) FUNCTION.REG(Tr1)=.0,21373E-021(098,86.4) FUNCTION.REG(Tr1)=.0,21373E-021(098,86.4) FUNCTION.REG(Tr1)=.0,21373E-021(098,86.4) FUNCTION.REG(Tr1)=.0,21373E-021(098,86.4) FUNCTION.REG(Tr1)=.0,21373E-021(098,86.4) FUNCTION.REG(Tr1)=.0,21373E-021(098,86.4) FUNCTION.REG(Tr1)=.0,21373E-021(098,86.4) FUNCTION.REG(Tr1)=.0,21373E-021(098,86.4) FUNCTION.REG(Tr1)=.0,21373E-021(098,86.4) FUNCTION.REG(Tr1)=.0,21373E-021(098,86.4) FUNCTION.REG(Tr1)=.0,21373E-021(098,86.4) FUNCTION.REG(Tr1)=.0,21373E-021(098,86.4) FUNCTION.REG(Tr1)=.0,21373E-021(098,86.4) FUNCTION.REG(Tr1)=.0,21373E-021(098,86.4) FUNCTION.REG(Tr1)=.0,21373E-021(098,86.4) FUNCTION.REG(Tr1)=.0,21373E-021(098,86.4) FUNCTION.REG(Tr1)=.0,21372E-021(098,86.4) FUNCTION.REG(TT1)=.0,21372E-021(098,86.4) FUNCTION.REG(TT1)=.0,21372E-021(098,86.4) FUNCTION.REG(TT1)=.0,21372E-021(098,86.4) FUNCTION.REG(TT1)=.0,21372E-021(098,86.4) FUNCTION.REG(TT1)=.0,21372E-021(098,86.4) FUNCTION.REG(TT1)=.0,21372E-021(098,86.4) FUNCTION.REG(TT1)=.0,21372E-021(098,86.4) FUNCTION.REG(TT1)=.0,21372E-021(098,86.4) FUNCTION.REG(TT1)=.0,21372E-021(098,86.4) FUNCTION.REG(TT1)=.0,21372E-021(098,86.4) FUNCTION.REG(TT1)=.0,21372E-021(098,86.4) FUNCTION.REG(TT1)=.0,21						
Field (TT 1) a       0.4/227E-01(1098,84.2)         REG (T 7) 1       0.40035-024(0098,84.3)         FUNCTION REG (T 7) 1       0.12043E-08(1098,84.4)         FUNCTION REG (T 7) 1       0.11098,84.5)         FUNCTION REG (T 7) 1       0.11098,84.5)         FUNCTION REG (T 7) 1       0.12043E-01(1098,84.5)         FUNCTION REG (T 7) 1       0.12078E-01(1098,84.7)         FUNCTION REG (T 7) 1       0.2172E-021(1098,84.7)         FUNCTION PREC (T 7) 1       1.23101E-01       VIL - 0.40000E-01         FUNCTION PREC (T 7) - 0.2172E-02(1098,84.8)       1.05032E 03       6.75924E 02       0.55172E 02         FUNCTION PREC (T 7) - 0.2172E-02       VIL - 0.40000E-01       -0.40000E-01       -0.4000E-01       -0.4000E-01       -0.4000E-01       -0.4000E-01	FUNCTION REQUITAL					
REGC(Tr1):       0.46202E=011098.8431         REQ(Tr1):       0.12043E=021098.8431         REQ(Tr1):       0.12043E=011098.8431         FUNCTION REQC(Tr1):       0.12042E=011098.8431         FUNCTION PRESCIT:       0.12045E=01         FUNCTION PRESCIT:       0.12045E=05         FUNCTION PRESCIT:       0.12045E=05         FUNCTION PRESCIT:       0.12045E=05         FUNCTION PRESCIT:       0.10000E=01         FUNCTION PRESCIT:       0.10000E=01         FUNCTION PRESCIT:       0.12045E=05         FUNCTION PRESCIT:       0.12045E=05         FUNCTION PRESCIT:       0.10000E=01         FUNCTION PRESCIT:       0.12045E=05         FUNCTION PRESCIT:       0.00000E=01         FUNCTION PRESCIT:       0.00000E=01	REQC(T+I)=0+15835E	-01(1098+84+1)				
REGC(T)1 - 0,10003E-024(009.84, 4) FUNCTION REGC(T,1) REGC(T)1 - 0,120402-08(1098.84, 5) FUNCTION REGC(T,1) FUNCTION REG(T,1) FUNCTION REG(T,1) FUN	REQC(T+I)= 0.44262E	=01(1098,84, 2)				
FUNCTION REQCIT,1) FUNCTION REQUINE FUNCTION REQUINE	FUNCTION REQC(T,I)			· • · · · · · · · · · · · · · · · · · ·		
REGC(7)1 = 0,12643E-08(1098,46,4) REGC(7,1) = 0,42540E 01(1098,46,5) FUNCTION REGC(7,1) = 0,2137EE 01(1098,46,5) FUNCTION REGC(7,1) = 0,2137EE 01(1098,46,7) FUNCTION REGC(7,1) = 0,2132E02(1098,46,8) FUNCTION REGC(7,1) = 0,2132E02(1098,46,8) FUNCTION PRESC(15) = 0,2122E02(1098,	- FUNCTION REOC(T.I.)				·····	
REGC(T)1): 0,22326-01(1098,84-5) REGC(T)1): 0,12373E-01(1098,84-5) FUNCTION REGC(T)1: 0,12373E-01(1098,84-7) FEVCTION REGC(T)1: 0,21732E-02(1098,84-7) FRGC(T)1: 0,21732E-02(1098,84-7) FUNCTION REGC(T): 0,21732E-02(1098,84-8) FUNCTION REGC(T): 0,21732E-02(1098,84-8) FUNCTION PRE(IS1) REVUE 7,00546E-05 VIJSE 2,47318E-05 DEN= 1,34434E-01 FRUETION FRESO(T) REVUE 7,00546E-05 VIJSE 2,47318E-05 DEN= 1,34434E-05 FRUETION FRESO(T) REVUE 7,00546E-05 VIJSE 2,47318E-05 DEN= 1,40000E-01 REVUE 7,00546E-05 DEN= 1,0000E-01 REVUE 7,0000E-01 DEN= 1,00000E-01 REVUE 7,0000E-01 REVUE 7,0	REQC(TJI)= 0.12643E	=08(1098,84,4)	<b>*</b>		· · · · · · · · · · · · · · · · · · ·	
FUNCTION REGG(T,11 FUNCTION REGG(T,1) FUNCTION REGG(T,1) FUNCTION REGG(T,1) FUNCTION REGG(T,1) FUNCTION PREGG(T,1) FUNCTION FUNCTION FUNCTION FUNCTION FUNCTION FUNCTION PREGG(T,1) FUNCTION PREGG(T,1) FUNCTION FUNCTION FU	FUNCTION REQC(T,1)					
REGC(77,1)*       0,12373E_01(1098,646)         PUNCTION PREC(77,1)*       0,221732E=02(1098,646)         REGC(77,1)*       0,21732E=02(1098,646)         FUNCTION PREC(15,1)       1,25001E=01         VUNCTION PREC(15,1)       1,25001E=01         VUNCTUN PREC(15,1)       1,25001E=01         VUNCTUN PREC(15,1)       1,22304500,2         PUNCTION PREC(15,1)       1,2230450,2         PUNCTUN PREC(15,1)       1,2230450,2         PUNCTUN PREC(15,1)       1,2230450,2         PUNCTUN PREC(15,1)       1,2230450,2         PUNCTUN PREC(15,1)       1,2203450,2         PUNCTUN PREC(15,1)       1,2203450,2         PUNCTUN PREC(15,1)       1,200000,1         PUNCTUN PREC(15,1)       1,200000,1         PUNCTUN PREC(15,1)       1,2203450,0         PUNCTUN PREC(15,1)       1,200000,1         PUNCTUN PREC(15,1)       1,20000,1         PUNCTUN PREC(15,1)       1,610,0,1	FUNCTION REOC(T.I)					
REGC(7)]* 0,2192E=02(1098,84.7) FUNCTION PRR(IS) FUNCTION PRR(IS) FUNCTION PRR(IS) FUNCTION PRR(IS) FUNCTION PRR(IS) FUNCTON ARESNELD* AD1(1)* 1,25001E=01 VDL* 0.00000E=01 FUNCTON ARESNELD* 2,47218E=05 DEN* 1,24434E=01 FRI(FIDD FRCTOR* 1,2336E=00 VL/2VAR 1,06632E 03 6.55824E 02 B.56175E 02 TEMPERTURE* 1098.042RESSURE D* 4.77255E=01 1-A ACETVLENE 0.40000E=01 0.00000E=01 3-C N=BUTANE 0.40000E=01 0.00000E=01 4-D ISD-BUTENE 4,18226E=08 6.30623E=03 5-E ETHANE 1.10141E=03 8.2832E 0.1 6-F ETHANE 5.18298E=04 4.55014E 0.1 6-F ETHANE 5.18298E=04 4.55014E 0.1 6-F ETHANE 5.18298E=04 4.55014E 0.1 6-F ETHANE 5.18298E=04 4.55014E 0.1 6-F ETHANE 5.1937E=04 4.55014E 0.1 1-C ANDOREN 0.0000E=0.1 1-K AATER 9.35229E=04 4.55014E 0.1 1-K AATER 9.35229E=04 7.0372E=0.1 1-K AATER 9.35229E=04 7.0372E=0.1 1-K AATER 9.35229E=05 0.0000E=0.1 1-K AATER 7.48638E=10 5.63072E=0.1 1-K AATER 7.48638E=10 5.63072E=0.5 CONVERSION OF ETHANE TO ETHYLENE 15.35+79%	REQC(T,I) . 0.12373E	-01(1098.84.6)				
FUNCTION.REQCLT.111.       0.21732E=02(1098.84. B)         FUNCTION PRRIIS.       PR.         PR.       7.76997E.00         RENUE       7.00540E.05         PINCTION PRRSD(T)       VIS.         RENUE       7.00540E.05         PINCTION PRRSD(T)       VIS.         RENUE       7.00540E.05         VIS.       2.47335E=03         DI-A       ACTOTME.         1-A       ACTOTME.         5.0175E.02       4.77355E=01         1-A       ACTOTME.         1-A       ACTOTME.         5.0178E.02       4.77355E=02         2-6       NEUTANE         5.0178E.02       4.77355E=02         2-7       SIBUTANE         5.00000E=01       0.00000E=01         4-0       150-BUTENE         5.18216E=08       4.90020E=01         4-0       150-BUTENE         5.18216E=08       4.9314E=01         6-7       ENTIALENE         6.10100E=01       0.0000E=01         6-7       ENTIALENE         6.1010E       0.0000E=01         6.7       PRIMORENE         6.8       1607E_00         6.9       0.0000E=01      <	REQC(T+T)= 0.25191E	00(1098.84.7)				
FUNCTION PRR(IS) PR - 7.74997E 00 RAD1(1) 1.25001E-01 VIL 0.000/00E-01 FUNCTION PRESD(T) REMU- 7.00540E 05 VIS 2.47338E-05 DEN= 1.344345-01 FRICTION FACTOR= 1.23364E02 VILV2VA1 1.05552E 03 6.55824E 02 8.550175E 02 TEMPERTURE= 1098.842RESSURE DE 4.77853E-01 1-4 ACETVLENE 5.61184E-07 4.22059E-02 2-5 ISO 8UTANE 0.00000E-01 0.00000E-01 3-C N=BUTANE 0.00000E-01 0.00000E-01 5-C REMARE 1.0141E-03 8.28352E 01 6-F ETHVLENE 6.18298E-04 4.65014E 01 6-F ETHVLENE 6.18298E-04 4.65014E 01 8-H METHANE 2.15144E-05 1.61807E 00 9-I PROPANE 0.00000E+01 0.00000E+01 10-4 PROPENE 0.00000E+01 0.00000E+02 11-K WATER 9.32229E-04 7.03372E 01 11-K WATER 9.32229E-05 7.03372E 01 11-K WATER 9.32229E-05 7.03372E 01 12-L CARBON 100XIDE 7.48838E-10 5.63073E=05 CONVERSION 0F ETHANE TO ETHVLENE 15.35+79%	FUNCTION REQCIT, I)					
FUNCTION PRK(ISI       VDL*       0.00000E=01         FUNCTION PRESS(T)       FUNCTION PRESS(T)       FUNCTION PRESS(T)         FRICTION FACTOR       1.223364E.02       VIJV2/VA*       1.05652E.03       6.55824E.02       0.55073E.02         FRICTION FACTOR       1.223364E.02       VIJV2/VA*       1.05652E.03       6.55824E.02       0.55073E.02         FRICTION FACTOR       1.223364E.02       VIJV2/VA*       1.05652E.03       6.55824E.02       0.55073E.02         TEMPERTURE       1.6184E-07       4.22059E+02       4.278550+01       1.00000E+01       0.0000E+01         2-8       ISO BUTANE       0.00000E+01       0.00000E+01       0.0000E+01       0.0000E+01         3-50 FBUTANE       9.18276E+08       4.2832E+01		-02(1098,84, 8)				
PR       7,74997E.00       PA01(1)=       1.23001E-01       VUL=       0.00000E-01         REMUCTION PRESD(T)       DEN=       1.34434E-01       0.5522E.02       0.55075E.02         TEMPERTURE=       1.23304E-02       VIX/VX4=       1.05652E.03       0.5522E.02       0.55075E.02         TEMPERTURE=       5.61184E-07       4.22059E-02       0.55075E.02       0.55075E.02         1-A       ACETVLENE       5.61184E-07       4.22059E-02       0.0000E-01         2-6       N-600704E-01       0.00000E-01       0.0000E-01         3-6       N-6017ANE       0.40000E-01       0.0000E-01         3-7       N-6017ANE       0.42052E-03       0.5532E.01         5-7       R+10ANE       0.42032E-03       0.5532E.01         5-7       R+10ANE       0.18295E-04       4.65014E.01         5-7       R+10ANE       0.18295E-04       4.65012E.01         5-8       R+10ANE       2.15144E-05       1.61807E.00         5-9       FTANE       2.15144E-05       1.61807E.00         5-9       PTROREN       0.00000E-01       0.00000E-01         10-4       PR0PENE       0.00000E-01       0.00000E-01         12-4       CARGON       NONOXIDE       7.4869			and the second			
RENU-       7.00546E.03       VISa       2.47318E-03       DENa       1.34434E-01         FERTETION FACTORA       1.233648PC02       VIV2/VAB       1.05552E.02       8.550175E.02         TEMPERTURE*       1.998.648PRESSURE       Deve       4.77855E-01       0.0000E+01         1-A       ACETVLENE       5.61184E+07       4.22059E+02       0.0000E+01         2-8       IS0 80TANE       0.00000E+01       0.00000E+01         3-C       N-BUTANE       0.00000E+01       0.00000E+01         4-0       IS0-BUTENE       9.18276E+08       6.30627E+03         5-E       ETHANE       1.10141E+03       6.28352E_01         6-F       ETHVLENE       6.18298E+04       4.65014E_01         7-G       HVDRGEN       6.19298E+04       4.65014E_01         7-G       HVDRGEN       0.00000E+01       0.00000E+01         9-I       PROPANE       0.00000E+01       0.00000E+01         10-J       PROPENE       0.00000E+01       0.00000E+01         10-J       PROPENE       0.00000E+01       0.00000E+01         12-L       CARBON       1.04289E+08       0.00000E+01         12-L       CARBON       TO       ETHYLENE       IS-35-79% <td>PR= 7.74997E 00</td> <td>RAD1(1)= 1.25001E=01</td> <td>VOL= 0.00000E-01</td> <td></td> <td></td> <td></td>	PR= 7.74997E 00	RAD1(1)= 1.25001E=01	VOL= 0.00000E-01			
FRICTION FACTOR*       1:23364E=02       V1:V2/VA*       1:0552E=03       8:55175E=02         I*A ACETYLENE       5:61184E=07       4:22059E=02       8:55175E=02         1*A ACETYLENE       5:61184E=07       4:22059E=02       8:55175E=02         2-8       150 BUTANE       0:00000E=01       0:00000E=01       8:00000E=01         3-C       N=BUTANE       0:00000E=01       0:00000E=01       8:00000E=01         4-0       15:018UTENE       9:18276E=08       6:30623E=03       8:2852E=03         5-F       ETHANE       1:10141E=03       8:2852E=03       8:58128       8:58128         5-F       ETHANE       1:10141E=03       8:2852E=03       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128       8:58128	FUNCTION PRESD(T)					
TEMPERTURE 1098.649RESURE Di 4.77855E-01         1-A ACETVLENE 5.61184E-07. 4.22059E-02         2-B 150 8UTANE 0.00000E-01 0.00000E-01         3-C N-BUTANE 0.00000E-01 0.00000E-01         4-O 15D-BUTENE 1.10141E-03 8.28352E 01         5-E ETHANE 1.10141E-03 8.28352E 01         6-F ETHANE 1.10141E-03 8.28352E 01         7-G MYURDGEN 6.09387E-04 4.55014E 01         7-G MYURDGEN 6.09387E-04 4.55014E 01         7-G MYURDGEN 6.009387E-04 4.55014E 01         7-J PROPANE 0.00000E-01 0.00000E-01         9-L PROPANE 0.00000E-01 0.00000E-01         10-J PROPENE 0.00000E-01 0.00000E-01         10-J PROPENE 0.00000E-01 0.00000E-01         10-J PROPENE 0.00000E-01 0.00000E-01         12-L CARBON 1.04289E-08 0.00000E-01         13-H CARBON MDNOXIDE 7.48698E-10 5.63073E-05         CONVERSION 0F_ETHANE TO ETHYLENE IS_35.79%	FRICTION FACTOR	- 23364E-02 VI+V2+VAR 1			6175E 02	
4-0 ISD-BUTENE 9,18276E-08 6,90623E-03 5-5 ETHANE 1,1014FE-03 8,28352E-01 6-F ETHYLENE 6,18298E-04 4,65014E 01 7-C HYDROGEN 6,09307E-04 4,55312E 01 8-H METHANE 2,1514KE-05 1,61807E 00 9-1 PROPANE 0,00000E-01 0,000000E+01 10-J PROPENE 0,00000E+01 0,000000E+01 11-K WATER 9,35229E-04 7,03372E 01 12-L CARBON 1,04289E-08 0,00000E+01 13-H CARBON MONOXIDE 7,48683E-10 5,63073E+05 CONVERSION OF ETHANE TO ETHYLENE 15-35+79%	TEMPERTURE= 1098-84PR	ESSURE De 4.77855E=01				
4-0 ISD-BUTENE 9,18276E-08 6,90623E-03 5-5 ETHANE 1,1014FE-03 8,28352E-01 6-F ETHYLENE 6,18298E-04 4,65014E 01 7-C HYDROGEN 6,09307E-04 4,55312E 01 8-H METHANE 2,1514KE-05 1,61807E 00 9-1 PROPANE 0,00000E-01 0,000000E+01 10-J PROPENE 0,00000E+01 0,000000E+01 11-K WATER 9,35229E-04 7,03372E 01 12-L CARBON 1,04289E-08 0,00000E+01 13-H CARBON MONOXIDE 7,48683E-10 5,63073E+05 CONVERSION OF ETHANE TO ETHYLENE 15-35+79%			.22059E=02		· · · · · · · · · · · · · · · · · · ·	·
4-0 ISD-BUTENE 9,18276E-08 6,90623E-03 5-5 ETHANE 1,1014FE-03 8,28352E-01 6-F ETHYLENE 6,18298E-04 4,65014E 01 7-C HYDROGEN 6,09307E-04 4,55312E 01 8-H METHANE 2,1514KE-05 1,61807E 00 9-1 PROPANE 0,00000E-01 0,000000E+01 10-J PROPENE 0,00000E+01 0,000000E+01 11-K WATER 9,35229E-04 7,03372E 01 12-L CARBON 1,04289E-08 0,00000E+01 13-H CARBON MONOXIDE 7,48683E-10 5,63073E+05 CONVERSION OF ETHANE TO ETHYLENE 15-35+79%			-00000E=01			
6-F       FTHYLENE       6,18298E-04       4,65014E       01         7-C       HYDRUGEN       6,09387E-04       4,58312E       01         8-H       HETHANE       2,151146E-05       1,61807E       00         9-1       PRDPANE       0,00000E+01       0,00000E+01         10-J       PROPENE       0,00000E+01       0,00000E+01         11-K       HATER       9,35229E+04       7,03372E       01         12-L       CARBON       1,04289E+08       0,00000E+01       10         13-H       CARBON       MONXIDE       7,48683E+10       5,63073E+05         CONVERSION OF ETHANE       TO       ETHYLENE       IS_35+79%	4-0_ISD-BUTENE	9,18276E-08 6	90623E=03			
7-C       HYDROGEN       6.09387E-04       4.58312E 01         8-H       METHANE       2.15144E-05       1.61807E 00         9-I       PROPANE       0.00000E-01       0.00000E-01         10-J       PROPENE       0.00000E-01       0.00000E-01         11-K       WATER       9.35229E-04       7.03372E 01         12-L       CARBON       1.04289E-08       0.00000E-01         13-H       CARBON MONOXIDE       7.48683E-10       5.63073E-05         CONVERSION OF ETHANE       TO       ETHYLENE       IS_35+79%						
8-H       METHANE       2.15144E=05       1.61807E 00         9-I       PROPANE       0.00000E=01       0.00000E=01         10-J       PROPENE       0.00000E=01       0.00000E=01         11-K       WATER       9.35229E=04       7.03372E=01         12-L       CARBON       1.04289E=08       0.00000E=01         13-H       CARBON       1.04289E=08       0.00000E=01         13-H       CARBON       MONOXIDE       7.48683E=10       5.63073E=05         CONVERSION       DF ETHANE       TO ETHYLENE       IS=35+79%						
10-JPROPENE       0.00000E=01       0.00000E=01         11-K_WATER       9.35229E=04       7.03372E_01         12-L_CARBON       1.04289E=08       0.00000E=01         13-M_CARBON MONXIDE       7.48683E=10       5.63073E=05         CONVERSION OF ETHANE       TO_ETHYLENE       IS_35+79%	8-H METHANE	2.15144E-05	61807E_00			
11-K. WATER       9,35229E-04       7.03372E 01         12-L CARBON       1.04289E-08       0.00000E-01         13-M. CARBON MONOXIDE       7.48683E-10       5.63073E-05         CONVERSION OF ETHANE       TO ETHYLENE       IS-35.79%	9-I PROPANE	0.00000E-010				
12-L         CARBON         1.04289E-08         0.00000E=01           13-M         CARBON         MONOXIDE         7.48683E-10         5.63073E=05           CONVERSION         DF         ETHANE         TO         ETHYLENE         IS_35.79%	10-JPRUPENE	9.35229E-04 7				
CONVERSION DE ETHANE TO ETHYLENE IS-35-79%	12-1 CARBON	1.04289E-080	.00000E-01			
	13-M CARBON MONDXIDE	7.48683E-105	63073E-05		·	
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_____ System_3___820 -_ 1100 K O' ۲ C)° CONVERSION OF Ethane to Ethylene Time Increment - 200. Hours 11 a 400,00_FT_____ CL  $O^{n}$ 齡 71 7 6 5 4 3 7 * * 2 3 4 5 6 7 + 0 * 234567 + 7 6 5 4 3 2 * 6 7 6 5 4 3 2 * + ----- *-- 23-4-5-6----7-----7 6 5 4 32 * + 0 * 2 3 4 5 6 7 + _____765432* ß * 23 4 56 7 + _____7 65 4 32 *_ #_23456_7__ + 7 65432 * О * 2456 7 . 7 6542 * 8 ..... ----- \$-34567---76543 * + Pil . * 3567 ... + 7653 *  $\bigcirc$ 764 * 6 + * 47 74 * + .*...57. 75 * +  $\mathbf{O}$ ۲ .*_.67. + 76 * 7 * *....7... + . * 7 + 7 * 7 * * 7 + 7 * * 7 + 4 7 * N CO 0 7 * * 7. + 7 * *...7 + Ē 7 * 2 ٠ *._7 E ۰  $\circ$ * 7 7 * 7 * * 7 ÷ 7 * * 7 + 7 * O *....7. + 鸖 7 * + *.7 7¥ * 7 + 7 * ŵ *_7 7 * . * 7 + 7 * *_7 + 7 * * 7 . ÷ 7 * *...7. 4. 7 * 4. 7 * *...7 7 * 7 * * . 7. 7 * + * 7 7 * + * 7 . 7 × 4. 7 * Ø С *...7 7 * + *...7 + 7 * 12 *...7 + 7 * 1168 0 7 7 * + 10 * 7 + 7 * , + 7 *  $\mathbf{O}$ • . * 7. ..... + 7 * .... * 7 7 * + 방학법 * 7 2 * 7 ____ 7 * 0 .t... S 9 4 œ. СL ٢ . ;

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System 4_820_ 1110°K			· · · · · · · · · · · · · · · · · · ·
INVERSION OF Ethane to Ethylene	Time Increment - 100 Hours		· · · · · · · · · · · · · · · · · · ·
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SYSTEM_5 820. T0-1115					
FUNCTION REQC(T)]	01(1114-67-1)				
FUNCTION REQC(T, I)					
REQC(T)I) = 0.48158E= FUNCTION REQC(T)I	G1( <u>11</u> <u>2</u> 4,67, <u>2</u> )				
REQC(T.I.) = 0.27851E	02(1114.67.3)				
FUNCTION REQC(T, 1)					· · · · · · · · · · · · · · · · · · ·
REQC(T)I)= 0.12534E= FUNCTION REQC(T)I)	08(1114,0/, 4)				
REQC(T,1)=0.42059E_	01(1114.67.5)				
FUNCTION_REQC(T)]	01/111/ 47- 41				
FUNCTION REQC(T,1)					· · · ·
REOC(T,I)= 0.24328E	00(1114.67.7)		· · · · · · · · · · · · · · · · · · ·		
FUNCTION REQC( $T \neq I$ ) REQC( $T \neq I$ ) = 0,22778E=	-02(1114 67. R)				
REAC(1)1)=022110==		······			
FUNCTION PRR(IS)					· · · · · · · · · · · · · · · · · · ·
PR= 5.79999E 00	RADI(1)= 1.25000E=01	VOL= 0.00000	E=01		
-RENU=6.73864E05	VIS= 2.70204E=05	DEN= 9.66144E-0	2		
FRICTION FACTOR	24207E=02 V1+V2+VA		4.24147E 02	7.53847E_02	
TEMPERTURE= 1114.67PRE		7.65848E-02			
		0.00000E=01			
2-B ISD BUTANE					
3-C N-BUTANE	0.00000E-01	0.00000E-01	9		
3-C N-BUTANE 4-D ISD-BUTENE	0.00000E-01 2.73525E-08	0.00000E-01 5.06103E-03			
3-C N-BUTANE 4-D ISD-BUTENE 5-E ETHANE	0.00000E=01 2.73525E=08 3.62656E=04	0.00000E-01			
3-C N-BUTANE 4-D ISD#BUTENE 5-E ETHANE 6-F ETHYLENE 7-G HYDROGEN	0.00000E-01 2.73525E-08 3.62656E-04 3.36698E-04 3.32943E-04	0,00000E=01 5,06103E=03 6,71020E 01 6,22992E 01 6,16044E 01			
3-C N-BUTANE 4-D ISD#BUTENE 5-E ETHANE 6-F ETHYLENE 7-G HYDRDGEN 8-H METHANE	0.00000E=01 2.73525E=08 3.62656E=04 3.36698E=04 3.32943E=04 1.02583E=05	0,00000E=01 5,06103E=03 6,71020E 01 6,22992E 01 6,16044E 01 1,89810E 00			
3-C N-BUTANE 4-D ISD=BUTENE 5-E ETHANE 6-F ETHYLENE 7-G HYDROGEN 8-H METHANE 9-I PROPANE 10-J PROPENE	0.00000E-01 2.73525E-08 3.62656E=04 3.36698E=04 3.32943E=04 1.02583E=05 0.00000E=01 0.00000E=01	0,00000E=01 5,06103E=03 6,71020E 01 6,22992E 01 6,16044E 01			
3-C N-BUTANE 4-D ISD=BUTENE 5-E ETHANE 6-F ETHYLENE 7-C HYDROGEN 8-H METHANE 9-I PROPANE 10-J PROPENE 11-K WATER	0.00000E-01 2.73525E-08 3.62656E=04 3.36698E=04 3.32943E=04 1.02583E=05 0.00000E=01 0.00000E=01 3.81377E=04	0,00000E=01 5,06103E=03 6,71020E 01 6,22992E 01 6,16044E 01 1,89810E 00 0,00000E=01 0,00000E=01 7,05661E 01			
3-C N-BUTANE 4-D ISD=BUTENE 5-E ETHANE 6-F ETHYLENE 7-G HYDROGEN 8-H METHANE 9+I PROPANE 10+J PROPENE 11-K WATER 12-L CARBON	0.00000E-01 2.73525E-08 3.62656E=04 3.36698E=04 3.32943E-04 1.02583E=05 0.00000E=01 0.00000E=01 3.81377E=04 1.04717E=08	0,00000E-01 5,06103E-03 6,71020E 01 6,22992E 01 6,16044E 01 1,89810E 00 0,00000E-01 0,00000E-01 7,05661E 01 0,00000E-01			
3-C N-BUTANE 4-D ISD-BUTENE 5-E ETHANE 6-F ETHYLENE 7-G HYDROGEN 8-H METHANE 9-I PROPANE 10-J PROPENE 11-K WATER 12-L CARBON 13-M CARBON_MONOXIDE	0+00000E=01 2+73525E=08 3+62656E=04 3+36698E=04 3+32943E=04 1+02583E=05 0+00000E=01 0+00000E=01 3+81377E=04 1+04717E=08 5+11157E=10	0,00000E=01 5,06103E=03 6,71020E 01 6,22992E 01 6,16044E 01 1,89810E 00 0,00000E=01 7,05661E 01 0,00000E=01 9,45793E=05			
3-C N-BUTANE 4-D ISD-BUTENE 5-E ETHANE 6-F ETHYLENE 7-G HYDROGEN 8-H METHANE 9-I PROPANE 10-J PROPENE 11-K WATER 12-L CARBON 13-M CARBON_MONOXIDE	0+00000E=01 2+73525E=08 3+62656E=04 3+36698E=04 3+32943E=04 1+02583E=05 0+00000E=01 0+00000E=01 3+81377E=04 1+04717E=08 5+11157E=10	0,00000E=01 5,06103E=03 6,71020E 01 6,22992E 01 6,16044E 01 1,89810E 00 0,00000E=01 7,05661E 01 0,00000E=01 9,45793E=05	94%		
3-C N-BUTANE 4-D ISD-BUTENE 5-E ETHANE 6-F ETHYLENE 7-G HYDROGEN 8-H METHANE 9-I PROPANE 10-J PROPENE 11-K WATER 12-L CARBON 13-M CARBON_MONOXIDE	0+00000E=01 2+73525E=08 3+62656E=04 3+36698E=04 3+32943E=04 1+02583E=05 0+00000E=01 0+00000E=01 3+81377E=04 1+04717E=08 5+11157E=10	0,00000E=01 5,06103E=03 6,71020E 01 6,22992E 01 6,16044E 01 1,89810E 00 0,00000E=01 7,05661E 01 0,00000E=01 9,45793E=05	94%		
3-C N-BUTANE 4-D ISD-BUTENE 5-E ETHANE 6-F ETHYLENE 7-G HYDROGEN 8-H METHANE 9-I PROPANE 10-J PROPENE 11-K WATER 12-L CARBON 13-M CARBON_MONOXIDE	0+00000E=01 2+73525E=08 3+62656E=04 3+36698E=04 3+32943E=04 1+02583E=05 0+00000E=01 0+00000E=01 3+81377E=04 1+04717E=08 5+11157E=10	0,00000E=01 5,06103E=03 6,71020E 01 6,22992E 01 6,16044E 01 1,89810E 00 0,00000E=01 7,05661E 01 0,00000E=01 9,45793E=05	94%		
3-C N-BUTANE 4-D ISD-BUTENE 5-E ETHANE 6-F ETHYLENE 7-G HYDROGEN 8-H METHANE 9-I PROPANE 10-J PROPENE 11-K WATER 12-L CARBON 13-M CARBON_MONOXIDE	0+00000E=01 2+73525E=08 3+62656E=04 3+36698E=04 3+32943E=04 1+02583E=05 0+00000E=01 0+00000E=01 3+81377E=04 1+04717E=08 5+11157E=10	0,00000E=01 5,06103E=03 6,71020E 01 6,22992E 01 6,16044E 01 1,89810E 00 0,00000E=01 7,05661E 01 0,00000E=01 9,45793E=05	94%		
3-C N-BUTANE 4-D ISD-BUTENE 5-E ETHANE 6-F ETHYLENE 7-G HYDROGEN 8-H METHANE 9-I PROPANE 10-J PROPENE 11-K WATER 12-L CARBON 13-M CARBON_MONOXIDE	0+00000E=01 2+73525E=08 3+62656E=04 3+36698E=04 3+32943E=04 1+02583E=05 0+00000E=01 0+00000E=01 3+81377E=04 1+04717E=08 5+11157E=10	0,00000E=01 5,06103E=03 6,71020E 01 6,22992E 01 6,16044E 01 1,89810E 00 0,00000E=01 7,05661E 01 0,00000E=01 9,45793E=05	942		
3-C N-BUTANE 4-D ISD-BUTENE 5-E ETHANE 6-F ETHYLENE 7-G HYDROGEN 8-H METHANE 9-I PROPANE 10-J PROPENE 11-K WATER 12-L CARBON 13-M CARBON_MONOXIDE	0+00000E=01 2+73525E=08 3+62656E=04 3+36698E=04 3+32943E=04 1+02583E=05 0+00000E=01 0+00000E=01 3+81377E=04 1+04717E=08 5+11157E=10	0,00000E=01 5,06103E=03 6,71020E 01 6,22992E 01 6,16044E 01 1,89810E 00 0,00000E=01 7,05661E 01 0,00000E=01 9,45793E=05	94%		
3-C N-BUTANE 4-D ISO-BUTENE 5-E ETHANE 6-F ETHYLENE 7-G HYDROGEN 8-H METHANE 9-I PROPANE 10-J PROPENE 11-K WATER 12-L CARBON 13-M CARBON_MONOXIDE	0+00000E=01 2+73525E=08 3+62656E=04 3+36698E=04 3+32943E=04 1+02583E=05 0+00000E=01 0+00000E=01 3+81377E=04 1+04717E=08 5+11157E=10	0,00000E=01 5,06103E=03 6,71020E 01 6,22992E 01 6,16044E 01 1,89810E 00 0,00000E=01 7,05661E 01 0,00000E=01 9,45793E=05	942		
3-C N-BUTANE 4-D ISD-BUTENE 5-E ETHANE 6-F ETHYLENE 7-G HYDROGEN 8-H METHANE 9-I PROPANE 10-J PROPENE 11-K WATER 12-L CARBON 13-M CARBON_MONOXIDE	0+00000E=01 2+73525E=08 3+62656E=04 3+36698E=04 3+32943E=04 1+02583E=05 0+00000E=01 0+00000E=01 3+81377E=04 1+04717E=08 5+11157E=10	0,00000E=01 5,06103E=03 6,71020E 01 6,22992E 01 6,16044E 01 1,89810E 00 0,00000E=01 7,05661E 01 0,00000E=01 9,45793E=05	94%		
3-C N-BUTANE 4-D ISD-BUTENE 5-E ETHANE 6-F ETHYLENE 7-G HYDROGEN 8-H METHANE 9-I PROPANE 10-J PROPENE 11-K WATER 12-L CARBON 13-M CARBON_MONOXIDE	0+00000E=01 2+73525E=08 3+62656E=04 3+36698E=04 3+32943E=04 1+02583E=05 0+00000E=01 0+00000E=01 3+81377E=04 1+04717E=08 5+11157E=10	0,00000E=01 5,06103E=03 6,71020E 01 6,22992E 01 6,16044E 01 1,89810E 00 0,00000E=01 7,05661E 01 0,00000E=01 9,45793E=05	94%		
3-C N-BUTANE 4-D ISD-BUTENE 5-E ETHANE 6-F ETHYLENE 7-G HYDROGEN 8-H METHANE 9-I PROPANE 10-J PROPENE 11-K WATER 12-L CARBON 13-M CARBON_MONOXIDE	0+00000E=01 2+73525E=08 3+62656E=04 3+36698E=04 3+32943E=04 1+02583E=05 0+00000E=01 0+00000E=01 3+81377E=04 1+04717E=08 5+11157E=10	0,00000E=01 5,06103E=03 6,71020E 01 6,22992E 01 6,16044E 01 1,89810E 00 0,00000E=01 7,05661E 01 0,00000E=01 9,45793E=05	94%		
2-B ISO BUTANE 3-C N-BUTANE 4-D ISO-BUTENE 5-E ETHANE 6-F ETHYLENE 7-G HYDROGEN 8-H METHANE 9-I PROPANE 10-J PROPENE 11-K WATER 12-L CARBON 13-M CARBON MONOXIDE CONVERSION DF ETHANE	0+00000E=01 2+73525E=08 3+62656E=04 3+36698E=04 3+32943E=04 1+02583E=05 0+00000E=01 0+00000E=01 3+81377E=04 1+04717E=08 5+11157E=10	0,00000E=01 5,06103E=03 6,71020E 01 6,22992E 01 6,16044E 01 1,89810E 00 0,00000E=01 7,05661E 01 0,00000E=01 9,45793E=05	94%		

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FUNCTION REOC(T, I)	01(1114,70,-1)	· · · · · · · · · · · · · · · · · · ·
FUNCTION REOC(T.I)		
	01(1114,70, 2)	
FUNCTION REQC(T,1)	2(1114.70	
FUNCTION REQC(T,I)		
REQC(T)I) = 0,12534E= FUNCTION_REQC(T)I)	)8(1114,70,4)	
REQC(T.I)= 0.42058E	)](]]]4+70+ 5)	
FUNCTION_REQC(T,1) REQC(T,1)=0,14653E		
FUNCTION REQC(T.I)		
REQC(T,I) =0.24327E	10(1114,70,-7)	· · · · · · · · · · · · · · · · · · ·
FUNCTION_REQC(T,1) REQC(T,1)=0,22780E=	)2(1114.7(). R)	
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FUNCTION PRR(IS)	ADI(1)= 1,25000E=01 VOL= 0,00000E=01	· · · · · · · · · · · · · · · · · · ·
FUNCTION PRESD(T)		
RENU= 6.31483E 05		7.25677E 02
TEMPERTURE 1114.70PRE		
1-A ACETYLENE	6,76840E-07 9,14025E-02	
2-B ISO BUTANE	0.00000E-01 0.0000E-01	
	6.02082E-08 8.13068E-03	······································
S-E ETHANE	<u>4.55308E-04</u> <u>6.14861E_01</u>	
6-F ETHYLENE	<u>5.01102E-04</u> <u>6.76703E 01</u> <u>4.95826E-04</u> <u>6.69579E 01</u>	
8-H METHANE	1.53378E-05 2.07126E 00	
9-IPROPANE	0,00000E-01 0,00000E-01	
11-KWATER		
12-L CARBON	9,17796E-090,00000E=01	
13-M. CARBON MONOXIDE	8.44405E-101.14031E=04	
CONVERSION OF ETHANE	TOETHYLENE IS 52,08%	
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	DEG_K				
FUNCTION_REQC(T.1)					
REQC(1)1)=0+144535 FUNCTION_REQC(7,1)	01(1114,85,1)				
REQC(T+1) = 0.48204E.	01(1114.85.2)				
FUNCTION REQC(T,1)	03(11)4 88. 3)				
FUNCTION REOC (T.I.)					
REQC(T,I)= 0.12333E-	08(1114-85-4)				
FUNCTION_REQC(T_1) REQC(T_1)=0.42054E_	01(1114.85. 5)	·		· · · · · · · · · · · · · · · · · · ·	
FUNCTION REQC(T)1)					
REQC(T,I)= 0.14675E FUNCTION REQC(T,I)	01(1114,85, 6)				
REQC(T)1). 0.24319E	00(1114.85.7)				
FUNCTION_REQC(T.I)					
REQC(T)1)=0.22790E=	02(1114-85-8)				······································
FUNCTION PRR(IS)				· · · · · · · · · · · · · · · · · · ·	
PR= 6,99997E_00	RADI(1)= 1.25000E=01	VOL= 0.00000E-01			
FUNCTION PRESD(T.) RENU=7.49695E_05	VIS= 2.70237E=05	DEN= 1.16410F-01			
FRICTION FACTORs 1.	21918E=02 V1+V2+VA=	1.20843E 03 6.63	983E 02	9.36220E 02	
TEMPERTURE 1114.85PRE	SSURE D= 8.02283E=01	1.08446F=01			
2-B ISO BUTANE		0.00000F=01			
3-C N-BUTANE	0.00000E-01	0.00000E-01			
4-D ISO-BUTENE		<u>1.26354E=02</u> 5.56720E 01			
6-F ETHYLENE		7.32843E 01			
7-G HYDROGEN	6.31855E-04	7.25595E_01			
8-H		2,28134E 00		· · · · · · · · · · · · · · · · · · ·	
10-J_PROPENE	0.00000E=01	0_00000E=01		· · · · · · · · · · · · · · · · · · ·	
11-KWATER	6.13818E-04	7.04881E_01			
12-L CARBON 13-M CARBON MONOXIDE	1+06108E=08 1+36979E=09	0.00000E=01	<u> </u>		
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CONVERSION OF ETHANE	TO ETHYLENG	IS_56+40%			
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0:	SYSTEM 6 820 TO 1120DEG K	
- 	FUNCTION REQC(T,I)	······································
Ő"	REQC(T,I)= 0,14050E_01(1119,91, 1)	
<u>ី ដ</u> ្ឋ	FUNCTION REQC(T.I)	
	REQC(T,I)= 0.49497E=01(1119.91, 2)	
<u></u>	FUNCTION REQC(T,I)	
	FUNCTION REQC(TJI)	
0	REQC(T/I)+ 0,12498E=08(1119,91, 4)	· · · · · · · · · · · · · · · · · · ·
	FUNCTION REOC(T.I.)	······································
0	REQC(T)]= 0.41902E 01(119.91, 5) FUNCTION REQC(T)]	······································
	REQC(T,1)= 0,15473E_01(119,91, 6)	
~	FUNCTION REQC(T,I)	
0	REQC(T,I)= 0.24055E 00(1119.91, 7) FUNCTION REQC(T,I)	· · · · · · · · · · · · · · · · · · ·
	REQC(T,I)=0.23129E-02(1119.91, 8)	
Q		· · · · · · · · · · · · · · · · · · ·
	FUNCTION PRR(IS) PR= 5.849995_00RADI(1)= 1.25000E=01VOL= 0.00000E=01	
0	PR= 5.84999 <u>E_00RADI(1)= 1.25000E=01VDL= 0.00000E=01</u>	· · · · · · · · · · · · · · · · · · ·
o g p	RENU= 6.10596E 05 VIS= 2.71156E-05 DEN= 9.86432E-02	
akta	RENU=       6.10596E       05       VIS=       2.71156E=05       DEN=       9.86432E=02         FRICTION FACTOR=       1.26393E=02       V1.V2.VA=       9.19750E       02       4.22967E       02         TEMPERTURE=       119.91PRESSURE       D=       4.65656E=01	
	TENPERTURE 1119.91PRESSURE D= 4.65656E-01	š
	1-A_ACETYLENE6.53945E-071.05104E-01           2-B_ISD_BUTANE0.00000E-01	<u></u>
	3-C N-BUTANE 0.00000E-01 0.00000E-01	F
	4-D_ISD-BUTENE4.75505E-08 7.64244E-03	
	5-E ETHANE 3.54534E-04 5.69815E 01	
	6-F         ETHYLENE         4.49031E-04         7.21694E         01           7-G         HYDRUGEN         4.44716E-04         7.14759E         01	
	8-H METHANE 1.33184E-05 2.14058E 00	· · · · · · · · · · · · · · · · · · ·
- O - 2	9-1_ PROPANE0.00000E-010.00000E-01	
	10-J_PRBPENE0.00000E-010.00000E-01	
	11-K         WATER         4.38917E-04         7.05439E 01           12-L         CARBON         1.06738E-08         0.00000E-01	
-0	12-L CARBON MONOXIDE 7.45954E-10 1.19892E-04	
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_	SYSTEM 6 820 TO 1120_DE			······································			
5							
	FUNCTION REQC(T, I)						
1 1	REQC(T,I)= 0.14053E_01						
•	FUNCTION REQC(T, I) REQC(T, I) # 0.49486E-01						
			······································	······		· · · · · · · · · · · · · · · · · · ·	······································
		2(1)19,86, 3)					
	FUNCTION REQC(T, I)						
	REQC(T,I)= 0.12499E=08	8(1119.86, 4)					
	FUNCTION REOC (T.I)						······································
	REQC(T,I) = 0.41904E_01	1(1119,86, 5)				· · · · · · · · · · · · · · · · · · ·	
	FUNCTION REQC(T, 1)						
	REQC(T.I)= 0.15466E_0	1(1119.86.6)					····
•	FUNCTION REQUITIS						· · · · · · · · · · · · · · · · · · ·
- 12	REQC(T.I)= 0.24057E_0						
	FUNCTION REOC(T, 1)	· ·				······	
	REQC(T,I)= 0.23126E=0	2(1119,86, 8)	·			• •	
	FUNCTION PRR(IS)	ADI(1)= 1.25000E=01	VDL= 0.0000	25-01	· · · · · · · · · · · · · · · · · · ·	······································	· · · · · · · · · · · · · · · · · · ·
	FUNCTION PRESD(T)	AUILIJE I.ZBUUDEHUL	VUL40.00000	JE-01	······································		
	RENUE 6.02925E 05	VIS= 2.71148E-05	DEN= 1.06391E-	01			
· · · · ·	RENU= 6.02925E 05	VIS= 2.71148E-05 6678E=02 VI>V2>VA	DEN= 1.06391E- 8.81027E 02	01 4.97107E 02	6.89065E 02		
- 199-22 2 - 192 - 1 2 - 1	RENU= 6.02925E_05 FRICTION FACTOR=1.20 TEMPERTURE= 1119.86PRES	6678E=02 V1+V2+VA	8.81027E 02	01 4.97107E 02	6.89065E U2		
• -	FRICTION FACTOR 1.20 TEMPERTURE 1119.86PRES	6678E=02 V1>V2>VA SURE_D=3.84182E=01 9.96890E=07	8.81027E 02 1.22141E=01	01 4.97107E 02	6.89065E_02		
• .	FRICTION FACTOR 1.20 TEMPERTURE 1119.86PRES 1-A ACETYLENE 2-8 ISO BUTANE	6678E=02 V1+V2+VA SURE_D= 3.84182E=01 9.96890E=07 0.00000E=01	= 8.81027F 02 1.22141E=01 0.00000E=01	01 4.97107E 02	6.89065E_02		
• •	FRICTION FACTOR 1.20 TEMPERTURE 1119.86PRES 1-A ACETYLENE 2-8 ISO BUTANE 3-C N-BUTANE	6678E=02 V1+V2+VA SURE_D= 3.84182E=01 9.96890E=07 0.00000E=01 0.00000E=01	B.81027E 02 1.22141E=01 0.00000E=01 0.00000E=01	01 4.97107E 02	6.89065E_U2		· · · · · · · · · · · · · · · · · · ·
•. •.•	FRICTION FACTOR       1.20         TEMPERTURE       119.86PRES         1-A       ACETYLENE         2-8       ISO BUTANE         3-C       N-BUTANE         4+0       ISO #BUTENE	6678E=02 V1+V2+VA SURE_D=3.84182E=01 9.96890E=07 0.00000E=01 0.00000E=01 0.0000E=01 9.47991E=08	<ul> <li>B.81027E 02</li> <li>1.22141E=01</li> <li>0.00000E=01</li> <li>0.00000E=01</li> <li>1.16149E=02</li> </ul>	01 4.97107E 02	6.89065E_U2		· · · · · · · · · · · · · · · · · · ·
• . • . • .	FRICTION FACTOR       1.20         TEMPERTURE       119.86PRES         1-A       ACETYLENE         2-8       ISO BUTANE         3-C       N-BUTANE         4-0       ISO+BUTENE         5-E       ETHANE	6678E=02 V1=V2=VA SURE_D= 3.84182E=01 9.96890E=07 0.00000E=01 0.00000E=01 9.47991E=08 4.21674E=04	B.81027E 02 1.22141E=01 0.00000E=01 0.00000E=01 1.16149E=02 5.16642E 01	01 4.97107E 02	6.89065E 02		
•.	FRICTION FACTOR       1.20         TEMPERTURE       119.86PRES         1-A       ACETYLENE         2-8       ISO BUTANE         3-C       N-BUTANE         4-0       ISO+BUTENE         5-E       ETHANE         6-F       ETHYLENE	6678E=02 SURE_D=3.84182E=01 9.96890E=07 0.00000E=01 0.00000E=01 9.47991E=08 4.21674E=04 6.30941E=04	B.81027E 02 1.22141E=01 0.00000E=01 0.00000E=01 1.16149E=02 5.16642E 01 7.73040E_01	01 4.97107E 02	6.89065E uz		
•.	FRICTION FACTOR       1.21         TEMPERTURE       119.86PRES         1-A       ACETYLENE         2-8       ISO BUTANE         3-C       N-BUTANE         4-0       ISO-BUTANE         5-E       ETHANE         6-F       ETHYLENE         7-G       HYDBOGEN	6678E=02 SURE_D=3.84182E=01 9.96890E=07 0.00000E=01 9.47991E=08 4.21674E=04 6.30941E=04 6.25368E=04	B.81027E 02 1.22141E=01 0.00000E=01 0.00000E=01 1.16149E=02 5.16642E 01 7.73040E_01 7.66212E_01	4.97107E 02	6.89065E uz		
•	FRICTION FACTOR       1.21         TEMPERTURE       1119.86PRES:         1-A       ACETYLENE         2-8       ISO BUTANE         3-C       N-BUTANE         4-0       ISO+BUTENE         5-E       ETHANE         6-F       ETHYLENE         7-G       HYDROGEN         8-H       METHANE	6678E=02 SURE_D=3.84182E=01 9.96890E=07 0.00000E=01 9.47991E=08 4.21674E=04 6.30941E=04 6.25368E=04 1.88371E=05	B.81027E 02 1.22141E=01 0.00000E=01 0.00000E=01 1.16149E=02 5.16642E 01 7.73040E 01 7.66212E 01 2.30795E 00	4.97107E 02	6.89065E uz		
•.	FRICTION FACTOR       1.21         TEMPERTURE       119.86PRES:         1-A       ACETYLENE         2-B       ISO BUTANE         3-C       N-BUTANE         4-D       ISO BUTANE         5-E       ETHANE         6-F       ETHYLENE         7-G       Hydrogen         8-H       METHANE         9-I       PROPANE	6678E=02 SURE_D=3.84182E=01 9.96890E=07 0.00000E=01 0.00000E=01 9.47991E=08 4.21674E=04 6.30941E=04 6.30941E=04 1.88371E=05 0.0000E=01	<ul> <li>B.81027E 02</li> <li>1.22141E=01</li> <li>0.00000E=01</li> <li>1.16149E=02</li> <li>5.16642E 01</li> <li>7.73040E 01</li> <li>7.66212E 01</li> <li>2.30795E 00</li> <li>0.00000E=01</li> </ul>	4.97107E 02	6.89065E uz		
•. •. •. •.	FRICTION FACTOR       1.21         TEMPERTURE       119.86PRES         1-A       ACETYLENE         2-8       ISO BUTANE         3-C       N-BUTANE         4-D       ISO-BUTENE         5-E       ETHANE         6-F       ETHYLENE         7-G       HYDROGEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-K       WATER	6678E=02 SURE_D= 3.84182E=01 9.96890E=07 0.00000E=01 9.47991E=08 4.21674E=04 6.30941E=04 1.88371E=05 0.0000E=01 0.00000E=01 0.00000E=01 5.75646E=04	B.81027E 02 1.22141E=01 0.00000E=01 1.16149E=02 5.16642E 01 7.73040E 01 7.66212E 01 2.30795E 00 0.00000E=01 0.00000E=01 7.05291E 01	4.97107E 02	6.89065E uz		
•. •. •. •.	FRICTION FACTOR       1.21         TEMPERTURE       119.86PRESI         1-A       ACETYLENE         2-8       ISO BUTANE         3-C       N-BUTANE         4-D       ISO-BUTANE         5-E       ETHANE         6-F       ETHYLENE         7-G       HYDROCEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-K       WATER	6678E=02 SURE_D=3.84182E=01 9.96890E=07 0.00000E=01 9.47991E=08 4.21674E=04 6.30941E=04 6.25368E=04 1.88371E=05 0.0000E=01 5.75646E=04 1.71810E=08	B.81027E 02 1.22141E=01 0.0000E=01 0.0000E=01 1.16149E=02 5.16642E 01 7.73040E_01 7.66212E_01 2.30795E_00 0.00000E=01 7.05291E_01 7.05291E_01 0.0000E=01	4.97107E 02	6.89065E uz		
• . • . • . • .	FRICTION FACTOR       1.21         TEMPERTURE       119.86PRESI         1-A       ACETYLENE         2-8       ISO BUTANE         3-C       N-BUTANE         4-D       ISO-BUTANE         5-E       ETHANE         6-F       ETHYLENE         7-G       HYDROCEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-K       WATER	6678E=02 SURE_D=3.84182E=01 9.96890E=07 0.00000E=01 9.47991E=08 4.21674E=04 6.30941E=04 6.25368E=04 1.88371E=05 0.0000E=01 5.75646E=04 1.71810E=08	B.81027E 02 1.22141E=01 0.0000E=01 0.0000E=01 1.16149E=02 5.16642E 01 7.73040E_01 7.66212E_01 2.30795E_00 0.00000E=01 7.05291E_01 7.05291E_01 0.0000E=01	4.97107E 02	6.89065E uz		
	FRICTION FACTOR       1.21         TEMPERTURE       119.86PRES         1-A       ACETYLENE         2-8       ISO BUTANE         3-C       N-BUTANE         4-D       ISO-BUTENE         5-E       ETHANE         6-F       ETHYLENE         7-G       HYDROGEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-K       WATER         12-L       CARBON         MONOXIDE	6678E=02 SURE_D=3.84182E=01 9.96890E=07 0.00000E=01 0.00000E=01 9.47991E=08 4.21674E=04 6.30941E=04 6.25368E=04 1.88371E=05 0.00000E=01 0.00000E=01 5.75646E=04 1.71810E=08 1.32108E=09	B.81027E 02 1.22141E=01 0.00000E=01 0.00000E=01 1.16149E=02 5.16642E 01 7.73040E 01 7.66212E 01 2.30795E 00 0.00000E=01 7.05291E 01 0.00000E=01 1.61861E=04	4.97107E 02	6.89065E uz		
	FRICTION FACTOR       1.21         TEMPERTURE       119.86PRES:         1-A       ACETYLENE         2-8       ISO BUTANE         3-C       N-BUTANE         3-C       N-BUTANE         3-C       N-BUTANE         5-E       ETHANE         6-F       ETHYLENE         7-G       HYDROCEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-K       WATER         12-L       CARBON <monoxide< td="">         CONVERSION       OF_ETHANE</monoxide<>	6678E=02 SURE_D=3.84182E=01 9.96890E=07 0.00000E=01 0.00000E=01 9.47991E=08 4.21674E=04 6.30941E=04 6.25368E=04 1.88371E=05 0.00000E=01 0.00000E=01 5.75646E=04 1.71810E=08 1.32108E=09	B.81027E 02 1.22141E=01 0.00000E=01 0.00000E=01 1.16149E=02 5.16642E 01 7.73040E 01 7.66212E 01 2.30795E 00 0.00000E=01 7.05291E 01 0.00000E=01 1.61861E=04	4.97107E 02	6.89065E_02		
	FRICTION FACTOR       1.21         TEMPERTURE       119.86PRES         1-A       ACETYLENE         2-8       ISO BUTANE         3-C       N-BUTANE         4-D       ISO-BUTENE         5-E       ETHANE         6-F       ETHYLENE         7-G       HYDROGEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-K       WATER         12-L       CARBON         MONOXIDE	6678E=02 SURE_D=3.84182E=01 9.96890E=07 0.00000E=01 0.00000E=01 9.47991E=08 4.21674E=04 6.30941E=04 6.25368E=04 1.88371E=05 0.00000E=01 0.00000E=01 5.75646E=04 1.71810E=08 1.32108E=09	B.81027E 02 1.22141E=01 0.00000E=01 0.00000E=01 1.16149E=02 5.16642E 01 7.73040E 01 7.66212E 01 2.30795E 00 0.00000E=01 7.05291E 01 0.00000E=01 1.61861E=04	4.97107E 02	6.89065E_02		
	FRICTION FACTOR       1.21         TEMPERTURE       119.86PRES:         1-A       ACETYLENE         2-8       ISO BUTANE         3-C       N-BUTANE         3-C       N-BUTANE         3-C       N-BUTANE         5-E       ETHANE         6-F       ETHYLENE         7-G       HYDROCEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-K       WATER         12-L       CARBON <monoxide< td="">         CONVERSION       OF_ETHANE</monoxide<>	6678E=02 SURE_D=3.84182E=01 9.96890E=07 0.00000E=01 0.00000E=01 9.47991E=08 4.21674E=04 6.30941E=04 6.25368E=04 1.88371E=05 0.00000E=01 0.00000E=01 5.75646E=04 1.71810E=08 1.32108E=09	B.81027E 02 1.22141E=01 0.00000E=01 0.00000E=01 1.16149E=02 5.16642E 01 7.73040E 01 7.66212E 01 2.30795E 00 0.00000E=01 7.05291E 01 0.00000E=01 1.61861E=04	4.97107E 02	6.89065E_02		
	FRICTION FACTOR       1.21         TEMPERTURE       119.86PRES:         1-A       ACETYLENE         2-B       ISO BUTANE         3-C       N-BUTANE         3-C       N-BUTANE         3-C       N-BUTANE         5-E       ETHANE         6-F       ETHYLENE         7-G       HYDROCEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-K       WATER         12-L       CARBON <monoxide< td="">         CONVERSION       OF_ETHANE</monoxide<>	6678E=02 SURE_D=3.84182E=01 9.96890E=07 0.00000E=01 0.00000E=01 9.47991E=08 4.21674E=04 6.30941E=04 6.25368E=04 1.88371E=05 0.00000E=01 0.00000E=01 5.75646E=04 1.71810E=08 1.32108E=09	B.81027E 02 1.22141E=01 0.00000E=01 0.00000E=01 1.16149E=02 5.16642E 01 7.73040E 01 7.66212E 01 2.30795E 00 0.00000E=01 7.05291E 01 0.00000E=01 1.61861E=04	4.97107E 02	6.89065E_02		
	FRICTION FACTOR       1.21         TEMPERTURE       119.86PRES:         1-A       ACETYLENE         2-B       ISO BUTANE         3-C       N-BUTANE         3-C       N-BUTANE         3-C       N-BUTANE         5-E       ETHANE         6-F       ETHYLENE         7-G       HYDROCEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-K       WATER         12-L       CARBON <monoxide< td="">         CONVERSION       OF_ETHANE</monoxide<>	6678E=02 SURE_D=3.84182E=01 9.96890E=07 0.00000E=01 0.00000E=01 9.47991E=08 4.21674E=04 6.30941E=04 6.25368E=04 1.88371E=05 0.00000E=01 0.00000E=01 5.75646E=04 1.71810E=08 1.32108E=09	B.81027E 02 1.22141E=01 0.00000E=01 0.00000E=01 1.16149E=02 5.16642E 01 7.73040E 01 7.66212E 01 2.30795E 00 0.00000E=01 7.05291E 01 0.00000E=01 1.61861E=04	4.97107E 02	6.89065E_02		
	FRICTION FACTOR       1.21         TEMPERTURE       119.86PRESI         1-A       ACETYLENE         2-8       ISO BUTANE         3-C       N-BUTANE         4-0       ISO-BUTENE         5-E       ETHANE         6-F       ETHYLENE         7-G       HYDROCEN         8-H       METHANE         9-I       PROPANE         10-J       PROPANE         11-K       WATER         12-L       CARBON         MONOXIDE         CONVERSION       OF-LETHANE	6678E=02 SURE_D=3.84182E=01 9.96890E=07 0.00000E=01 0.00000E=01 9.47991E=08 4.21674E=04 6.30941E=04 6.25368E=04 1.88371E=05 0.00000E=01 0.00000E=01 5.75646E=04 1.71810E=08 1.32108E=09	B.81027E 02 1.22141E=01 0.00000E=01 0.00000E=01 1.16149E=02 5.16642E 01 7.73040E 01 7.66212E 01 2.30795E 00 0.00000E=01 7.05291E 01 0.00000E=01 1.61861E=04	4.97107E 02	6.89065E uz		
	FRICTION FACTOR       1.21         TEMPERTURE       119.86PRES:         1-A       ACETYLENE         2-B       ISO BUTANE         3-C       N-BUTANE         3-C       N-BUTANE         3-C       N-BUTANE         5-E       ETHANE         6-F       ETHYLENE         7-G       HYDROCEN         8-H       METHANE         9-I       PROPANE         10-J       PROPENE         11-K       WATER         12-L       CARBON <monoxide< td="">         CONVERSION       OF_ETHANE</monoxide<>	6678E=02 SURE_D=3.84182E=01 9.96890E=07 0.00000E=01 0.00000E=01 9.47991E=08 4.21674E=04 6.30941E=04 6.25368E=04 1.88371E=05 0.00000E=01 0.00000E=01 5.75646E=04 1.71810E=08 1.32108E=09	B.81027E 02 1.22141E=01 0.00000E=01 0.00000E=01 1.16149E=02 5.16642E 01 7.73040E 01 7.66212E 01 2.30795E 00 0.00000E=01 7.05291E 01 0.00000E=01 1.61861E=04	4.97107E 02	6.89065E uz		
	FRICTION FACTOR       1.21         TEMPERTURE       119.86PRESI         1-A       ACETYLENE         2-8       ISO BUTANE         3-C       N-BUTANE         4-0       ISO-BUTENE         5-E       ETHANE         6-F       ETHYLENE         7-G       HYDROCEN         8-H       METHANE         9-I       PROPANE         10-J       PROPANE         11-K       WATER         12-L       CARBON         MONOXIDE         CONVERSION       OF-LETHANE	6678E=02 SURE_D=3.84182E=01 9.96890E=07 0.00000E=01 0.00000E=01 9.47991E=08 4.21674E=04 6.30941E=04 6.25368E=04 1.88371E=05 0.00000E=01 0.00000E=01 5.75646E=04 1.71810E=08 1.32108E=09	B.81027E 02 1.22141E=01 0.00000E=01 0.00000E=01 1.16149E=02 5.16642E 01 7.73040E 01 7.66212E 01 2.30795E 00 0.00000E=01 7.05291E 01 0.00000E=01 1.61861E=04	4.97107E 02	6.89065E_02		
	FRICTION FACTOR       1.21         TEMPERTURE       119.86PRESI         1-A       ACETYLENE         2-8       ISO BUTANE         3-C       N-BUTANE         4-0       ISO-BUTENE         5-E       ETHANE         6-F       ETHYLENE         7-G       HYDROCEN         8-H       METHANE         9-I       PROPANE         10-J       PROPANE         11-K       WATER         12-L       CARBON         MONOXIDE         CONVERSION       OF-LETHANE	6678E=02 SURE_D=3.84182E=01 9.96890E=07 0.00000E=01 0.00000E=01 9.47991E=08 4.21674E=04 6.30941E=04 6.25368E=04 1.88371E=05 0.00000E=01 0.00000E=01 5.75646E=04 1.71810E=08 1.32108E=09	B.81027E 02 1.22141E=01 0.00000E=01 0.00000E=01 1.16149E=02 5.16642E 01 7.73040E 01 7.66212E 01 2.30795E 00 0.00000E=01 7.05291E 01 0.00000E=01 1.61861E=04	4.97107E 02	6.89065E_02		

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FUNCTION REQUITAL					
REQC(T)]. 0.14070E FUNCTION REQC(T)]		<u></u>			
REQC(T,I)= 0.49431E	-01(1119.65, 2)				
FUNCTION REQC(Y,1).	<u>, , , , , , , , , , , , , , , , , , , </u>				
REQC(T.I)=0.24895E	02(1119.65, 3)			······	
FUNCTION REQC(T,I) REQC(T,I)= 0.12500E	-08(1)19.65. 4)				
FUNCTION REOC(T.I)					
REQC(T,I)= 0.41910E	01(1119.65, 5)	· · · · · · · · · · · · · · · · · · ·			
FUNCTION REQC(T,I)					
REQC(T,I) = 0.15433E FUNCTION REQC(T,I)	<u>UIVIII9+02+0/</u>			······································	
REQC(T)1) . 0.24068E	00(1119.65.7)			· · · · · · · · · · · · · · · · · · ·	
FUNCTION REOC(T.I)	· · · · · · · · · · · · · · · · · · ·			· · · · · · · · · · · · · · · · · · ·	۰. 
REQC(T,I)= 0.23112E	-02(1119.65, 8)				
FUNCTION PRR(15)			·····		
PR= 7.64997E 00	RADI(1)= 1.25000E=01	VOL= 0.0000	0E-01		
FUNCTION PRESD(T)	VIS= 2.71110E-05		01	······································	·
RENU= 7.04669E 05 FRICTION FACTOR= 1	23238E=02 V1, V2, VA		6.91321E 02	8.44205E 02	······································
	ESSURE D= 4.15535E-01				
1-A ACETYLENE	1.88742E-06	1.56755E-01			
2-B ISD BUTANE	0.00000E-01 0.00000E-01	0.00000E-01 0.00000E-01			
4-D_ISO-BUTENE		2.31749E=02	· · · · · · · · · · · · · · · · · · ·		
S-E ETHANE	5.06610E-04	4.20753E 01			
6-F ETHYLENE	<u>1.04224E-03</u>	8,65607E 01			
7-G HYDROGEN 8-H METHANE	1.03460E-03 3.20098E-05	<u>8.59261E 01</u> 2.65849E 00			
9-1 PROPANE	0.00000E=01	0.00000E=01			
10-J_PROPENE	0.00000E-01	0.00000E-01			· · · · · · · · · · · · · · · · · · ·
11-K WATER	8.49430E-04	7.05473E 01			
12-L CARBON MONOXIDE	2.84832E-08 3.63621E-09	0.00000E-01 3.01996E-04		<u> </u>	
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CONVERSION OF ETHANE	TO ETHYLE	NEIS_66			
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SYSTEM_8_820_T0_113	0DEGK				
FUNCTION REQC(T)1)					
REQC(T,I)= 0.13314 FUNCTION REQC(T,I)					
REQC(T.I)= 0,52056	E=01(1129.65.2)				· · · · · · · · · · · · · · · · · · ·
FUNCTION REQC(T,I) REQC(T,I) = 0.19939	E 02(1128 65. 3)				· · · · · · · · · · · · · · · · · · ·
FUNCTION REQC(T, I)					
REQC(T,I)= 0.12433	E=08(1129,65, 4)				
FUNCTION_REQC(T,1) REQC(T,1)#0.41613	E 01(1129.65. 5)				
FUNCTION REQC(T,1)					and a second
REQC(TAI)= 0.17111	E 01(1129,65, 6)				· · · · · · · · · · · · · · · · · · ·
FUNCTION REQC(T,1) REQC(T,1)= 0.23561	E_00(1)29.65. 7)	·			
FUNCTION REQC(T,I)					
REQC(T+1)= 0.23789	E=02(1129.65.8)			<u></u>	
FUNCTION PRR(IS)					· · · · · · · · · · · · · · · · · · ·
PR= 5.84999E_00	RADI(1) 1.25000E-01	VOL= 0.00000E-01			
FUNCTION PRESD(T) RENU# 5.93554E 05	VIS= 2.72921E=05	DEN= 9.84756E-02			
FRICTION FACTOR	1.27033E-02 V1, V2, VA	8.71775E 02 4.44	4210E 02	6.58005E 02	
TEMPERTURE: 1129.65PI	RESSURE D= 3.87296E-01				
1-A ACETYLENE	1.05678E-06 0.00000E-01	1.61268E=01 0.00000E=01		· · · · · · · · · · · · · · · · · · ·	· · · ·
3-C N-BUTANE	0.00000E=01	0.000JOE=01			
4-D ISD-BUTENE 5-E ETHANE	7.79846E-08 2.72974E-04	<u>1.19006E-02</u> 4.16566E 01		······································	
6-F ETHYLENE	5.71635E-04	8.72330E 01			
7-G HYDROGEN		8.66507E 01 2.47477E 00	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	
8-H METHANE	0.00000E=01	0.00000E=01	······		
10-J_PROPENE	0.000005-01	0.00000E-01		· · · · · · · · · · · · · · · · · · ·	
11-K WATER	4.62869E-04	7.06350E 01 0.00000E=01			
13-M CARBON MONOXID	2.37100E=08	2.20243E-04			
	TO_ETHYLEN		· · · ·		
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REACTOR	PRODUCT	(E)	REACTANT(R)	TEMPERATURE(T)	PRESSURE(P)	AFTER	20.HOUR

SYSTEM 8 820	D-1130-DEG-K	
FUNCTION REOC		
REQC(T.I) =	13301E_01(1129,82, 1)	
FUNCTION_REQC	52101E=01(1129.82, 2)	
FUNCTION-REOC		
REQC(T=1)	(9864E-02(1129,82,-3)	
FUNCTION REQC	01) 12432E=08(1129,82,4)	
FUNCTION_REDC	12432E=08(-1129+82)4)	
REQC(T)1)=	41608E_01(1129.82, 5)	
FUNCTION REOC	1) 17140E_01(1129,82, 6)	
FUNCTION REAC	17140E_01(1129,82, 6)	
REQC(T)	23553E_00(1129,82, 7)	
FUNCTION_REQC		
REQC(T+I)=	23801E=02(1129+82+-8)	
FUNCTION PRR	<u>;)</u>	
	RADI(1)= 1.25000E=01 VOL= 0.00000E=01	
FUNCTION PRES	T) E 05 VIS= 2.72952E=05 DEN= 1.02186E=01	·····
FRICTION FACT	■ 1.26966E=02 V1.×V2.×VA# 8.65936E 02 4.86969E 02 6.76450E_02	· · · · · · · · · · · · · · · · · · ·
TEMPERTURE: 1	9-82PRESSURE_Da3.59632E=01	
	1,29185E=06 1,73119E=01 E	
3-C N-BUTAN	0,0000E-01 0,0000E-01	
	E1.08193E=071.44989E=02	
S-E ETHANE		······································
7-6 HYDROGE	6.67016E-048.93860E_01	
. 8-H. METHANE	1.91202E-052.56228E_00	
	0,00000E=010,00000E=01	
	0.00000E=01 0.00000E=01 5.27161E=04 7.06442E 01	
12-L CARBON.	2.89197E-080.00000E-01	
13-M CARBON.	NOXIDE	
CONVERSION OF	THANETOETHYLENEIS_69+21%	
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SYSTEM 8 820 TO 1130	DEG.K.				· · · · · · · · · · · · · · · · · · ·	
UNCTION REOC(T.I)		·			· · · · · · · · · · · · · · · · · · ·	
REQC(T.I)	-01(1129.97.1)					
FUNCTION_REQC(T,1) REQC(T,1)= 0.52141E	-01/1120 87. 2)	······································	<b></b>		······································	
FUNCTION REOC(T.I)						
REQC(TJ]]=0,19799E_	02(1129.97.3)			· · · · · · · · · · · · · · · · · · ·		
FUNCTION REQC(T,I) REQC(T,I)=0.12431E+	.08(1129.97.4)		· · · · · · · · · · · · · · · · · · ·	·····		
FUNCTION_REQC(T,1)						
REQC(T)I) . 0.41604E						
REQC(T,I) = 0,17166E	01(1129.97.6)					·····
FUNCTION REOC(T,I)						
REQC(T,I)= 0.23546E FUNCTION REQC(T,I)	-00-1129+979-7			······································		
REQC(T,I)=0,23811E=	.02(1129.97.8)					
FUNCTION PRR(IS)		·····			-	
R= 6.24997E.00	RADI(1)= 1.25000E=01	VOL= 0.00000	)E-01			
FUNCTION PRESD(T) RENU: 6.43134E 05	VIE 2 729785-05	DEN= 1.04751E-0				
FRICTION FACTOR	25233E=02 V12V22VA		5.55756E 02	7.66881E_02		
TEMPERTURE= 1129.97PRE	SSURE_D= 4.63412E=01					
1-A ACETYLENE	<u>1.35765E=06</u> 0.00000E-01	<u>1.76994E=01</u> 0.00000E=01				<u>, , , , , , , , , , , , , , , , , , , </u>
3-C N-BUTANE	0.00000E-01	0.00000E-01				· · · · · · · · · · · · · · · · · · ·
4-D_ISD-BUTENE	<u>1.19764E-07</u> 2.91053E-04	1.56134E-02 3.79440E_01				
6-F ETHYLENE	6.96474E=04	9.07978E 01				
7-G HYDROGEN	6.92330E-D4	9.02576E 01				
8-H METHANE	<u> </u>	2.60541E 00 0.00000E=01				. <u></u>
10-J PROPENE	0.00000E=01	0,00000E-01				
11-KWATER	5.41815E=04 2.63970E=08	7.06355E 01	·	· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·
12-L CARBON MONDXIDE		2.70692E=04	······································			
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CONVERSION OF ETHANE	TO ETHYLEN	IEIS_69•	88%			
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FUNCTION REQC(T,1) REQC(T,1)= .0,13312E 01(1129,67, 2) REQC(T,1)= .0,232061E-01(1129,67, 2) REQC(T,1)= .0,19729E 02(1129,67, 3) REQC(T,1)= .0,1433EE-08(1129,67, 4) REQC(T,1)= .0,2330E-00(1129,67, 7) FUNCTION REQC(T,1) REQC(T,1)= .0,2330E-00(1129,67, 7) FUNCTION REQC(T,1) REQC(T,1)= .0,23391E-02(1129,67, 8) REQC(T,1)= .0,23391E-02(1129,67, 8) REQC(T,1)= .0,23391E-02(1129,67, 8) FUNCTION PREQC(T,1) REQC(T,1)= .0,23391E-02(1129,67, 8) REQC(T,1)= .0,2391E-02(1129,67, 8)			
FUNCTION REQC(T,1) REQC(T,1)= .0,13312E 01(1129,67, 2) REQC(T,1)= .0,232061E-01(1129,67, 2) REQC(T,1)= .0,19729E 02(1129,67, 3) REQC(T,1)= .0,1433EE-08(1129,67, 4) REQC(T,1)= .0,2330E-00(1129,67, 7) FUNCTION REQC(T,1) REQC(T,1)= .0,2330E-00(1129,67, 7) FUNCTION REQC(T,1) REQC(T,1)= .0,23391E-02(1129,67, 8) REQC(T,1)= .0,23391E-02(1129,67, 8) REQC(T,1)= .0,23391E-02(1129,67, 8) FUNCTION PREQC(T,1) REQC(T,1)= .0,23391E-02(1129,67, 8) REQC(T,1)= .0,2391E-02(1129,67, 8)			
REQC(Tr1)= 0.13312E 01(1)29.67.1) REQC(Tr1)= 0.52061E=01(1)29.67.2) REQC(Tr1)= 0.12935E=02(1)29.67.3) REQC(Tr1)= 0.12433E=08(1)29.67.4) REQC(Tr1)= 0.12433E=08(1)29.67.4) REQC(Tr1)= 0.42435E=08(1)29.67.5) FUNCTION REQC(Tr1)= 0.41613E 01(1)29.67.5) FUNCTION REQC(Tr1)= 0.7350E=00(1)29.67.7) REQC(Tr1)= 0.7350E=00(1)29.67.7) FUNCTION REQC(Tr1)= 0.7350E=00(1)29.67.8) FUNCTION REQC(Tr1)= 0.7350E=01 V01= 0.00000E=01 FUNCTION REQC(Tr1)= 0.7350E=02 V1/227.80 FUNCTION REQC(Tr1)= 0.7350E=02 V1/227.80 FUNCTION REQC(TR1)= 1.25091E=02 V1/227.80 FUNCTION REQC(TR1)= 1.25091E=02 V1/227.80 FUNCTION REDC(T)= 0.00000E=01 0.00000E=01 2.8 ISO BUTANE 0.00000E=01 0.00000E=01 2.9 ISO BUTANE 0.00000E=01 0.00000E=01 4.0 ISO BUTANE 0.00000E=01 0.00000E=01 4.0 ISO BUTANE 0.00000E=01 0.00000E=01 4.0 ISO BUTANE 0.00000E=01 4.0 ISO	SYSTEM 8 820 TO 113		
REQC(Tr1)= .0,1312E 01(1129,67, 1) REQC(Tr1)= 0,52061E=01(1129,67, 2) REQC(Tr1)= 0,12433E=06(1129,67, 3) REQC(Tr1)= 0,12433E=06(1129,67, 4) REQC(Tr1)= 0,12433E=06(1129,67, 4) REQC(Tr1)= 0,12433E=06(1129,67, 4) REQC(Tr1)= 0,114E=01(1129,67, 6) REQC(Tr1)= 0,1345E=01(1129,67, 6) REQC(Tr1)= 0,1345E=01(1129,67, 6) REQC(Tr1)= 0,233791E=021129,67, 8) FUNCTION REQC(Tr1) REQC(Tr1)= 0,233791E=021129,67, 8) FUNCTION REQC(Tr1)= 0,233791E=021129,67, 8) FUNCTION REQC(TON = 1,23891E=02 V1/229,67, 8) FUNCTON REQC(TON = 1,23891E=02 V1/229,67,8) FUNCTON REQC(T,1)= FUNCE INSUE INS	FUNCTION REOC(T.I)		
REQC(17.1) = 0,52061E-01(1)29,67,2) REQC(7.1) = 0,12433E-08(1)29,67,3) REQC(7.1) = 0,12433E-08(1)29,67,4) FUNCTION FRC(T,1) = 0,41613E 01(1)29,67,5) FUNCTION FRC(T,1) = 0,41613E 01(1)29,67,5) FUNCTION FRC(T,1) = 0,23500E 00(1)29,67,7) FUNCTION FRC(T,1) = 0,23500E 00(1)29,67,7) FUNCTION FRC(T,1) = 0,23791E-02(1)29,67,7) FUNCTION FRC(T,1) = 0,23791E-02(1) = 0,00000E-01 FR(ETION FACTOR = 1,23991E-02 = 0,0000E-01 = 0,0000E-01 FR(ETUN FACTOR = 1,23931E-02 = 0,0000E-01 = 0,0000E-01 FR(ETUN FACTOR = 1,23931E-02 = 0,0000E-01 = 0,0000E-01 FR(ETUN FACTOR = 1,23931E-02 = 0,0000E-01 = 0,0000E-01 = 0,0000E-01 FR(ETUN FACTOR = 1,23931E-02 = 0,0000E-01 = 0,0000E	REQC(T,I)= 0.13312	E 01(1129.67, 1)	
PUNCTION RESO(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). REQ(T,1). R	FUNCTION_REQU(I)]	E-01(1)20.67. 2)	
PUNCTION RESO(T,1) = 0.12433E=08(1129.67.4) FUNCTION REGC(T,1) = 0.41613E 01(1129.67.5) FUNCTION REGC(T,1) = 0.41613E 01(1129.67.6) FUNCTION REGC(T,1) = 0.41613E 01(1129.67.6) FUNCTION REGC(T,1) = 0.42350E=00(1129.67.7) FUNCTION REGC(T,1) = 0.42350E=00(1129.67.8) FUNCTION REGC(T,1) = 0.42350E=01 VDL= 0.00000E=01 FUNCTION RESO(T) FUNCTION RESO(T) FRE 6.64997E 00 RAD(1).= 1.25000E=01 VDL= 0.00000E=01 FUNCTION RESO(T) RENUE 1.0.72379LE=02(1129.67.8) FUNCTION RESO(T) FRE 1.22891E=02 V1.V 2VA = 1.11424E=01 FUNCTION RESO(T) FUNCTION RESO(T) FENETURE 1.22891E=02 V1.V 2VA = 1.11624E=01 FUNCTION RESO(T) FENETURE 1.22891E=02 V1.V 2VA = 1.165074E 03 6.49465E 02 8.50081E 02 FENETURE 1.22891E=02 V1.V 2VA = 1.65074E 03 FENETURE 1.22891E=02 V1.V 2VA = 1.62631E=01 FENETURE 8.24550E=04 S.2371E=01 FENETURE 8.24550E=04 S.2373E=01 FENETURE 8.24550E=04 S.2373E=04 FENETURE 8.24550E=04 S.2373E=04 FENETURE 8.24550E=04 S.2373E=04 FENETURE 8.24550E=04 S.2373E=04 FENETURE 8.24550E=04 S.2373E=04 FENETURE	FUNCTION REQC(T,1)	·	
REQC(17.1) =	REQC(T+1) =0,19925	E 02(1129,67, 3)	
FUNCTION.REQC(T_1) REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= REQ(T_1)= RE	$\frac{FUNCTION}{REQC(T_{J}I)} = 0.12433$	E=08(1129,67, 4)	
FUNCTION REQC(T_1) REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1): REQC(T_1):	FUNCTION REQC (T.I)		
REGC(7,1) =0,17114E_01(1129,67, 6) FUNCTION REGC(7,1) REGC(7,1) =0,23560E_00(1129,67, 7) FUNCTION REGC(7,1) FUNCTION PRE(15.) FUNCTION PRESD(1.) FUNCTION PRESD(1.) RENUE 6,63693E_05 VISE 2,72925E=05 DEN= 1,11424E=01 FRICTION FACTOR= 1,23891E=02 V1/V2/V4 = 1,05074E_03 6.49466E_02 8.50081E_02 TEMPERTURE* 1129,67PRESSURE D* 5,00304E=01 1=A ACETYLENE 1,67021E=06 1.89261E=01 2=B 15D BUTANE 0,00000E=01 0,00000E=01 3=C N=BUTANE 0,00000E=01 0,00000E=01 3=C N=BUTANE 0,00000E=01 0,00000E=01 4=D ACETYLENE 1,22851E=07 1,95693E=02 5=E ETHANE 3,10223E=04 3,51531E_01 6=F ETHYLENE 8,24950E=04 9,34795E_01 7=G HYROREM 8,20531E=04 9,27737E_01 8=H METHANE 2,39291E=05 2,71155E_00 9=1 PROPANE 0,00000E=01 0,00000E=01 0=1.5PCANE 0,00000E=01 0,00000E=01 1=A ACETYLENE 8,24950E=04 9,34795E_01 7=G HYROREM 8,20531E=04 9,27737E_01 8=H METHANE 2,39291E=05 2,71155E_00 9=1.PROPANE 0,00000E=01 0,00000E=01 1=A ACETYLENE 1,239291E=05 2,71155E_00 1=-1 ACROREM 3,16117E=08 0,00000E=01 1=-1 ACROREM ACE 10 ETHYLENE 15.71+94% CONVERSION OF ETHANE TO ETHYLENE 15.71+94%	REQC(T)1)=0.41613	E 01(1129.67, 5)	
REQC(T/1)=	REQC(T.I)=0.17114	E 01(1129,67, 6)	
FUNCTION REGC(T,1)         REQC(T,1)*       0,23791E=021129,67,8)         FUNCTION PRR(IS)         FW*       6,64997E         FUNCTION PRESO(T)         FUNCTION PRESO(T)         FUNCTION PRESO(T)         FUNCTION PRESO(T)         FRNU#       6,83693E         0.5       92.72925E=05         DEN#       1.11424E=01         FRIVE       6.83693E         FRIVE       1.23891E=02         V1.Y2.YA#       1.05074E         1.4       ACETYLENE         1.4       ACETYLENE         1.4       ACETYLENE         1.6       0.00006E=01         0.00006E=01       0.00006E=01         3.5       0.00006E=01         3.5       0.00006E=01         3.6       P.5693E=02         5.5       ETMANE         3.10223E=04       9.31531E<01			······································
FUNCTION PRR(IS)         PR=       6.64997E.00         RADI(1)=       1.25000E=01         VUL=       0.00000E=01         FUNCTION PRESD(T)       RENU=         RRNU=       6.83693E         6.83693E       05         YIS=       2.72925E=05         DEN=       1.11424E=01         FRICTION FACTOR=       1.23891E=02         VI.V2.VA       1.05074E         TEMPERTURE       1.29.67PRESSURE         1=A       ACETYLENE         1=C       75092E=02         2=ETHANE       3.10223E=04         2=C       74059E=07         2=C       FHANE         2	FUNCTION REQC(T.I)		
PR=       6.64997E.00       RADI(1)=       1.25000E=01         FUNCTION PRESD(T)       FRINU=       0.00000E=01         FRNU=       6.83693E.05       V1S=       2.72925E=05       DEN=       1.11424E=01         FRICTION FACTOR*       1.23891E=02       V1VV2/VA=       1.405074E.03       6.49466E.02       8.50081E.02         TEMPERTURE*       1.20801E.00       0.40000E=01       0.40000E=01       0.40000E=01       0.40000E=01         2-8       JSD.BUTANE       0.40000E=01       0.40000E=01       0.40000E=01       0.40000E=01         3-C       N=BUTANE       0.40000E=01       0.40000E=01       0.40000E=01       0.40000E=01         4-D       JSD_23E=04       9.34735E.01       0.27155E.00       0.40000E=01       0.40000E=01       0.40000E=01       0.40000E=01       0.40000E=01       0.40000E=01       0.40000E=01       0.40000E=01       0.40000E=01       0.400000E=01       0.40000E=01	REQC(T+1)=0.23791	E=02(1129.67. 8)	٠ 
PR=       6.64997E.00       RADI(1)=       1.25000E=01         FUNCTION PRESD(T)       FRICTION       FACTOR=       1.223891E=02       V1V2/VA=       1.05074E.03       6.49466E.02       8.50081E.02         FRICTION FACTOR=       1.223891E=02       V1V2/VA=       1.05074E.03       6.49466E.02       8.50081E.02         TEMPERTURE=       1.23891E=02       V1V2/VA=       1.05074E.03       6.49466E.02       8.50081E.02         TEMPERTURE=       1.23891E=02       V1V2/VA=       1.05074E.03       6.49466E.02       8.50081E.02         TEMPERTURE=       1.23891E=02       V1V2/VA=       1.05074E.03       6.49466E.02       8.50081E.02         TEMPERTURE=       1.223891E=02       V1V2/VA=       1.05074E.03       6.49466E.02       8.50081E.02         TEMPERTURE=       1.223891E=06       1.89261E=01       0.00000E=01       0.00000E=01         2-8       JSD.BUTANE       0.00000E=01       0.00000E=01       0.00000E=01         3-C       N=BUTANE       0.00000E=01       0.90000E=01       0.0000E=01         4-D       JSD23E=04       9.29787E 01       0.271154E.00       0.00000E=01       0.00000E=01         6-F       ETHYLENE       8.205031E=05       2.711554E.00       0.000000E=01       0.000000E=01       0	FUNCTION PRR(IS)		·
FUNCTION PRESO(1)	PR= _ 6.64997E_00	RADI(1)= 1.25000E=01 VOL= 0.00000E=01	· · · · · · · · · · · · · · · · · · ·
FRICTION FACTOR:       1:23891E=02       V1:V2:VA:       1:05074E 03       6:49466E 02       8:50081E 02         TEMPERTURE:       1:67021E=06       1:89261E=01	FUNCTION PRESD(T)		
TEMPERTURE 1129.67PRESSURE D*       5.00304E=01         1-A       ACETYLENE       1.67021E=06         2-8. ISD BUTANE       0.00000E=01       0.00000E=01         3-C       N-BUTANE       0.00000E=01       0.00000E=01         4-D       ISD-BUTENE       1.72698E=07       1.95693E=02         5-E       ETHANE       3.10223E=04       3.51531E 01         6-F       ETHYLENE       8.20531E=04       9.29787E 01         7-G       HYDROGEN       8.20531E=04       9.29787E 01         8-H       METHANE       2.39291E=05       2.71154E 00         9-T       PROPANE       0.00000E=01       0.00000E=01         10-J       PRUPENE       0.00000E=01       0.00000E=01         11-K       WATER       6.23476E=04       7.06494E 01         12-L       CARBON       3.16117E=08       0.00000E=01         13-M       CARBON       MONDXIDE       3.01506E=09       3.41653E=04	FRICTION FACTOR	1.23891E=02 V1,V2,VA= 1.05074E 03 6.49466E 02 8.50081E 02	
2-8       ISD_BUTANE       0.00000E-01       0.00000E-01         3-C       N-BUTANE       0.00000E-01       0.00000E-01         4-D       ISD-BUTENE       1.72698E-07       1.95693E-02         5-E       ETHANE       3.10223E-04       3.51531E 01         6-F       ETHYLENE       8.24950E-04       9.34795E 01         7-G       HYDROGEN       8.20531E-04       9.29787E 01         8-H       METHANE       2.39291E-05       2.71154E 00         9-1       PROPANE       0.00000E-01       0.00000E-01         10-J       PROPANE       0.00000E-01       0.00000E-01         10-J       PROPENE       0.00000E-01       0.00000E-01         11-K       WATER       6.23476E-04       7.06494E 01         12-L       CARBON       3.16117E-08       0.00000E-01         13-M       CARBON       MONOXIDE       3.01506E-09       3.41653E-04	TEMPERTURE= 1129.67	PRESSURE_D=5.00304E=01	
3-C       N+BUTANE       0.00000E-01       0.00000E-01         4-D       ISO-BUTENE       1.72698E-07       1.95693E-02         5-E       ETHANE       3.10223E+04       3.51531E 01         6-F       ETHYLENE       8.24950E+05       9.34795E 01         7-G       HYDRDGEN       8.20531E+04       9.29787E 01         8-H       METHANE       2.39291E+05       2.71154E 00         9-1       PROPANE       0.00000E+01       0.00000E+01         10-J       PROPENE       0.00000E+01       0.00000E+01         11-K       WATER       6.23476E+04       7.06494E+01         12-L       CARBON       3.16117E+08       0.00000E=01         13-M       CARBON       MONDXIDE       3.01506E=09       3.41653E=04         CONVERSION_OF_ETHANE       TO_ETHYLENE       IS_71.94%       IS_71.94%			
5-E       ETHANE       3.10223E+04       3.51531E 01         6-F       ETHYLENE       8.24950E+04       9.34795E 01         7-G       HYDRDGEN       8.20531E+04       9.29787E 01         8-H       METHANE       2.39291E+05       2.71154E 00         9-I       PROPANE       0.00000E+01       0.00000E+01         10-J       PRUPENE       0.00000E+01       0.00000E+01         11-K       WATER       6.23476E+04       7.06494E 01         12-L       CARBON       3.16117E+08       0.00000E+01         13-M       CARBON       MONDXIDE       3.01506E+09         3.41653E+04       15.71+94%		0.00000E-01 0.00000E-01	
6-F       ETHYLENE       8.24950E-04       9.34795E 01         7-G       HYDRDGEN       8.20531E-04       9.29787E 01         8-H       METHANE       2.39291E-05       2.71154E 00         9-I       PROPANE       0.00000E-01       0.00000E-01         10-J       PRUPENE       0.00000E-01       0.00000E-01         11-K       WATER       6.23476E-04       7.06494E 01         12-L       CARBON       3.16117E-08       0.00000E-01         13-M       CARBON       MONDXIDE       3.01506E-09       3.41653E-04	4-D ISO-BUTENE		
7-G. HYDROGEN       B.20531E-04       9.29787E 01         8-H. METHANE       2.39291E-05       2.71154E 00         9-I. PROPANE       0.00000E-01       0.00000E-01         10-J. PROPENE       0.00000E-01       0.00000E-01         11-K. WATER       6.23476E-04       7.06494E 01         12-L. CARBON       3.16117E-08       0.00000E-01         13-M. CARBON       MONDX1DE       3.01506E-09         3.41653E-04       71.94%			· · · · · · · · · · · · · · · · · · ·
9-1       PROPANE       0.00000E-01       0.00000E-01         10-J       PRUPENE       0.00000E-01       0.00000E-01         11-K       WATER       6.23476E-04       7.06494E 01         12-L       CARBON       3.16117E-08       0.00000E-01         13-M       CARBON       MONDX1DE       3.01506E-09       3.41653E-04	7-G HYDRDGEN	8.20531E-04 9.29787E 01	
10-JPRDPENE       0.00000E=01       0.00000E=01         11-KWATER       6.23476E=04       7.06494E_01         12-L. CARBON       3.16117E=08       0.00000E=01         13-MCARBON       MONDXIDE       3.01506E=09         3.41653E=04       3.41653E=04         CONVERSION_OF_ETHANE       TO_ETHYLENE       15.71.94%	8-H METHANE	2.39291E-05 2.71154E 00	
11-K_WATER6.23476E-04       7.06494E_01         12-L_CARBON3.16117E-08       0.00000E-01         13-M_CARBON_MONDXIDE3.01506E-09       3.41653E-04         CONVERSION_OF_ETHANETOETHYLENEIS_71.94%       IS_71.94%		0.00000E=01 0.00000E=01	
13-MCARBON_MONDXIDE3.01506E=093.41653E=04 CONVERSION_OF_ETHANETOETHYLENEIS_71.94%	11-KWATER	6.23476E-04 7.06494E 01	
CONVERSION_OF_ETHANETOETHYLENEIS_71.94%	12-L CARBON	<u>3.16117E-08</u> <u>0.00000E-01</u> E 3.01506E-09 <u>3.41653E-04</u>	······································
CONVERSION_OF_ETHANETOETHYLENEIS_71.94%	I 3-U CAKDON-HONOKID		
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SYSTEM 8.820 .TD1130.D	G. K		antan kaplanyan ( kato yanan e sama na kato kato na kato mata ya na mata na mata na kato na kato na kato na ka		· · · · · · · · · · · · · · · · · · ·
FUNCTION REQC(T,I)		a an ann an an an an an an ann an ann an a			
REQC(T,I) . 0.13292E 01	(1129,94, 1)				
FUNCTION_REQC(T+I) REQC(T+I)=0.52134E=01	(1120 04 2)				
FUNCTION REQC(T_1)			······································	· · · · · · · · · · · · · · · · · · ·	
REQC(T,1) = 0.19810E 02	(1129.94, 3)				
FUNCTION REQC(T.I)					
REQC(T+I) = 0.12431E=08	(1129,94,4)		<u> </u>		
REQC(T,I)	(1129.94, 5)				······································
FUNCTION REOC(T,1)					
REQC(T,I) = 0.17162E 01 FUNCTION REQC(T,I)			-		
REQC(T+1)=0.23547E_00					
FUNCTION REOC(T, 1)					······································
REQC(T,I)= 0.23809E=02	(1129.94, 8)				•••••
FUNCTION PRR(IS)	•	······································			· · · · · · · · · · · · · · · · · · ·
PR= 7.44996E 00 R	DI(1)= 1.25000E-01	VOL= 0.00000E	-01		
FUNCTION PRESD(T)		DEN= 1.25442F-01	ا هم الاستان الماري ( 197 - 1999 ) . الماري الماري ( 197 - 1999 ) .		
RENU# 7.35213E 05 FRICTION FACTOR# 1.22	331E=02 V1,V2,VA=		7.50084E 02	9.20201E U2	
TEMPERTURE= 1129.94PRESS	URE_D= 4.85847E-01				
1-A ACETYLENE	2.35869E-06	2.15433E-01	· · · · · · · · · · · · · · · · · · ·		
2-B ISO BUTANE 3-C N-BUTANE	0.00000E-01	0.00000E-01 0.00000E-01	·		
	3.04831E-07	2.78419E-02			
5-E ETHANE	3.24966E-04	2.96810E 01			
6-F ETHYLENE	1.08120E-03	9.87522E 01 9.83651E 01		· · · · · · · · · · · · · · · · · · ·	
	<u> </u>	2.91110E 00			
9-1 PROPANE	0.00000E-01	0.00000E-01			
	0.00000E-01	0.00000E-01 7.06803E 01			·
	7.73853E-04 4.26280E-08	0.00000E-01			
13-M CARBON MONOXIDE	5.46271E-09	4.98941E-04			
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CONVERSION OF ETHANE	TOETHYLEN	EIS_76+0	02		·
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		9 8 765 432 *
* 23456 78 9		9 87 65432 *
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* 2456789		9876542 *
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139.97.3)			·	
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139.97, 8)				
<u>(1)= 1.25000E=01</u>	VUL=0.000	DOOE-01		
S= 2.74785E=05	DEN= 9.825191			
/0E=02 V1≠V2≠VA= ≥E_D= 3,09964E=01	. 8.10474E 02	4.68698E 02	6.39595E 02	
	2,50507E-01			
0.00000E-01	0.00000E=01	· · · · · · · · · · · · · · · · · · ·		
<u>1.28877E=07</u>		****		
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	1139.97.2) 1139.97.3) 1139.97.3) 1139.97.4) 1139.97.6) 1139.97.6) 1139.97.6) 1139.97.6) 1139.97.7) 1139.97.8) 1139.97.8) 1(1)= 1.25000E=01 1.35562E=05 20E=02 V1.V2.VA= 2.74785E=05 2.74785E=05 0.0000E=01 1.75562E=06 0.00000E=01 1.28877E=07 1.71303E=04 7.29314E=04 7.29314E=04 7.29314E=04 7.29314E=04 2.0016E=05 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=01 0.0000E=00 0.0000E=00 0.0000E=00 0.0000E=00 0.0000E=00 0.00	1139,97, 3) 1139,97, 4) 1139,97, 5) 1139,97, 6) 1139,97, 6) 1139,97, 7) 1139,97, 8) 1139,97, 8) 1139,	1139.97.2) 1139.97.3) 1139.97.4) 1139.97.6) 1139.97.6) 1139.97.7) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.8) 1139.97.80.80 1139.97.80 1139.97.80 1139.97.80 1139.97.80 113	1139,97, 2) 1139,97, 3) 1139,97, 4) 1139,97, 5) 1139,97, 6) 1139,97, 7) 1139,97, 7) 1139,97, 8) 1(1)= 1+25000E=01 VCL= 0.00000E=01 15= 2,74785E=05 DEN= 9.82519E=02 90E=02 V1×V2×VA= 8.10474E 02 4.68698E 02 6.39595E 02 RE D= 3.09964E=01 1.75562E=06 2.50507E=01 0.00000E=01 0.00000E=01 1.28877E=07 1.83893E=02 1.71303E=04 2.44429E 01 7.29314E=04 1.04065E 02 7.28052E=04 1.03885E 02 2.00016E=01 0.00000E=01 1.28872E=04 1.03885E 02 2.00016E=01 0.00000E=01 0.00000E=01 0.00000E=01 1.28852E=04 1.03885E 02 2.00016E=04 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 0.00000E=01 2.6875TE=09 3.83485E=04

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REACTOR PRODUCT (E) REACTANT(R) TEMPERATURE(T) PRESSURE(P) AFTER 10.HOURS OF RUN

SYSTEM 9 820 T0 1140 DEG K         FUNCTION REQC(T,1)         REQC(T,1) 0 0.12591E 01(1139.92, 1)         FUNCTION REQC(T,1)         REQC(T,1) 0 0.54851E-01(1139.92, 2)         FUNCTION REQC(T,1)         REQC(T,1) 0 0.5933E 02(1139.92, 3)         FUNCTION REQC(T,1)         REQC(T,1) 0 0.12304E=08(1139.92, 3)         FUNCTION REQC(T,1)         REQC(T,1) 0 0.12304E=08(1139.92, 4)         FUNCTION REQC(T,1)         REQC(T,1) = 0.12304E=08(1139.92, 4)         FUNCTION REQC(T,1)         REQC(T,1) = 0.41312E 01(1139.92, 5)         FUNCTION REQC(T,1)         REQC(T,1) = 0.18991E 01(1139.92, 6)         FUNCTION REQC(T,1)         REQC(T,1) = 0.23061E 00(1139.92, 7)         FUNCTION REQC(T,1)         REQC(T,1) = 0.23061E 00(1139.92, 8)         FUNCTION REQC(T,1)         REQC(T,1) = 0.23061E 00 (1139.92, 8)         FUNCTION PRR(IS)         PR = 6.04998E 00 RADI(1) = 1.25000E         FUNCTION PRESD(T)         RENU = 5.89074E 05 VIS 2.2.74777E=0 <th>05 DEN#1.01651F-</th> <th>-01</th> <th></th> <th></th> <th></th>	05 DEN#1.01651F-	-01			
FUNCTION_REQC(T,1) REQC(T,1)=	05 DEN#1.01651F-	-01			
FUNCTION_REQC(T,1) REQC(T,1)=0,12591E_01(1139,92, 1) FUNCTION_REQC(T,1) REQC(T,1)=0,54851E=01(1139,92, 2) FUNCTION_REQC(T,1) REQC(T,1)=0,15933E_02(1139,92, 3) FUNCTION_REQC(T,1) REQC(T,1)=0,12364E=08(1139,92, 4) FUNCTION_REQC(T,1) REQC(T,1)=0,41312E_01(1139,92, 4) FUNCTION_REQC(T,1) REQC(T,1)=0,41312E_01(1139,92, 5) FUNCTION_REQC(T,1) REQC(T,1)=0,18991E_01(1139,92, 6) FUNCTION_REQC(T,1) REQC(T,1)=0,23061E_00(1139,92, 7) FUNCTION_REQC(T,1) REQC(T,1)=0,24496E=02(1139,92, 8) FUNCTION_PRR(IS) PR= 6.04998E_00RADI(1)= 1.25000E FUNCTION_PRESD(T) RENU=5,89074E_05	05 DEN#1.01651F-	-01			
FUNCTION_REQC(T,1) REQC(T,1)=0,12591E_01(1139,92,1) FUNCTION_REQC(T,1) REQC(T,1)=0,54851E=01(1139,92,2) FUNCTION_REQC(T,1) REQC(T,1)=0,15933E_02(1139,92,3) FUNCTION_REQC(T,1) REQC(T,1)=0,12364E=08(1139,92,4) FUNCTION_REQC(T,1) REQC(T,1)=0,41312E_01(1139,92,4) FUNCTION_REQC(T,1) REQC(T,1)=0,41312E_01(1139,92,5) FUNCTION_REQC(T,1) REQC(T,1)=0,41312E_01(1139,92,6) FUNCTION_REQC(T,1) REQC(T,1)=0,23061E_00(1139,92,7) FUNCTION_REQC(T,1) REQC(T,1)=0,24496E=02(1139,92,8) FUNCTION_PRR(IS) PR=0,4998E_00RADI(1)=25000E FUNCTION_RESD(T) RENU=589074E_0515221777E=0	05 DEN#1.01651F-	-01			
REQC(T,1)= 0.12591E 01(1139.92, 1) FUNCTION_REQC(T,1) REQC(T,1)= 0.54851E=01(1139.92, 2) FUNCTION_REQC(T,1) REQC(T,1)= 0.15933E 02(1139.92, 3) FUNCTION_REQC(T,1) REQC(T,1)= 0.12364E=08(1139.92, 4) FUNCTION_REQC(T,1) REQC(T,1)= 0.41312E 01(1139.92, 4) FUNCTION_REQC(T,1) REQC(T,1)= 0.18991E 01(1139.92, 6) FUNCTION_REQC(T,1) REQC(T,1)= 0.23061E 00(1139.92, 7) FUNCTION_REQC(T,1) REQC(T,1)= 0.24496E=02(1139.92, 8) FUNCTION_REQC(T,1) REQC(T,1)= 0.24496E=02(1139.92, 8) FUNCTION_PRR(IS) PR= 6.04998E 00 RADI(1)= 1.25000E FUNCTION_RESO(T) RENU= 5.89074E 05 VIS= 2.74777E=0	05 DEN#1.01651F-	-01			
FUNCTION_REQC(T,I) REQC(T,I)*0,54851E=01(1139.92, 2) FUNCTION_REQC(T,I) REQC(T,I)*0,15933E_02(1139.92, 3) FUNCTION_REQC(T,I) REQC(T,I)*0,12364E=08(1139.92, 4) FUNCTION_REQC(T,I) REQC(T,I)*0,41312E_01(1139.92, 5) FUNCTION_REQC(T,I) REQC(T,I)*0,8991E_01(1139.92, 6) FUNCTION_REQC(T,I) REQC(T,I)*0,23061E_00(1139.92, 7) FUNCTION_REQC(T,I) REQC(T,I)*0,23061E_00(1139.92, 7) FUNCTION_REQC(T,I) REQC(T,I)*0,24496E=02(1139.92, 8) FUNCTION_PRR(IS) PR* 6.04998E_00RADI(1)*1.25000E FUNCTION_PRESD(T) RENU*5,89074E_05VIS*2.74777E=0	05 DEN#1.01651F-	-01			
REQC(T,I) = 0.54851E=01(1139.92, 2) FUNCTION.REQC(T,I) REQC(T,I) = 0.15933E 02(1139.92, 3) FUNCTION.REQC(T,I) REQC(T,I) = 0.12364E=08(1139.92, 4) FUNCTION.REQC(T,I) REQC(T,I) = 0.41312E 01(1139.92, 5) FUNCTION REQC(T,I) REQC(T,I) = 0.18991E 01(1139.92, 6) FUNCTION REQC(T,I) REQC(T,I) = 0.23061E 00(1139.92, 7) FUNCTION REQC(T,I) REQC(T,I) = 0.24496E=02(1139.92, 8) FUNCTION PRR(IS) PR = 6.04998E 00 RADI(1) = 1.25000E FUNCTION PRESD(T) RENUE - 5.89074E 05 VISE 2.74777E=0	05 DEN#1.01651F-	-01			
FUNCTION REQC(T,I) REQC(T,I) = 0.15933E 02(1139.92.3) FUNCTION REQC(T,I) REQC(T,I) = 0.12364E=08(1139.92.4) FUNCTION REQC(T,I) REQC(T,I) = 0.41312E 01(1139.92.5) FUNCTION REQC(T,I) REQC(T,I) = 0.18991E 01(1139.92.6) FUNCTION REQC(T,I) REQC(T,I) = 0.23061E 00(1139.92.7) FUNCTION REQC(T,I) REQC(T,I) = 0.24496E=02(1139.92.8) FUNCTION PRR(IS) PR = 6.04998E 00 RADI(1) = 1.25000E FUNCTION PRESD(T) RENUE - 5.89074E 05 VISE 2.74777E=0	05 DEN#1.01651F-	-01			
REQC(T,I) = 0.15933E 02(1139.92, 3) FUNCTION_REQC(T,I) REQC(T,I) = 0.12364E=08(1139.92, 4) FUNCTION_REQC(T,I) REQC(T,I) = 0.41312E 01(1139.92, 5) FUNCTION REQC(T,I) REQC(T,I) = 0.18991E 01(1139.92, 6) FUNCTION REQC(T,I) REQC(T,I) = 0.23061E 00(1139.92, 7) FUNCTION_REQC(T,I) REQC(T,I) = 0.24496E=02(1139.92, 8) FUNCTION_PRR(IS) PR = 6.04998E 00 RADI(1) = 1.25000E FUNCTION_RESD(T) RENUE 5.89074E 05 VIS= 2.74777E=0	05 DEN#1.01651F-	-01			
FUNCTION REQC(T,I) REQC(T,I) = 0.12364E=08(1139.92, 4) FUNCTION REQC(T,I) REQC(T,I) = 0.41312E 01(1139.92, 5) FUNCTION REQC(T,I) REQC(T,I) = 0.18991E 01(1139.92, 6) FUNCTION REQC(T,I) REQC(T,I) = 0.23061E 00(1139.92, 7) FUNCTION REQC(T,I) REQC(T,I) = 0.24496E=02(1139.92, 8) FUNCTION PRR(IS) PR = 6.04998E 00 RADI(1) = 1.25000E FUNCTION PRESD(T) RENUE 5.89074E 05 VIS= 2.74777E=0	05 DEN#1.01651F-	-01			
REQC(T,1)= 0.12364E=08(1139.92, 4) FUNCTION_REQC(T,1) REQC(T,1)= 0.41312E 01(1139.92, 5) FUNCTION REQC(T,1) REQC(T,1)= 0.18991E 01(1139.92, 6) FUNCTION REQC(T,1) REQC(T,1)= 0.23661E 00(1139.92, 7) FUNCTION_REQC(T,1) REQC(T,1)= 0.24496E=02(1139.92, 8) FUNCTION_PRR(IS) PR= 6.04998E 00 RADI(1)= 1.25000E FUNCTION_PRESD(T) RENU= 5.89074E 05 VIS= 2.74777E=0	05 DEN#1.01651F-	-01			
FUNCTION_REQC(T,1) REQC(T,1)= 0.41312E 01(1139.92, 5) FUNCTION REQC(T,1) REQC(T,1)= 0.18991E 01(1139.92, 6) FUNCTION REQC(T,1) REQC(T,1)= 0.23061E 00(1139.92, 7) FUNCTION_REQC(T,1) REQC(T,1)= 0.24496E=02(1139.92, 8) FUNCTION_PRR(IS) PR= 6.04998E 00 RADI(1)= 1.25000E FUNCTION_PRESD(T) RENU= 5.89074E 05 V15= 2.74777E=0	05 DEN#1.01651F-	-01			
REQC(T,1)= 0.41312E 01(1139.92, 5) FUNCTION REQC(T,1) REQC(T,1)= 0.18991E 01(1139.92, 6) FUNCTION REQC(T,1) REQC(T,1)= 0.23061E 00(1139.92, 7) FUNCTION REQC(T,1) REQC(T,1)= 0.24496E=02(1139.92, 8) FUNCTION PRR(IS) PR= 6.04998E 00 RADI(1)= 1.25000E FUNCTION PRESD(T) RENU= 5.89074E 05 V15= 2.74777E=0	05 DEN#1.01651F-	-01			
REQC(T,I)= 0.18991E 01(1139.92, 6) FUNCTION REQC(T,I) REQC(T,I)= 0.23061E 00(1139.92, 7) FUNCTION REQC(T.1) REQC(T,I)= 0.24496E=02(1139.92, 8) FUNCTION PRR(IS) PR= 6.04998E 00 RADI(1)= 1.25000E FUNCTION PRESD(T) RENU= 5.89074E 05 VIS= 2.74777E=0	05 DEN#1.01651F-	-01			
FUNCTION REQC(T,I) REQC(T,I) = 0,23061E 00(1139,92,7) FUNCTION_REQC(T,I) REQC(T,I) = 0,24496E=02(1139,92,8) FUNCTION PRR(IS) PR = 6,04998E 00 RADI(1) = 1,25000E FUNCTION PRESD(T) FUNCTION PRESD(T) FUNCTION PRESD(T) RENU = 5,89074E 05 VIST 2,74777E=0	05 DEN#1.01651F-	-01			
REQC(T,I)= 0.23061E 00(1139.92, 7) FUNCTION_REQC(T,I) REQC(T,I)= 0.24496E=02(1139.92, 8) FUNCTION_PRR(IS) PR= 6.04998E 00 RADI(1)= 1.25000E FUNCTION_PRESD(T) RENU= 5.89074E 05 VIS= 2.74777E=0	05 DEN#1.01651F-	-01		· · · · · · · · · · · · · · · · · · ·	
FUNCTION_REQC(T_1) REQC(T_J])=0.24496E=02(1139.92, 8) FUNCTION_PRR(IS) PR= 6.04998E_00RADI(1)=1.25000E FUNCTION_PRESD(T_) FUNCTION_PRESD(T_) RENU=5.89074E_05VIS=2.74777E=0	05 DEN#1.01651F-	-01			
REQC( $T_{J}I$ ) =0.24496E=02( <u>1139.92, 8</u> ) FUNCTION PRR( <u>IS</u> ) PR# 6.04998E_00RAD <u>I(1) = 1.25000E</u> FUNCTION PRESD( <u>T</u> ) FUNCTION PRESD( <u>T</u> ) RENU= 5.89074E_05VIS= 2.74777E=0	05 DEN#1.01651F-	-01			
FUNCTION PRR(IS) PR= 6.04998E_00RADI(1)= 1.25000E FUNCTION PRESD(T) RENU= 5.89074E_05VIS= 2.74777E=0	05 DEN#1.01651F-	-01		·	
PR = 6.04998E_00RADI(1) = 1.25000E FUNCTION_PRESD(T) RENU= 5.89074E_05VIS= 2.74777E=0	05 DEN#1.01651F-	-01			
FUNCTION PRESD(T)	05 DEN#1.01651F-	-01			
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RENU= 5.89074E 05 VIS= 2.74777E=C	D5 DEN# 1.01651E-				
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FRICTION_FACTOR		5.23113E 02	6.82828E 02		
1=A ACETYLENE 2.01457E-06	2.59881E-01	······			·
1-A ACETYLENE 2.01457E-06 2-B ISD BUTANE 0.00000E-01	0.00000F-01				
3-C N-BUTANE 0.00000E-01	0.00000E-01				
4-D ISO-BUTENE 1.63693E-07	2.11164E-02			·	
5-E ETHANE 1.77148E-04	2.28523E 01				
6-F ETHYLENE 8.18407E-04	1.05575E 02			· · · · · · · · · · · · · · · · · · ·	
7-G HYDRDGEN 8.17481E-04	<u>1.05455E 02</u>				
8-H_METHANE2.25896E-05 9-1_PROPANE0.00000E-01	2.91407E 00 0.00000E=01		•		
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12-L CARBON2.94898E=08					
13-M_ CARBON_MONOXIDE3.30073E-09_	4.25796E-04	· · ·			
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CONVERSION OF ETHANE TO ETH	HYLENE IS 81	1.25%			
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EM 9 820 TO 1140	DEG K	• • • • • • • • • • • • • • • • • • •	• * * * * * * * * * * * * * * * * * * *	• ተ <del>ጥ</del> ዋ ዋ ዋ ዋ ም ጥ ጥ ጥ ም	~~ <b>~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~</b>	· ም ም ም ም ም ም ም ም ም 		****	
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UNCTION REQC(T,1)		an a	and a give sum diverse legities of a spin fill general diversity of the spin by sum on our sum, where sum a legit	n a file a file and the second at a second state of the second second second second second second second second	
EQC(T.1) 0,12587E	01(1139,99, 1)				
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UNCTION REQC(1,1)	02(1139,99, 3)		·		
EQC(T.I) . 0.12364E.	-08(1139,99, 4)			ander Generation die autopie eine auf generation die fahren vollen die eine autopie die die eine die die die di	
UNCTION REQC(T,1)			and an and the set of		
EQC(1,1)= 0.41310E UNCTION REQC(1,1)	01(1139,99, 5)				
EQC(T,1)= 0.19004E	01(1139,99, 6)				
UNCTION REQC(T,1) EQC(T,1) 0,23058E	00(1139,99, 7)	. <u></u>			
UNCTION REOC(T.I)					· · · · · · · · · · · · · · · · · · ·
EQC(T.1) 0.24501E	-02(1139,99, 8)				
FUNCTION PRR(IS)			·····		
R= 6.64927E 00	RADI(1)= 1.25000E=01	VOL# 0.00000	DE-01		
ENU= 6.76480E 05	VIS: 2,74789E=05	DEN= 1.10855E-0			
	•24122E=02 V1•V2•VA=	1,01716E 03	6.77111E 02	8.47114E 02	
EMPERTURE 1139,99PK	ESSURE D= 4,47788E=01 2,46985E=06	2.763176-01			· · · · · · · · · · · · · · · · · · ·
2 B ISD BUTANE	0.00000E=01	0,00000E-01			
3-C N-BUTANE 4-D ISD-BUTENE	0.00000E=01	0,00000E=01			
5-E ETHANE	2.37965E=07 1.79596E=04	2.66226E=02 2.00925E 01			······································
6-F STHYLENE	9.66924E-04	1.08176E 02			
7-G HYDROGEN 8-H METHANE	9,66943E-04 2,71818E-05	1.08178E 02 3.04100E 00			
9-1 PRUPANE	0.000005-01	0.00000E-01			
O-J PROPENE 1-K WATER	0.000005-01	0.00000E-01 7.07129E 01			
2-L CARBON	2.93477E-08	0.00000E-01			
3-M CARBON MUNDXIDE	4.63480E-09	5.185258=04			
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SYSTEM 9 820 TO 1140 DE					
UNCTION REAC(T)		······································	· · · · · · · · · · · · · · · · · · ·		
UNCTION REQC(T, I)	(1139,93) 11	· · · · · · · · · · · · · · · · · · ·			
EQC(T.I)= 0.54853E=01	(1139,93, 2)				
UNCTION REQC(T,1) REQC(T,1)# 0,15931E 02	(1120,93, 3)				
UNCTION REAC(1,1)					· · · ·
EQC(T,1)= 0.12364E=08 UNCTION REQC(T,1)	(1139.93, 4)	······································			
EQC(1,1)= 0.41312E 01	(1139.93, 5)				
UNCTION REQC(T, I)					
EQC(T) I) = 0.18992E 01 UNCTION REQC(T,I)	(1139,93) 61		**************************************		
EQC(T,1)= 0.23061E 00	(1139,93, 7)				
UNCTION REQC(T,1) REQC(T,1)= 0,24496E=02	(1120 02 0)				
LEQC(T.1)= 0.24496E=02	(1139,93) 01				
FUNCTION PRR(15)					
R= 7.24926E 00 RA UNCTION PRESD(T)	DI(1)= 1.25000E=01	VDL= 0,00000			·····
ENU= 7.42135E 05	VIS= 2.74778E=05	DEN= 1.20414E=0			
RICTION FACTOR: 1.22 EMPERTURE: 1139.93PRESS	133E=02 V1,V2,VA= URE D= 5,39792E=01	1.12288E 03	7.81735E 02	9,52323E 02	
1=A ACETYLENE	2,93686E=06	2,92000E=01			· · ·
2-B ISO BUTANE	0.00000E=01	0.00000E=01	· · · · · · · · · · · · · · · · · · ·		
4+D ISD-BUTENE	0.00000E=01 3.25328E=07	0.00000E=01 3.23460E=02			
5-E ETHANE	1,77117E=04	1,76100E 01			
6-F ETHYLENE 7-G HYDROGEN	1.11169E-03 1.11313E-03	1,10531E 02 1,10674E 02	-		
8-H METHANE	3.17107E=05	3,15287E 00	· · · · · · · · · · · · · · · · · · ·		
9-1 PROPANE	0.00000E=01 0.00000E=01	0.00000E=01 0.00000E=01			· · · · · · · · · · · · · · · · · · ·
1=K WATER	7,11395E=04	7,07310E 01			
2-L CARBON	3.09526E=08 6.45205E=09	0.00000E-01	an des 1999 de la companya de la companya de contra de la companya de contra de la companya de la companya de Altra de la companya d		
3.4 CARBON MONOXIDE	0,432050=09	6,41501E-04			
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SYSTEM 9 320 TO 1140 DEC K           FUNCTION REG(T/1) FEQCT/1) = 0,158DE 011139,95, 21           FUNCTION REG(T/1) FEQCT/1) = 0,158DE 011139,95, 21           FUNCTION REG(T/1) FEQCT/1) = 0,158DE 011139,95, 21           FUNCTION REG(T/1) FEQCT/1) = 0,15912E 02(1)39,95, 31           FUNCTION REG(T/1) FEQCT/1) = 0,15912E 02(1)39,95, 31           FUNCTION REG(T/1) FEQCT/1) = 0,15912E 02(1)39,95, 41           FUNCTION REG(T/1) FEQCT/1) = 0,15912E 02(1)39,95, 41           FUNCTION REG(T/1) FEQCT/1) = 0,0505E 00(1)39,95, 61           FUNCTION REG(T/1) FEQCT/1) = 0,2055E 00(1)39,95, 61           FUNCTION REG(T/1) FEQCT/1) = 0,2055E 00(1)39,95, 81           FUNCTION REG(T/1) FEQCT/1) = 0,2055E 00(1)39,95,95           FUNCTION REG(T/1) FEQCT/1) = 0,2050E=01           FEQUE/1) =	
<pre>4 RESCIT.11&gt; 0.12507E 01(1139,96,1) • FUNCTION RESCIT.11 # CONTACT TI PUNCTION RESCIT.11&gt; # CONTACT TI # /pre>	
<pre>4 REG(T,T)= 0,12507E01(1139,96,1) • FUNCTION REG(T,T)= • FUNCTION FUNCTION = 1,2727E-02 • FUNCTION FUNCTION = 1,2737E-04 • FUNCTION FUNCTION = 1,2737E-04 • FUNCTION FUNCTION = 1,3737E-04 • FUNC</pre>	
<pre>% REGC[7]]* 0,54265E=01(1139,98,2) FUNC[10N REGC[7,1] % REGC[7,1]* 0,15912E 02(1139,98,3) FUNC[10N REGC[7,1] REGC[7,1]* 0,12364E=08(1139,98,4) FUNC[10N REGC[7,1] REGC[7,1]* 0,41311E 01(1139,98,4) FUNC[10N REGC[7,1] REGC[7,1]* 0,19002E 01(1139,98,4) FUNC[10N REGC[7,1] REGC[7,1]* 0,23058E 00(1139,98,7) FUNC[10N REGC[7,1] REGC[7,1]* 0,24500E=02(1139,98,8) FUNC[10N REGC[7,1]* 0,24500E=02(1139,98,8) FUNC[10]* 0,00000E=01 FUNC[10]* 0,00000E=01 FUNC[10]* 0,00000E=01 FUNC[10]* 0,00000E=01 FUNC[10]* 0,00000E=01 FUNC[10]* 0,00000E=01 FUNC[10]* 0,00000E=01 FUNC[10]* 0,00000E=01 FUNC[10]* 0,00000E=01 FUNC[10]* 0,00</pre>	
<pre>     PURCTION REQC(1,1)     REQC(1,1)</pre>	
***       FUNCTION RESC(1,1)         RESC(17,1)       0.12364E-08(1139,98,4)         ***       FUNCTION RESC(1,1)         RESC(17,1)       0.4131E O1(1139,98,5)         FUNCTION RESC(1,1)       ************************************	
FUNCTION REC(IT,1)       0.41311E 01(1139.98, 5)         FUNCTION REC(IT,1)       0.19002E 01(1139.98, 6)         FUNCTION REC(IT,1)       0.19002E 01(1139.98, 7)         FUNCTION REC(IT,1)       0.23058E 00(1139.98, 7)         FUNCTION REC(IT,1)       0.23050E-02(1139.98, 8)         REOC(IT,1) = 0.24500E-02(1139.98, 8)	
RECC(7,1) • 0,41311E 01(1129,78,5) FUNCTION RECC(7,1) • 0,19002E 01(1139,98,6) FUNCTION REC(7,1) • 0,23058E 00(1139,98,7) FUNCTION REC(7,1) • 0,23058E 00(1139,98,7) FUNCTION PAR(15) PR• 7,584925E 00 RADI(1)* 1,25000E=01 V0(* 0,00000E=01 FUNCTION PAR(15) PR• 7,584925E 00 RADI(1)* 1,25000E=01 V0(* 0,00000E=01 FUNCTION PAR(15) PR• 7,58376E 05 V1,52 2,74787E=05 DEN* 1,31628E=01 FRENUE 7,58376E 05 V1,7274E=05 DEN* 1,31628E=01 FRENUE 7,58376E 05 V1,7274E=05 DEN* 1,00204E 02 9,49272E 02 TEMPERTURE* 1139,987EESSURE 3,71278E=06 3,11269E=01 2** 150 RUTANE 0,00000E=01 0,00000E=01 2** 150 RUTANE 0,00000E=01 0,00000E=01 2** 150 RUTANE 0,00000E=01 0,00000E=01 3*C N=00TANE 0,00000E=01 0,00000E=01 3*C N=00TANE 0,7037E=04 1,41737E=04 5*C ETHANE 1,2732E=02 1,13518E 02 5*C ETHANE 1,27491E=03 1,1373E 02 5*C ETHANE 1,24590E=03 1,13518E 02 5*C ETHANE 34991E=03 1,13518E 02 5*C ETHANE 3490E=03 2,6684E 00 5*C ETHANE 3490E=03 2,6684E 00 5*C ETHANE 3490E=01 0,00000E=01 10*A PROPEVE 0,00000E=01 0,00000E=01 10*C CARBON MENOXIDE 9,58926E=09 8,03938E=04 ************************************	
REC(17.1) = 0.19002E 01(1139.98.6)         FUNCTION REAC(17.1)         REOC(17.1) = 0.23058E 00(1139.98.7)         FUNCTION RE2C(17.1)         REOC(17.1) = 0.24500E=02(1139.98.8)         FUNCTION PRR(15)         PR. 7.84225E 00         RENUE 7.100 PRR(15)         PR. 7.84225E 00         RENUE 7.55376E 05         VISE 2.74787E-05         DEN= 1.31628E-01         FRICTION PRESOTT         RENUE 7.56376E 05         VISE 2.74787E-05         DEN= 1.31628E-01         FRICTION FACTOR= 1.21732E=02         VISE 2.74787E-05         VISE 2.74787E-05         PRENUE 7.56376E 05         VISE 2.74787E-05         PRENUE 7.56376E 05         VISE 2.74787E-06         SUB CUTAIL         PRETURE 139.9478E30KE 00         * A30182E-01         * A ACETYLENE         3.71278E-06         3.71278E-06         3.71278E-06         3.71278E-06         3.71278E-07         * SUB CUTAILE         0.00000E-01         0.00000E-01         2.6         FUNCTINE         3.71278E-03         1.3518E 02         * THVLENE     <	
FUNCTION REQC(T,1)         REQC(T,1):       0.23058E 00(1139,98,7)         FUNCTION REQC(T,1):       0.24500E=02(1139,98,8)         REQC(T,1):       0.24500E=02(1139,98,8)         FUNCTION PRR(IS)	• • • • •
FUNCTION RE2C(1,1)       REQC(17,1)         REQC(17,1)*       0,24500E=02(1139,98,8)         FUNCTION PRC15)       PR         PR       7,89225E 00         RENUE 7,50370E 05       VIS* 2,74787E=05         DEN* 1,31628E=01         RENU* 7,50370E 05       VIS* 2,74787E=05         DEN* 1,31628E=01         RENU* 7,50370E 05       VIS* 2,74787E=05         DEN* 1,31628E=01         RENU* 7,50370E 05       1.21732E=02         VI/V2/VA* 1.08204E 03       8.16480E 02         9,49272E 02         TEMPERTURE* 1139,980RESSUE 0*       4,39163E=01         1*A CETYLENE       3.71278E=06         3.11269E=01       0.00000E=01         2*B 15U BUTANE       0.00000E=01         3*C N=BUTANE       0.00000E=01         4*O 150-BUTENE       4.70404E=07         4*O 150-BUTENE       4.70404E=07         4*O 150-BUTENE       1.47037E=04         5*E ETHANE       1.7037E=04         1*34925 02       1.3518E         6*E ETHYLENE       1.39403E=03         0*G.       7*G HYDRUGEN         1.3518E 02       1.3518E         8*H METHANE       3.89664E=05       3.6684E 00         9*, PROPANE       0.000000E=01	• • • • •
FUNCTION PRR(IS)         PR       7.84225E 00       RADI(1)*       1.25000E*01       V0L*       0.00000E*01         FUNCTION PRESO(T)       RENU#       7.56376E 05       VIS*       2.74787E*05       DEN*       1.31628E*01         RENU#       7.56376E 05       VIS*       2.74787E*05       DEN*       1.31628E*01         FRICTION FACTOR*       1.21732E*02       VIV2/VA*       1.08204E 03       8.16480E 02       9.49272E 02         TEMPERTURE*       1.39.98PRESSURE D*       4.39163E*01       8.106480E 02       9.49272E 02         TEMPERTURE*       1.21732E*06       3.11269E*01       8.00000E*01       0.00000E*01         2*8       SU BUTANE       0.00000E*01       0.00000E*01       0.00000E*01         3*C       N=0UTANE       0.00000E*01       0.00000E*01       0.00000E*01         4*D       ISU BUTANE       1.77037E*04       1.48423E 01       0.0000E*01         5*E       ETHANE       1.34091E*03       1.13173E 02       0.00000E*01         5*E       PROPANE       0.00000E*01       0.00000E*01       0.00000E*01         6*F       ETHYLENE       1.35403E*03       1.13173E 02       0.0000E*01         7*G       HYDRGEN       1.35403E*03       1.13173E 02	• •
PR*       7,54925E       00       RADI(1)*       1.25000E*01       V0L*       0.00000E-01         FUNCTION       PRESD(T)       0       0.00000E=01       0.00000E-01         RENU*       7,55376E       05       VIs*       2,74787E=05       DEN*       1,31628E=01         FRICTION       FACTOR*       1.21732E=02       V1,V22VA*       1.08204E       03       8,16480E       02       9,49272E       02         TEMPERTURE*       1139,98PRESSURE       D*       4,39163E=01       0.00000E=01       0.00000E=01       0.00000E=01         2*8       ISU BUTANE       0.00000E=01       0.00000E=01       0.00000E=01       0.00000E=01         3*C       N=0UTANE       0.00000E=01       0.00000E=01       0.00000E=01         3*C       N=0UTANE       1.77037E=04       1.48423E       01         5*E       ETHANE       1.34991E=03       1.3173E       02         7*G       Hyd BEN       1.35403E=05       3.26684E       00         9*;       PROPANE       0.00000E=01       0.00000E=01       0.00000E=01         10=-J       PROPANE       0.00000E=01       0.00000E=01       0.00000E=01         10=-J       PROPANE       0.00000E=01       0.00000E=01 <th>• •</th>	• •
FUNCTION PRESD(T)         RENU#       7,56376E       05       V15#       2,74787E=05       DEN#       1,31628E=01         FRITION       FACIDR#       1,2128E=06       3,11269E=01       3,16480E       02       9,49272E       02         TEMPERTURE#       1139,98PRESSURE       D#       4,39163E=01       3,11269E=01       3,11269E=01         1=4       ACETYLENE       3,71278E=06       3,11269E=01       3,0000E=01       0,0000E=01         2=8       ISU BUTANE       0,00000E=01       0,0000E=01       0,0000E=01         3=C       N=BUTANE       0,0000E=01       0,0000E=01         3=C       N=BUTANE       0,0000E=01       0,0000E=01         3=C       N=BUTANE       1,77037E=04       1,48423E<01         6=F       ETHANE       1,35403E=03       1,13178E       02         7=G       HYDRUGEN       1,35403E=03       1,13178E       02         8=H       METHANE       3,89664E=05       3,26684E       00         9=J       PROPANE       0,00000E=01       0,00000E=01         10=J       PROPENE       0,00000E=01       0,00000E=01         11=K       WATER       8,43966E=04       7,07558E       01         12=	
FRICTION FACTOR=       1.21732E=02       V1.V2.VA=       1.08204E       03       8.16480E       02       9.49272E       02         TEMPERTURE=       139.98PRESSURE       D=       4.39163E=01       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0	
TEMPERTURE       1139.98PRESSURE       D=       4.39163E=01         1=A       ACETYLENE       3.71278E=06       3.11269E=01         2=B       ISU BUTANE       0.00000E=01       0.00000E=01         3=C       N=BUTANE       0.00000E=01       0.00000E=01         3=C       N=BUTANE       0.00000E=01       0.00000E=01         4=D       ISD=9UTENE       4.78404E=07       4.01081E=02         5=E       ETHANE       1.77037E=04       1.48423E 01         6=F       ETHYLENE       1.35491E=03       1.13173E 02         7=G       HYDRDGEN       1.35403E=03       1.13518E 02         8=H       METHANE       3.89664E=05       3.26684E 00         9=I       PROPANE       0.00000E=01       0.00000E=01         10=J       PROPANE       0.00000E=01       0.00000E=01         10=J       PAOPENE       0.43966E=04       7.07558E 01         12=L       CARBON       4.22950E=08       0.00000E=01         12=L       CARBON       4.22950E=08       0.00000E=01         13=M       CARBON MUNOXIDE       9.58926E=09       8.03938E=04	
2*8       ISU RUTANE       0.0000E=01       0.0000E=01         3-C       N=BUTANE       0.0000E=01       0.0000E=01         4-D       ISD=BUTENE       4.78404E=07       4.01081E=02         5-E       ETHANE       1.77037E=04       1.48423E 01         6-F       ETHYLENE       1.34991E=03       1.13173E 02         7-G       HYDRUGEN       1.35403E=03       1.13518E 02         8-H       METHANE       3.89664E=05       3.26684E 00         9-;       PROPANE       0.00000E=01       0.00000E=01         10-J       PROPENE       0.00000E=01       0.00000E=01         11-K       WATER       8.43966E=04       7.07558E 01         12-L       CARBON       4.22950E=08       0.00000E=01         13-M       CARBON MUNDXIDE       9.58926E=09       8.03938E=04	
4=D       ISD=BUTENE       4.78404E=07       4.01081E=02         5=E       ETHANE       1.77037E=04       1.48423E       01         6=F       ETHYLENE       1.34991E=03       1.13173E       02         7=C       HYDRUGEN       1.35403E=03       1.13518E       02         8=H       METHANE       3.89664E=05       3.26684E       00         9=j       PROPANE       0.00000E=01       0.00000E=01         10=J       PROPENE       0.00000E=04       7.07558E       01         11=K       WATER       8.43966E=04       7.07558E       01         12=L       CARBON       4.22950E=08       0.00000E=01       0.00000E=01         13=H       CARBON MUNDXIDE       9.58926E=09       8.03938E=04       0.0000E=01	o
5=E       ETHANE       1.77037E=04       1.48423E       01         6=F       ETHYLENE       1.34991E=03       1.13173E       02         7=G       HYDRUGEN       1.35403E=03       1.13518E       02         8=H       METHANE       3.89664E=05       3.26684E       00         9=j       PROPANE       0.00000E=01       0.00000E=01         10=J       PROPENE       0.00000E=01       0.00000E=01         11=K       WATER       8.43966E=04       7.07558E         12=L       CARBON       4.22950E=0B       0.00000E=01         13=H       CARBON MUNDXIDE       9.58926E=09       8.03938E=04	
6=F       ETHYLENE       1,34991E=03       1,13173E 02         7=G       HYDRUGEN       1.35403E=03       1.13518E 02         8=H       METHANE       3.89664E=05       3.26684E 00         9=j       PROPANE       0.00000E=01       0.00000E=01         10=J       PROPENE       0.00000E=01       0.00000E=01         11=K       WATER       8.43966E=04       7.07558E 01         12=L       CARBON       4.22950E=08       0.00000E=01         13=H       CARBON MUNOXIDE       9.58926E=09       8.03938E=04	
B-H       METHANE       3.89664E=05       3.26684E 00         9-j       PROPANE       0.00000E=01       0.00000E=01         10=J       PROPENE       0.00000E=01       0.00000E=01         11=K       WATER       8.43966E=04       7.07558E 01         12=L       CARBON       4.22950E=0B       0.00000E=01         13=H       CARBON MUNDXIDE       9.58926E=09       8.03938E=04	
IO=J         PROPENE         0,00000E=01         0,00000E=01           11=K         WATER         8,43966E=04         7,07558E         01           12=L         CARBON         4,22950E=0B         0,00000E=01           13=H         CARBON         9,58926E=09         8,03938E=04	······
11=K         WATER         8.43966E=04         7.07558E 01           12=L         CARBON         4.22950E=0B         0.00000E=01           13=H         CARBON         MONOXIDE         9.58926E=09         8.03938E=04	o
13-H         CARBON         MUNDXIDE         9,58926E-09         8,03938E-04	
CONVERSION OF ETHANE TO ETHYLENE IS 87.10%	o
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## System 9 820 to 1140°k

EACTOR RADIUS PROFILE FROM START TO CLOSE DOWN	Conversion of Ethane to Ethylene Time Increment - 5 Hours	
400.00 FT	CL	
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* 2 3 45 6 7 8 9 1	+ 198765432 *	
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* 234 56 7 89 1	+ 1 98 7 65 432 #	
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* 2345 678 9 1	+ 1 9 876 5432 *	· · · · · · · · · · · · · · · · · · ·
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* 2457891	+ 1987542 *	<u> </u>
* 356891	+ 198653 +	
* 357691	+ 198753 *	
* 36791	+ 19763 *	
* 4781	1874 *	
* 4791	+ 1974 *	
<u>* 581</u> * 391	+ 185 * + 196 *	
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SYSTEM 9 820 TO 1140 DEG K		

#### Appendix H

## Explanation of How to Use PYRO

A. Data

The data given on the last two pages of this appendix shows the entire input of PYRO. It is best to break the data into card sets. This procedure simplifies the understanding of the data. It is also a great aid in setting up different data sets.

B. The reaction system chosen to prove this program was the pyrolysis of ethane. Six independent equations were set up with a combined total of 13 components and interts.

The six equations were: (48)

(1)	$C_2H_6 \rightarrow C_2H_4 + H_2$	Order Forward 1	Order Reverse 1-1
(2)	$C_2H_6 \rightarrow CH_4 + \frac{1}{2}C_2H_4$	1	1-1
(3)	$C_2H_4 \rightarrow C_2H_2 + H_2$	1	1-1
(4)	$C_2H_2 \rightarrow 2C + H_2$	2	1-1
(5)	$2C_2H_2 \rightarrow C_4H_4$ (i.e.) $C_4$	1	1
(6)	$C + H_2 \rightarrow CO + H_2$	1-0	1-1

A number designation was arbitarily assigned to each

.

1.	$CH \cong CH$	Acetylene	(A)
2.	CH ₃ CH-CH ₃	Iso-Butane	(B)
3.	CH ₄ -(CH ₂ ) ₂ -CH ₄	Butane	(C)
4.	CH ₃ CH ₃ C=CH ₂	Iso-Butene	(D)
5.	CH ₃ -CH ₃	Ethane	(E)
6.	CH ₂ =CH ₂	Ethene	(F)
7.	^H 2	Hydrogen	(G)
8.	сн ₄	Methane	(Ħ)
9.	CH ₃ -CH ₂ -CH ₃	Propane	(1)
10.	CH ₂ =CH-CH ₃	Propene	(J)
11.	^H 2 ⁰	Water	(K)
12.	C	Carbon	(L)
13.	CO	Carbon Monoxide	(M)

The six equations were rewritten using the following conventions:

A value was assigned to IA corresponding to the value assigned to the component for each position in each equation (i.e.) in Equation 1.

$$C_2H_6 \longrightarrow C_2H_4 + H_2$$
  
(5) (6) (7)

Therefore

IA(1,1)=5 IA(1,2)=6 IA(1,3)=7

Using this system, it was possible to set up values for each of the equations with the restriction of 10 components per equation and 25 equations and 25 components per system.

The coefficient of each equation was read in in a similar manner:

or

Equation 1.

$$C_2^{H_6} \longrightarrow C_2^{H_4} + H_2$$
  
(1) (1) (1)

B(1,1)=1 B(1,2)=1 B(1,3)=1

Equation 5.

B(5,1)=2 B(5,2)=1

The order of reaction of each component was read in in a similar manner:

Reaction 4.

$$C_2H_2^2 \rightarrow 2C^1 + H_2^1$$

BB(4,1)=2 BB(4,2)=1 BB(4,3)=1

If an equation is irreversible the most probably value was assigned to BB).

In all of the above examples, several things became apparent.

The first subscription in each subscripted variable referred to the equation number. The second subscript referred to the position in the equation. There was no need to fill blanks for positions or equations not used.

It was now necessary to tell the computer which components were reactants and which were products. This was done by counting the total number of each and reporting the results.

(i.e.) SF(1)=1 SR(1)=2

SF(5)=1 SR(5)=1

### SF(6)=2 SR(6)=2

The first equation had one forward and two reverse components. The fifth had one each. The sixth had two each etc.

The foregoing conventions were used to set up the card sets used in PYRO.

<u>Card Set 1</u> (Cards 1-2) Read (5,935), ID, F(ID) Format (12,E8.0) Any changes in the Arrhenius Frequency Factor were made here. The factor F(I) was assumed to be (1.) unless a different value was found here. The changes were multiplied by the existing Arrhenius factor. The computer continued to read values until the 25th value was read in. The first variable was I and referred to the factor in which change was desired. The second value was the factor itself. The last card in this set had to contain a value of ID equal to 25 whether or not 25 equations were employed or the 25 equations remained unchanged. If either of these latter were the case, the following was used:

### 25 1.00E 00.

Card Set 2 (Card 3) Read (5,900) IR, IS Format (212)

This card set read in IR total number of reactants and and IS, the total number of chemical compounds and inerts. <u>Card Set 3</u> (4-6 cards) This card set read in the temperature profile and instructions on the size of the time increment and total number of increments used in carbon deposition and instructions on how data was presented.

(Card 4) Read (5,943)IGOW,(Z(II),II=1,II) Format (13,11F7.0)

IGOW was a computer internal control.

If: IGOW = 1 computer disregarded this data set and read in new data set.

IGOW = 2 computer continued on this data set.

IGOW = 3 computer stopped.

Z was the temperature taken at 10% intervals along the reactor length (there were a total of eleven values since both 0% and 100% values were included.)

(Card 5) Read (5,950) Card Format (80A1)

This card was used to identify the temperature profile. Any valid punch could have been used. This card was printed at the top of each new page.

(Card 6) Read (5,958)IB, IZZ, IPLOT

IB = number of hours comprising increment of carbon
deposition.

IZZ = total number of increment before force out i.e. computer goes to new case.

- IPLOT = 1 Plot results Do not write out detailed calculation
- IPLOT = 2 Plot results Write out detailed calculation
  IPLOT = 3 Do not plot Write out detailed calculation
  results
- IPLOT = 4 Do not plot Do not write out detailed calresults culation

Card Set 4 (Card 6) Read (5,919)T,PT,PRES,ZT,DL,POUT FORMAT (6E12.5).

T was the intial temperature at reactor inlet  $(^{\circ}K)$ .

PT was the intial total pressure of all components (in atmospheres).

ZT was the total length of reactor (in feet).

DL was the intial reactor increment (in feet).

POUT was the minimum pressure at the outlet of the reactor (in atmospheres).

<u>Card Set 5</u> (Card 8) Read (5,901) (SF(I),SR(I),I=1,IR) FORMAT (4012)

SF(I) was the total number of reactants in equation I.
SR(I) was the total number of products in equation I.
Up to 20 reactions were read in per card.

<u>Card Set 6</u> (Card 9-16) Read (5,901)ID,(IA(I,M)M=1,IT) FORMAT (4012) IA(IM) was the identification by position of each component.

The value of IT was equal to SF(I) + SR(I) (i.e.) the total number of reactants and products in the reaction (I). Only one equation was read per card.

ID was an identity check. It had to have the same value as the internally generated value of I or the program would stop after writing an appropriate error message.

<u>Card Set 7</u> Read (5,903)ID, (B(I,M), M=1,IT), (BB(I,M) M=1,IT) Only values from one equation were read per card.

ID and IT were the same as in Card Set 6.

B(I,M) was the coefficient of the component in the Ith equation Mth position.

BB(I,M) was the order of reaction of the components of the Ith equation Mth position.

<u>Card Set 8</u> Read (5,904)(C(J), J=1,IS) Cards (25-28) FORMAT (12F6.5)

C(J) was the partial pressure of component (J). The sum IS C(J) had to equal PT. C(J) was in atmospheres. 12 J=1

values were read per card.

<u>Card Set 9</u> (Cards 27 - 30) Read (5,905) (ENAME(J)J=1,IT) FORMAT (80A1)

ENAME(20*1) was the alphanumeric identification of each component IT=20*IS.

Any valid punch was acceptable. 20 spaces were allowed per identification. All unfilled spaces had to contain blanks. Four identifications were contained on a card.

<u>Card Set 10</u> Cards (31 - 43) Read (5,906)(CP(J,M),M=1,4) ID Cards (31 - 43) FORMAT (4E16,8,17)

CP(J,M) was the heat capacity data for the Jth component of the form CP(J)=CP(J,1)+CP(J,2)*T+CP(J,3)*T²+CP(J,4)*T³

One card per component was read.

ID had to be equal to J or an error message was generated and the computer program was stopped.

The data used for heat capacity was generated by a second computer program Marquardt Non-Linear Regression Analysis adapted by the author and given in Appendix H of this study.

<u>Card Set 11</u> (Cards 44 - 51) FORMAT (12,E7.1,FI).4) Read (5,901)ID,EA(I),EE(I)

EA(I) was the Arrhenius Frequency Factor for the Ith equation.

EE(I) was the Arrhenius Activation Energy of the Ith equation. (23) (29) (33) (46) (55)

ID had to equal J or the program was stopped and the appropriate error message was printed.

<u>Card Set 12</u> (Cards 52 - 64) Read (5,908)ID,DS,(J), DH(J),DF(J) FORMAT (12,3F9.2)

ID (See Card Set (6))

DS(J) was the entropy of the Jth component BTU/1b mole  $o_{K}^{(22)}$ .

DH(J) was the enthalpy of the Jth component BTU/1b mole  $\ensuremath{^{\text{o}}_{\text{K}}}$ 

DF(J) was the Log ( $K_f$ ) of the Jth component⁽⁴⁴⁾

The data for each component was on a different card.

<u>Card Set 13</u> (Cards 65 - 78) Read (5,911) ID, (CLJ(J,M),

M=1,2),SMWT(J) If (CLJ(J,2).EQ.0) Read (5,940)DE(J)911

FORMAT(12,3X3F5.2) 940 FORMAT(F10.0)

ID (see Card (et (6))

CLJ(J,1) was the constant of Lennard and Jones collision (7) parameter

CLJ(J,2) was the constant of Lennard and Jones /K (^OK) SMWT(J) was the molecular weight of the Jth component.

DP(J) If the component was a solid under reaction conditions, the constants of Lennard and Jones were equal to zero and DE(J), the density of the component, was read in as the next card  $(1bs/ft^3)$ . There was one card per gas component and two cards per solid component. <u>Card Set 14</u> Read (5,908)IJ,TT,FI(I) Cards (79 - 86) FORMAT (12,3F9.2)

IJ was the same as ID (See Card Set (6))

TT was the temperature ( $^{O}K$ ) at which the equilibrium constant ( $K_{c}$ ) was known.

PI(I) was the equilibrium constant  $K_{C}$  for the Ith equation⁽⁴⁸⁾. There was one card per equation.

<u>Card Set 15</u> (Card 87) Read (5,902)RAD, TMPH FORMAT (2F10.5)

RAD was the radius of the reactor in feet.

TMPH was the total molar flow at the beginning of the reaction in pound moles per hour.

Card Set 16 (Card 89) Read (5,909) KEYR, KEYP FORMAT (212)

KEYR was the component number of the key reactant.

KEYP was the component number of the key product.

<u>Card Set 17</u> (Cards 89 - 91) This card set was the same as Card Set (3). This card set could be repeated for as many new temperature profiles as desired. All other constants remained fixed at initial values.

Card Set 1 41,00F 02	
Card Set 2 0813	4a 
Cond Cot 3 007 820, 970. 1020, 1045. 1060. 1067. 1080. 1090, 1105. 1125. 1140.	4
CHIC SYSTEM 9 820 TO 1140 DEG K	
Card Set A 820, F 10 4.0E 10 8.00E 00 400, F 10 .5000E 00 2.000E 00	2
Cord Sat 31 0102010201020102010201020102	8
	-10
03060107	<u></u>
0611121307	Ĩě
7 910 7	12
Card Set 7 911. 1. 1. 1. 1.	16
02 2. 7. 1. 1. 15	18
03 le le le le le le 04 le 7e le le le	20
05 2. 1. 2. 1.	21
no 1. 1. 1. 0. 1. 1. 1.	22
07 le	- <u>9</u> 4
	25
Uhitu 10.0	20
Card Set ACETYLENE IST BUTANE N-BUTANE IST-BUTENE	28
PROPANE PROPENE WATER CARBON	30
Card Set IN 0.58672039E 01 0.19574307E-01 -0.12957129E-04 0.34664522E-08 00001	- <u></u>
-0,19009199F 01 0,99299729E-01 -0,54748874E-04 0,11818035E-07 00002	32
0,91144075E-01 0,92179775E-01 -0.47610869E-04 0,95772386E-08 00003 0.70977575E 00 0.82089603E-01 -0.45349472E-04 0.98367536E-08 00004	
	32
0,98467213E 00 0,37012149E-01 -0,19448082E-04 0,40415057E-08 00005	36
0.70099134E 01 =0.53663156E=03 0.10657875E=05 =0.24534463E=09 00007 0.40096772E 01 0.14933866E=01 =0.17771594E=06 =0.15927819E=08 00008	37 38
-0.10725567E 01 0.73140860E-01 -0.37875361E-04 0.76718720E-08 00009	30
0,73419832E 00 0,56630877E=01 =0.28379858E=04 0.55099498E=08 10	40
0.77182677E 11 0.12946531E-03 0.31513555E-05 -0.11503503E-08 00011 -0.13559093E 01 0.14472824E-01 -0.11009429E-04 0.30278435E-08 00012	41
0.68630542E 01 -0.40551929E-03 0.24804694E-05 -0.10177783E-08 0001	- 1.3
Card Set 11 016,04816 52000.	44
62 1.6F12 67000. 03 1.8F13 76000.	45
04 9.7F10 67000.	47
<u>05 2.0F13 0000.</u> 069.255E3 21300.	48
07 2.9913 63300.	50
08 3.2713 63000,	-51
Card Set 12'01 47.997 54194. =8.8738 02 70.42 =31452. =14.5973	-52
03 74.10 -2941214.1427	54
04 73.48 28013.669	
05 54.85 =20236. =5.7014 06 52.45 12496. =0.1738	
07 31.711 0. 0.	58 50 60
08 44.50 =17859 =1.0075	59

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	04 5.388314. 55.12		- 6
·	05 4.418 230.30.07	28 70	
	00 4.221 185.28.05	76	
	07 2.915 38. 2.016 08 3.822 137.16.04	• 71	_ @
	09 5.061 254.44.09		
	10 4.757 281.42.08		
	11 3.210 499.18.02	<u> </u>	_ c
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	135.		- 0
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	2 1000. 40.45		- 0
	3 875036	81	
	4 1000, 74800000,	<u>87</u>	
	5 1000, 21643,	8 <u>2</u> 8 <u>2</u>	_ 0
	6 900. 33.P 7 1000. 3.196	87	
	7 1000. 3.196	85	
Card Set			_ 0
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# Appendix I

- I Determination of Pipe Temperature on Outside Wall of Reactor
- II Data Calculated by Computer
  - A. Equilibrium Constants
  - B. Enthalpy of Reaction BTU/Lb Mole ^OK
  - C. Heat Capacity BTU/Lb Mole ^OK

## I Determination of Pipe Temperature on Outside

# Wall of Reactor Optimum Case Worst Conditions

A. Heat Flux due to Reaction

	Q = 1	I=IR ZAH _F - Z J=1	X i	TMPH _J I		(1)	
I or J	TMPH _J <u>LB moles</u> Hour	H _{ri} <u>Cal</u> gm moles	Ji	TMPHJ _T <u>Gm moles</u> Hour	X _i <u>Lb Moles</u> Lb Moles 46' Reactor	(X _i )(TMPH) ^H ri <u>Cal</u> gm mole* <u>Lb mole</u> * Hour <u>Lb</u> mole .464 ft.	
1	.1165	12093	5	.53.34	4.109 <b>E-</b> 3	2650.472	
2	0	-14333	5	53.34	9.156E-5	-69.985	
3	0	530 <b>2</b> 4	6	75.51	1.83E-3	82.781	
4	.0191	1492	2	.1165	5.237 <b>E-</b> 3	.910	
5	53.34	1847	6	75.51	1.24 <b>E-</b> 7	.173	
6	75.51	-27601	11	70.49	7.39 <b>E-</b> 9	-1.438	
7	74.83	3391	9	0		0	
8	2.26	-8277	9	0		0	
9	0	Tota	1-206	69 020-411-0-			
10	0	1014	Tota1*2662.838*Hours*1.8 BTU .46 Foot Reactor				
11	70.44	4793.01BTU/(Hours464 ft. reactor)					
12	0						
13	1.234X10 ⁻⁴						

B. Heat Flux due to Heating

$$Q_{TR} \stackrel{IS}{\underset{J=1}{\hookrightarrow}} (C_{P_J}) (TMPH_J) (\Delta T/.464 \text{ ft. reactor})$$
 (2)  
373.9 ft. into reactor T was 1115.14 K  
390.0 ft. into reactor T is 1121.24 K

$$\frac{\Delta T}{\Delta L} = \frac{1121.24 - 1115.14}{390.0 - 373.7} = \frac{6.10}{16.3} = \frac{.3742^{\circ}K}{ft} = \frac{.1736^{\circ}K \text{ temp. rise}}{.464 \text{ ft reactor}}$$
(3)

J	CPJ BTULbMole OR	TMPHJ Lb Moles Hr	TMPH _J CP _J T/.464 BTU/Hr/ .46 ft reactor	
1	16.40	.1165	.5970	
2	57.24	0	0	
3	57.07	0	0	
4	49.58	.091	.2959	
5	31.04	53.34	517.398	
6	23.72	75.51	559.72	
7	7.33	74.83	171.41	
8	18.28	2.26	12.91	
9	44.41	0	0	
10	36.30	0	0	
11	10.20	70.44	224.68	
12	5.29	0	0	
13	8.09	1.234X10 ⁻⁴	.00831	
	المحمد المحم المحمد المحمد المحم	TOTAL	487.01	1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 -

Total heat flux = 4793.01 + 1487.01 = 6280.02 BTU/Hr. .464 ft. reactor)

$$\frac{17.83 \text{ BTU}}{C_{\text{P}}} = \frac{C_{\text{P}J}\text{TMPH}_{\text{J}}}{\text{TMPH}_{\text{J}}} = \frac{17.83 \text{ BTU}}{\text{Lb Mole } \sigma_{\text{R}}}$$
(4)

$$\frac{18.74 \text{ Lb moles}}{\text{TMPH}_{J}} = \frac{18.74 \text{ Lb moles}}{\text{Lb}}$$
(5)

Average heat capacity = 
$$\frac{\overline{CP}}{\overline{MW}}$$
 =  $\frac{17.83}{18.74}$  = .9514  $\frac{BTU}{LB^{OR}}$ 

.9514 
$$\frac{BTU}{Lb^{O}R} * \frac{1.8^{O}R}{O_{K}} = \frac{1.713}{Lb^{O}K} \frac{BTU}{Lb^{O}K}$$
 (6)

$$K = \begin{bmatrix} C_{P} + \frac{5}{4} & \frac{R}{M} \end{bmatrix} \quad U \quad (6)$$

$$K = .9514 \frac{BTU}{Lb^{0}R} + \frac{1.25 \times Lb \text{ mole }^{0}R}{1.875 Lb/Lb \text{ mole}} 2.705 \times 10^{-5} \frac{Lb}{\text{ft sec}} \times$$

$$K = \frac{\frac{3600 \text{ sec}}{\text{hour}}}{.1055^{\circ}\text{R hour ft}^{2}/\text{ft}} = \frac{BTU}{1900^{\circ}\text{K hour ft}^{2}/\text{ft}}$$
(8)  

$$C_{\text{PU}} = (.951/4)(2.7139 \times 10^{-5}) = 2600$$

$$Pr_{N} = \frac{Opt}{K} \qquad \frac{(.9514)(2.7139 \times 10^{-})}{.1075} \qquad * \frac{3600}{ft} \qquad (9)$$

$$\Pr_{NU} = 0.8811$$

$$\frac{H_{o} D^{o}}{K} = (0.026) (RE)^{.8} (Pr)^{.33} \left(\frac{U_{o}}{U_{i}}\right)$$
(10)

$$\frac{H_0 D}{K} = (.026) (5.582 \text{ E5})^{.8} (.8811)^{.33} \underbrace{(2.701 \text{ E-5})^{.14}}_{2.705 \text{ E-5}}$$
(11)

$$H_0 = 978 * \frac{K}{B} = 978 * \frac{(1900)}{.141} = 1318 \frac{BTU}{Hr \ K \ ft^2}$$
 (12)

$$q = \frac{2\pi\Delta L(T_a - T_b)}{\frac{1}{r_o h_o} + \frac{Ln(r_1/r_0)}{K_{carbon}} + \frac{Ln(r_2/r_1)}{K_{steel}}$$
(13)

$$K_{\text{carbon}} = .55 \xrightarrow{\text{BTU}}_{\text{R hour ft}} \frac{2}{/\text{ft}} * \frac{1.8^{\circ}\text{R}}{1.0^{\circ}\text{K}} = .990 \xrightarrow{\text{BTU}}_{\text{\circ K hour}} (14)$$

$$K_{\text{steel}} = 26 \frac{BTU_2}{CR \text{ hour ft}^2/\text{ft}} + \frac{1.8^{OR}_{OR}}{1.0 \text{ K}} = 46.8 \frac{BTU}{CK \text{ hour}}$$
(15)

Using the value calulated in equation (14) and (15) and a heat flux of 6280 BTU/hour the following is obtained:

$$6280 = 2 (.464) (1200 - T_b)$$

$$\frac{1}{(.0705) 1318} + \ln \frac{.125}{.0705} + \frac{\ln .150}{.125}$$

$$ft - 1.0800 - 46.8 (16)$$

$$6280 = \frac{2.915(1200 - T_b)}{.01076 + .5784 + .003995}$$
(17)

$$T_{b} = 1120 + \underline{6280(.01076 + .5784 + .003895)}_{2.915} = 1120 + 2.915$$

$$1270 = 2390^{\circ} K \tag{18}$$

Clean Tube  

$$\frac{6280 \ 1}{.125h_{0}} + \frac{\ln \ .150}{.125} \\
\frac{46.8}{2.915} = \frac{6280(.006069+.003895)}{2.915} \\$$
(19)

$$T_b = 2.47 + 1120 = 1141.47^{\circ}K$$
 (20)

The safe operating temperature was 1480°K.

$$q = \frac{2L(T_a - T_b)}{\frac{1}{r_o h_o} + \frac{Ln(r_1/r_0)}{K \text{ carbon}} + \frac{Ln(r_2/r_1)}{K \text{ steel}}}$$
(21)

$$-6280 = \frac{2 (.464) (1120 - T_b) {}^{0}K}{1} + \frac{LN \left(\frac{.125}{.0705}\right)}{10.8} + \frac{LN \left(\frac{.150}{.125}\right)}{46.8}$$
(22)

$$T_{b} = 1267.4^{\circ}K$$

Incornell (25% Cr 20% Ni 55%Fe) is safe to work with up to  $2200^{\circ}$ F or 1477.[°]K.

This means that it would be both safe and possible to operate the reactor with this optimum temperature profile without melting the pipes or exposing the reactor to unsafe conditions.

R _o Ft.	т ^о к	Temperature Skin ^O K	Thickness of Carbon Layer (ft)
.125	21.48	1141.48	0
.120	30.15	1150.15	.005
.110	48.25	1168.	.015
.095	80.34	1200.	.030
.080	117.8	1238.	.045
.070	147.0	1267.	.055
.060	182.0	1302.	.065
.030	347.0	1467.	.095

### Data Calculated by Computer

Reactor Position 390.00 ft. Reynolds Number 5.672 X  $10^5$ VIS = 2.7139 X  $10^{-5}$  Lb/ft. sec. Reactor Increment of Conversion .469 feet Thermo conduction steel = 26.0 X 1.8 = 46.8 BTU/^oK Hour ft²/ft Thermo conduction coke = 6.0 X 1.8 = 10.8 BTU/^oK Hour ft²/ft

### Appendix J

#### Nomenclature PYRO

- AMWT Average molecular weight of reacting system
- B(I,K) Coefficient of component in Kth position Ith reaction
- BB(I,K) Order of reaction of component in Ith position Kth reaction

C(J) Concentration of  $J^{th}$  component (1b. moles/ft.³)

- Card(80) Alphanumeric identification of reaction system
- CF Temporary constant used in calculating the product of concentration raised to order of reaction components in the forward direction
- CLJ(J,1) Constant of Lennard and Jones collision diameter (A)Jth component
- CLJ(J,2) Constant of Lennard and Jones C/K (°K) Jth component
- CP(J,1-4) Heat capacity data for  $J^{th}$  component  $C_P=CP(J,1) + CP(J,2)*T+CP(J,3)*T^2+CP(J,4)*T^3$  (BTU/lb.mole ^oF)
- CR Temporary constant used in calculating the products of concentration raised to the order of reaction of each reaction component in the reverse direction  $CT = \{C(J) \ (1b.moles/ft^3)\}$
- D =MAX(ABS(DXA(I))) i.e. the max of the absolute incremental change of reaction

$$DCP(I,1-4) = \sum_{K=SF(I)+1}^{SR(I)} \frac{B(I,K)}{B(I,1)} CP(I,1-4) - \sum_{K=1}^{SF(I)} K=1$$

$$\frac{B(I,K)}{B(I,1)} CP(I,1-4) (BTU/1b.mole {}^{O}F) (1)$$
(1)

- DF(I) Summation of free energy of products free energy of reactants Ith reaction (BTU/lb.mole)
- DH(I) Summation of heat of formation of products heat of formation of reactants (BTU/1b.mole)
- DS(I) Summation of entropy of products entropy of reactants (BTU/1b.mole)
- EA(I) Arrhenius frequency factor of Ith reaction
- **EE(I)** Arrhenius activation energy of  $I^{th}$  reaction (ca1/m)

ENAME(20J) Alphanumeric identification of the Jth component (maximum 20 characters)

- F(J) Factor by which the Arrhenius frequency factor is changed - assumed to be one
- FI(I) Constant of integration used in calculating the equilibrium constant

GC Gas constant =  $1.341 \text{ At/lb} \text{ mole}^{O}K$ 

HR Number of hours in which carbon has been accumulating

HT(J) Heat of reaction of the (J) component (BTU/1b.mole)

- I Temporary storage to denote Ith reaction
- IA(I,K) Used to identify J in the reaction species in the Ith reaction the Kth position (i.e. J=IA(J,K)
- IB Number of increments the reactor will calculate before it is forced off
- ID Temporary storage
- IDATA(K) Used in printing information on reaction systems
- IDATB(K) Used in printing information on reaction systems
- IDATP(K) Used in plotting subroutines
- IGO Used in print-out as control variable
- IGOTO Used as control in determining whether to continue calculation or to read in new data
- IGOW Used as control
- II Temporary
- IIN Temporary
- IJ Temporary
- IJK Temporary
- IM Temporary
- IPLOT Used to determine form of print-out
- IR Total number of reactions
- IS Total number of chemical species

ISS Temporary

IT Temporary

ITEST	Used	as	program	control

IWMZ Used in print-out

IX Temporary

- IZZ Temporary
- 11 Temporary
- 12 Temporary
- 13 Temporary
- J Temporary
- JJ Temporary
- JJ1 Temporary
- JJ2 Temporary
- J1 Temporary
- J2 Temporary
- J3 Temporary
- J4 Temporary
- K Temporary usually refers to position in reaction
- KEYP Key product identification. Used by computer in yield calculation as well as plotting.
- KEYR Key reactant identification. Used by computer in yield calculation as well as plotting

KK Temporary

L Temporary - usually used to denote particular heat capacity term

MA Used as computer control. Limits total number of iterations.

MAZE Used as computer control in pressure calculation

MB Used to determine size of the step

- MI Temporary
- MM Temporary
- MMM Temporary
- MT Temporary
- MY Computer control number of small iterations between print-out
- MZ Computer control number of print-outs desired
- M10 Computer control
- N Temporary
- NO Temporary number of solid components
- P(J) Pressure of J component (at)
- PD Pressure drop increment (in At.)
- PDIP Initial incremental pressure change used in convergence (At)
- PI Pressure into reactor (At)
- POUT Pressure out of reactor (At)
- PPI(J) Initial pressure of Jth component (At)
- PRES Max. allowable pressure in reactor (At)
- PRETT Pressure used if valocity of sound is exceeded (At)

- PSAVE Pressure in previous increment (At)
- PT Total pressure in reactor at any point (At)
- PTI Initial total pressure (At)
- PTTE Temporary pressure storage (At)
- PT2 Temporary pressure storage (At)
- R Gas constant 1.987 cal/gram mole ^OK
- RA Rate of reaction
- RAD Radius of the reactor (Ft)
- RADD(I) Radius of reactor at 1% temporary storage (Ft)
- RADF(I) Radius of reactor at I% previously calculated (Ft)
- RADI(I) Radius of reactor at 1% presently being calculated

RADU Original radius of clean reactor (Ft)

- RAF Original radius of clean reactor (Ft)
- RATE Total rate of reaction
- REQ Reciprocal of equilibrium constant
- **REQTT** Reciprocal of equilibrium constant
- RIJ Used to calculate percent position in reactor
- RJ Used to calculate percent position in reactor
- RN1 Moles before reaction segment DL (1b.moles)
- RN2 Moles after reaction segment DL (1b.moles)
- RI Temporary
- SF(I) (Integer) Number of components in Ith forward reaction SMWT(J) Molecular weight of Jth component

SR(I) (Integer) number of components in Ith reverse reaction

ST Temporary

- T Temperature of reactor (any point)  $({}^{O}F)$ TIN Temperature of inlet conditions  $({}^{O}F)$
- TM Temporary temperature storage
- TMPHTotal moles per hour (1b moles/hour)
- TMPHIInitial molar flow rate(lb.moles/hour)
- TR Temporary storage temperature  $(^{O}_{F})$
- TT Temporary temperature storage (^OF)
- VEL1 Velocity of gas at any point in reactor (ft/sec)

 $(^{\circ}F)$ 

- VI(I) Viscosity of component (I) (1b/ft sec)
- VIS Viscosity of reaction system (1b/ft sec)
- VC(J,L) Concentration of component J at L% into reactor
- WDZA(I,L) Rate of reaction I at distance L% into reactor
- WPJ(L) Pressure L% into reactor (At)
- WT(L) Temperature L% into reactor ([°]F)
- WTM(J,L) Total mole/hour of component J, L% into reactor
- WTMPH(L) Total mole/hour L% into reactor
- WVEL1(L) Velocity ft/sec L% into reactor
- WZIC(L) Length ft L% into reactor
- X Used as temporary in calculating heat of reaction, heat capacity
- XN Used to calculate temperature profile in reactor

- YIELD WTM(KEYR, 100)/WTM(KEYR, 0)*100
- Z(L) Temperature profiles at 10% distance along reactor ([°]F)