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SRC-I PHASE EQUILIBRIUM AND ENTHALPY DATA FOR
COAL LIQUEFACTION AND SOLVENT RECOVERY AREAS

Final Report

By
D. C. Mehta
I. C. Chu

Work Performed Under Contract No. AC05-78OR03054

International Coal Refining Company
Allentown, Pennsylvania

Technical Information Center
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SUBCONTRACTED R&D FINAL REPORT:
SRC-I PHASE EQUILIBRIUM AND ENTHALPY DATA
FOR COAL LIQUEFACTION AND SOLVENT RECOVERY AREAS

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Prepared for the
UNITED STATES DEPARTMENT OF ENERGY
Office of Solvent-Refined Coal Products
under Contract DE-AC05-78-OR-03054

TABLE OF CONTENTS

	<u>Page</u>
<u>VOLUME 1</u>	
EXECUTIVE SUMMARY	1
INTRODUCTION	2
PROGRAM OBJECTIVES	4
EXPERIMENTAL PLAN AND PERFORMING ORGANIZATIONS	4
SAMPLE ACQUISITION, PREPARATION, AND CHARACTERIZATION PROGRAM	6
VAPOR-LIQUID EQUILIBRIUM PROGRAM	9
ENTHALPY PROGRAM	12
LITERATURE CITED	16
APPENDIX I - PHASE EQUILIBRIUM AND ENTHALPY DATA PROPOSAL	
APPENDIX II - SAMPLE PREPARATION AND ANALYTICAL SUPPORT FOR PHASE EQUILIBRIUM AND ENTHALPY PROGRAMS	
<u>VOLUME 2</u>	
APPENDIX III - THERMODYNAMIC DATA FOR COAL LIQUEFACTION - TASK 2	
<u>VOLUME 3</u>	
APPENDIX IV - FINAL REPORT TO ICRC: ENTHALPY PROGRAM, 01-13023-00	

APPENDIX IV

FINAL REPORT TO INTERNATIONAL COAL REFINING COMPANY
SUBCONTRACT TITLE AND NUMBER: ENTHALPY PROGRAM, 01-13023-00

Final Report
to
International Coal Refining Company

Subcontract Title and Number:

Enthalpy Program

01-13023-00

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TABLE OF CONTENTS

INTRODUCTION	1
EQUIPMENT AND OPERATING PROCEDURE	3
TASK 3.1.1 HP FLASH BOTTOMS	25
TASK 3.1.2 HP FLASH OVERHEAD	27
TASK 3.1.3 SECOND STAGE MP FLASH DRUM OVERHEAD	38
TASK 3.1.4 PROCESS SOLVENT COLUMN REBOILER	49
TASK 3.2.1 700-750 °F DISTILLATION CUT	59
TASK 3.2.2 600-650 °F DISTILLATION CUT	76
TASK 3.2.3 500-550 °F DISTILLATION CUT	87
TASK 3.2.4 400-450 °F DISTILLATION CUT	99
TASK 3.3.1 BASE (QUINOLINE)	112
TASK 3.3.2 SATURATE (DECALIN)	114
TASK 3.3.3 ACID/BASE SYSTEM	149
APPENDIX A TECHNICAL AGREEMENT BETWEEN ICRC AND CSM	246

INTRODUCTION

The Enthalpy Program was a 20-month project initiated on January 18, 1982 by the International Coal Refining Company (ICRC) and under the technical direction of Professor Arthur J. Kidnay and Professor V. F. Yesavage at the Colorado School of Mines (CSM), Golden, Colorado.

The objective of the program was to gather enthalpy data on representative pure model compounds, mixtures of model compounds, and selected coal-derived liquid samples furnished by ICRC. A copy of the technical agreement between ICRC and CSM is included in this report as Appendix A.

The experimental work was performed by Kirk Cerise, David Flanigan, Vicki Niesen, Scott Robinson, and Jamal Sandarusi under the direction of the Principal investigators, A. J. Kidnay and V. F. Yesavage.

This report was prepared by David Flanigan and Scott Robinson, and was edited by A. J. Kidnay and V. F. Yesavage.

REPORT FORMAT

This final report contains a complete description of the calorimeter and the experimental procedures used, separate data sections for each experimental task, and a copy of the technical agreement between ICRC and CSM.

Each section of this report is organized to "stand alone"; thus, there are no general lists of references, tables of notation, or overall data tables.

Readers not familiar with the agreement between ICRC and CSM should consult Appendix A before reading the report.

EQUIPMENT AND OPERATING PROCEDURE

Theoretical Background

Enthalpy measurements were obtained with a reference fluid boil-off type calorimeter. The fluid of interest is pumped and heated to the desired pressure and temperature as it flows through the calorimeter. In the calorimeter, energy in the form of heat is transferred from the fluid of interest to the reference fluid. The reference fluid, freon 11 (trichlorofluoromethane), boils off as a result of this heat transfer. The freon in the calorimeter is always kept at its boiling point, which is approximately 291.5 K (65 °F) at the average atmospheric pressure (620 mm Hg) in Golden, Colorado. The fluid of interest is brought down to this temperature as a result of its loss of heat.

Applying a mathematical statement of the first law of thermodynamics (assuming steady state) to the flow calorimeter yields the following equation:

$$H = (Q + W + \Delta KE + \Delta PE + HL)/M \quad (1)$$

where,

$H =$ The enthalpy change of the sample fluid between the inlet and outlet of the calorimeter. $H(t,p)_{in} - H(t,p)_{out}$

$Q =$ The heat removed from the sample.

$M =$ The mass flow rate of the sample.

$W =$ Shaft work done by sample.

ΔKE = The change in kinetic energy of the sample between the calorimeter inlet and outlet.

ΔPE = The change in potential energy of the sample between the calorimeter inlet and outlet.

HL = Heat leak into or out of the calorimeter.

$H(t,p)_{in}$ = The enthalpy of the sample at the calorimeter inlet.

$H(t,p)_{out}$ = The enthalpy of the sample at the calorimeter outlet.

Four of the preceding terms can be neglected without introducing a detectable error in the final enthalpy value. The sample performs no shaft work and the changes in kinetic and potential energy of the sample are more than an order-of-magnitude less than the claimed accuracy of the equipment. These terms are therefore neglected. A heat leak experiment was performed to show that the heat leak terms were also negligible. The results of this experiment are presented later.

After eliminating the appropriate terms, equation 1 becomes:

$$H = Q/M = H(t,p)_{in} - H(t,p)_{out} \quad (2)$$

Q is not only the heat given up by the sample, but is also the heat absorbed by the vaporizing freon. The freon is always at its boiling point; therefore, the quantity of energy it absorbs can be found using the latent heat of

vaporization at the temperature of the freon bath. Now, the first law balance becomes:

$$H = Q/M = (M_f \cdot \lambda_f)/M \quad (3)$$

where,

λ_f = Latent heat of vaporization of freon 11 at the temperature of the freon bath.

M_f = The mass flow rate of freon 11.

The temperature of the boiling freon bath and the latent heat of vaporization are a function of the atmospheric pressure to which the freon bath is vented. The latent heat of vaporization of freon 11 is known to be 184.2 kJ/kg (79.18 Btu/lb) at 291.5 K and to vary by -0.38 kJ/kg K (-0.09 Btu/lb $^{\circ}$ F) for small temperature rises around 291.5 K (65 $^{\circ}$ F).

For reasons of convenience, it is desirable to set the enthalpy of the outlet $H(t,p)$ out to zero or define a reference datum. The reference chosen for this experiment was the enthalpy of the sample at one atmosphere and 291.5 K (65 $^{\circ}$ F). Since the temperature of the sample as it leaves the calorimeter is rarely 291.5 K, it is necessary to make a small correction. From the experimental data, an average or mean heat capacity was estimated at 291.5 K. The difference between the temperature of the sample at the exit and the reference temperature was then taken into account using this heat capacity. Pressure corrections to the enthalpy values were made using Kesler and Lee's 1

modification of the Benedict-Webb-Rubin (BWR) equation of state. The calculation was made using a program written by Mohr 2.

The enthalpies presented in the data tables in the various sections of this report were calculated using the following expression:

$$H(t,p) = M_f \cdot (184.2 - .38 \cdot (T_f - T_r)) / M_s + (T_s - T_r) \cdot C_p + H_p(291.5 \text{ K}, 1 \text{ atm}) \quad (4)$$

where,

$H(t,p)$ = Corrected enthalpy.

M_s = Mass of sample in grams.

T_f = Temperature of freon bath.

T_r = Reference temperature 291.5 K.

T_s = Temperature of sample at exit of calorimeter in K.

C_p = Mean heat capacity at 291.5 K.

H_p = Pressure correction.

All of the corrections made on the data were basically negligible except the pressure corrections for the high pressure isobars. For this reason, the pressure corrections were listed separately in the data tables.

Process Flow Description

Figure 1 is a detailed drawing of the calorimeter. Figure 2 is a schematic diagram that illustrates fluid flow in the experimental apparatus used in this experiment. Figure 2 shows that the flow system of the apparatus is comprised of two circuits: (1) a sample flow circuit, and (2) a reference fluid flow circuit.

The Sample Fluid Circuit

The sample circuit is represented in Figure 2 as a solid line. There were two basic modifications made on the sample circuit during the present study. The first modification was to replace the coil inside the calorimeter. The original calorimeter coil was 1/8 inch o.d. (.035 inch wall thickness) and was replaced by a 3/16 inch o.d. (.035 inch wall thickness) stainless steel tubing. The second modification was the installation of a Ruska manual precision pressure adjuster in-line with the back pressure regulator. The pressure adjuster made it possible to finely control the pressure of the sample circuit without greatly upsetting the system as had been previously experienced. This change tended to make the operation of the apparatus in the two-phase region smoother. The modification also reduced scatter by allowing the operating pressure to be kept at a constant value.

FIGURE 1 FLOW CALORIMETER

Figure 2. Flow Diagram of the Calorimeter Recycle Flow System.

The Reference Fluid Circuit

The reference fluid circuit (shown as a dashed line in Figure 2) needed minor modifications for the present study. All solenoid valves were replaced by standard stainless steel, hand-operated valves. A third condenser was placed at the vent of the reference fluid collection tube. The third condenser provided visual evidence of any freon escaping the reference fluid collection tube by condensing it and returning the freon to the collection flask.

Procedural Adaptations

A great deal has been written about procedural and equipment modifications in past theses. Sufficient information is obtainable from theses of McConnell 3, Sharma 4, Andrew 5, and Hinman 6, Cerise 7, modified the start-up and shut-down procedures used by Mohr 2.

System Start-up Procedure

1. Turn on heating tapes, the return heater and the refrigeration unit.
2. Isolate the Heise gauges and pressure damper system by valving off these items.
3. Turn on the main pump and set an approximate operating pressure by applying nitrogen pressure to the back-pressure regulator. The pressure gauges on the regulators of the nitrogen tanks are used to give the operator an idea of the approximate system pressure.
4. Apply approximately the same amount of nitrogen pressure to the damper that was applied to the back-pressure regulator.

5. Open the valve between the sample circuit and the damper and allow the liquid level in the pressure damper to stabilize at some reasonable level. This level is observed in the Jurgeson gauge and is generally kept in midrange of the sight glass. This prevents a system upset from flooding the damper or back flushing the pump with nitrogen (causing loss of prime) before the upset can be corrected.
6. Slowly open the Heise gauge valves to observe the actual system pressure.
7. Set the temperature on the preheater control and turn it on.
8. The system pressure can be adjusted and fine-tuned by manipulating the nitrogen pressure to the back-pressure regulator with the pressure adjustor. Any significant changes in pressure on the back pressure regulating system must be compensated for by appropriately changing the damper pressure.

This system start-up procedure was implemented to prevent any initial component separation of the binary systems during start-up.

Cerise's 7 shut-down procedure was modified by adding a cooling coil to the preheater bath. Addition of the cooling coil allowed the preheater bath to be cooled down quickly and saved at least one hour in the shut-down procedure. This modified shut-down procedure is described in the following subsection.

System Shut-Down Procedure

1. Valve off Heise gauges and the pressure damper.

2. Turn off preheater and final heater.
3. Turn on cooling water to preheater cooling coil.
4. Relieve all the pressure from the back-pressure regulator. This is done now by using the pressure adjustor vent.
5. Slowly bleed all of the sample fluid from the damper system.
6. When the liquid level is no longer visible in the Jurgeson gauge, isolate the pressure damper from the sample circuit and bleed the nitrogen pressure from the damper.
7. Turn off the main pump when the preheater temperature falls below 150° C.
8. Turn off cooling water.
9. Turn off all remaining equipment and slowly bleed pressure from Heise gauges.
10. Isolate the sample circuit from the atmosphere by valving off vent system.
11. Isolate freon circuit from atmosphere by closing all vents.

The association properties of many of the samples investigated and reported here required that any contact with water be eliminated. For this reason, all vents in the sample circuit were connected to drierite gas drying canisters.

The freon circuit is vented through its own drierite canisters as well. The freon circuit also has an in-line refrigeration drying cartridge, which contacts the saturated freon just before it enters the calorimeter. By preventing the absorption of water in the sample and reference fluids, accurate and reproducible data were consistently obtained.

Clean-Out Procedure

1. Turn on the heating tapes and return heater.
2. Turn on refrigeration unit.
3. Open sample and reference circuit vents.
4. Drain sample fluid from surge tank.
5. Blow sample circuit out with nitrogen forcing the sample fluid out the knock-out vents.
6. One at a time, use nitrogen to flush out the Heise gauges.
7. After as much of the sample fluid as possible has been removed, by flushing with nitrogen, load the sample circuit with a solvent (generally acetone is used).
8. Isolate the Heise gauges and pressure damper by valving off these items.
9. Set the flowrate on the main pump to approximately 90% of capacity and turn it on.
10. One at a time, flush Heise gauges with the solvent now flowing through the sample circuit.
11. One at a time, clean sample system knock-out vents by flushing with solvent.
12. Open damper and flush with solvent.
13. Isolate pressure damper from sample circuit.
14. Set preheater control to approximately 90-100 °C and turn on preheater.

15. After a couple of hours, shut off the main pump and drain solvent from sample circuit. If the solvent has picked up a great deal of impurities (usually just a visual judgment is made), then charge sample circuit with fresh solvent and start again at Step 9.
16. Once the sample circuit has been reasonably cleaned, blow it out with nitrogen until dry.
17. Attach auxiliary vacuum pump to one of the sample circuit vents, using an inline cold trap.
18. Evacuate the sample circuit. Maintain pulling a vacuum on the sample circuit for at least 12 hours.

Since flow calorimetry is an expensive experiment to perform, it is necessary to obtain accurate data and to avoid repetition of the experiments. Hence, periodic equipment checks are necessary to spot drifting calibrations and malfunctioning equipment. A brief discussion of the periodic checks follow.

Resistance Measurement Check

Three platinum resistance thermometers are used to evaluate the fluid temperatures in the operation of the calorimeter system. The resistance of the PRTs is measured by a digital multimeter. Originally, there were two Fluke multimeters; one constantly in use and one serving as a backup. When checking these multimeters against standard resistors, it was found that the calibrations were drifting. Because of this fact, both meters were taken to a CSM electronics technician to be recalibrated. The technician explained that the Fluke meters used batteries in their resistance measurements and were

subject to calibration drift as the batteries became older. Also, it was discovered that one meter was non-repairable. Weekly calibration checks of the Fluke meter were made using a set of standard resistors to ensure the accuracy of the resistance measurement. Eventually, the Fluke meter was replaced by a Keithley 191 digital multimeter. The Keithley meter, because of its design, provides a more consistent and accurate performance. The Keithley does not require batteries. The Fluke meters calibration was never allowed to drift significantly.

Platinum Resistance Thermometer Check

It is difficult to check the calibration of the platinum resistance thermometers without detaching them from their electrical harnesses and removing them from the calorimeter. However, when this is done, defects in the wiring harness or switching arrangement can be detected. A one-point, in-place calibration check was performed by placing the three PRTs in a water bath. A narrow range (20-30 °C) mercury thermometer capable of determining the temperature within $\pm .005$ °C was used as a standard. The results of this check, presented in Table 1, show that the PRTs are accurate to within the claimed accuracy of $\pm .28$.

Table 1
PRT CALIBRATION CHECK

<u>Thermometer</u>	<u>Temperature °C</u>
Mercury Standard	25.320
PRT #1	25.181
PRT #2	25.181
PRT #3	25.153

Pressure Gauge Checks

In the program initiated February 1982, all the Heise gauges receive regular maintenance and calibration checks at least once a year. EIL Instrument Corporation performs the maintenance on the Heise gauges. Because the inlet pressure measurement is the most critical pressure measurement, the inlet pressure can be evaluated from one of the two Heise gauges. The two gauges serve as constant calibration checks against each other. If the two inlet gauges do not read the same pressure, the defective gauge is identified and serviced.

As described, many regular checks were made to ensure that the experimental equipment is operating properly. In particular, measurements on the enthalpy of water were made to check the overall accuracy and precision of the calorimeter.

Accuracy and Precision Checks

Measurements of the enthalpy of water were made using the flow calorimeter to check the overall performance of the equipment. Water was chosen because of the universal acceptance of the steam table 8 enthalpies. However,

due to the extremely high values of the heat of vaporization of water and flow rate limitations in the equipment, the vapor phase enthalpies could not be measured, and thus data were gathered in the liquid and two-phase regions only. The latter provide comparisons with vapor pressures listed in the steam tables.

De-ionized and purified water, equivalent to a triple distillation, was used. The water was sampled periodically by solvent extraction, and the extract (a methylene chloride phase) was analyzed using gas chromatography to check for organic impurities. No contamination was observed in any of the samples.

In this investigation, the 100 and 500 psia isobars were measured. The experimental enthalpies were adjusted to 65 °F and 1 atm using pressure and temperature corrections from the steam tables. The steam table enthalpy values were similarly brought to the same reference point for the sake of comparison. The results of the measurements and the comparisons are given in Tables 2 and 3. The results in the two-phase region (vapor pressure measurements) have been compared to the steam table saturation values in two ways: first, by assuming that the measured temperatures are correct and calculating the pressure error; and second, by assuming that the measured pressures are correct and calculating the temperature error. The average absolute deviation in enthalpy for all 21 runs in the compressed liquid region is 0.20%, and the two-phase (vapor pressure) measurements are consistent with the estimated temperature and pressure calibration errors of ± 0.5 °F and ± 0.5 psia ($\pm 0.1\%$ of the full-scale pressure gauge recording), respectively. The ΔP obtained when assuming an accurate temperature measurement exceeds 0.5 psia, but if

TABLE 2
WATER ENTHALPY DATA

100 PSIA Isobar

1	2	3	4	5	6	7	8
DATE	RUN#	T*	P***	H** (EXP)	H** STMTBL	ΔH^{**} (5-6)	DIFF.
7/18/83	1	248.72	99.98	184.14	184.30	-0.16	.09
	2	266.51	99.98	201.90	202.39	-0.49	.24
	5	315.07	99.98	251.81	252.22	-0.41	.16
	6	316.33	100.01	253.31	253.52	-0.21	.08
7/19/83	1	180.82	100.03	114.68	115.28	-0.60	.52
	4	293.22	99.98	228.77	229.69	-0.92	.40
	5	293.29	100.03	229.15	229.76	-0.61	.27
	6	303.40	99.98	239.35	240.16	-0.81	.34
	7	307.10	100.03	243.21	243.99	-0.78	.32
	9	318.65	100.03	255.49	255.92	-0.43	.17
	11	327.46	99.98	301.10	Two-phase point		
	12	327.75	99.98	375.93	Two-phase point		
Average (Absolute)						-0.54	.26

Two-phase Region

Correct Temperature Assumption

RUN#	P*** (EXP)	T*	P*** STMTBL	ΔP^{***}	%
11	99.98	327.46	99.46	+.52	.52
12	99.98	327.75	99.86	+.12	.12
			Average	+.32	.32

Correct Pressure Assumption

RUN#	T* MEASURED	P*** EXP	T* STMTBL	ΔT^*	%
11	327.46	99.98	327.84	-.38	.12
12	327.75	99.98	327.84	-.09	.03
			Average	-.34	.08

* T - Temperature (in °F)

** H (in Btu/lb)

*** P Pressure (in PSIA)

TABLE 3
WATER ENTHALPY DATA

500 PSIA Isobar

1	2	3	4	5	6	7	8
DATE	RUN#	T*	P***	H** (EXP)	H** STMTBL	ΔH^{**} (5-6)	DIFF.
7/20/83	1	289.37	498.05	226.07	226.56	-0.49	.22
	2	289.83	500.05	226.53	227.03	-0.50	.22
	5	341.75	500.05	280.44	280.69	-0.29	.10
	6	378.69	499.55	319.55	319.67	-0.12	.04
	7	393.38	500.01	335.30	335.25	+0.05	.01
7/21/83	2	416.28	500.01	360.01	360.11	-0.10	.03
	3	424.25	500.01	368.98	368.84	+0.15	.04
	5	440.57	501.05	387.54	386.73	+0.81	.21
	6	453.87	501.05	402.39	401.52	+0.87	.22
7/22/83	3	457.72	501.05	404.77	405.95	-1.18	.29
	4	458.69	500.05	406.42	407.07	-0.65	.16
	5	466.56	500.50	470.23	Two-phase point		
	6	466.80	500.50	581.53	Two-phase point		
Average (Absolute)						0.47	.14

Two-phase Region

Correct Temperature Assumption

RUN#	P*** (EXP)	T*	P*** STMTBL	ΔP^{***}	%
5	500.05	466.56	497.38	+2.67	.53
6	500.05	466.80	498.50	+1.55	.31
Average				+2.11	.42

Correct Pressure Assumption

RUN#	T* MEASURED	P*** (EXP)	T* STMTBL	ΔT^*	%
5	466.56	500.05	467.11	-.55	.12
6	466.80	500.05	467.11	-.31	.07
Average				-.43	.10

* T - Temperature (in °F)

** H (in Btu/lb)

*** P Pressure (in PSIA)

allowance is made for a small change ($<0.5^{\circ}\text{F}$) in the temperature, all of the pressure readings fall within the stated accuracy of ± 0.5 psia.

The pressure gauge calibrations, ± 0.5 psia for pressures less than 500 psia and ± 2 psia for pressures above 500 psia, were established by the manufacturer, while the temperature calibration $\pm 0.5^{\circ}\text{F}$, was established in this laboratory by comparing the sample inlet thermometer to a Leeds and Northrup standard platinum resistance thermometer with a calibration traceable to the National Bureau of Standards.

Heat Leak Check

In order to determine whether any noticeable heat leak was occurring for the calorimeter, measurements were made on heptane over the entire fluid flowrate range. The measurements were made at 297°F and 154 psia. The results of the heat leak experiment are presented graphically as enthalpy versus reciprocal flowrate, in Figure 3.

The normal fluid flowrate for operation of the calorimeter ranges between 20 and 80 grams/minute (reciprocal flowrates of 0.05 to 0.0125 minutes/gram). As seen on the graph presented here, the enthalpy values in this range are centered about a common enthalpy value of 135.3 Btu/lb. With a maximum deviation of 0.61 Btu/lb. At flowrates lower than 20 grams/minute or reciprocal flowrates greater than 0.05 minutes/gram, the scatter in enthalpy measurements is seen to increase significantly. Within the operational flowrate range, the scatter in the enthalpy values is minimal and is arbitrary. This suggests that no definite trend exists for the enthalpy as a function of flowrate. If

Figure 3

HEAT LEAK EXPERIMENTAL RESULTS
HEPTANE MEASUREMENTS AT 154 PSIA AND 297 F

a heat leak into or out of the calorimeter were present, a definite slope would be observed for the enthalpy values over the flowrate range. The measurements presented here indicate that no heat leak exists for the calorimeter.

Sample Composition Investigation

In order to ensure that the measurements taken during the various investigations were representative of the sample fluids they pertained to, compositional checks were constantly made. These checks, made periodically over the entire course of the calorimeter measurement period, were done using gas chromatography.

Initial samples were taken prior to the charging of the calorimeter. Additional samples were taken periodically during the data-gathering process for compositional comparison to the original samples. Analyses were carried out with a Hewlett-Packard 5710A gas chromatograph equipped with a fused silica capillary column. The chromatograph was coupled to a Hewlett-Packard 3385A automation system and integrator. The samples were diluted approximately 15 to 1 by volume with methylene chloride prior to analysis. Two microliter increments were then injected into the chromatograph manually. Where possible, the results of the chromatographic analyses were treated quantitatively. However, in many cases the complexity of the samples prevented the necessary resolution required for quantitative analysis.

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TASK 3.1.1**LIQUID BOTTOMS FROM WILSONVILLE V-110**

TASK 3.1.1 HP FLASH BOTTOMS

The sample referred to as "Liquid Bottoms from Wilsonville V-110" could not be run in our calorimeter since it was a solid at the reference temperature. The sample was run on a differential scanning calorimeter. The data and results will be presented and discussed with Task 3.2.1.

TASK 3.1.2**H.P. FLASH OVERHEAD**

TASK 3.1.2 HP FLASH OVERHEAD

Sample 2094 CB, known as the "Oil Product from Wilsonville V-105," was furnished by ICRC. The data desired were to include a phase change as well as sensible heat values. The pressures specified for the experiment were 10,342.1 and 11,721.5 kPa. When no phase change was detected at 10,342.1 kPa, the operating pressure was lowered until a phase change could be detected. As a result, data for sample 2094 CB was taken over a temperature range of 350 K to 675 K along isobars of 206.8, 1379.0, 6895.0, and 10342.1 kPa. The data for sample 2094 CB is shown in Figure 1 and presented in Tables 1 through 4.

The column in the data table entitled "Corrected Enthalpy" is the enthalpy value of the sample relative to 65 °F and 1 atm pressure. The pressure corrections were made using the procedure outlined by Kesler and Lee (Hydrocarbon Processing, March 1976, pp. 153-158). For sample 2094 CB, the property values used were $T_c = 741$ K, $P_c = 2.466$ MPa, acentric factor = 0.53, and molecular weight = 196. The specific gravity (60 °F) was 0.9186, and the mid-boiling point of the sample was assumed to be 500 °F. These values were used due to the lack of available information on sample 2094 CB.

Chromatographic analyses were conducted to ensure that sample 2094 CB remained compositionally stable during the data-gathering process. An initial sample was taken prior to the charging of the calorimeter. Additional samples were then taken periodically during the data-gathering process for compositional comparison to the original sample. The samples were diluted approximately 15 to 1 by volume with methylene chloride prior to analysis. Two microliter increments were then injected into the chromatograph manually. The

Figure 1

V105 OIL, SAMPLE 2094 CB

Table 1

SAMPLE 2094 CB

206.8 KPa (30 psia)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
5	569.8	566.0	212.0	30.8	96.5	14.0	832.4	357.9	0.00	0.02	832.4	357.9	03/07/83
12	576.6	578.3	214.3	30.5	117.2	17.0	881.8	379.1	0.01	0.01	881.9	379.1	03/03/83
6	579.4	583.2	206.8	30.0	96.5	14.0	899.5	386.7	0.00	0.02	899.4	386.7	03/07/83
13	589.3	601.0	210.3	30.5	117.2	17.0	937.8	403.2	0.01	0.02	937.8	403.2	03/03/83
14	592.2	606.3	210.3	30.5	120.7	17.5	947.2	407.2	0.02	0.01	947.2	407.2	03/03/83
15	593.4	608.4	210.3	30.5	117.2	17.0	952.4	409.5	0.01	0.01	952.5	409.5	03/03/83
16	600.0	621.7	214.3	30.5	117.2	17.0	974.6	419.0	0.01	0.01	974.7	419.0	03/03/83
17	609.9	638.1	206.8	30.0	120.7	17.5	996.7	428.5	0.02	0.01	996.7	428.5	03/03/83
18	613.5	644.6	206.8	30.0	124.1	18.0	1015.1	436.4	0.02	0.01	1015.1	436.4	03/03/83

Table 2

SAMPLE 2094 CB

1379 KPa (200 psia)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
4	356.2	185.1	1379.0	200.0	1303.1	189.0	121.5	52.2	0.99	0.42	122.5	52.7	02/24/83
7	358.3	185.3	1377.2	199.8	1275.6	156.2	124.4	53.5	0.82	0.34	125.2	53.8	03/07/83
5	377.6	220.0	1382.4	200.5	1330.7	193.0	163.7	70.4	1.01	0.43	164.7	70.8	02/24/83
8	391.7	245.3	1379.0	200.0	1275.6	156.0	196.4	84.4	0.80	0.34	197.2	84.8	03/07/83
6	421.6	263.3	1379.0	200.0	1316.9	191.0	234.2	100.7	1.00	0.43	235.2	101.1	02/24/83
7	431.6	317.1	1379.0	200.0	1316.9	191.0	291.9	125.5	1.00	0.43	292.9	125.9	02/24/83
8	446.6	344.2	1379.0	200.0	1316.9	191.0	326.2	140.2	1.00	0.43	327.2	140.7	02/24/83

Table 3
SAMPLE 2094 CB

6895 KPa (1000 psia)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	457.6	363.9	6874.1	997.0	6874.1	997.0	337.5	145.1	5.56	2.39	343.1	147.5	03/01/83
2	482.2	408.2	6894.8	1000.0	6894.8	1000.0	401.2	172.5	5.58	2.40	406.8	174.9	03/01/83
4	493.6	428.8	6894.8	1000.0	6812.0	988.0	429.4	184.6	5.51	2.37	434.9	187.0	03/01/83
5	500.1	440.5	6949.9	1000.0	6915.4	1003.0	444.5	191.1	5.60	2.41	450.1	193.5	03/01/83
6	511.0	460.1	6894.8	1000.0	6894.8	1000.0	469.9	202.0	5.58	2.40	475.4	204.4	03/01/83
7	523.9	483.3	6874.1	997.0	6812.0	988.0	510.0	219.6	5.51	2.37	515.5	222.0	03/01/83
8	533.6	500.8	6867.2	996.0	6812.0	988.0	523.6	225.1	5.51	2.37	529.2	227.5	03/01/83
9	544.1	519.7	6867.2	996.0	6812.0	988.0	558.4	240.1	5.51	2.37	563.9	242.4	03/01/83
10	572.5	573.8	6894.8	1000.0	6812.0	988.0	636.8	273.8	5.51	2.37	642.3	276.2	03/01/83
11	586.7	596.3	6881.0	998.0	6812.0	988.0	676.6	290.9	5.51	2.37	682.1	293.3	03/01/83
12	592.3	602.9	6887.9	999.0	6812.0	988.0	682.1	293.3	5.51	2.37	687.7	295.6	03/01/83
17	629.3	673.1	6881.0	998.0	6529.3	947.1	792.7	340.8	5.28	2.27	798.0	343.1	03/03/83
24	636.3	685.7	6874.1	997.0	6543.1	949.3	807.8	344.3	5.29	2.27	803.1	346.5	03/03/83

Table 4

SAMPLE 2094 CB

10342 KPa (1500 psia)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG BTU/LB		KJ/KG BTU/LB		KJ/KG BTU/LB		
1	424.9	298.8	10349.0	1501.0	9921.6	1439.0	252.6	107.8	8.06	3.47	258.7	111.2	03/08/83
2	423.5	372.7	10342.1	1500.0	9949.1	1443.0	246.0	105.7	8.09	3.48	254.0	109.2	03/08/83
4	455.1	359.5	10342.1	1500.0	9976.7	1447.0	332.9	143.1	8.11	3.49	341.0	146.6	03/08/82
5	465.5	378.3	10342.1	1500.0	9983.6	1448.0	356.3	153.2	8.11	3.49	364.4	156.7	03/08/83
1	483.2	409.8	10335.2	1499.0	10100.8	1465.0	399.9	171.9	8.21	3.53	408.1	175.5	03/15/83
2	491.9	425.8	10320.8	1494.0	10093.9	1464.0	413.3	177.7	8.20	3.53	421.5	181.2	03/15/83
1	492.8	427.3	10342.1	1500.0	9859.5	1430.0	427.7	183.9	8.01	3.44	435.7	187.3	03/17/83
2	501.5	443.1	10342.1	1500.0	9866.4	1431.0	450.2	193.6	8.02	3.45	458.2	197.0	03/17/83
3	517.2	471.3	10314.6	1496.0	10100.8	1465.0	480.6	206.6	8.21	3.53	488.8	210.1	03/15/83
4	523.8	483.1	10342.1	1500.0	9907.8	1437.0	501.2	215.5	8.05	3.46	509.2	218.9	03/17/83
5	536.2	505.5	10342.1	1500.0	9907.0	1437.0	536.1	230.5	8.05	3.46	544.2	234.0	03/17/83
6	547.8	526.4	10342.1	1500.0	9924.5	1440.0	571.5	245.7	8.07	3.47	579.5	249.2	03/17/83
7	560.3	548.8	10328.3	1498.0	9928.5	1442.0	593.7	255.3	8.07	3.47	601.8	258.7	03/17/83
8	579.2	582.8	10335.2	1497.0	9956.0	1444.0	651.2	280.2	8.09	3.48	659.3	283.5	03/17/83
9	587.3	597.4	10321.5	1497.0	9956.0	1444.0	674.1	289.8	8.09	3.48	682.2	293.3	03/17/83

Table 4 (continued)

SAMPLE 2094 CB

10342 KPa (1500 psia)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
11	588.6	599.8	10347.7	1495.2	9956.0	1444.0	679.1	292.0	8.09	3.43	687.2	295.4	03/17/83
12	622.9	625.5	10328.3	1498.3	9956.0	1444.0	714.7	307.3	8.09	3.43	722.8	310.7	03/17/83
13	615.1	647.6	10355.9	1522.0	10059.5	1459.0	743.3	319.6	8.18	3.52	751.5	323.1	03/17/83
14	618.5	653.6	10349.0	1531.0	10059.5	1459.3	754.3	324.3	8.18	3.52	762.5	327.8	03/17/83

complexity of the samples prevented the necessary resolution required for quantitative analysis.

The following chromatographic conditions were used while analyzing the V-105 oil:

COLUMN CONDITIONS

Chart Speed	1
Zero	10
Attenuation	5
Auxillary Signal	A
Slope Sensitivity	0.1
Area Reject	300

TIME PROGRAMMING

<u>Time</u>		
0.2	Area Reject	99980000
1.2	Area Reject	300
25	Stop	
Oven Temperature	=	115 °C
Detector Temperature	=	300 °C
Injection Port Temperature	=	250 °C

The major peaks for the V-105 oil occur at retention times of 1.80, 2.44, 3.55, 4.06, 5.42, and 6.69 minutes. The relative sizes of these peaks appeared to remain constant throughout the data-gathering process. Figures 2 & 3 illustrate this point.

Figure 2

787

Figure 3

V-105
(Final Used Charge)

134

TASK 3.1.3**LIQUID 1.3H BLEND**

TASK 3.1.3 SECOND STAGE MP FLASH DRUM OVERHEAD

The liquid provided by ICRC for Task 3.1.3 is referred to as "Liquid 1.3 H Blend" or sample 2128 CB. As specified by contract data, it was taken along isobars of 517.1 (75 psia) and 723.9 kPa (105 psia). However, no phase change was detected and additional data was taken along an isobar of 206.8 kPa (30 psia) so that an estimate of the heat of vaporization could be obtained. The data for sample 2128 CB is illustrated in Figure 1 and presented in Tables 1 through 3.

The column in the data table entitled "Corrected Enthalpy" is the enthalpy value of the sample relative to 65 °F and 1 atm pressure. The pressure corrections were made using the procedure outlined by Kesler and Lee (Hydrocarbon Processing, March 1976, pp. 153-158). The parameters for sample 2128 CB were $T_c = 530$ K, $P_c = 2.276$ MPa, acentric factor = 0.60, and molecular weight = 227. The specific gravity of the sample (60 °F) was 0.9524 and the mid-boiling point of the fraction was taken as the mid-boiling point of the cut, 575 °F. The boiling range reported by ICRC as 350-800 °F.

Chromatographic Analysis of the Liquid 1.3H Blend (Sample 2128 CB)

Chromatograms for the sample represented by the enthalpy data in this report were measured at various times during the data-gathering process to ensure that no significant changes occurred in the composition of the mixture under study. The analyses indicate that compositional stability was maintained throughout the data-gathering process. In the interest of brevity, two example chromatograms are included in this report, Figures 2 and 3.

Figure 1

LIQUID 1.3 H BLEND SAMPLE 2128 CE

Table 1
LIQUID 1.3 H BLEND SAMPLE 2128 CB
206.8 kPa Isobar
(30 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
14	613.3	644.2	210.3	30.5	172.4	25.0	957.9	411.8	0.03	0.01	957.9	411.8	03/31/83
22	621.8	659.6	213.7	31.0	151.7	22.0	993.6	427.2	0.02	0.01	993.7	427.2	03/31/83
17	624.0	663.4	206.8	30.0	199.9	29.0	1012.5	435.3	0.04	0.02	1012.6	435.3	03/31/83
23	627.9	670.6	210.3	30.5	158.6	23.0	1010.8	434.6	0.02	0.01	1010.8	434.6	03/31/83
21	628.0	670.7	210.3	30.5	151.7	22.0	1008.4	433.5	0.02	0.01	1008.4	433.5	03/31/83
18	633.0	679.8	206.8	30.0	151.7	22.0	1023.7	440.1	0.02	0.01	1023.7	440.1	03/31/83
20	638.0	688.7	210.3	30.5	151.7	22.0	1035.1	445.0	0.02	0.01	1035.1	445.0	03/31/83
19	638.9	690.4	213.7	31.0	151.7	22.0	1032.4	443.9	0.02	0.01	1032.5	443.9	02/31/83

Table 2
LIQUID 1.3 H BLEND SAMPLE 2128 CB
517.1 kPa Isobar
(75 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
2	351.1	172.3	513.7	74.5	355.1	51.5	106.7	45.9	0.10	0.04	106.8	45.9	03/31/83
3	362.2	192.2	517.1	75.0	351.6	51.0	128.7	55.3	0.10	0.04	128.8	55.4	03/31/83
4	377.4	219.6	517.1	75.0	355.1	51.5	160.4	69.0	0.10	0.04	160.5	69.0	03/31/83
5	404.6	268.7	520.6	75.5	358.5	52.0	218.8	94.1	0.10	0.05	218.9	94.1	03/31/83
1	436.8	326.6	515.4	74.8	317.2	46.0	288.8	124.2	0.09	0.04	288.9	124.2	03/29/83
2	449.3	349.1	513.7	74.5	337.8	49.0	316.1	135.9	0.10	0.04	316.2	135.9	03/29/83
3	465.9	378.9	517.1	75.0	344.7	50.0	353.5	152.0	0.10	0.04	353.6	152.0	03/29/83
5	482.1	408.1	517.1	75.0	344.7	50.0	391.7	168.4	0.10	0.04	391.8	168.4	03/29/83
6	490.4	423.0	517.1	75.0	344.7	50.0	411.2	176.8	0.10	0.04	411.3	176.8	03/29/83
7	516.6	470.2	517.1	75.0	151.7	22.0	474.6	204.0	0.02	0.01	474.6	204.1	03/29/83
10	542.6	517.0	517.1	75.0	393.0	57.0	532.4	228.9	0.12	0.05	532.5	228.9	03/29/83
11	549.3	529.1	517.1	75.0	386.1	56.0	551.7	237.2	0.12	0.05	551.8	237.3	03/29/83
12	554.5	538.5	520.1	75.4	386.1	56.0	562.4	241.8	0.12	0.05	562.5	241.9	03/29/83
13	560.3	548.8	513.8	75.3	386.1	56.0	578.7	248.8	0.12	0.05	578.9	248.9	03/29/83
14	563.5	554.6	513.8	75.3	389.6	56.5	586.3	252.1	0.12	0.05	586.4	252.1	03/29/83

Table 2 (continued)
LIQUID 1.3 H BLEND SAMPLE 2128 CB
517.1 kPa Isobar
(75 PSIA)

PUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
15	578.5	581.7	518.8	75.3	389.6	56.5	624.2	268.4	0.12	0.05	624.3	268.4	03/29/83
16	590.5	603.1	518.8	75.3	389.6	56.5	659.0	283.3	0.12	0.05	659.1	283.4	03/29/83
17	511.3	640.7	518.8	75.3	389.6	56.5	715.2	307.5	0.12	0.05	715.3	307.5	03/29/83
18	616.7	650.4	518.8	75.3	389.6	56.5	736.4	316.6	0.12	0.05	736.5	316.6	03/29/83

Table 3
LIQUID 1.3 H BLEND SAMPLE 2128 CB
723.9 kPa Isobar
(105 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	352.4	174.7	720.5	104.5	496.4	72.0	108.9	46.8	0.16	0.07	109.0	46.9	03/25/83
2	366.1	199.4	723.9	105.0	579.2	84.0	130.9	56.3	0.19	0.03	131.1	56.4	03/25/83
5	406.0	271.1	723.9	105.0	565.4	82.0	219.4	94.3	0.19	0.08	219.6	94.4	03/24/83
6	420.6	297.5	723.9	105.0	565.4	82.0	250.8	107.8	0.19	0.08	251.0	107.9	03/24/83
7	435.9	324.9	727.4	105.5	565.4	82.0	286.1	123.0	0.19	0.08	286.3	123.1	03/24/83
8	450.1	350.6	723.9	105.0	565.4	82.0	316.9	136.2	0.19	0.08	317.0	136.3	03/24/83
9	468.7	384.0	720.5	104.5	565.4	82.0	357.6	153.7	0.19	0.08	357.7	153.8	03/24/83
10	483.1	409.9	720.5	104.5	565.4	82.0	389.5	167.5	0.19	0.08	389.7	167.5	03/24/83
11	497.7	436.3	723.9	105.0	565.4	82.0	427.6	183.8	0.19	0.08	427.8	183.9	03/24/83
12	512.6	463.0	723.9	105.0	565.4	82.0	464.8	199.8	0.19	0.08	465.0	199.9	03/24/83
13	527.1	489.2	723.9	105.0	565.4	82.0	512.4	220.3	0.19	0.08	512.6	220.4	03/24/83
14	550.5	531.2	723.9	105.0	565.4	82.0	559.2	240.4	0.19	0.08	559.4	240.5	03/24/83
5	554.8	539.0	717.1	104.0	551.6	80.0	570.2	245.1	0.18	0.08	570.4	245.2	03/31/83
7	562.3	552.5	723.9	105.0	592.9	86.0	587.0	252.4	0.20	0.09	587.2	252.4	03/31/83
8	567.0	560.9	730.8	106.0	606.7	88.0	595.9	256.2	0.21	0.09	596.1	256.3	03/31/83

Table 3 (continued)
LIQUID 1.3 H BLEND SAME 2128 CB
723.9 kPa Isobar
(105 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	MO/DAY/YR
10	595.3	611.8	722.2	104.8	613.6	89.0	665.4	286.1	0.21	0.09	665.6	286.2	03/31/83
11	605.0	629.3	723.9	105.0	613.6	89.0	695.3	298.9	0.21	0.09	695.5	299.0	03/31/83
12	615.9	648.9	727.4	105.5	613.6	89.0	722.8	310.7	0.21	0.09	723.0	310.8	03/31/83

The important observation is that the qualitative appearance of the chromatograms indicate little or no breakdown of the components in the samples.

COLUMN CONDITIONS

Chart Speed	1
Zero	10
Attenuation	5
Auxillary Signal	A
Slope Sensitivity	0.1
Area Reject	300

TIME PROGRAMMING

<u>Time</u>		
0.2	Area Reject	99980000
1.2	Area Reject	300
30	Stop	
Oven Temperature	=	137 °C
Detector Temperature	=	300 °C
Injection Port Temperature	=	250 °C

Major peaks can be seen at retention times of 2.27, 3.05, 3.76, 5.42, and 5.67 minutes. These peaks remained relatively constant for samples taken throughout the data-gathering process.

TASK 3.1.4**PROCESS SOLVENT COLUMN REBOILER**

TASK 3.1.4 PROCESS SOLVENT COLUMN REBOILER

The sample 2093 CB furnished by ICRC is also known as "Original Charge Material." As requested by ICRC, data was taken along isobars of 206.8 and 275.8 kPa (30 and 40 psia) over a temperature range of 200-600 °F. To ensure accuracy and to avoid operational problems, data was taken along an isobar of 689.5 kPa (100 psia) to confirm low temperature liquid phase enthalpy values. Data for the sample 2903 CB is shown in Figure 1 and presented in Tables 1 through 3.

The column in the data table entitled "Corrected Enthalpy" is the enthalpy value of the sample relative to 65 °F and 1 atm pressure. The pressure corrections were made using the procedure outlined by Kesler and Lee (Hydrocarbon Processing, March 1976, pp. 153-158). For sample 2093 CB, the property values used were $T_c = 809$ K, $P_c = 2.555$ MPa, acentric factor = 0.55, and molecular weight = 224. The specific gravity (60 °F) was 1.0026, and the mid-boiling point of the sample was assumed to be 590 °F.

Chromatographic Analysis of the Process Solvent (Sample 2093 CB)

Chromatograms for the sample represented by the enthalpy data in this report were measured at various times during the data-gathering process to ensure that no significant changes occurred in the composition of the mixture under study. The analyses indicate that compositional stability was maintained throughout the data-gathering process. Figures 2 and 3 are included as

Figure 1

PROCESS SOLVENT, ORIG. CHARGE MAT. 2093 CB

Table 1
PROCESS SOLVENT, ORIGINAL CHARGE MATERIAL
SAMPLE 2093 CB
206.8 kPa Isobar

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	513.2	464.1	225.6	32.0	148.2	21.5	450.4	193.6	0.04	0.02	450.4	193.6	04/14/83
2	531.2	496.6	210.3	30.5	141.3	20.5	492.7	211.8	0.03	0.01	492.7	211.8	04/14/83
3	556.5	542.1	208.6	30.3	137.9	20.0	566.0	243.3	0.03	0.01	566.0	243.3	04/14/83
4	578.5	581.7	213.7	31.0	137.9	20.0	646.1	277.8	0.03	0.01	646.1	277.8	04/14/83
5	587.9	598.6	215.5	31.3	134.4	19.5	700.5	301.2	0.03	0.01	700.5	301.2	04/14/83
6	593.6	608.9	220.6	32.0	134.4	19.5	732.1	314.7	0.03	0.01	732.1	314.7	04/14/83
7	593.7	608.9	218.9	31.8	134.4	19.5	732.6	315.0	0.03	0.01	732.6	315.0	04/14/83
8	598.4	617.4	220.6	32.0	131.0	19.0	763.0	328.0	0.02	0.01	763.0	328.0	04/14/83
9	606.2	631.5	215.5	31.3	131.0	19.0	819.1	352.2	0.02	0.01	819.2	352.2	04/14/83
10	614.8	647.0	220.6	32.0	131.0	19.0	869.0	373.6	0.02	0.01	869.0	373.6	04/14/83
11	619.5	655.5	219.9	31.8	131.0	19.0	894.0	384.4	0.02	0.01	894.0	384.4	04/14/83
12	628.4	671.5	222.4	32.3	131.0	19.0	939.7	404.0	0.02	0.01	939.7	404.0	04/14/83
13	635.1	683.5	218.9	31.8	131.0	19.0	974.4	418.9	0.02	0.01	974.4	418.9	04/14/83
14	646.3	703.6	231.0	33.5	131.0	19.0	1018.4	437.8	0.02	0.01	1018.4	437.8	04/14/83

Table 2
PROCESS SOLVENT, ORIGINAL CHARGE MATERIAL
SAMPLE 2093 CB
275.8 kPa Isobar

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
12	593.6	608.8	284.4	41.3	165.5	24.0	679.1	291.9	0.05	0.02	679.1	292.0	04/12/83
13	601.7	623.3	293.0	42.5	165.5	24.0	714.4	307.1	0.05	0.02	714.4	307.1	03/12/83
14	611.5	641.0	289.6	42.0	162.0	23.5	767.8	330.1	0.05	0.02	767.9	330.1	03/12/83
15	617.4	651.6	289.6	42.0	165.5	24.0	804.8	346.0	0.05	0.02	804.9	346.0	03/12/83
14	618.0	652.8	279.2	40.5	165.5	24.0	811.5	348.9	0.05	0.02	811.5	348.9	04/07/83
15	622.4	660.7	279.2	40.5	165.5	24.0	844.4	363.0	0.05	0.02	844.5	363.1	04/07/83
16	623.7	662.9	291.3	42.3	165.5	24.0	848.1	364.6	0.05	0.02	848.1	364.6	04/12/83
16	627.6	670.1	279.2	40.5	165.5	24.0	877.8	377.4	0.05	0.02	877.8	377.4	04/07/83
16	632.3	678.5	279.2	40.5	137.9	20.0	921.4	396.1	0.03	0.01	921.4	396.1	04/14/83
17	633.2	680.1	279.2	40.5	165.5	24.0	911.9	392.1	0.05	0.02	912.0	392.1	04/07/83
17	636.3	685.7	289.6	42.0	165.5	24.0	932.8	401.0	0.05	0.02	932.9	401.1	03/12/83
18	636.7	686.4	275.8	40.0	165.5	24.0	927.1	398.6	0.05	0.02	927.2	398.6	04/07/83
17	637.5	687.8	281.0	40.8	137.9	20.0	945.5	406.5	0.03	0.01	945.6	406.5	04/14/83
18	645.4	702.1	289.6	42.0	137.9	20.0	979.7	421.2	0.03	0.01	979.8	421.2	04/14/83

Table 2 (continued)
PROCESS SOLVENT, ORIGINAL CHARGE MATERIAL
SAMPLE 2093 CB
275.8 kPa Isobar

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
3	444.5	340.4	262.7	41.0	172.4	25.0	300.9	129.4	0.06	0.03	301.0	129.4	04/07/83
2	488.6	419.8	346.5	50.3	199.9	29.0	398.4	171.3	0.08	0.03	398.5	171.3	04/12/83
6	489.9	422.1	289.6	42.0	172.4	25.0	396.2	170.3	0.06	0.03	396.2	170.4	04/07/83
3	489.9	422.2	282.7	41.0	165.5	24.0	399.8	171.9	0.05	0.02	399.8	171.9	04/12/83
4	497.5	436.6	277.5	40.3	165.5	24.0	417.0	179.3	0.05	0.02	417.0	179.3	04/12/83
7	504.2	447.9	232.7	41.0	165.5	24.0	430.6	185.1	0.05	0.02	430.6	185.1	03/07/83
8	517.2	471.3	279.2	40.5	165.5	24.0	464.3	199.6	0.05	0.02	464.3	199.6	03/07/83
6	530.0	494.4	282.7	41.0	165.5	24.0	496.5	213.5	0.05	0.02	496.6	213.5	04/12/83
9	538.2	509.1	279.2	40.5	172.4	25.0	511.8	220.0	0.06	0.03	511.9	220.1	04/07/83
7	547.2	525.2	286.1	41.5	165.5	24.0	538.6	231.6	0.05	0.02	538.7	231.6	04/12/83
8	556.0	541.1	282.7	41.0	165.5	24.0	560.9	241.2	0.05	0.02	561.0	241.2	04/12/83
10	563.6	554.8	275.8	40.0	165.5	24.0	583.9	251.0	0.05	0.02	584.0	251.1	03/07/83
9	568.7	562.6	286.1	41.5	165.5	24.0	592.4	254.7	0.05	0.02	592.5	254.7	04/12/83
10	574.5	574.4	289.6	42.0	165.5	24.0	616.9	265.2	0.05	0.02	617.0	265.2	04/12/83
11	576.8	578.5	284.4	41.3	165.5	24.0	620.7	266.9	0.05	0.02	620.8	266.9	04/12/83

Table 3
PROCESS SOLVENT, ORIGINAL CHARGE MATERIAL
SAMPLE 2093 CB
689.5 kPa Isobar

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
2	342.3	156.5	680.9	98.8	372.3	54.0	87.3	37.5	0.22	0.10	87.5	37.6	04/19/83
3	356.2	181.4	687.8	99.8	393.0	57.0	111.4	47.9	0.24	0.10	111.7	48.0	04/19/83
1	377.1	219.2	691.2	100.3	366.3	52.3	150.6	64.8	0.21	0.09	150.8	64.8	04/19/83
4	409.1	276.7	689.5	100.0	393.0	57.0	221.8	95.4	0.24	0.10	222.1	95.5	04/19/83
5	441.7	335.3	684.3	99.3	399.9	58.0	296.3	127.4	0.24	0.11	296.5	127.5	04/19/83
6	465.2	377.7	699.8	101.5	406.8	59.0	348.1	149.7	0.25	0.11	348.4	149.8	04/19/83
1	481.6	407.2	351.6	51.0	179.3	26.0	382.9	164.6	0.06	0.03	383.0	164.6	04/12/83
7	491.6	425.3	689.5	100.0	420.6	61.0	410.2	176.3	0.26	0.11	410.4	176.5	04/19/83

illustrative examples. The important observation is that the qualitative appearance of the chromatograms indicate little or no breakdown of the components in the samples.

COLUMN CONDITIONS

Chart Speed	1
Zero	10
Attenuation	5
Auxillary Signal	A
Slope Sensitivity	0.1
Area Reject	300

TIME PROGRAMMING

<u>Time</u>		
0.2	Area Reject	99980000
1.2	Area Reject	300
30	Stop	

Oven Temperature	= 137 °C
Detector Temperature	= 300 °C
Injection Port Temperature	= 250 °C

The major peaks occur at 2.27, 3.03, and 3.73 minutes. Qualitatively, these peaks remain constant relative to one another as shown by the two chromatograms presented here. A few minor peaks with retention times in the range of 8.5 to 16 minutes are seen to diminish or disappear in the chromatogram for the charge sample taken towards the end of the data-gathering process as compared to the chromatogram for the original material. However, these peaks are for very minor constituents.

Figure 2

152

Figure 3

TASK 3.2.1**700-750°F DISTILLATION CUT**

NOTE: Data for Task 3.1.1 "HP Flash Bottoms" are also presented in this section.

TASK 3.2.1 V-110 BOTTOMS, ORIGINAL CHARGE MATERIAL AND 700-750 °FDISTILLATION CUT SAMPLES

The results of the enthalpy measurements for the V-110 bottoms, original charge for the 700-650 °F distillation cut (sample no. 2125 CB-8) are presented in this section. Due to the nature of these samples, it was necessary to obtain enthalpy data using a differential scanning calorimeter (DSC). The samples are solids at room temperature; therefore, it is not feasible to run them in the flow calorimeter without drastic equipment modifications. The differential scanning calorimeter, however, is well suited to measuring values for solid and liquid samples. Unfortunately, it cannot be used for samples in the vapor phase.

The two samples were scanned over a temperature range of 230-540 K. The 600-650 °F distillation cut sample, previously investigated by flow calorimetry, was also scanned, but over the temperature range of 230-420 K. This was done in order to provide a comparison of the DSC technique with the flow calorimetry technique for measuring enthalpy values.

The DSC method gives heat capacity values over scanned temperature ranges. For data-taking purposes, these ranges are divided into separate scan intervals of about 70 K each. Therefore, the total temperature range for the data is comprised of individual data sets for each interval. These data sets are pieced together to obtain the final results.

The apparatus and instrumentation of the DSC prohibit scanning a sample at high temperatures; specifically a sample which vaporizes. The samples are

encapsulated, but not sealed; and therefore, loss by evaporation is possible. Any significant loss not only results in poor heat capacity measurements, but also has a damaging effect on the calorimeter. For these reasons, an upper limit of 540 K (512 °F) was set for both samples (the 600-650 °F cut sample measurements were only carried out to 420 K). This upper limit was found satisfactory for the V-110 bottoms sample; however, the 700-750 °F distillation cut sample experienced a weight loss of about 10% at some point during the scanning process.

A simulated gas chromatography distillation was done on the 700-750 °F distillation cut to determine how much, if any, of the sample boils below 700 °F. Similarly, one was done for the 600-650 °F cut. The results show that about 37% of the 700-750 °F sample boils below 700 °F (the boiling point begins at 636 °F). The 600-650 °F cut also showed a large portion of pre-600 °F boiling components (The boiling point begins at 528 °F). The results for the former, the 700-750 °F cut, seem to account for the observed loss of sample experienced during DSC measurements.

Data Reduction Procedure

Heat capacity values were taken every 2 K over each temperature interval for each sample. The values for the 700-750 °F distillation cut sample in the 263 to 332 K range were found to be invalid due to the occurrence of a phase transition. The 600-650 °F cut also exhibited a phase transition, but it occurred before the reference point of 291.48 K (65 °F). The V-110 bottoms sample posed no problems over the entire range of interest.

The heat capacity values were for each temperature interval with second-order polynomials by the method of least squares. The heat capacity values and their "best-fit" polynomials are presented graphically for each sample. The resulting polynomials were each integrated to give equations for enthalpy change over the temperature interval for which each polynomial applies. These enthalpies were then pieced together starting at the reference temperature of 65 °F (291.48 K). The 700-750 °F distillation cut sample posed a slight problem as the reference temperature normally used (65 °F) was found to occur in the middle of a phase transition peak. The method by which this problem was handled will be mentioned later.

Results

600-650 °F Distillation Cut. The equations for enthalpy as a function of temperature are presented below. The equations are given in three sets of units with the reference point at 65 °F. As mentioned previously, each equation applies to a specific temperature range. Comparison is made below for enthalpy values generated by these equations with values recorded by flow calorimetry and presented in the Quarterly Progress Report for January-March 1983.

Inlet T _{emp} (K)	Enthalpy Values				Deviation	
	kJ/kg		Btu/lb		Btu/lb	%
	DSC	Flow	DSC	Flow		
379.4	155.8	144.7	66.95	62.2	4.75	7.1
390.2	178.8	166.2	76.00	71.4	4.60	6.4
402.2	200.5	192.1	86.21	82.6	3.61	4.2
404.7	205.5	196.9	88.31	84.6	3.71	4.2
418.5	233.5	225.1	100.3	96.8	3.50	3.5

It must be mentioned that the process of referencing the DSC enthalpy values to 65 °F (291.48 K) may involve some error. Since a phase transition was found to occur immediately prior to 291 K, it is possible that this transition may not have been entirely over at 291.48 K. A second problem was the extrapolation of the heat capacity polynomial which applies above 300 K back to 291.48 K in order to make the reference enthalpy 291.48 K. This extrapolation procedure may well involve some error.

Enthalpy and Heat Capacity Equations

300-360 K Interval

Heat Capacity (T in K):

$$C_p \text{ (cal/g-K)} = 0.0711702 + 0.0012194T - 0.0000005T^2$$

Enthalpy:

(T in K)

$$H \text{ (cal/g)} = -68.418 + 0.071170T + 0.00060970T^2 - 0.000000167T^3$$

$$H \text{ (kJ/kg)} = -286.45 + 0.29797T + 0.0025527T^2 - 6.992 \times 10^{-7}T^3$$

(T in °F)

$$H \text{ (Btu/lb)} = -23.871 + 0.34990T + 0.00026765T^2 - 5.154 \times 10^{-8}T^3$$

DSC HEAT CAPACITY DATA
600-650 F DISTILLATION CUT

600-650 F DISTILLATION CUT (DSC DATA)

360-420 K Interval

Heat Capacity (T in K):

$$C_p(\text{cal/g-K}) = -0.0486252 + 0.0019098T - 0.0000015 T^3$$

Enthalpy:

(T in K)

$$H(\text{cal/g}) = -54.493 - 0.048625T + 0.00095490T^2 - 0.0000005T^3$$

$$H(\text{kJ/kg}) = -228.15 - 0.20358T + 0.0039980T^2 - 2.093 \times 10^{-6} T^3$$

(T in °F)

$$H(\text{Btu/lb}) = -23.332 + 0.34126T + 0.00031769T^2 - 1.543 \times 10^{-7} T^3$$

700-750 °F Distillation Cut. Due to the occurrence of a phase transition in the temperature region of 263-332 K, the heat capacities values in this region are invalid. As a result, the usual reference point of 291.48 K (65 °F) could not be used for enthalpy calculations and the reference point used for this example was 334 K (141.5 °F).

Enthalpy and Heat Capacity Equations334-360 K Interval

Heat Capacity (T in K):

$$C_p(\text{cal/g-K}) = 0.73848 - 0.0023034T + 0.0000042T^2$$

Enthalpy:

(T in K)

$$H(\text{cal/g}) = -170.34 + 0.73848T - 0.0011517T^2 + 0.0000014T^3$$

$$H(\text{kJ/kg}) = -713.18 + 3.0919T - 0.0048219T^2 + 0.00000586T^3$$

(T in °F)

$$H(\text{Btu/lb}) = -60.385 + 0.42416T - 0.000043970 T^2 + 4.321 \times 10^{-7} T^3$$

360-420 K Interval

Heat Capacity (T in K):

$$C_p(\text{cal/g-K}) = 0.73967 - 0.0020974T + 0.0000036T^2$$

Enthalpy:

(T in K)

$$H(\text{cal/g}) = -174.79 + 0.73967T - 0.0010487T^2 + 0.0000012T^3$$

$$H(\text{kJ/kg}) = -731.81 + 3.0969T - 0.0043907T^2 + 0.00000502T^3$$

(T in °F)

$$H(\text{Btu/lb}) = -61.752 + 0.43883T - 0.000071872T^2 + 3.704 \times 10^{-7} T^3$$

420-480 K Interval

Heat Capacity (T in K):

$$C_p(\text{cal/g-K}) = -0.0535224 + 0.0019956T - 0.0000017T^2$$

Enthalpy:

(T in K)

$$H(\text{cal/g}) = -71.760 - 0.05352T + 0.00099780T^2 - 5.667 \times 10^{-7}T^3$$

$$H(\text{kJ/kg}) = -300.44 - 0.22408T + 0.0041776T^2 - 0.00000237T^3$$

(T in °F)

$$H(\text{Btu/lb}) = -53.626 + 0.34523T + 0.00031314T^2 - 1.749 \times 10^{-7}T^3$$

480-540 K Interval

Heat Capacity (T in K):

$$C_p(\text{cal/g-K}) = 0.0342615 + 0.0015958T - 0.0000012T^2$$

Enthalpy:

(T in K)

$$H(\text{cal/g}) = -86.274 + 0.034262T + 0.00079790T^2 - 4.00 \times 10^{-7}T^3$$

$$H(\text{kJ/kg}) = -361.21 + 0.14345T + 0.0033406T^2 - 0.00000168T^3$$

(T in °F)

$$H(\text{Btu/lb}) = -57.869 + 0.36353T + 0.00027303T^2 - 1.235 \times 10^{-7}T^3$$

V-110 Bottoms, Original Charge Material. The V-110 sample posed no problems for the DSC technique. The enthalpy fits were therefore referenced to 65 °F. Unlike the 600-650 °F distillation cut where the heat capacity

DSC HEAT CAPACITY DATA
700-750 F DISTILLATION CUT

700-750 F DISTILLATION CUT (DSC DATA)

polynomial for the interval of 300-360 K had to be extrapolated back to 291.48 K (65 °F) for the purpose of referencing the enthalpy values, this sample had reliable heat capacity data surrounding the reference temperature. Consequently, no extrapolations were necessary.

Enthalpy and Heat Capacity Equations:

291.48-300 K Interval

Heat Capacity (T in K):

$$C_p(\text{cal/g-K}) = -0.9511978 + 0.0084395T - 0.0000133T^2$$

Enthalpy:

(T in K)

$$H(\text{cal/g}) = 28.531 - 0.95120T + 0.0042198T^2 - 4.4333 \times 10^{-6}T^3$$

$$H(\text{kJ/kg}) = 119.45 - 3.982T + 0.017667T^2 - 1.8561 \times 10^{-5}T^3$$

(T in °F)

$$H(\text{Btu/lb}) = -23.417 + 0.33669T + 0.00045745T^2 - 1.3683 \times 10^{-6}T^3$$

300-360 K Interval

Heat Capacity (T in K):

$$C_p(\text{cal/g-K}) = 0.831985 - 0.0032748T + 0.0000060T^2$$

Enthalpy:

(T in K)

$$H(\text{cal/g}) = -152.98 + 0.83199T - 0.0016374T^2 + 0.000002T^3$$

$$H(\text{kJ/kg}) = -640.50 + 3.4834T - 0.0068555T^2 + 8.3736 \times 10^{-6}T^3$$

(T in °F)

$$H(\text{Btu/lb}) = -25.183 + 0.38698T - 0.000058434T^2 + 6.1728 \times 10^{-7}T^3$$

360-420 K Interval

Heat Capacity (T in K):

$$C_p(\text{cal/g-K}) = 0.237636 + 0.0003821T + 0.0000004T^2$$

Enthalpy:

(T in K)

$$H(\text{cal/g}) = -88.888 + 0.23764T + 0.0001911T^2 + 0.000000133T^3$$

$$H(\text{kJ/kg}) = -372.16 + 0.99495T + 0.0008001T^2 + 5.5684 \times 10^{-7}T^3$$

(T in °F)

$$H(\text{Btu/lb}) = -24.342 + 0.36226T + 0.00016278T^2 + 4.1049 \times 10^{-8}T^3$$

420-480 K Interval

Heat Capacity (T in K):

$$C_p(\text{cal/g-K}) = 0.0229454 + 0.0015328T - 0.0000012T^2$$

Enthalpy:

(T in K)

$$H(\text{cal/g}) = -60.710 + 0.022945T + 0.0007664T^2 - 0.0000004T^3$$

$$H(\text{kJ/kg}) = -254.18 + 0.096066T + 0.0032088T^2 - 1.6747 \times 10^{-6}T^3$$

(T in °F)

$$H(\text{Btu/lb}) = -20.754 + 0.33612T + 0.00025553T^2 - 1.2346 \times 10^{-7}T^3$$

480-540 K Interval

Heat Capacity (T in K):

$$C_p(\text{cal/g-K}) = 1.563826 - 0.0043166T + 0.0000044T^2$$

Enthalpy:

(T in K)

$$H(\text{cal/g}) = -332.92 + 1.5638T - 0.003258T^2 + 0.00000147T^3$$

$$H(\text{kJ/kg}) = -1393.9 + 6.5473T - 0.0090351T^2 + 6.1546 \times 10^{-6}T^3$$

(T in °F)

$$H(\text{Btu/lb}) = -89.685 + 0.74921T - 0.00057324T^2 + 4.5370 \times 10^{-7}T^3$$

DCS HEAT CAPACITY DATA
V-110 BOTTOMS, ORIGINAL CHARGE MATERIAL

V-110 BOTTOMS (DSC DATA)

TASK 3.2.2**600-650° F DISTILLATION CUT**

TASK 3.2.2 600-650 °F DISTILLATION CUT

The 600-650 °F cut (sample 2093 CB-6) was supplied by ICRC and measurements were to be made along isobars of 1500 and 100 psia over a temperature range of 500-750 °F. When no phase change was detected at the requested pressures, additional data was collected at a pressure of 60 psia. However, no phase change was detected. Data for the sample 2093 CB-67 was taken along isobars of 344.75, 689.5, and 10342.5 kPa (60, 100, and 1500 psia) over a temperature range of 375 to 675 K (215-750 °F). Data for sample 2093 CB-6 is illustrated in Figure 1 and presented in Tables 1 through 3.

The column in the data table entitled "Corrected Enthalpy" is the enthalpy value of the sample relative to 65 °F and 1 atm pressure. The pressure corrections were made using the procedure outlined by Kesler and Lee (Hydrocarbon Processing, March 1976, pp. 153-158). The parameters for sample 2093 CB-6 were $T_c = 833$ K, $P_c = 2.486$ MPa, acentric factor = 0.57, and molecular weight = 236. The specific gravity of the sample 60 °F was 1.0264 and the mid-boiling point of the fraction was taken as the mid-boiling point of the cut, 625 °F.

Chromatographic Analysis of 600-650 °F Cut Sample 2093 CB-6

Chromatograms for the sample represented by the enthalpy data in this report were measured at various times during the data-gathering process to ensure that no significant changes occurred in the composition of the mixture under study. The analyses indicate that compositional stability was maintained

Figure 1

600-650F DISTILLATION CUT SAMPLE 2093 CB-6

Table 1
 ENTHALPY DATA FOR 600 - 650 F
 DISTILLATION CUT

SAMPLE 2093 CB-6

413.7 KPa (60 psia)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	572.8	571.3	413.7	60.0	220.6	32.0	586.9	252.3	0.10	0.04	587.0	252.4	1/13/83
2	576.9	578.8	406.8	59.0	208.6	30.3	601.3	258.5	0.09	0.04	601.4	258.5	1/13/83
3	603.2	626.2	413.7	60.0	220.6	32.0	670.5	288.3	0.10	0.04	670.6	288.3	1/13/83
4	615.6	648.4	427.5	62.0	208.6	30.3	688.1	295.8	0.09	0.04	688.2	295.9	1/13/83
5	625.6	666.4	420.6	61.0	220.6	32.0	728.6	313.2	0.10	0.04	728.7	313.3	1/13/83
6	635.6	684.3	417.1	60.5	213.7	31.0	753.6	324.0	0.09	0.04	753.7	324.0	1/13/83
7	645.6	702.4	413.7	60.0	206.8	30.0	778.5	334.7	0.09	0.04	778.6	334.8	1/13/83
8	656.6	722.2	406.8	59.0	206.8	30.0	819.6	352.4	0.09	0.04	819.7	352.4	1/13/83

Table 2

ENTHALPY DATA FOR 600 -650 F
DISTILLATION CUT

SAMPLE 2093 CB-6

689.5 KPa (100 psia)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	379.4	223.2	692.9	100.5	455.1	66.0	144.7	62.2	0.29	0.13	145.0	62.4	1/18/83
2	390.2	242.7	692.9	100.5	441.3	64.0	166.2	71.4	0.28	0.12	166.5	71.6	1/18/83
1	402.2	264.3	686.0	99.5	402.6	70.0	192.1	82.6	0.32	0.14	192.4	82.7	1/25/83
3	404.7	268.7	692.9	100.5	427.5	62.0	196.9	84.6	0.27	0.12	197.1	84.8	1/18/83
4	418.5	293.6	696.4	101.0	427.5	62.0	225.1	96.8	0.27	0.12	225.4	96.9	1/18/83
5	432.2	313.3	692.9	100.5	427.5	62.0	255.3	109.7	0.27	0.12	255.5	109.9	1/18/83
6	464.3	376.1	686.0	99.5	358.5	52.0	326.3	140.3	0.21	0.09	326.5	140.4	1/18/83
7	495.8	432.8	689.5	100.0	420.6	61.0	396.0	170.2	0.26	0.11	396.2	170.3	1/18/83
8	509.4	457.2	691.2	100.3	358.5	52.0	428.4	184.2	0.21	0.09	428.7	184.3	1/18/83
9	527.5	489.8	696.4	101.0	358.5	52.0	470.4	202.3	0.21	0.09	470.7	202.3	1/18/83
10	531.5	497.0	692.9	100.5	358.5	52.0	480.1	206.4	0.21	0.09	480.3	206.5	1/18/83
11	540.7	513.5	692.9	100.5	358.5	52.0	500.7	215.2	0.21	0.09	500.9	215.3	1/18/83
12	549.7	529.8	689.5	100.0	351.6	51.0	526.7	226.4	0.21	0.09	526.9	226.5	1/18/83
11	553.3	536.2	689.5	100.0	551.6	80.0	526.0	226.1	0.37	0.16	526.4	226.3	1/13/83
13	557.7	544.1	692.9	100.5	351.6	51.0	543.9	233.9	0.21	0.09	544.2	233.9	1/18/83

Table 2 (continued)

ENTHALPY DATA FOR 600 -650 F
DISTILLATION CUT

SAMPLE 2093 CB-6

689.5 KPa (100 psia)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
12	566.9	560.8	696.4	101.0	551.6	80.0	577.8	248.4	0.37	0.16	578.2	248.6	1/13/83
14	572.8	571.3	689.5	100.0	351.6	51.0	583.5	250.9	0.21	0.09	583.7	250.9	1/18/83
13	575.1	575.5	689.5	100.0	558.5	81.0	588.2	252.9	0.38	0.16	588.6	253.1	1/13/83
15	588.5	599.6	692.9	100.5	620.5	90.0	631.2	271.4	0.43	0.19	631.6	271.5	1/13/83
14	589.2	600.8	696.4	101.0	586.1	85.0	625.2	268.8	0.40	0.17	625.6	269.0	1/13/83
16	598.3	617.3	668.8	97.0	427.5	62.0	653.1	280.8	0.27	0.12	653.4	280.9	1/13/83
17	599.3	619.1	689.5	100.0	496.4	72.0	644.0	276.9	0.33	0.14	644.3	277.0	1/13/83
18	610.3	638.8	694.6	100.8	524.0	76.0	669.2	287.7	0.35	0.15	669.6	287.9	1/13/83
19	617.2	651.2	682.6	99.0	496.4	72.0	707.3	304.1	0.33	0.14	707.6	304.2	1/13/83
15	620.2	656.8	682.6	99.0	351.6	51.0	706.5	303.8	0.21	0.09	706.7	303.8	1/18/83

Table 3
ENTHALPY DATA FOR 600 -650 F
DISTILLATION CUT

SAMPLE 2093 CB-6
10342 KPa (1500 psia)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
2	429.2	312.9	10342.1	1500.0	10066.3	1460.0	240.8	103.5	8.25	3.55	249.0	107.1	1/20/83
3	444.5	340.4	10355.5	1502.0	10080.1	1462.0	271.6	116.8	8.26	3.55	279.9	120.3	1/20/83
2	471.9	385.8	10342.1	1500.0	10245.6	1486.0	333.3	143.3	8.40	3.61	341.7	146.9	1/25/83
1	494.7	430.8	10342.1	1500.0	10156.0	1473.0	391.9	168.5	8.32	3.58	400.2	172.1	1/27/83
3	495.3	431.8	10383.5	1506.0	10245.6	1486.0	390.1	167.7	8.40	3.61	398.5	171.3	1/25/83
4	509.6	451.7	10342.1	1500.0	10183.6	1477.0	421.7	181.3	8.34	3.59	430.1	184.9	1/25/83
3	511.9	461.7	10342.1	1500.0	10121.5	1468.0	433.9	186.5	8.29	3.57	442.2	190.1	1/27/83
4	522.2	480.3	10328.3	1498.0	10100.0	1465.0	450.0	193.5	8.28	3.56	458.3	197.0	1/27/83
5	522.5	480.7	10342.1	1500.0	10176.7	1476.0	451.4	194.1	8.34	3.59	459.7	197.6	1/25/83
5	532.1	498.0	10328.3	1498.0	10107.7	1466.0	476.8	205.0	8.28	3.56	485.1	208.5	1/27/83
7	575.8	576.7	10287.0	1492.0	10204.2	1480.0	582.2	250.3	8.36	3.59	590.5	253.9	1/27/83
9	587.6	597.9	10259.4	1488.0	10162.9	1474.0	617.9	265.6	8.33	3.58	626.2	269.2	1/27/83
10	598.1	616.9	10342.1	1500.0	10204.2	1480.0	640.0	275.1	8.36	3.59	648.3	278.7	1/27/83
12	600.0	620.3	10342.1	1500.0	10190.5	1473.0	651.6	280.1	8.35	3.59	659.9	283.7	1/27/83
13	624.3	664.0	10376.6	1505.0	10200.1	1491.0	714.8	307.3	8.42	3.62	723.2	310.9	1/27/83

Table 3 (continued)

ENTHALPY DATA FOR 600 - 650 F
DISTILLATION CUT

SAMPLE 2093 CB-6

10342 KPa (1500 psia)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
14	619.4	655.3	10342.1	1500.0	10190.5	1478.0	687.6	295.6	8.35	3.59	695.9	299.2	1/27/83

throughout the data-gathering process. Figures 2 and 3 are example chromatograms. The important observation is that the qualitative appearance of the chromatograms indicate little to no breakdown of the components in the samples.

COLUMN CONDITIONS

Chart Speed	1
Zero	10
Attenuation	5
Auxillary Signal	A
Slope Sensitivity	0.1
Area Reject	300

TIME PROGRAMMING

<u>Time</u>		
0.2	Area Reject	99980000
1.2	Area Reject	300
25	Stop	

Oven Temperature	= 170 °C
Detector Temperature	= 300 °C
Injection Port Temperature	= 250 °C

The chromatograms for the 600-650 °F distillation cut follow. A qualitative inspection of these chromatograms show that no noteworthy compositional changes occurred for the calorimeter charge. The peak at 1.13 minutes is the methylene chloride peak while those at 7.71, 11.14, 11.39, 16.55, and 24.67 minutes are due to the principal components of the sample. As seen in the successive chromatograms, the relative sizes of these peaks remain constant.

Figure 2
600-650 CUT
(Original Material)

TASK 3.2.3**500-550° F DISTILLATION CUT**

TASK 3.2.3 500-550 °F DISTILLATION CUT

As requested by ICRC, data was taken along isobars of 689.5 and 10342.1 kPa (100 and 1500 psia) for the 500-550 °F cut (sample 2093 CB-4), furnished by ICRC. However, no phase change was detected and additional data was taken along an isobar of 206.8 kPa (30 psia). Data for sample 2093 CB-4 was taken along isobars of 206.8, 689.5, and 10342.1 kPa over a temperature range of 350 to 675 K. The data is illustrated in Figure 1 and presented in Tables 1 through 3.

The column in the data table entitled "Corrected Enthalpy" is the enthalpy value of the sample relative to 65 °F and 1 atm pressure. The pressure corrections were made using the procedure outlined by Kesler and Lee (Hydrocarbon Processing, March 1976, pp. 153-158). The following parameters were used for sample 2093 CB-4: $T_c = 1390^\circ\text{R}$, $P_c = 27.0 \text{ atm}$, acentric factor = 0.49, and molecular weight = 196.

Chromatographic Analysis for 500-550 °F Cut Sample 2093 CB-4. Chromatograms for the two samples represented by the enthalpy data in this report were measured at various times during the data-gathering process to ensure that no significant changes occurred in the composition of the mixture under study. The analyses indicate that compositional stability was maintained throughout the data-gathering process. Figures 2 and 3 are example chromatograms. The important observation is that the qualitative appearance of the chromatograms indicate little or no breakdown of the components in the samples.

Figure 1

ENTHALPY OF 500 - 550°F DISTILLATION CUT
SAMPLE 2093 CB-4 TASK 3.2.3

TABLE 1
 ENTHALPY DATA FOR 500 - 550⁰F DISTILLATION CUT
 SAMPLE 2093 CB-4 TASK 3.2.3
 206.8 KPa (30 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
4	400.2	260.8	206.8	30.0	110.3	16.0	203.5	87.5	0.01	0.00	203.6	87.5	12/15/82
2	420.9	298.0	206.8	30.0	124.1	18.0	253.4	108.9	0.02	0.01	253.4	108.9	12/14/82
3	443.4	338.5	210.3	30.5	124.1	18.0	310.9	133.7	0.02	0.01	310.9	133.7	12/14/82
4	483.9	411.3	213.7	31.0	131.0	19.0	398.0	171.1	0.02	0.01	398.0	171.1	12/14/82
5	498.6	437.7	210.3	30.5	124.1	18.0	433.6	186.4	0.02	0.01	433.6	186.4	12/14/82
6	520.4	491.5	206.8	30.0	124.1	18.0	506.0	217.9	0.02	0.01	506.8	217.9	12/14/82
1	534.6	502.6	210.3	30.5	113.8	16.5	525.9	226.1	0.01	0.00	526.0	226.1	12/17/82
6	541.5	515.0	208.6	30.3	110.3	16.0	541.9	233.0	0.01	0.00	541.9	233.0	12/15/82
2	545.3	521.5	208.6	30.3	117.2	17.0	552.1	237.4	0.01	0.01	552.1	237.4	12/17/82
7	546.1	523.2	208.6	30.3	110.3	16.0	553.2	237.8	0.01	0.00	553.2	237.8	12/15/82
3	554.8	538.9	210.3	30.5	117.2	17.0	577.3	248.2	0.01	0.01	577.3	248.2	12/17/82
8	555.9	541.0	206.8	30.0	110.3	16.0	588.7	253.1	0.01	0.00	588.7	253.1	12/15/82
4	561.7	551.3	208.6	30.3	117.2	17.0	600.0	258.0	0.01	0.01	600.0	258.0	12/17/82
5	568.3	563.2	206.8	30.0	117.2	17.0	619.5	266.3	0.01	0.01	619.5	266.3	12/17/82
6	575.2	575.8	206.8	30.0	117.2	17.0	643.8	276.8	0.01	0.01	643.9	276.8	12/17/82

TABLE 1
 ENTHALPY DATA FOR 500 - 550°F DISTILLATION CUT
 SAMPLE 2093 CB-4 TASK 3.2.3
 206.8 KPa (30 PSIA) (continued)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
7	578.2	581.1	206.8	30.0	117.2	17.0	667.5	287.0	0.01	0.01	667.5	287.0	12/17/82
8	580.2	584.8	206.8	30.0	117.2	17.0	693.0	297.9	0.01	0.01	693.0	297.9	12/17/82
9	581.7	587.1	206.8	30.0	117.2	17.0	711.5	305.9	0.01	0.01	711.5	305.9	12/17/82
10	582.7	589.1	206.8	30.0	117.2	17.0	736.2	316.5	0.01	0.01	736.2	316.5	12/17/82
11	582.8	589.4	206.8	30.0	117.2	17.0	791.6	340.3	0.01	0.01	791.6	340.3	12/17/82
12	583.2	590.1	205.1	29.9	117.2	17.0	835.8	359.3	0.01	0.01	835.8	359.3	12/17/82
13	583.6	590.9	203.4	29.5	117.2	17.0	894.7	384.7	0.01	0.01	894.7	384.7	12/17/82
7	584.1	591.6	206.8	30.0	131.0	19.0	868.8	373.5	0.02	0.01	868.8	373.5	12/14/82
9	585.2	593.7	206.8	30.0	131.0	19.0	904.1	388.7	0.02	0.01	904.1	388.7	12/14/82
8	586.6	596.2	206.8	30.0	124.1	18.0	925.8	398.0	0.02	0.01	925.8	398.0	12/14/82
14	591.9	605.6	203.4	29.5	117.2	17.0	941.7	404.8	0.01	0.01	941.7	404.8	12/14/82
10	598.7	618.0	206.8	30.0	131.0	19.0	956.0	411.0	0.02	0.01	956.0	411.0	12/14/82
11	604.0	627.5	206.8	30.0	131.0	19.0	965.4	415.1	0.02	0.01	965.4	415.1	12/14/82
12	612.0	642.0	206.8	30.0	131.0	19.0	985.5	423.7	0.02	0.01	985.5	423.7	12/14/82
15	613.3	644.3	203.4	29.5	117.2	17.0	984.5	423.3	0.01	0.01	984.5	423.3	12/17/82

TABLE 1
 ENTHALPY DATA FOR 500 - 550⁰F DISTILLATION CUT
 SAMPLE 2093 CB-4 TASK 3.2.3
 206.8 KPa (30 PSIA) (continued)

ROW	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
13	621.5	659.1	206.8	30.0	124.1	18.0	1007.6	433.2	0.02	0.01	1007.6	433.2	12/14/82
16	631.4	674.8	203.4	29.5	117.2	17.0	1028.7	442.3	0.01	0.01	1028.7	442.3	12/17/82
17	646.9	704.7	203.4	29.5	117.2	17.0	1068.1	459.2	0.01	0.01	1068.2	459.2	12/17/82

TABLE 2
 ENTHALPY DATA FOR 500 - 550°F DISTILLATION CUT
 SAMPLE 2093 CB-4 TASK 3.2.3
 689.5 KPa (100 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	363.8	195.1	689.5	100.0	448.2	65.0	136.5	58.7	0.27	0.12	136.7	58.8	12/16/82
3	371.3	208.8	691.2	100.3	489.5	71.0	147.3	63.3	0.31	0.13	147.6	63.5	12/16/82
2	372.8	211.3	689.5	100.0	461.9	67.0	154.1	66.3	0.28	0.12	154.4	66.4	12/16/82
5	380.7	225.6	689.5	100.0	503.3	73.0	169.5	72.9	0.32	0.14	169.8	73.0	12/16/82
6	390.6	243.4	689.5	100.0	510.2	74.0	189.6	81.5	0.32	0.14	189.9	81.7	12/16/82
7	404.9	269.1	689.5	100.0	510.2	74.0	220.9	95.0	0.32	0.14	221.2	95.1	12/16/82
8	419.7	295.8	689.5	100.0	510.2	74.0	251.0	108.3	0.32	0.14	252.1	108.4	12/16/82
9	434.1	321.8	689.5	100.0	510.2	74.0	283.6	121.9	0.32	0.14	283.9	122.1	12/16/82
10	448.2	347.2	689.5	100.0	510.2	74.0	316.1	135.9	0.32	0.14	316.4	136.0	12/16/82

TABLE 3
 ENTHALPY DATA FOR 500 - 550°F DISTILLATION CUT
 SAMPLE 2093 CB-4 TASK 3.2.3
 10342.1 KPa (1500 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	371.2	208.4	10328.3	1498.0	10245.6	1486.0	145.7	62.6	7.98	3.43	153.7	66.1	12/31/82
2	393.6	240.9	10335.2	1499.0	10259.4	1488.0	194.8	83.8	7.99	3.44	202.8	87.2	12/31/82
1	421.0	298.1	10342.1	1500.0	10259.4	1488.0	247.2	106.3	7.99	3.44	255.2	109.7	12/30/82
1	450.3	350.8	10349.0	1501.0	10266.3	1489.0	309.1	132.9	8.00	3.44	317.1	136.3	12/20/82
2	464.5	376.4	10349.0	1501.0	10266.3	1489.0	340.5	146.4	8.00	3.44	348.5	149.8	12/20/82
2	472.0	389.9	10342.1	1500.0	10259.4	1488.0	359.5	154.5	7.99	3.44	367.5	158.0	12/30/82
3	484.0	411.5	10349.0	1501.0	10266.3	1489.0	395.1	169.9	8.00	3.44	403.1	173.3	12/31/82
3	490.6	423.4	10342.1	1500.0	10259.4	1488.0	406.0	174.5	7.99	3.44	414.0	178.0	12/30/82
1	519.3	475.0	10307.7	1495.0	10224.9	1483.0	477.5	205.3	7.96	3.42	485.5	208.7	01/03/83
4	521.0	478.0	10342.1	1500.0	10259.4	1488.0	476.6	204.9	7.99	3.44	484.6	208.3	12/30/82
2	542.0	515.9	10342.1	1500.0	10259.4	1488.0	531.6	228.6	7.99	3.44	539.6	232.0	01/03/83
5	559.5	547.5	10342.1	1500.0	10259.4	1488.0	580.0	249.4	7.99	3.44	588.0	252.8	12/30/82
6	570.7	567.5	10342.1	1500.0	10259.4	1488.0	612.6	263.4	7.99	3.44	620.6	266.8	12/30/82
7	580.3	584.9	10342.1	1500.0	10259.4	1488.0	631.7	271.6	7.99	3.44	639.7	275.0	12/30/82
3	584.6	592.7	10335.2	1499.0	10252.5	1487.0	646.0	277.7	7.99	3.43	654.0	281.2	01/03/83

TABLE 3
 ENTHALPY DATA FOR 500 - 550°F DISTILLATION CUT
 SAMPLE 2093 CB-4 TASK 3.2.3
 10342.1 KPa (1500 PSIA) (continued)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
8	592.5	606.9	10342.1	1500.0	10259.4	1488.0	668.2	287.3	7.99	3.44	676.2	290.7	12/30/82
4	596.6	614.2	10348.3	1498.0	10245.6	1486.0	675.9	290.6	7.98	3.43	683.9	294.0	01/03/83
5	606.9	632.7	10341.5	1497.0	10238.7	1485.0	703.5	302.5	7.97	3.43	711.5	305.9	01/03/83
10	615.9	649.0	10342.1	1500.0	10259.4	1488.0	725.6	311.9	7.99	3.44	733.6	315.4	12/30/82
6	625.1	665.5	10342.1	1500.0	10259.4	1488.0	753.2	323.8	7.99	3.44	761.2	327.2	01/03/83
7	637.5	687.3	10342.1	1500.0	10259.4	1488.0	784.5	337.3	7.99	3.44	792.5	340.7	01/03/83

COLUMN CONDITIONS

Chart Speed	1.00
Zero	10.0
Attenuation	5
Auxillary Signal	A
Slope Sensitivity	0.10
Area Reject	200

TIME PROGRAMMING

<u>Time</u>		
0.20	Area Reject	9998000
1.13	Area Reject	200
Oven Temperature		115 °C
Detector Temperature		295 °C
Injection Port Temperature		248 °C

Figure 2
 SAMPLE CL-0 12/19/82
 ORIGINAL 500-550°F CUT

Figure 3
SAMPLE CL-7 (1500 PSIA) 1/03/83

RUN 5 - LIQUID

TASK 3.2.4**400-450° F DISTILLATION CUT**

TASK 3.2.4 400-450 °F CUT

The 400-450 °F distillation cut (sample 2093 CB-2) was furnished by ICRC. Data was taken along isobars of 689.5 and 10342.1 kPa (100 and 1500 psia) as requested by ICRC. Additional data was taken along an isobar of 206.8 kPa (30 psia). The data is illustrated in Figure 1 and presented in Tables 1 through 3.

The column in the tables entitled "Corrected Enthalpy" is the enthalpy value of the sample relative to 65 °F and 1 atm pressure. The pressure corrections were made using the procedure outlined by Kesler and Lee (Hydrocarbon Processing, March 1976, pp. 153-158). The following parameters were used for sample 2093 CB-2: $T_c = 1284^\circ \text{ R}$, $P_c = 30.8 \text{ atm}$, acentric factor = 0.41, and molecular weight = 158.

Chromatographic Analysis for the 400-450 °F Cut (Sample 2093 CB-2)

Chromatograms for the two samples represented by the enthalpy data in this report were measured at various times during the data-gathering process to ensure that no significant changes occurred in the composition of the mixture under study. The analyses indicate that compositional stability was maintained throughout the data-gathering process. Figures 2 and 3 are examples of chromatograms used in this report.

Figure 1
400-450F DISTILLATION CUT SAMPLE 2093-CB

TABLE 1
SAMPLE 2093 CB-2
DISTILLATION CUT 400-450 °F
30 PSIA (206.8 KPa) ISOBAR

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
5	443.4	338.4	206.8	30.0	196.2	27.5	321.0	138.0	0.06	0.03	321.1	138.0	10/14/82
6	488.9	420.4	206.8	30.0	182.7	26.5	426.1	183.2	0.06	0.03	426.2	183.2	10/14/82
1	501.0	442.1	206.8	30.0	186.2	27.0	447.4	192.4	0.06	0.03	447.5	192.4	10/19/82
3	501.6	443.2	206.8	30.0	189.6	27.5	453.3	194.9	0.07	0.03	453.4	194.9	10/19/82
2	501.7	443.4	206.8	30.0	189.6	27.5	455.2	195.7	0.07	0.03	455.3	195.7	10/19/82
7	507.8	454.4	208.6	30.3	186.2	27.0	477.9	205.5	0.06	0.03	478.0	205.5	10/14/82
4	516.8	470.5	206.8	30.0	186.2	27.0	505.5	217.3	0.05	0.03	505.6	217.3	10/19/82
8	519.4	475.2	208.6	30.3	182.7	26.5	516.6	222.1	0.06	0.03	516.7	222.1	10/14/82
5	521.7	474.4	206.8	30.0	186.2	27.0	539.9	232.1	0.06	0.03	539.9	232.1	10/19/82
6	523.9	483.3	206.8	30.0	186.2	27.0	561.5	241.4	0.06	0.03	561.6	241.4	10/19/82
9	528.0	490.8	206.8	30.0	186.2	27.0	599.0	257.5	0.06	0.03	599.1	257.6	10/14/82
7	528.9	494.4	206.8	30.0	186.2	27.0	636.9	273.8	0.06	0.03	636.9	273.8	10/19/82
10	531.5	497.0	208.6	30.3	182.7	26.5	726.9	313.4	0.06	0.03	729.0	313.4	10/14/82
11	532.5	498.7	209.6	30.3	182.7	26.5	755.2	324.7	0.06	0.03	755.3	324.7	10/14/82
12	535.5	504.2	209.6	30.3	182.7	26.5	826.6	355.4	0.05	0.03	826.6	355.4	10/14/82

TABLE 1 (Continued)
SAMPLE 2093 CB-2
DISTILLATION CUT 400-450 °F
30 PSIA (206.8 KPa) ISOBAR

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
13	536.3	505.6	208.6	30.3	182.7	26.5	871.3	357.4	0.06	0.03	831.3	357.4	10/14/82
14	538.7	509.9	208.6	30.3	182.7	26.5	844.5	363.1	0.06	0.03	844.6	363.1	10/14/82
8	539.4	511.2	206.8	30.0	179.3	26.0	855.5	367.8	0.06	0.03	855.5	367.8	10/19/82
15	540.8	513.7	210.3	30.5	182.7	26.5	851.0	365.9	0.06	0.03	851.0	365.9	10/14/82
5	545.0	521.4	206.8	30.3	165.5	24.0	867.8	373.1	0.05	0.02	867.8	373.1	10/16/82
9	550.0	530.3	208.6	30.3	179.3	26.0	873.2	375.4	0.06	0.03	873.2	375.4	10/19/82
10	550.0	530.3	210.3	30.5	179.3	26.0	875.7	376.5	0.06	0.03	875.8	376.5	10/19/82
11	557.8	544.4	210.3	30.5	182.7	26.5	891.1	383.1	0.06	0.03	891.1	383.1	10/19/82
6	558.7	546.1	206.8	30.3	165.5	24.0	892.6	383.7	0.05	0.02	892.6	383.8	10/16/82
12	564.6	556.7	212.0	30.8	179.3	26.0	908.4	390.5	0.06	0.03	908.4	390.6	10/19/82
13	572.9	571.5	206.8	30.0	179.3	26.0	925.2	397.8	0.06	0.03	925.3	397.8	10/19/82
14	580.0	584.3	206.8	30.3	179.3	26.0	938.1	403.3	0.06	0.03	938.2	403.3	10/19/82
7	583.9	591.3	206.8	30.0	151.7	22.0	950.1	408.5	0.04	0.02	950.1	408.5	10/16/82
15	584.7	592.8	210.3	30.5	174.1	18.0	950.3	408.6	0.02	0.01	950.3	408.6	10/19/82
17	600.8	621.7	203.4	29.5	174.1	18.0	984.8	423.4	0.02	0.01	984.8	423.4	10/19/82

TABLE 1 (Continued)
SAMPLE 2093 CB-2
DISTILLATION CUT 400-450 °F
30 PSIA (206.8 KPa) ISOBAR

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
18	605.9	632.8	205.1	29.8	124.1	18.0	994.5	427.5	0.02	0.01	994.5	427.6	10/19/82
20	625.2	655.6	212.0	30.8	117.2	17.0	1039.0	446.7	0.01	0.01	1039.1	446.7	10/19/82

TABLE 2
SAMPLE 2093 CB-2
DISTILLATION CUT 400-450 °F
100 PSIA (689.5 KPa) ISOBAR

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
2	345.5	162.2	689.5	100.0	606.7	88.0	100.1	43.0	0.38	0.16	100.5	43.2	10/14/82
1	362.3	192.4	687.8	99.8	634.3	92.0	134.3	57.7	0.40	0.17	134.7	57.9	10/13/82
3	370.0	206.3	689.5	100.0	648.1	94.0	151.7	65.2	0.41	0.18	152.2	65.4	10/13/82
5	383.4	230.4	689.5	100.0	641.2	93.0	184.4	79.3	0.41	0.17	184.8	79.4	10/13/82
6	394.4	250.3	686.0	99.5	634.3	92.0	208.0	89.4	0.40	0.17	208.4	89.6	10/13/82
7	404.4	268.3	689.5	100.0	648.1	94.0	270.5	99.1	0.41	0.18	231.0	99.3	10/13/82
8	419.2	295.0	689.5	100.0	648.1	94.0	265.6	114.2	0.41	0.18	266.0	114.3	10/13/82
3	451.2	352.6	687.8	99.8	620.5	90.0	341.6	146.9	0.39	0.17	342.0	147.0	10/14/82
1	460.7	369.5	689.5	100.0	627.4	91.0	361.1	155.2	0.40	0.17	361.5	155.4	10/12/82
4	468.7	383.9	687.8	99.8	620.5	90.0	378.5	162.7	0.39	0.17	378.9	162.9	10/14/82
2	484.8	413.0	689.5	100.0	627.4	91.0	418.1	179.7	0.40	0.17	418.5	179.9	10/12/82
3	499.8	439.9	689.5	100.0	627.4	91.0	456.5	196.3	0.40	0.17	456.9	196.4	10/12/82
4	508.2	455.1	689.5	100.0	627.4	91.0	479.3	206.1	0.40	0.17	479.7	206.2	10/12/82
5	512.8	463.4	689.5	100.0	627.4	91.0	489.2	210.3	0.40	0.17	489.6	210.5	10/12/82
6	526.9	488.8	689.5	100.0	634.3	92.0	525.8	226.0	0.40	0.17	526.2	226.2	10/12/82

TABLE 2 (Continued)
SAMPLE 2093 CB-2
DISTILLATION CUT 400-450 °F
100 PSIA (689.5 KPa) ISOBAR

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
6	541.1	514.2	689.5	100.0	634.3	92.0	561.5	241.4	0.40	0.17	561.9	241.6	10/12/82
7	552.6	534.9	689.5	100.0	634.3	92.0	592.8	254.9	0.40	0.17	593.2	255.0	10/12/82
9	557.7	544.3	689.5	100.0	641.2	93.0	603.4	259.4	0.41	0.17	603.8	259.6	10/12/82
1	568.6	563.8	689.5	100.0	641.2	93.0	634.7	272.9	0.41	0.17	635.2	273.1	10/20/82
10	568.8	564.1	689.5	100.0	644.7	93.5	633.7	272.5	0.41	0.18	634.1	272.6	10/12/82
1	579.4	567.0	689.5	100.0	648.1	94.0	640.6	275.4	0.41	0.18	641.0	275.6	10/21/82
11	576.6	578.2	689.5	100.0	644.7	93.5	661.7	284.5	0.41	0.18	662.1	284.7	10/12/82
12	583.0	589.8	689.5	100.0	648.1	94.0	692.9	293.6	0.41	0.18	693.3	293.8	10/12/82
13	586.7	595.4	689.5	100.0	648.1	94.0	696.7	299.5	0.41	0.18	697.1	299.7	10/12/82
14	590.0	602.3	689.5	100.0	648.1	94.0	724.4	311.5	0.41	0.18	724.8	311.6	10/12/82
15	593.2	606.1	689.5	100.0	648.1	94.0	756.9	325.4	0.41	0.18	757.3	325.6	10/15/82
16	599.7	619.7	689.5	100.0	648.1	94.0	914.6	393.2	0.41	0.18	915.0	393.4	10/12/82
17	601.3	622.7	689.5	100.0	648.1	94.0	955.9	411.0	0.41	0.18	956.3	411.1	10/17/82
1	601.6	623.1	689.5	100.0	661.9	96.0	946.2	406.8	0.42	0.18	946.7	407.0	10/21/82
18	604.8	628.9	691.2	100.3	648.1	94.0	976.1	419.6	0.41	0.18	976.5	419.8	10/12/82

TABLE 2 (Continued)
SAMPLE 2093 CB-2
DISTILLATION CUT 400-450 °F
100 PSIA (689.5 KPa) ISOBAR

PUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
19	608.8	636.2	689.5	100.0	640.1	94.0	988.1	424.8	0.41	0.18	988.5	425.0	10/12/82
4	609.7	637.6	689.5	100.0	641.2	93.0	993.7	427.2	0.41	0.17	994.1	427.4	10/20/82
5	610.9	640.0	689.5	100.0	641.2	93.0	989.5	425.4	0.41	0.17	989.9	425.6	10/20/82
4	611.4	640.9	689.5	100.0	661.9	96.0	1001.2	430.4	0.42	0.18	1001.6	430.6	10/21/82
27	614.0	645.6	689.5	100.0	640.1	94.0	1001.4	430.5	0.41	0.18	1001.8	430.7	10/12/82
6	616.8	650.6	689.5	100.0	640.1	94.0	1006.7	432.8	0.41	0.18	1007.1	433.0	10/20/82
5	623.5	662.6	692.9	100.5	661.9	96.0	1019.0	438.1	0.42	0.18	1019.4	438.3	10/21/82
7	625.1	665.5	689.5	100.0	641.2	93.0	1029.0	442.4	0.41	0.17	1029.4	442.5	10/20/82
6	626.2	671.1	692.9	100.5	661.9	96.0	1036.1	445.4	0.42	0.18	1036.5	445.6	10/21/82
7	632.6	679.1	692.9	100.5	661.9	96.0	1042.1	448.0	0.42	0.18	1042.6	448.2	10/21/82
8	636.8	686.5	692.9	100.5	661.9	96.0	1049.5	451.2	0.42	0.18	1049.9	451.4	10/21/82
23	639.4	691.3	689.5	100.0	640.1	94.0	1059.0	455.3	0.41	0.18	1059.4	455.5	10/12/82

TABLE 3
SAMPLE 2093 CB-2
DISTILLATION CUT 400-450 °F
1500 PSIA (10342.1 KPa) ISOBAR

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
2	524.4	494.3	10342.1	1500.0	10273.2	1490.0	508.6	218.7	7.68	3.30	516.3	222.0	10/22/82
3	538.2	500.1	10342.1	1500.0	10287.0	1492.0	548.6	235.8	7.70	3.31	556.3	239.2	10/22/82
4	555.3	533.9	10342.1	1500.0	10287.0	1492.0	595.4	256.0	7.70	3.31	603.0	259.3	10/22/82
5	564.8	556.9	10342.1	1500.0	10259.4	1488.0	615.3	264.5	7.67	3.30	622.9	267.8	10/22/82
6	577.9	580.5	10342.1	1500.0	10259.4	1488.0	644.3	277.0	7.67	3.30	651.9	280.3	10/22/82
7	589.2	600.9	10342.1	1500.0	10259.4	1488.0	681.4	293.0	7.67	3.30	689.1	296.3	10/22/82
8	603.8	627.2	10342.1	1499.0	10252.5	1487.0	719.8	309.4	7.67	3.30	727.4	312.7	10/22/82
9	613.6	644.8	10342.1	1499.0	10252.5	1487.0	747.8	321.5	7.67	3.30	755.5	324.8	10/22/82
11	618.2	653.1	10342.1	1500.0	10259.4	1488.0	758.4	326.1	7.67	3.30	766.1	329.4	10/22/82

COLUMN CONDITIONS

Chart Speed	1.00
Zero	10.0
Attenuation	5
Auxillary Signal	A
Slope Sensitivity	0.10
Area Reject	200

TIME PROGRAMMING

<u>Time</u>		
0.20	Area Reject	998000
1.13	Area Reject	200
0.50	Stop	
Oven Temperature		115 °C
Detector Temperature		295 °C
Injection Port Temperature		248 °C

No attempt is made here to identify the specific peaks on the chromatograms of the samples. It may be noted, however, that five major peaks occur at retention times of 3.54, 4.04, 5.38, 5.76, and 6.69 minutes (the peak at approximately one minute is methylene chloride). No major changes occur in the area percent contribution of these peaks for the progression of samples taken during the data-gathering process. It seems safe to assume, therefore, that no major compositional changes occurred in the calorimeter during the gathering of the data.

Figure 2

SAMPLE 1 10/12/82

ORIGINAL 400-450°F CUT

40 RUN # 347
AREA %

OCT/19/82

TIME 03:35:37

RT	AREA	AREA %
2.41	354	1.347
3.25	673	2.551
3.54	3764	14.325
3.65	219	0.833
3.69	246	0.936
3.94	838	3.189
4.04	2207	8.400
4.22	227	0.864
4.61	1385	4.967
4.86	763	2.904
4.96	795	3.026
5.38	3441	13.096
5.76	1859	7.075
5.97	237	0.902
6.12	223	0.849
6.21	266	1.017
6.69	7036	26.778
6.86	242	0.921
7.15	932	3.547
7.40	422	1.606
7.73	226	0.868

NFI FACTOR: 1.0000 E+ 0

1/0

Figure 3

SAMPLE 9 (30 PSIA) 10/16/82

RUN 14 - VAPOR

WD PIN 8 344
AREA %

OCT/19/82

TIME 02:58:22

WT	AREA	AREA %
1.17	246	1.214
2.42	281	1.387
3.37	565	2.789
3.56	3065	15.128
3.67	393	1.940
3.96	683	3.371
4.06	1804	8.904
4.24	234	1.155
4.63	1047	5.168
4.88	613	3.026
4.98	642	3.169
5.40	2757	13.608
5.79	1501	7.409
6.23	207	1.022
6.70	5467	26.984
7.17	437	2.157
7.43	318	1.570

ALL FACTOR: 1.0000 E+ 0

TASK 3.3.1

BASE (QUINOLINE)

TASK 3.3.1 QUINOLINE ENTHALPY DATA

Data for this Task is presented in the section with Task 3.3.3 Acid/Base System

TASK 3.3.2**SATURATE (DECALIN)**

TASK 3.3.2 DECALIN ENTHALPY MEASUREMENTS

Structural Characteristics

Decalin is a saturated naphthalene hydrocarbon which falls into the category of compounds called "bicyclic alkanes." It is a liquid at room temperature and is also known under the name "decahydronaphthalene." It is comprised of two fused 6-carbon rings with two bridge-head carbon atoms. It has the formula $C_{10}H_{18}$ and its structure may be represented by the following:

Due to the different possibilities for carbon-to-hydrogen bonding at both bridge-head carbon atoms, two isomers arise. These isomers are stereoisomers (or geometric isomers) but are not structural isomers as the types of atoms and their order of attachment to each other are the same in all cases. They are isomers because each is not super-imposable upon the other. This characteristic leads to slightly different physical properties. The two isomers for decalin, known as "cis-decalin" and "trans-decalin" may be shown as:

or:

It is easily seen that the positions of the hydrogen atoms bonded to the bridge-head carbons lead to the non-superimposability of the two forms and the rings prevent inter-conversion of their conformational arrangement by bond rotation. The isomers differ in their respective boiling points with cis-boiling at 195 °C (1 atm.) and trans-boiling at 185.5 °C (1 atm.) 1.

Literature on the thermodynamic equilibrium of the decalin isomers reports that it will consist of approximately 98-99% trans-decalin at normal conditions 2, 3. However, commercial decalin is largely a mixture of both cis-decalin and trans-decalin with a composition of about 57% cis-decalin and 43% trans-decalin. This is due to the way in which decalin is manufactured. A simple distillation is therefore impractical when a high degree of upgrading is required. For this reason, it would be preferable to convert the mixture as close as possible to this thermodynamic equilibrium and settle on obtaining the trans-decalin form of the two isomers. Seyer and Yip 4, as well as some other investigators 5, 6, describe a process of catalytic conversion of the mixture to its thermodynamically favored composition. The process incorporates the use of aluminum chloride (AlCl_3) as the catalytic surface for the conversion. It lowers the activation energy to the point where the rotation of the hydrogen-carbon bond at the bridge-head carbon can occur and can,

therefore, relieve the strain present in the cis-decalin form. The reaction is exothermic and is, thus, less favored at higher temperatures. Unfortunately, the kinetics are slow so that the temperature plays an important and sensitive role in the reaction.

Sample Preparation

With the intent of obtaining decalin of high purity in one isomer for the measurements given in this report, it was decided that trans-decalin would be the easiest isomer to obtain. In order to do that, a conversion and purification scheme was adopted. The final product of this scheme is a liquid comprised of 99.2% trans-decalin, .5-.6% cis-decalin, with the remaining .2-.3% being some other close boiling impurities formed during the conversion reaction.

Catalytic Conversion

Commercial decalin (purified grade) purchased from Fisher Scientific Company with a raw composition of 43% trans-decalin and 56% cis-decalin was used. Crystalline anhydrous aluminum chloride also purchased from Fisher Scientific Company was used as the catalyst for the conversion. Although it provides for a somewhat slow reaction, aluminum chloride is relatively inexpensive compared to the other aluminum halides.

A batch-stirred tank reactor was assembled to perform the conversion reaction. It consisted of a large glass vessel with a removable top and a capacity of 4-5 liters. The top had ports through which a mechanical stirrer

could be inserted. The stirrer was comprised of a stainless steel shaft with two sets of blades and was connected to a small sewing machine motor. The motor was wired to a variable rheostat. Although somewhat crude, the reactor was found to be very satisfactory.

Upon initialization of the reaction procedure, the reactor was charged with approximately two to three liters of raw decalin. To this about 500 grams of aluminum chloride was added. The stirrer was then installed and was set at a rate just fast enough to keep the reaction vessel contents well agitated. Conditions were kept at ambient.

The reaction rate was found to be much slower than that reported in the literature. Literature reports the reaction to be complete in about 24-48 hours with an end product of 99%+ trans-decalin 4. It was found here that the reaction took about one and one-half to two weeks and was limited to about 96% trans-decalin end product. Furthermore, it was found that the initial catalyst charge lost its effectiveness after about two days while bringing the percentage of trans-decalin up to only about 60-65%. At this point, the catalyst was removed and a second, fresh charge was added. An interesting characteristic which was noted was the coloration arising from the catalyst charges. The first charge gave a brilliant yellow color to the mixture and maintained it throughout its occupancy in the vessel. Oddly, the second charge did not do this. Instead, it maintained a dirty white coloration--white being the original color of the catalyst.

The final product was removed from the reactor when conversion seemed complete and the catalyst was promptly separated by a high-speed centrifuge

and subsequent filtration. Chromatographic analysis revealed this product to be just over 96% trans-decalin and about 3% cis-decalin. The other 1% was close-boiling impurities formed during the conversion reaction. Literature reports these impurities to be a substantial problem, especially where the reaction temperature is above ambient.

Distillation

Distillation was incorporated to bring the trans-decalin level up to 99%+ from 96% where it comes out from the reactor process. It was found desirable to do a solvent extraction on the decalin first before performing the distillation. This was thought necessary because the decalin still might have contained some aluminum chloride and the high temperature environment of a distillation apparatus would probably lead to a seemingly constant production of the same byproduct impurities encountered in the conversion reaction process. If this were to occur, the separation power of distillation would be ruined since the byproducts have a lower boiling point than any of the decalin isomers. A water wash was done because of the high reactivity of water with aluminum chloride and because of water's immiscibility in decalin. After separating the phases, decalin was then put over silica gel to remove any traces of water.

Distillation was performed in a Perkin-Elmer 36-inch adiabatic spinning band column. The process involved removing most of the lower boiling impurities first, then pulling off an initial overhead product with a trans-decalin percentage of about 98.3-98.8%. Trans-decalin comes off first since

it boils at a slightly lower temperature than cis-decalin. A second distillation on this product was required to bring the purity of the trans-decalin up to 99%+.

Purity Checks

The calorimeter was charged with the high-purity trans-decalin obtained from the combined conversion-distillation process. Purity checks were made at the outset of, and routinely during, the calorimetric measurements by means of gas chromatography. These analyses could then be compared to an analysis made of a sample taken from the trans-decalin prior to charging the calorimeter.

A sample of typical chromatographs for decalin follow. The first is for raw decalin and the second for purified trans-decalin. It is easily seen that the raw decalin initially has very few impurities outside of the two isomers. However, purification results in the formation of some other close boiling impurities as already mentioned. The trans-decalin peak is seen to occur at a retention time of 2.03 in the first and 2.01 in the second chromatograph. The cis-decalin peak immediately follows the trans-decalin in each case.

The initial composition of the calorimeter charge was 99.75% decalin and 0.25% impurities. The trans-decalin percentage was 99.2% and the cis-decalin percentage was 0.55%. The percentage of the impurities was observed to remain relatively constant with no significant increase over the entire data-gathering period. For the most part, the trans-decalin percentage remained above 99%. However, when measurements were made on the charge at 1500 psia, it was

DECALIN CHROMATOGRAPHIC ANALYSIS RESULTS

TOP- Raw Commercial Grade Decalin

BOTTOM- Converted and Purified Decalin (Trans-)

HP DIN #1068
AREA %

AUG/18/83

TIME 23:43:50

RT	AREA	AREA %
1.24	10	0.008
2.03	51360	43.376
2.38	67300	56.707
3.07	11	0.009

ALL FACTOR: 1.0000 E+ 0

HP DIN #1070
AREA %

AUG/22/83

TIME 10:05:20

RT	AREA	AREA %
1.74	48	0.114
1.87	99	0.234
2.01	41830	99.041
2.27	258	0.611

ALL FACTOR: 1.0000 E+ 0

necessary to add additional charge which, consequently, brought the trans-decalin purity down without affecting the overall decalin concentration. For these measurements (which were liquid phase measurements), the trans-decalin percentage was 98.7-99% with .6-.9% cis-decalin.

COLUMN CONDITIONS

Chart Speed	1
Zero	10
Attenuation	5
Auxillary Signal	A
Slope Sensitivity	0.10
Area Reject	0

Time Programming

<u>Time</u>		
0.20	Area Reject	999998000
1.20	Area Reject	0
4.00	Stop	
Oven Temperature		120 °C
Detector Temperature	300 °C	
Injection Port Temperature		250 °C

Calorimetric Enthalpy Measurements

Enthalpy measurements were made on trans-decalin along several isobars and for temperatures up to 720 °F. These isobars include 20, 50, 100, 150, 200, 250, 456 (critical), and 1500 psia measurements were also made at pressures of 30, 40, 60, 70, 80, and 90 psia for the two-phase region location only. All values were corrected to a reference point of 65 °F and 1 atm using the Kesler-Lee technique 7.

Reid, Sherwood, and Prausnitz 8 report that the critical temperature for trans-decalin is 690 K (782.3 °F) and the critical pressure is 31 atm (456

psia). Due to equipment limitations, it was not feasible to carry measurements up to and beyond the critical temperature.

Enthalpy values are presented in Tables 1 through 8 for individual isobars. The reference enthalpy ($H=0$) datum is 65 °F, 1 atm, and the enthalpy of the liquid. These values are preliminary results and could be subject to some follow-up measurements should various analyses deem this desirable. The last table provides a compilation of all the two-phase measurements made. The enthalpy values in that table are total values for the combined liquid and vapor phases. Finally, graphs are given for the enthalpy versus temperature relationship of the isobars on an individual, as well as composite, basis, Figures 1 through 9.

TABLE 1
DECALIN ENTHALPY DATA
137.5 kPa (20.0 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	410.6	279.3	148.2	21.5	112.0	16.3	221.6	95.3	0.01	0.00	221.6	95.3	07/28/83
2	430.2	314.6	137.9	20.0	110.3	16.0	265.2	114.0	0.01	0.00	265.2	114.0	07/28/83
3	445.0	341.2	137.9	20.0	110.3	16.0	300.3	129.1	0.01	0.00	300.3	129.1	07/28/83
4	457.7	364.3	139.6	20.3	110.3	16.0	328.3	141.1	0.01	0.00	328.3	141.1	07/28/83
6	470.6	387.4	137.9	20.0	110.3	16.0	363.0	156.0	0.01	0.00	363.0	156.0	07/28/83
7	472.1	390.1	138.8	20.1	110.3	16.0	368.2	158.3	0.01	0.00	368.2	158.3	07/28/83
10	473.1	392.0	137.9	20.0	110.3	16.0	524.5	225.5	0.01	0.00	524.5	225.5	07/28/83
8	473.5	392.7	138.8	20.1	110.3	16.0	402.2	172.9	0.01	0.00	402.2	172.9	07/28/83
5	473.8	393.2	141.3	20.5	110.3	16.0	422.6	181.7	0.01	0.00	422.6	181.7	07/28/83
9	474.0	393.5	140.5	20.4	110.3	16.0	447.2	192.3	0.01	0.00	447.2	192.3	07/28/83
11	474.2	393.0	142.2	20.6	110.3	16.0	628.9	270.4	0.01	0.00	628.9	270.4	07/28/83
12	483.4	410.5	144.8	21.0	96.5	14.0	666.1	286.4	0.00	0.00	666.1	286.4	07/28/83
13	491.2	424.5	139.6	20.3	105.2	15.3	681.2	292.9	0.00	0.00	681.2	292.9	07/28/83
14	505.0	449.4	141.3	20.5	96.5	14.0	713.0	306.5	0.00	0.00	713.0	306.5	07/28/83
15	519.2	475.3	139.6	20.3	96.5	14.0	747.4	321.3	0.00	0.00	747.4	321.3	07/28/83

TABLE 1. (Continued)
DECALIN ENTHALPY DATA
137.9 kPa (20.0 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
16	532.3	498.5	148.2	21.5	96.5	14.0	778.0	334.5	0.00	0.00	778.0	334.5	07/28/83
17	547.0	525.0	149.1	21.6	93.1	13.5	815.4	350.5	-0.01	0.00	815.4	350.5	07/28/83
18	559.8	548.0	137.9	20.0	89.6	13.0	845.7	363.6	-0.01	0.00	845.7	363.6	07/28/83
7	560.3	548.0	139.6	20.3	89.6	13.0	842.8	362.3	-0.01	0.00	842.7	362.3	08/02/83
8	577.2	579.3	141.3	20.5	89.6	13.0	889.2	382.3	-0.01	0.00	889.2	382.3	08/02/83
9	589.2	600.8	137.1	19.9	87.9	12.8	923.5	397.0	-0.01	0.00	923.5	397.0	08/02/83
10	602.2	624.0	137.9	20.0	89.6	13.0	962.2	413.7	-0.01	0.00	962.2	413.7	08/02/83
11	615.2	647.6	139.6	20.3	89.6	13.0	998.2	429.1	-0.01	0.00	998.2	429.1	08/02/83
12	623.8	674.0	136.2	19.8	86.2	12.5	1041.9	447.9	-0.01	-0.01	1041.9	447.9	08/02/83
13	640.1	692.5	141.3	20.5	86.2	12.5	1065.0	457.9	-0.01	-0.01	1065.0	457.9	08/02/83
14	640.1	692.5	141.3	20.5	86.2	12.5	1068.0	459.2	-0.01	-0.01	1068.0	459.1	08/02/83
15	640.6	693.4	143.1	20.8	86.2	12.5	1067.2	458.8	-0.01	-0.01	1067.2	458.8	08/02/83

TABLE 2
DECALIN ENTHALPY DATA
344.7 kPa (50.0 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	520.2	476.7	343.9	49.9	303.4	44.0	581.0	249.8	0.17	0.07	581.1	249.8	08/02/83
7	520.6	477.5	345.6	50.1	312.0	45.3	698.6	300.3	0.17	0.07	698.8	300.4	07/31/83
6	521.4	478.9	346.5	50.3	317.2	46.0	711.6	306.0	0.18	0.08	711.8	306.0	07/31/83
2	521.5	479.0	343.9	49.9	299.9	43.5	733.6	315.4	0.16	0.07	733.8	315.5	08/02/83
3	526.1	487.2	344.7	50.0	299.9	43.5	748.1	321.6	0.16	0.07	748.2	321.7	08/02/83
4	538.3	509.2	344.7	50.0	299.9	43.5	778.6	334.8	0.16	0.07	778.8	334.8	08/02/83
6	564.8	557.0	343.9	49.9	299.9	43.5	843.6	362.7	0.16	0.07	843.8	362.8	08/02/83
5	565.1	557.5	351.6	51.0	299.9	43.5	844.1	362.9	0.16	0.07	844.2	363.0	08/02/83
1	642.3	696.5	346.5	50.3	189.6	27.5	1058.7	455.1	0.07	0.03	1058.7	455.2	08/05/83

TABLE 3.
DECALIN ENTHALPY DATA
689.5 kPa (100.0 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	369.4	189.1	696.4	101.0	596.4	86.5	117.4	50.5	0.41	0.18	117.9	50.7	07/27/83
2	368.0	202.8	689.5	100.0	579.2	84.0	130.7	56.2	0.39	0.17	131.1	56.4	07/27/83
3	376.9	218.7	688.6	99.9	620.5	90.0	148.9	64.0	0.43	0.18	149.3	64.2	07/27/83
4	375.3	251.8	687.8	99.8	634.3	92.0	187.5	80.6	0.44	0.19	187.9	80.8	07/27/83
5	423.6	302.8	689.5	100.0	641.2	93.0	249.9	107.4	0.44	0.19	250.3	107.6	07/27/83
6	436.7	326.3	691.2	100.3	639.5	92.8	278.8	119.9	0.44	0.19	279.2	120.0	07/27/83
7	449.8	350.0	691.2	100.3	642.9	93.3	306.1	131.6	0.45	0.19	306.5	131.8	07/27/83
8	463.9	375.4	688.6	99.9	641.2	93.0	340.9	146.6	0.44	0.19	341.3	146.7	07/27/83
9	477.3	399.5	694.6	100.8	641.2	93.0	375.4	161.4	0.44	0.19	375.9	161.6	07/27/83
10	430.5	423.7	688.6	99.9	641.2	93.0	409.2	175.9	0.44	0.19	409.7	176.1	07/27/83
11	506.7	452.4	689.5	100.0	641.2	93.0	451.0	193.9	0.44	0.19	451.4	194.1	07/27/83
12	518.2	473.1	692.9	100.5	641.2	93.0	482.5	207.4	0.44	0.19	482.9	207.6	07/27/83
19	531.6	497.7	690.4	100.1	648.1	94.0	514.1	221.0	0.45	0.19	514.6	221.2	07/28/83
20	546.2	523.4	690.4	100.1	648.1	94.0	557.2	239.5	0.45	0.19	557.6	239.7	07/28/83
21	557.5	543.0	692.9	100.5	648.1	94.0	599.7	257.8	0.45	0.19	600.1	258.0	07/28/83

TABLE 3. (Continued)
 DECALIN ENTHALPY DATA
 689.5 kPa (100.0 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
27	563.1	553.9	688.6	99.9	644.7	93.5	770.4	331.2	0.45	0.19	770.9	331.4	07/28/83
22	563.1	554.0	694.6	100.8	648.1	94.0	639.2	274.8	0.45	0.19	639.7	275.0	07/28/83
26	563.2	554.0	688.6	99.9	641.2	93.0	658.9	283.3	0.44	0.19	659.3	283.5	07/28/83
23	563.2	554.0	689.5	100.0	644.7	93.5	731.6	314.5	0.45	0.19	732.0	314.7	07/28/83
24	563.2	554.1	686.9	99.6	641.2	93.0	748.6	321.8	0.44	0.19	749.0	322.0	07/28/83
25	563.2	554.1	689.5	100.0	641.2	93.0	745.6	320.6	0.44	0.19	746.1	320.8	07/28/83
28	567.4	561.6	691.2	100.3	641.2	93.0	841.5	361.8	0.44	0.19	841.9	362.0	07/28/83
29	578.0	580.7	689.5	100.0	641.2	93.0	872.6	375.2	0.44	0.19	873.1	375.4	07/28/83
30	596.0	613.2	689.5	100.0	637.8	92.5	921.2	396.0	0.44	0.19	921.6	396.2	07/28/83
15	602.8	625.4	688.6	99.9	648.1	94.0	939.9	404.1	0.45	0.19	940.3	404.3	07/29/83
31	614.2	645.8	691.2	100.3	634.3	92.0	966.8	415.6	0.44	0.19	967.2	415.8	07/28/83
18	628.6	671.9	692.1	100.4	634.3	92.0	1012.0	435.1	0.44	0.19	1012.5	435.3	07/29/83
19	642.6	697.9	691.2	100.3	634.3	92.0	1049.1	451.0	0.44	0.19	1049.5	451.2	07/29/83
23	651.1	712.3	686.9	99.6	634.3	92.0	1078.3	463.6	0.44	0.19	1078.8	463.8	07/29/83

TABLE 4
DECALIN ENTHALPY DATA
1034.2 kPa (150.0 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	510.8	459.8	1030.8	149.5	986.0	143.0	462.0	198.6	0.73	0.31	462.7	198.9	07/29/83
2	526.0	487.1	1034.2	150.0	992.8	144.0	502.8	216.2	0.73	0.32	503.5	216.5	07/29/83
3	543.6	518.9	1032.5	149.8	986.0	143.0	552.4	237.5	0.73	0.31	553.2	237.8	07/29/83
4	563.4	554.5	1034.2	150.0	992.8	144.0	606.7	260.8	0.73	0.32	607.5	261.2	07/29/83
5	575.0	575.4	1037.7	150.5	999.7	145.0	636.9	273.8	0.74	0.32	637.7	274.1	07/29/83
6	585.5	594.2	1032.5	149.8	992.8	144.0	672.8	289.2	0.73	0.32	673.5	289.6	07/29/83
8	588.7	600.1	1034.2	150.0	992.8	144.0	697.8	295.7	0.73	0.32	698.5	296.0	07/29/83
9	591.7	605.4	1034.2	150.0	992.8	144.0	723.7	311.1	0.73	0.32	724.5	311.5	07/29/83
7	591.9	605.8	1034.2	150.0	999.7	145.0	750.4	322.6	0.74	0.32	751.2	323.0	07/29/83
10	592.6	607.0	1034.2	150.0	992.8	144.0	856.5	368.2	0.73	0.32	857.2	368.5	07/29/83
11	592.8	607.4	1035.9	150.3	992.8	144.0	879.6	378.1	0.73	0.32	880.3	378.5	07/29/83
12	593.6	608.8	1037.0	150.4	992.8	144.0	894.2	384.4	0.73	0.32	894.9	384.7	07/29/83
13	596.7	614.3	1035.1	150.1	996.3	144.5	908.7	390.7	0.74	0.32	909.4	391.0	07/29/83
14	603.5	626.6	1034.2	150.0	999.7	145.0	926.1	398.2	0.74	0.32	926.9	398.5	07/29/83
16	615.9	648.9	1034.2	150.0	992.8	144.0	969.0	416.6	0.73	0.32	969.7	416.9	07/29/83
17	628.0	670.8	1034.2	150.0	992.8	144.0	996.9	428.6	0.73	0.32	997.6	428.9	07/29/83
21	641.0	694.2	1034.2	150.0	992.8	144.0	1036.5	445.6	0.73	0.32	1037.3	445.9	07/29/83
20	641.1	694.2	1034.2	150.0	992.8	144.0	1039.9	447.1	0.73	0.32	1040.6	447.4	07/29/83
22	649.2	708.9	1033.4	149.9	992.8	144.0	1064.0	457.4	0.73	0.32	1064.7	457.7	07/29/83

TABLE 5
DECALIN ENTHALPY DATA
1379.0 kPa (200.0 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	477.5	899.8	1379.0	200.0	1323.8	192.0	377.9	162.5	1.01	0.43	378.9	162.9	08/01/83
4	515.7	968.7	1379.0	200.0	1323.8	192.0	477.4	205.2	1.01	0.43	478.4	205.7	08/01/83
5	531.8	997.6	1379.0	200.0	1334.1	193.5	519.3	223.2	1.02	0.44	520.3	223.7	08/01/83
6	549.3	1029.0	1379.0	200.0	1337.6	194.0	563.8	242.4	1.02	0.44	564.8	242.8	08/01/83
7	571.8	1060.6	1382.4	200.5	1337.6	194.0	632.2	271.8	1.02	0.44	633.3	272.3	08/01/83
8	596.7	1114.4	1382.4	200.5	1337.6	194.0	703.6	302.5	1.02	0.44	704.6	302.9	08/01/83
9	608.8	1136.1	1379.0	200.0	1334.1	193.5	750.0	322.4	1.02	0.44	751.0	322.9	08/01/83
10	614.2	1145.0	1379.0	200.0	1334.1	193.5	797.6	342.9	1.02	0.44	798.7	343.4	08/01/83
11	614.4	1146.3	1379.0	200.0	1337.6	194.0	813.2	349.6	1.02	0.44	814.2	350.0	08/01/83
12	614.5	1146.5	1379.0	200.0	1334.1	193.5	813.1	349.6	1.02	0.44	814.1	350.0	08/01/83
14	615.0	1147.4	1379.0	200.0	1341.0	194.5	881.3	378.9	1.02	0.44	882.3	379.3	08/01/83
15	615.0	1147.4	1379.0	200.0	1339.3	194.3	881.6	379.0	1.02	0.44	882.6	379.5	08/01/83
13	615.6	1148.5	1382.4	200.5	1337.6	194.0	934.8	401.9	1.02	0.44	935.9	402.3	08/01/83
16	617.3	1151.4	1378.1	199.9	1334.1	193.5	948.7	407.9	1.02	0.44	949.7	408.3	08/01/83
17	622.3	1160.4	1379.0	200.0	1334.1	193.5	973.1	418.4	1.02	0.44	974.2	418.8	08/01/83

TABLE 5 (Continued)
 DECALIN ENTHALPY DATA
 1379.0 kPa (200.0 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
19	629.8	674.0	1379.8	200.1	1334.1	193.5	993.7	427.2	1.02	0.44	994.7	427.7	08/01/83
18	630.0	674.4	1379.0	200.0	1334.1	193.5	990.9	426.0	1.02	0.44	991.9	426.4	08/01/83
20	635.3	683.9	1379.0	200.0	1337.6	194.0	1005.5	432.3	1.02	0.44	1006.6	432.7	08/01/83
21	645.9	703.0	1382.4	200.5	1334.1	193.5	1038.5	446.5	1.02	0.44	1039.5	446.9	08/01/83

TABLE 6
DECALIN ENTHALPY DATA
1723.7 kPa (250.0 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
23	565.3	557.8	1723.7	250.0	1668.5	242.0	614.5	264.2	1.29	0.56	615.8	264.8	08/01/83
24	587.4	597.7	1726.3	250.4	1668.5	242.0	679.2	292.0	1.29	0.56	680.5	292.6	08/01/83
26	616.4	649.8	1723.7	250.0	1675.4	243.0	762.5	327.8	1.30	0.56	763.8	328.4	08/01/83
25	626.0	667.2	1723.7	250.0	1678.9	243.5	797.7	343.0	1.30	0.56	799.0	343.5	08/01/83
27	630.7	675.6	1723.7	250.0	1682.3	244.0	822.8	353.7	1.30	0.56	824.1	354.3	08/01/83
28	632.7	679.2	1723.7	250.0	1682.3	244.0	865.5	372.1	1.30	0.56	866.8	372.6	08/01/83
29	633.6	686.7	1722.0	249.8	1682.3	244.0	928.5	399.2	1.30	0.56	929.8	399.7	08/01/83
30	633.7	680.9	1722.9	249.9	1675.4	243.0	952.4	409.5	1.30	0.56	953.7	410.0	08/01/83
31	634.1	691.8	1718.5	249.3	1682.3	244.0	974.4	418.9	1.30	0.56	975.7	419.5	08/01/83
32	636.2	685.5	1720.2	249.5	1682.3	244.0	990.8	426.0	1.30	0.56	992.1	426.5	08/01/83
33	641.5	695.0	1724.6	250.1	1682.3	244.0	1005.9	432.5	1.30	0.56	1007.2	433.0	08/01/83
34	644.5	700.3	1723.7	250.0	1682.3	244.0	1017.2	437.3	1.30	0.56	1018.5	437.9	08/01/83
35	648.0	706.8	1723.7	250.0	1678.9	243.5	1031.9	443.6	1.30	0.56	1033.2	444.2	08/01/83

TABLE 7
DECALIN ENTHALPY DATA
3144 kPa (456.0 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	454.2	357.9	3150.9	457.0	3033.7	440.0	315.4	135.6	2.42	1.04	317.8	136.6	08/03/83
2	480.7	405.6	3144.0	456.0	3047.5	442.0	381.7	164.1	2.43	1.05	384.1	165.1	08/03/83
3	513.9	465.2	3144.0	456.0	3061.3	444.0	465.3	200.0	2.44	1.05	467.7	201.1	08/03/83
4	546.4	523.0	3144.0	456.0	3061.3	444.0	556.0	239.0	2.44	1.05	558.5	240.1	08/03/83
5	580.0	584.3	3144.0	456.0	3047.5	442.0	655.9	282.0	2.43	1.05	658.4	283.1	08/03/83
6	605.3	629.8	3147.5	456.5	3054.4	443.0	731.9	314.7	2.44	1.05	734.3	315.7	08/03/83
7	623.9	663.2	3140.6	455.5	3047.5	442.0	791.2	340.1	2.43	1.05	793.6	341.2	08/03/83
8	633.3	680.3	3147.5	456.5	3054.4	443.0	826.7	355.4	2.44	1.05	829.2	356.5	08/03/83
13	640.6	693.4	3140.6	455.5	3057.8	443.5	839.6	361.0	2.44	1.05	842.1	362.0	08/03/83
14	641.1	694.2	3140.6	455.5	3061.3	444.0	844.2	362.9	2.44	1.05	846.6	364.0	08/03/83
10	647.4	705.7	3144.0	456.0	3061.3	444.0	869.7	373.9	2.44	1.05	872.1	374.9	08/03/83
11	650.7	711.6	3144.0	456.0	3061.3	444.0	878.4	377.6	2.44	1.05	880.8	378.7	08/03/83
12	655.0	721.0	3144.0	456.0	3061.3	444.0	895.6	385.1	2.44	1.05	898.1	386.1	08/03/83

TABLE 8
 DECALIN ENTHALPY DATA
 10,342.1 kPa (1500.0 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
2	453.5	456.7	10342.1	1500.0	10059.5	1459.0	315.2	135.5	8.25	3.55	323.5	139.1	08/04/83
3	486.9	416.7	10342.1	1500.0	10059.5	1459.0	397.4	170.8	8.25	3.55	405.6	174.4	08/04/83
16	524.2	483.8	10342.1	1500.0	10080.1	1462.0	496.1	213.3	8.27	3.55	504.4	216.8	08/04/83
4	528.9	492.3	10338.7	1499.5	10080.1	1462.0	510.8	219.6	8.27	3.55	519.1	223.2	08/04/83
6	551.8	533.6	10345.6	1500.5	10080.1	1462.0	568.6	244.5	8.27	3.55	576.9	248.0	08/04/83
7	560.6	549.4	10342.1	1500.0	10080.1	1462.0	591.4	254.3	8.27	3.55	599.7	257.8	08/04/83
8	581.0	586.2	10349.0	1501.0	10080.1	1462.0	651.7	280.2	8.27	3.55	659.9	283.7	08/04/83
9	606.4	631.9	10349.0	1501.0	10080.1	1462.0	728.8	313.3	8.27	3.55	737.0	316.9	08/04/83
10	616.9	650.8	10355.9	1502.0	10080.1	1462.0	762.7	327.9	8.27	3.55	771.0	331.5	08/04/83
11	629.2	672.8	10349.0	1501.0	10080.1	1462.0	794.8	341.7	8.27	3.55	803.0	345.2	08/04/83
13	634.4	682.3	10349.0	1501.0	10080.1	1462.0	810.9	348.6	8.27	3.55	819.2	352.2	08/04/83
14	644.6	710.6	10349.0	1501.0	10080.1	1462.0	837.8	360.2	8.27	3.55	846.1	363.8	08/04/83
15	650.9	711.9	10342.1	1500.0	10080.1	1462.0	860.9	370.1	8.27	3.55	869.1	373.7	08/04/83

TABLE 9 (Continued)
DECALIN ENTHALPY DATA
TWO-PHASE REGION MEASUREMENTS

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
10	530.9	496.0	413.89	60.03	386.1	56.0	653.3	280.8	0.23	0.10	653.5	281.0	07/31/83
11	539.8	512.0	482.01	69.91	448.2	65.0	595.3	256.0	0.29	0.12	595.6	256.1	07/31/83
12	540.8	513.8	482.84	70.03	455.1	66.0	737.6	317.1	0.29	0.13	737.9	317.2	07/31/83
13	548.9	528.3	546.62	79.28	517.1	75.0	757.7	325.7	0.34	0.15	758.0	325.9	07/31/83
14	549.0	528.4	551.79	80.03	524.0	76.0	679.6	292.2	0.35	0.15	679.9	292.3	07/31/83
15	556.3	541.8	619.91	89.91	582.6	84.5	674.9	290.2	0.40	0.17	675.3	290.3	07/31/83
16	556.7	542.3	620.74	90.03	582.6	84.5	778.5	334.7	0.40	0.17	778.9	334.9	07/31/83
27	563.1	553.9	688.65	99.88	644.7	93.5	770.4	331.2	0.45	0.19	770.9	331.4	07/28/83
22	563.1	554.0	694.65	100.75	648.1	94.0	639.2	274.8	0.45	0.19	639.7	275.0	07/28/83
26	563.2	554.0	688.65	99.88	641.2	93.0	658.9	283.3	0.44	0.19	659.3	283.5	07/28/83
23	563.2	554.0	689.47	100.00	644.7	93.5	731.6	314.5	0.45	0.19	732.0	314.7	07/28/83
24	563.2	554.1	686.93	99.63	641.2	93.0	748.6	321.8	0.44	0.19	749.0	322.0	07/28/83
25	563.2	554.1	689.47	100.00	641.2	93.0	745.6	320.6	0.44	0.19	746.1	320.8	07/28/83
9	591.7	605.4	1034.51	150.04	992.8	144.0	723.7	311.1	0.73	0.32	724.5	311.5	07/29/83
7	591.9	605.8	1034.51	150.04	999.7	145.0	750.4	322.6	0.74	0.32	751.2	323.0	07/29/83

TABLE 9.
DECALIN ENTHALPY DATA
TWO-PHASE REGION MEASUREMENTS

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
10	473.1	392.0	137.73	19.98	112.3	16.0	524.5	225.5	0.01	0.00	524.5	225.5	07/28/83
8	473.5	392.7	138.63	20.11	110.3	16.0	402.2	172.9	0.01	0.00	402.2	172.9	08/27/83
5	473.8	393.2	141.18	20.48	112.3	16.0	422.6	181.7	0.01	0.00	422.6	181.7	07/28/83
9	474.2	393.5	141.35	20.36	110.3	16.0	447.2	192.3	0.01	0.00	447.2	192.3	07/28/83
1	491.1	424.3	207.24	30.03	168.9	24.5	418.7	180.0	0.06	0.02	418.7	180.0	07/31/83
2	492.9	427.5	207.94	30.16	175.8	25.5	523.1	224.9	0.06	0.03	523.1	224.9	07/31/83
3	493.2	428.1	207.94	30.16	165.5	24.0	624.3	268.4	0.05	0.02	624.4	268.4	07/31/83
4	508.0	454.7	276.89	40.16	244.8	35.5	579.0	248.9	0.12	0.05	579.1	249.0	07/31/83
5	508.5	455.6	275.99	40.03	234.4	34.0	700.9	301.3	0.11	0.05	701.0	301.4	07/31/83
1	520.2	476.7	344.06	49.90	303.4	44.0	581.0	249.8	0.17	0.07	581.1	249.8	08/02/83
7	520.6	477.5	345.84	50.16	312.0	45.3	698.6	300.3	0.17	0.07	698.8	300.4	07/31/83
6	521.4	478.9	346.66	50.28	317.2	46.0	711.6	306.0	0.18	0.08	711.8	306.0	07/31/83
2	521.5	479.0	344.05	49.90	299.9	43.5	733.6	315.4	0.16	0.07	733.8	315.5	08/02/83
8	530.1	494.5	415.61	60.28	386.1	56.0	515.3	221.5	0.23	0.10	515.5	221.6	07/31/83
9	530.3	494.8	413.89	60.03	358.5	52.0	537.4	231.1	0.21	0.09	537.6	231.1	07/31/83

TABLE 9 (Continued)
DECALIN ENTHALPY DATA
TWO-PHASE REGION MEASUREMENTS

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
10	592.6	607.0	1034.51	150.24	992.8	144.0	856.5	368.2	0.73	0.32	857.2	368.5	07/29/83
11	592.8	607.4	1036.23	150.29	992.8	144.0	879.6	378.1	0.73	0.32	880.3	378.5	07/29/83
10	614.2	645.9	1379.03	200.01	1334.1	193.5	797.6	342.9	1.02	0.44	798.7	343.4	08/01/83
11	614.4	646.3	1379.08	200.01	1337.6	194.0	813.2	349.6	1.02	0.44	814.2	350.0	08/01/83
12	614.5	646.5	1379.08	200.01	1334.1	193.5	813.1	349.6	1.02	0.44	814.1	350.0	08/01/83
14	615.0	647.4	1379.08	200.01	1341.0	194.5	881.3	378.9	1.02	0.44	882.3	379.3	08/01/83
15	615.0	647.4	1379.08	200.01	1339.3	194.3	881.6	379.0	1.02	0.44	882.6	379.5	08/01/83
13	615.6	648.5	1380.81	200.26	1337.6	194.0	934.8	401.9	1.02	0.44	935.9	402.3	08/01/83
28	632.7	679.2	1723.81	250.01	1682.3	244.0	865.5	372.1	1.30	0.56	866.8	372.6	08/01/83
29	633.6	680.7	1722.08	249.76	1682.3	244.0	929.5	399.2	1.30	0.56	929.8	399.7	08/01/83
30	633.7	680.9	1722.98	249.89	1675.4	243.0	952.4	409.5	1.30	0.56	953.7	410.0	08/01/83

DECALIN- 20 PSIA ISOBAR

DECALIN- 50 PSIA ISOBAR

DECALIN- 100 PSIA ISOBAR

DECALIN - 150 PSIA ISOBAR

DECALIN - 200 PSIA ISOBAR

DECALIN - 250 PSIA ISOBAR

DECALIN- CRITICAL ISOBAR

DECALIN - 1500 PSIA ISOBAR

DECALIN— EXPERIMENTAL ENTHALPY VALUES

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TASK 3.3.3**ACID/BASE SYSTEM**

NOTE: Enthalpy data for Task 3.3.1 Quinoline Enthalpy Data is presented and discussed in this section.

Enthalpy data for *m*-cresol, the acid component of Task 3.3.3 is presented and discussed in this section.

TASK 3.3.3 AND TASK 3.3.1 ACID BASE SYSTEM (m-CRESOL/QUINOLINE)

The m-cresol used in this study was purchased from Eastman Chemical Company and Sigma Chemical Company with a purity of 98 mole % m-cresol. The quinoline was purchased from Aldrich Chemical Company with a specification of 96 mole %. The compounds were further purified by spinning band distillation. Analysis of the final samples by gas chromatography indicated the purity of the m-cresol to be 99.9 mole %. The small, barely detectable, impurity in the m-cresol is thought to be one of the cresol isomer. The purity of the quinoline was at least 98.5 mole %. The 1.5 (or less) mole % contaminant was identified as isoquinoline. Although higher purities of quinoline could be obtained by further distillation, there appears to be an isomerization reaction which occurs during storage, since the composition of quinoline would gradually decrease and that of isoquinoline slowly increase. Due to chemical similarity, it is felt that the isoquinoline should not have a measurable effect on the measured enthalpy values.

The enthalpy data which were obtained for m-cresol are presented in Figure 1 and Tables 2 through 7. The figure combines earlier data obtained in 1980 and previously reported 1 with more recent data at lower pressures. The reference datum is the pure liquid at 291.48 K, 1 atm. Data covers the temperature range from 291.5 K to 665 K and the pressure range of 206.8 to 10342 kPa.

To check the consistency of the data presented in Figure 1, an enthalpy pressure cross-plot was constructed from smooth expanded curves of enthalpy versus temperature (Figure 2). The isotherms shown in Figure 2 behave as

expected. The slope of the dotted line in Figure 2 is the value of $(\frac{\delta H}{\delta P})_T$ listed in the 1980 m-cresol data. The difference in slopes is quite significant and is due to the lack of low pressure data in the 1980 investigation. Also shown is the slope at zero pressure obtained from Pitzer's second virial coefficient correlation 2. The isotherms in Figure 2 were extrapolated back to zero pressure to obtain an estimate of ideal gas enthalpies. These data were compared with ideal gas enthalpies obtained from Reid, et al 3 as shown in Figure 3 with both sets of values referenced to 565 K. The two sets of values differed by 3.7% over the 100 K range which is reasonable in view of the extrapolation of vapor phase data, which are taken in our region of maximum uncertainty, to zero pressure.

Enthalpy data for quinoline is shown in Figure 4 and presented in Tables 8 through 13 4. It should be noted that only selected points are plotted in Figure 4 to avoid cluttering. Flanigan's thesis 5 presents a detailed discussion and tables on all of the data points for the m-cresol quinoline system. Similar cross plots and ideal gas enthalpy comparisons are also reported. From the vertical breaks in the curves of enthalpy versus temperature diagrams, vapor pressures were obtained for both m-cresol and quinoline and compared with other investigations 6, 7, 8, 9, 10. A plot of the results for quinoline is presented in Figure 5. Although there is good agreement among the different sets of data at moderate conditions, there are widely varying reported values of critical temperature, 782 K 6 to 800 K 7, and critical pressure, 3800 kPa 6 to 5773 kPa 7. Based on extrapolation of the vapor pressure curve, the values (800 K and 5773 kPa) 7 reported by Glaser were selected. These values were the best set to use in equation of state correlations to predict vapor pressures and enthalpy. From the plotted data,

heats of vaporization can also be obtained. These are presented in Table 1 for both pure compounds.

Enthalpy Measurements for the Binary Mixtures of m-Cresol and Quinoline

The mixtures were made up from the distilled pure compounds discussed above. In reporting binary composition, mole % is determined by combining the minor compound present with m-cresol into the m-cresol, and combining isoquinoline with quinoline. Composition of the system was monitored during operation and the system was maintained at the nominal binary composition ± 0.2 mole %. Data for the 80% m-cresol mixture, 67% mixture, 50% mixture, 33% mixture, and 20% mixture are presented in Figures 6 through 10, respectively. Data points for these mixtures are presented in Tables 14 through 31. The reference datum for each mixture is the liquid at 298.48 K and 1 atm. A detailed analysis, including pressure and composition cross plots, are reported in Flanigan's thesis 5. The range of the data reported is generally from 291 K to about 675 K and pressures from 206 kPa to 10340 kPa. To illustrate the consistency of the vapor phase data, an expanded scale plot of all compositions is presented for the 689.5 kPa isobar in Figure 11. The smooth change of enthalpy with composition is illustrated especially since the vapor phase data represents our region of maximum uncertainty in the numerical values of enthalpy. The numerical values of enthalpy are large, resulting in a large numerical error for a given percent error.

Mixing Heats

To perform further analysis of the mixture data, it is desirable to reference all the enthalpy data to a common datum. The common datum state for this investigation is $h = 0$, at 1 atm., 291.48 Kelvin, pure fluids. By defining the excess property as follows:

$$H^E = H_{\text{(actual solution, at T,P, and X)}} - H_{\text{(ideal solution, same T,P, and X)}}$$

It is relatively apparent that the experimental mixture enthalpies in this investigation must be corrected by the respective heat of mixing at 291.48 K and 1 atm, in order to have the same datum as the pure fluid data. These values can be estimated from the enthalpy data pressure cross plots.

At the condition of zero pressure, all gases are ideal and do not interact with each other since their separation distances are infinite and the heat of mixing is zero. By plotting enthalpy versus composition at zero pressure at a given temperature, a non-linear curve is obtained. The difference between the non-linear curve and a straight line between pure cresol and quino-line is the heat of mixing at the reference condition 291.5 K and 1 atm. The values were determined at several temperatures and were averaged. The results are reported in Figure 12 after a temperature correction to 298.13 K using the experimental data.

Figure 12 also compares the smoothed heat of mixing values of Tchamler and Krischai 11 with those estimated from the enthalpy data presented in this investigation. Tchamler and Krischai reported heat of mixing values that are

approximately 5-20% higher than those estimated in this investigation. The largest discrepancy seems to be in range of concentration of .3 to .7 mole fraction *m*-cresol. This could be due to the fact that Tchamler and Krischai measured values in the concentration ranges of 0 - .3 and .7 - 1.0 mole fraction *m*-cresol only, which were then fit to a numerical expression from which the smooth values shown in Figure 12 were generated.

A simple calorimetric experiment of the heat of mixing described elsewhere 4 was performed at 298.15 K. The results of this experiment are also shown in Figure 12. Figure 12 shows that the heat of mixing estimates from the enthalpy data are in good agreement with those from our experiment 5.

The heat of mixing values used to determine our reference enthalpies are obtained from the smooth curve drawn through our data in Figure 12, corrected to 291.48 K (the reference datum).

The values of the heat of mixing at 291.48 K were used to correct the mixture enthalpies to the pure component reference datum state. Figure 13 is a composition cross plot at zero pressure with this common basis which illustrates two isotherms, 620 and 640 K. The isotherms shown in Figure 13 are essentially linear, as expected, with no heat of mixing at zero pressure.

Composition Cross Plots at 206.8 kPa

From the mixture enthalpy values and the pure component data, all at the same basis, excess enthalpies as functions of composition, temperature and pressure were obtained and are reported elsewhere 5. These results indicate

that there is an insignificant effect of pressure on excess enthalpy in the liquid phase. A summary plot of excess enthalpy versus temperature for the various liquid phase compositions is reported in Figure 14. From the plot, it can be seen that as temperature is increased, the excess enthalpy becomes less skewed and decreases in magnitude.

CONCLUSIONS

Enthalpy data for the *m*-cresol quinoline binary system have been obtained between 291 and 675 K and 207 and 10342 kPa at 7 compositions, and includes both pure compounds. From these data, gas heat capacities, heats of vaporization, and pure compound vapor pressures can be obtained in addition to excess enthalpies. The data appear to be internally consistent and generally agree with other published data, where available. It is estimated the data are accurate to $\pm 1.0\%$ in the enthalpy differences relative to the basis 291.4 K for all mixtures.

FIGURE 1

meta-Cresol Enthalpy Data
 Isobars: 206.8, $\square$; 689.5, $\circ$; 1379.0, $\triangle$;
 1723.7, $\diamond$; Liquid, $\odot$; 10342.1, $\triangleup$ kPa

FIGURE 2

m-Cresol Enthalpy-Pressure Cross-Plot
 Isotherms: 675, $\circ$; 655, $\diamond$; 630, $\triangle$;
 610, $\circ$; 585, $\square$; 565, $\circ$ K

FIGURE 3

meta-Cresol Enthalpy Differences at Zero Pressure

Line: Ideal Heat Capacity

Points: Actual Data

Figure 4
A Plot of Experimental Enthalpy Values
for Quinoline Along Six Different Isobars.
○, 517.1 kPa; ▽, 689.5 kPa; ●, 1034.2 kPa;
◆, 1379 kPa; ◇, 3799.1 kPa; ◯, 10342.5 kPa.

FIGURE 5

Quinoline Vapor Pressures
 Cerise, $\circ$; Sebastian et al., $\square$; Lin et al., $\diamond$;
 Wilson, $\triangle$; Kobayashi, $\square$; Glaser et al., $\triangle$;

FIGURE 6
Enthalpy Data for the 80 Mole Percent m-Cresol Mixture
Isobars: 413.7, $\square$; 689.5, $\circ$; 10342.1, $\triangle$ KPa

FIGURE 7

Enthalpy Data for the 66.7 Mole Percent m-Cresol Mixture
Isobars: 206.8, $\square$; 689.5, $\circ$; 10342.1, $\triangle$ kPa

FIGURE 8

Enthalpy Data for the 50 Mole Percent m-Cresol Mixture

Isobars: 206.8, $\square$; 689.5, $\circ$; 979.1, $\triangle$; 1185.9, $\diamond$;
1379.0, $\blacktriangle$; 10342.1, $\circ$ KPa

FIGURE 9

Enthalpy Data for the 33.3 Mole Percent m-Cresol Mixture
 Isobars: 206.8, $\square$; 689.5, $\circ$; 10342.1, $\triangle$ kPa

FIGURE 10

Enthalpy Data for 20 Mole Percent m-Cresol Mixture
Isobars: 206.8, $\square$; 689.5, $\circ$; 10342, $\triangle$ kPa

FIGURE 11

FIGURE 12

Excess Enthalpy for the Binary Mixture
of m-Cresol and Quinoline Extrapolated
from Enthalpy Data, Δ ; Measured $\circ$;
— — Tschamler & Krischai

FIGURE 13

Composition Cross-Plot for the Binary Mixture
of m-Cresol & Quinoline at Zero Pressure
Isotherms: 620K ○; 640K □

FIGURE 14

Excess Enthalpies for the Binary Mixture of
m-Cresol & Quinoline in the Liquid Phase
Compositions: 80, $\circ$; 66.7, $\square$; 50, $\diamond$, 33.3, $\triangle$;
20, $\bigcirc$ Mole % m-Cresol

TABLE 1
HEATS OF VAPORIZATION

<u>Temp (k)</u>	<u>ΔH_{vap} (kJ/kg)</u>	<u>Pressure (kPa)</u>
<u>m-Cresol</u>		
705.8 (T_c)	0	4559.61 (P_c)
626.5	270.0	1723.7
609.8	288.4	1379.0
564.8	344.2	689.5
504.3	412.7	206.8
475.4	438.4	101.3
<u>Quinoline</u>		
595.8	323.3	517.1
617.6	311.6	689.5
644.2	289.3	1034.2

TABLE 2
M-CRESOL ENTHALPY DATA
206.8 kPa (30 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	kPa	PSIA	kPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	457.1	363.1	206.8	30.0	110.3	16.0	372.0	159.9	0.01	0.00	372.0	159.9	11/16/82
2	494.6	430.6	215.5	31.3	131.0	19.0	466.3	200.5	0.02	0.01	466.3	200.5	11/16/82
3	501.7	443.3	208.6	30.3	124.1	18.0	489.1	210.3	0.02	0.01	489.2	210.3	11/16/82
4	502.7	445.1	208.6	30.3	124.1	18.0	494.4	212.5	0.02	0.01	494.4	212.6	11/16/82
1	503.6	446.8	206.8	30.0	117.2	17.0	652.5	280.5	0.01	0.01	652.5	280.5	11/29/82
5	503.7	447.0	210.3	30.5	124.1	18.0	519.2	223.2	0.02	0.01	519.2	223.2	11/16/82
2	503.7	447.0	208.6	30.3	110.3	16.0	641.2	275.7	0.01	0.00	641.2	275.7	11/29/82
7	503.8	447.2	205.1	29.8	131.0	19.0	774.4	332.9	0.02	0.01	774.4	332.9	11/16/82
6	504.0	447.5	210.3	30.5	131.0	19.0	561.2	241.3	0.02	0.01	561.2	241.3	11/16/82
1	504.2	447.8	206.8	30.0	137.9	20.0	513.6	220.8	0.03	0.01	513.7	220.8	12/06/82
2	505.1	449.5	210.3	30.5	151.7	22.0	835.6	359.2	0.04	0.02	835.6	359.2	11/23/82
3	505.2	449.7	210.3	30.5	151.7	22.0	867.9	373.1	0.04	0.02	868.0	373.2	11/23/82
1	505.2	449.8	210.3	30.5	137.9	20.0	840.0	361.1	0.03	0.01	840.1	361.2	11/23/82
2	507.9	454.6	205.1	29.8	137.9	20.0	914.7	393.3	0.03	0.01	914.8	393.3	12/06/82
3	511.1	460.4	206.8	30.0	117.2	17.0	923.1	396.9	0.01	0.01	923.1	396.9	11/29/82

TABLE 2 (Continued)
M-CRESOL ENTHALPY DATA
206.8 kPa (30 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
6	545.3	521.8	206.8	30.0	124.1	18.0	981.1	421.8	0.02	0.01	981.2	421.8	11/30/82
9	545.7	522.6	206.8	30.0	124.1	18.0	983.0	422.6	0.02	0.01	983.0	422.6	11/29/82
7	548.1	526.9	210.3	30.5	131.0	19.0	984.1	423.1	0.02	0.01	984.1	423.1	11/30/82
5	548.4	527.5	208.6	30.3	151.7	22.0	985.2	423.6	0.04	0.02	985.3	423.6	11/23/82
6	549.0	528.5	206.8	30.0	151.7	22.0	990.0	425.6	0.04	0.02	990.1	425.7	11/23/82
7	555.2	539.7	206.8	30.0	151.7	22.0	997.0	428.6	0.04	0.02	997.0	428.7	11/23/82
9	560.2	548.7	210.3	30.5	131.0	19.0	1005.7	432.4	0.02	0.01	1005.7	432.4	11/30/82
8	561.5	551.0	206.8	30.0	151.7	22.0	1010.6	434.5	0.04	0.02	1010.6	434.5	11/23/82
9	568.4	563.4	206.8	30.0	151.7	22.0	1029.7	442.7	0.04	0.02	1029.7	442.7	11/23/82
10	576.5	576.1	206.8	30.0	151.7	22.0	1042.6	448.2	0.04	0.02	1042.6	448.2	11/23/82
10	582.7	589.1	206.8	30.0	124.1	18.0	1057.2	454.5	0.02	0.01	1057.2	454.5	11/30/82
11	595.0	611.3	206.8	30.0	124.1	18.0	1086.8	467.2	0.02	0.01	1086.8	467.2	11/30/82
11	596.4	613.8	206.8	30.0	151.7	22.0	1088.7	468.1	0.04	0.02	1088.7	468.1	11/23/82
12	600.8	621.8	205.1	29.8	137.9	20.0	1090.4	468.8	0.03	0.01	1090.4	468.8	11/30/82
12	611.9	641.8	206.8	30.0	151.7	22.0	1121.0	481.9	0.04	0.02	1121.0	482.0	11/23/82

TABLE 2 (Continued)
M-CRESOL ENTHALPY DATA
206.8 kPa (30 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
7	513.9	465.4	206.8	30.0	144.8	21.0	922.6	396.6	0.03	0.01	922.6	396.7	12/06/82
4	514.0	465.5	206.8	30.0	117.2	17.0	921.2	396.1	0.01	0.01	921.2	396.1	11/29/82
5	515.8	468.7	206.8	30.0	120.7	17.5	928.4	399.1	0.01	0.01	928.4	399.1	11/29/82
1	517.8	472.5	213.7	31.0	110.3	16.0	926.3	398.2	0.01	0.00	926.3	398.2	11/30/82
5	518.1	472.8	213.7	31.0	151.7	22.0	925.0	397.7	0.04	0.02	925.0	397.7	12/06/82
4	518.2	473.1	213.7	31.0	151.7	22.0	927.7	398.8	0.04	0.02	927.8	398.9	12/06/82
6	521.7	479.4	210.3	30.5	151.7	22.0	932.9	401.1	0.04	0.02	933.0	401.1	12/06/82
3	527.4	489.7	206.8	30.0	124.1	18.0	945.3	406.4	0.02	0.01	945.3	406.4	11/30/82
2	527.8	490.3	213.7	31.0	124.1	18.0	948.5	407.8	0.02	0.01	948.5	407.8	11/30/82
4	530.9	495.9	206.8	30.0	124.1	18.0	956.6	411.3	0.02	0.01	956.6	411.3	11/30/82
10	532.4	498.6	206.8	30.0	131.0	19.0	959.5	412.5	0.02	0.01	959.5	412.5	11/16/82
12	533.0	499.7	206.8	30.0	131.0	19.0	961.5	413.4	0.02	0.01	961.6	413.4	11/16/82
6	533.9	501.3	206.8	30.0	124.1	18.0	956.9	411.4	0.02	0.01	956.9	411.4	11/29/82
8	538.3	509.2	206.8	30.0	124.1	18.0	967.9	416.1	0.02	0.01	968.0	416.1	11/29/82
5	538.7	509.9	206.8	30.0	124.1	18.0	971.6	417.7	0.02	0.01	971.6	417.7	11/30/82

TABLE 2 (Continued)
M-Cresol Enthalpy Data
206.9 kPa (30 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
13	616.4	649.9	205.1	29.8	137.9	20.0	1136.2	488.5	0.03	0.01	1136.2	488.5	11/30/82
14	627.0	669.0	206.8	30.0	137.9	20.0	1150.9	494.8	0.03	0.01	1151.0	494.8	11/30/82
12	628.6	671.7	209.6	30.3	151.7	22.0	1146.7	493.0	0.04	0.02	1146.7	493.0	12/07/82
11	629.0	672.5	206.8	30.0	151.7	22.0	1150.1	494.5	0.04	0.02	1150.2	494.5	12/07/82

TABLE 3
M-CRESOL ENTHALPY DATA
689.5 kPa (100 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
2	564.6	556.7	686.0	99.5	634.3	92.0	859.1	369.4	0.40	0.17	859.5	369.5	11/12/82
10	564.8	557.0	689.5	100.0	620.5	90.0	828.4	356.1	0.39	0.17	828.8	356.3	11/11/82
1	565.1	557.5	689.5	100.0	496.4	72.0	956.0	411.0	0.29	0.13	956.3	411.1	11/24/82
8	565.2	557.6	691.2	100.3	606.7	88.0	1000.2	430.0	0.38	0.16	1000.5	430.2	11/11/82
3	565.3	557.9	689.5	100.0	530.9	77.0	924.1	401.6	0.32	0.14	934.5	401.7	11/24/82
2	565.3	557.9	689.5	100.0	517.1	75.0	942.1	405.0	0.31	0.13	942.4	405.2	11/24/82
4	566.6	560.3	689.5	100.0	537.8	78.0	1010.1	434.2	0.32	0.14	1010.4	434.4	11/24/82
11	567.9	562.5	687.8	99.8	620.5	90.0	1011.7	434.9	0.39	0.17	1012.0	435.1	11/09/82
5	571.1	568.2	689.5	100.0	551.6	80.0	1018.0	437.7	0.33	0.14	1018.3	437.8	11/24/82
2	576.1	577.4	689.5	100.0	537.8	78.0	1030.5	443.0	0.32	0.14	1030.8	443.2	12/07/82
3	577.0	578.9	687.8	99.8	551.6	80.0	1027.5	441.7	0.33	0.14	1027.8	441.9	12/07/82
6	577.0	578.9	687.8	99.8	551.6	80.0	1026.5	441.3	0.33	0.14	1026.9	441.5	11/24/82
7	582.1	588.2	689.5	100.0	551.6	80.0	1045.9	449.7	0.33	0.14	1046.2	449.8	11/24/82
4	586.9	596.8	689.5	100.0	551.6	80.0	1048.4	450.7	0.33	0.14	1048.7	450.9	11/07/82
8	589.3	601.1	687.8	99.8	551.6	80.0	1056.5	454.2	0.33	0.14	1056.8	454.4	11/24/82

TABLE 3 (Continued)
M-CRESOL ENTHALPY DATA
689.5 kPa (100 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	408.4	275.4	682.6	99.0	586.1	85.0	253.8	109.1	0.36	0.15	254.2	109.3	11/09/82
2	437.9	328.6	689.5	100.0	510.2	74.0	331.9	142.7	0.30	0.13	332.2	142.8	11/09/82
1	497.0	434.9	692.9	100.5	592.9	86.0	478.1	205.6	0.36	0.16	478.5	205.7	11/15/82
3	497.3	435.5	694.6	100.8	592.9	86.0	474.3	203.9	0.36	0.16	474.7	204.1	11/09/82
1	540.8	513.8	687.8	99.8	337.8	49.0	579.1	249.0	0.18	0.08	579.3	249.1	11/11/82
2	541.2	514.4	686.0	99.5	351.6	51.0	591.1	254.1	0.19	0.08	591.3	254.2	11/11/82
3	543.3	518.2	686.0	99.5	420.6	61.0	588.7	253.1	0.24	0.10	589.0	253.2	11/11/82
4	543.8	519.3	689.5	100.0	455.1	66.0	594.7	255.7	0.26	0.11	595.0	255.8	11/11/82
7	552.1	534.1	687.8	99.8	599.8	87.0	615.5	264.6	0.37	0.16	615.9	264.8	11/09/82
1	557.6	544.0	692.9	100.5	524.0	76.0	639.6	275.0	0.31	0.13	639.9	275.1	12/07/82
2	559.6	547.6	692.9	100.5	530.9	77.0	648.3	278.7	0.32	0.14	648.6	278.9	12/07/82
1	562.0	551.8	692.9	100.5	641.2	93.0	686.8	296.1	0.40	0.17	689.2	296.3	11/12/82
7	564.5	556.5	689.5	100.0	606.7	88.0	924.1	397.3	0.38	0.16	924.5	397.5	11/11/82
9	564.6	556.6	689.5	100.0	606.7	88.0	868.3	373.3	0.38	0.16	868.7	373.5	11/11/82
2	564.6	556.6	689.5	100.0	559.8	87.0	905.4	389.2	0.37	0.16	905.7	389.4	11/15/82

TABLE 3 (Continued)
M-CRESOL ENTHALPY DATA
689.5 kPa (100 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
9	596.3	613.7	689.5	100.0	551.6	80.0	1089.7	464.6	0.33	0.14	1081.0	464.7	11/24/82
10	603.1	625.9	689.5	100.0	558.5	81.0	1090.8	469.0	0.34	0.15	1091.2	469.1	11/24/82
4	607.7	634.2	686.0	99.5	606.7	88.0	1104.9	475.0	0.38	0.16	1105.3	475.2	11/15/82
5	610.0	638.2	689.5	100.0	641.2	93.0	1105.7	475.4	0.40	0.17	1106.1	475.5	11/12/82
6	610.7	639.5	687.8	99.8	641.2	93.0	1101.4	473.5	0.40	0.17	1101.8	473.7	11/12/82
11	611.2	640.5	689.5	100.0	558.5	81.0	1111.4	477.8	0.34	0.15	1111.7	478.0	11/24/82
12	617.7	652.1	689.5	100.0	558.5	81.0	1121.0	481.9	0.34	0.15	1121.3	482.1	11/24/82
6	625.1	665.5	689.5	100.0	565.4	82.0	1135.5	488.2	0.34	0.15	1135.8	488.3	12/07/82
8	638.1	688.8	689.5	100.0	558.5	81.0	1160.7	499.0	0.34	0.15	1161.0	499.1	12/07/82
9	648.4	707.4	691.2	100.3	565.4	82.0	1183.1	508.6	0.34	0.15	1183.4	508.8	12/07/82
10	654.2	717.9	691.2	100.3	565.4	82.0	1196.5	514.4	0.34	0.15	1196.9	514.6	12/07/82

TABLE 4
M-CRESOL ENTHALPY DATA
1379.0 kPa (200 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	430.2	314.6	1399.6	203.0	172.4	25.0	313.3	134.7	0.05	0.02	313.4	134.7	05/01/81
2	456.5	362.0	1372.1	199.0	165.5	24.0	375.0	161.2	0.05	0.02	375.0	161.2	05/01/81
3	500.1	440.5	1399.6	203.0	172.4	25.0	483.6	207.9	0.05	0.02	483.6	207.9	05/01/81
4	533.5	500.6	1406.5	204.0	165.5	24.0	573.6	246.6	0.05	0.02	573.6	246.6	05/01/81
5	564.4	556.2	1399.6	203.0	165.5	24.0	649.4	279.2	0.05	0.02	649.5	279.2	05/01/81
7	589.9	502.1	1358.3	197.0	158.6	23.0	726.6	312.4	0.04	0.02	726.7	312.4	05/01/81
9	602.0	523.9	1379.0	200.0	158.6	23.0	764.3	328.6	0.04	0.02	764.4	328.6	05/01/81
6	603.5	526.7	1379.0	200.0	165.5	24.0	774.3	332.9	0.05	0.02	774.4	332.9	05/01/81
10	607.6	534.0	1379.0	200.0	158.6	23.0	839.2	360.8	0.04	0.02	839.3	360.8	05/01/81
8	609.3	537.0	1379.0	200.0	158.6	23.0	917.4	394.4	0.04	0.02	917.4	394.4	05/01/81
16	610.2	538.6	1385.8	201.0	358.5	52.0	975.1	419.2	0.19	0.08	975.3	419.3	05/01/81
11	612.2	542.2	1385.8	201.0	158.6	23.0	1096.9	471.6	0.04	0.02	1097.0	471.6	05/01/81
17	623.2	562.0	1372.1	199.0	413.7	60.0	1114.6	479.2	0.23	0.10	1114.9	479.3	05/01/81
19	630.0	574.3	1372.1	199.0	420.6	61.0	1131.4	486.4	0.24	0.10	1131.6	486.5	05/01/81
20	633.4	580.5	1385.8	201.0	420.6	61.0	1142.8	491.3	0.24	0.10	1143.0	491.4	05/01/81

TABLE 4 (Continued)
M-CRESOL ENTHALPY DATA
1379.0 kPa (200 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
18	639.5	691.4	1365.2	198.0	413.7	60.0	1159.5	498.5	0.23	0.10	1159.7	498.6	05/01/81
14	650.4	711.0	1372.1	199.0	399.9	58.0	1173.5	504.5	0.22	0.10	1173.7	504.6	05/31/81
22	655.3	719.9	1385.8	201.0	420.6	61.0	1192.1	512.5	0.24	0.10	1192.3	512.6	05/01/81
21	665.2	737.6	1406.5	204.0	420.6	61.0	1214.9	522.3	0.24	0.10	1215.1	522.4	05/01/81

TABLE 5
M-CRESOL ENTHALPY DATA
1723.7 kPa (250 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
26	580.0	584.3	1696.1	246.0	592.9	86.0	698.7	300.4	0.36	0.16	699.1	300.6	05/01/81
27	595.4	612.0	1730.6	251.0	675.7	98.0	738.5	317.5	0.43	0.18	738.9	317.7	05/01/81
28	616.9	650.8	1716.8	249.0	675.7	98.0	818.5	351.9	0.43	0.18	818.9	352.1	05/01/81
29	620.5	657.3	1716.8	249.0	696.4	101.0	850.2	365.5	0.44	0.19	850.6	365.7	05/01/81
23	623.2	662.0	1730.6	251.0	779.1	113.0	877.1	377.1	0.50	0.22	877.6	377.3	05/01/81
24	625.9	666.9	1730.6	251.0	779.1	113.0	974.8	419.1	0.50	0.22	975.3	419.3	05/01/81
30	627.0	668.9	1730.6	251.0	689.5	100.0	1064.1	457.5	0.44	0.19	1064.6	457.7	05/01/81
31	631.3	676.6	1730.6	251.0	696.4	101.0	1114.2	479.0	0.44	0.19	1114.6	479.2	05/01/81
25	643.5	698.6	1723.7	250.0	779.1	113.0	1143.0	491.4	0.50	0.22	1143.5	491.6	05/01/81
32	649.6	709.6	1723.7	250.0	696.4	101.0	1156.7	497.3	0.44	0.19	1157.2	497.5	05/01/81
33	661.6	731.2	1723.7	250.0	696.4	101.0	1192.3	512.6	0.44	0.19	1192.7	512.8	05/01/81
34	666.8	740.6	1723.7	250.0	696.4	101.0	1198.1	515.1	0.44	0.19	1198.6	515.3	05/01/81

TABLE 6
M-CRESOL ENTHALPY DATA
LIQUID PHASE DATA

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
54	363.5	194.7	2447.6	355.0	241.3	35.0	154.0	66.2	0.10	0.04	154.1	66.2	05/01/81
53	373.2	212.0	2385.6	346.0	234.4	34.0	177.5	76.3	0.10	0.04	177.6	76.3	05/01/81
52	382.4	228.6	2385.6	346.0	241.3	35.0	199.6	85.8	0.10	0.04	199.7	85.8	05/01/81
51	392.2	246.2	2339.4	338.0	241.3	35.0	221.2	95.1	0.10	0.04	221.3	95.1	05/01/81
50	402.0	263.9	2475.2	359.0	262.0	38.0	244.0	104.9	0.12	0.05	244.1	105.0	05/01/81
49	411.4	280.8	2516.6	365.0	262.0	38.0	269.8	116.0	0.12	0.05	269.9	116.1	05/01/81
48	424.3	304.1	2178.7	316.0	241.3	35.0	299.4	128.7	0.10	0.04	299.5	128.7	05/01/81

TABLE 7
M-CRESOL ENTHALPY DATA
10342.1 kPa (1500 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
35	495.1	431.5	10335.2	1499.0	9011.4	1307.0	468.9	201.6	6.62	2.85	475.5	204.4	05/01/81
36	531.9	497.7	10342.1	1500.0	9004.6	1306.0	560.6	241.0	6.61	2.84	567.2	243.8	05/01/81
41	546.6	524.2	10342.1	1500.0	8687.4	1260.0	603.6	259.5	6.38	2.74	610.0	262.2	05/01/81
40	548.2	527.1	10300.8	1494.0	8535.7	1238.0	611.7	263.0	6.26	2.69	618.0	265.7	05/01/81
37	563.6	554.8	10273.2	1490.0	9066.6	1315.0	642.9	276.4	6.66	2.86	649.6	279.3	05/01/81
38	589.4	601.3	10287.0	1492.0	8770.1	1272.0	715.9	307.6	6.44	2.77	722.4	310.6	05/01/81
39	619.3	655.1	10342.1	1500.0	8839.1	1282.0	799.2	343.6	6.49	2.79	805.7	346.4	05/01/81
42	634.7	682.8	10314.6	1496.0	8728.3	1266.0	844.6	363.1	6.41	2.75	851.0	365.9	05/01/81
43	646.7	704.3	10314.6	1496.0	8728.8	1266.0	885.0	380.5	6.41	2.75	891.5	383.3	05/01/81
45	654.2	717.9	10321.5	1497.0	8749.4	1269.0	899.7	386.8	6.42	2.76	906.1	389.6	05/01/81
44	660.7	729.6	10273.2	1490.0	8721.9	1265.0	916.9	394.2	6.40	2.75	923.3	397.0	05/01/81
46	667.0	741.0	10335.2	1499.0	8921.8	1294.0	936.9	402.8	6.55	2.82	943.5	405.6	05/01/81

TABLE 8
QUINOLINE ENTHALPY DATA
517.1 kPa (75 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	358.9	186.3	519.9	75.4	144.1	20.9	102.1	43.9	0.03	0.01	102.1	43.9	04/09/81
2	359.0	186.5	519.9	75.4	144.1	20.9	101.4	43.6	0.03	0.01	101.4	43.6	04/09/81
3	370.0	206.3	510.2	74.0	116.3	16.0	114.7	49.3	0.01	0.00	114.7	49.3	05/28/81
4	404.5	268.4	516.4	74.9	178.6	25.9	185.1	79.6	0.05	0.02	185.2	79.6	03/02/81
5	438.2	329.0	519.9	75.4	178.6	25.9	246.3	105.9	0.05	0.02	246.4	105.9	04/02/81
6	511.9	461.7	516.4	74.9	178.6	25.9	396.8	170.6	0.05	0.02	396.9	170.6	04/02/81
7	517.8	472.4	516.4	74.9	178.6	25.9	405.7	174.4	0.05	0.02	405.7	174.4	04/16/81
8	527.5	489.9	516.4	74.9	192.4	27.9	431.7	185.6	0.05	0.02	431.8	185.6	04/02/81
9	534.4	502.2	520.6	75.5	109.6	15.9	446.1	191.8	0.00	0.00	446.1	191.8	06/18/81
10	537.0	507.0	516.4	74.9	185.5	26.9	450.5	193.7	0.05	0.02	450.6	193.7	04/02/81
11	543.3	516.2	519.9	75.4	144.1	20.9	464.7	199.8	0.03	0.01	464.8	199.8	04/09/81
12	551.9	533.8	519.9	75.4	157.9	22.9	486.1	209.0	0.03	0.01	486.2	209.0	04/16/81
13	553.0	535.8	520.6	75.5	116.5	16.9	483.6	207.9	0.01	0.00	483.6	207.9	06/18/81
14	566.5	560.0	516.4	74.9	226.8	32.9	524.0	225.3	0.07	0.03	524.1	225.3	06/11/81
15	568.6	563.8	516.4	74.9	116.5	16.9	522.4	224.6	0.01	0.00	522.4	224.6	06/18/81

TABLE 8 (Continued)
QUINOLINE ENTHALPY DATA
517.1 kPa (75 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
16	575.5	576.2	516.4	74.9	164.8	23.9	544.3	234.0	0.04	0.02	544.3	234.0	06/12/81
17	585.3	593.9	516.4	74.9	157.9	22.9	571.7	245.8	0.03	0.01	571.8	245.8	04/16/81
18	585.8	594.7	518.5	75.2	165.5	24.0	578.0	248.5	0.04	0.02	578.0	248.5	06/24/81
19	587.3	597.5	518.5	75.2	179.3	26.0	579.9	249.3	0.05	0.02	579.9	249.3	06/24/81
21	588.8	600.1	517.1	75.0	110.3	16.0	594.5	255.6	0.01	0.00	594.5	255.6	06/18/81
22	590.1	602.5	517.1	75.0	358.5	52.0	600.3	258.1	0.15	0.06	600.5	258.2	06/04/81
23	591.3	604.7	517.1	75.0	344.7	50.0	618.9	266.1	0.14	0.06	619.1	266.2	06/04/81
24	592.5	606.8	517.1	75.0	255.1	37.0	608.9	261.8	0.09	0.04	609.0	261.8	06/22/81
25	594.4	610.2	517.1	75.0	252.0	38.0	628.5	270.2	0.09	0.04	628.6	270.2	06/22/81
26	595.3	611.9	517.1	75.0	358.5	52.0	683.6	293.9	0.15	0.06	683.8	294.0	06/04/81
27	595.4	612.0	517.1	75.0	89.6	13.0	667.8	287.1	-0.01	0.00	667.8	287.1	06/23/81
28	595.4	612.0	517.1	75.0	358.5	52.0	683.6	293.9	0.15	0.06	683.8	294.0	06/04/81
29	595.5	612.2	520.6	75.5	275.8	40.0	617.1	351.3	0.10	0.04	617.2	351.3	06/22/81
30	595.8	612.7	517.8	75.1	96.5	14.0	769.2	330.7	0.00	0.00	769.2	330.7	07/17/81
31	596.1	613.3	515.9	75.4	109.6	15.9	834.6	358.6	0.00	0.00	834.6	358.8	06/23/81

TABLE 8 (Continued)
QUINOLINE ENTHALPY DATA
517.1 kPa (75 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
32	596.3	613.6	519.9	75.4	95.8	13.9	914.1	393.0	0.00	0.00	914.1	393.0	06/23/81
33	596.3	613.6	516.4	74.9	95.8	13.9	877.6	377.3	0.00	0.00	877.6	377.3	06/23/81
34	596.8	614.5	516.4	74.9	357.8	51.9	907.4	390.1	0.15	0.06	907.5	390.2	06/04/81
35	597.4	615.7	516.4	74.9	95.8	13.9	912.3	392.2	0.00	0.00	912.3	392.2	05/27/81
36	601.5	623.1	516.4	74.9	357.8	51.9	926.0	398.1	0.15	0.06	926.1	398.2	06/04/81
37	603.2	626.1	520.5	75.5	96.5	14.0	920.2	395.6	0.00	0.00	920.2	395.6	07/17/81
38	604.3	628.1	516.4	74.9	357.8	51.9	934.8	401.9	0.15	0.06	935.0	402.0	06/04/81
39	608.4	635.4	516.4	74.9	96.5	14.0	930.9	400.2	0.00	0.00	930.9	400.2	07/17/81
40	617.9	652.6	516.4	74.9	357.8	51.9	957.4	411.6	0.15	0.06	957.5	411.7	06/04/81
41	620.8	657.7	515.7	74.8	96.5	14.0	963.9	414.4	0.00	0.00	963.9	414.4	07/17/81
42	621.9	659.8	517.1	75.0	96.5	14.0	966.5	415.5	0.00	0.00	966.5	415.5	07/17/81
43	627.5	669.8	517.1	75.0	96.5	14.0	966.9	415.7	0.00	0.00	966.9	415.7	07/17/81
44	632.3	678.5	517.1	75.0	371.6	53.9	979.5	421.1	0.16	0.07	979.6	421.2	06/04/81
45	640.0	692.3	515.7	74.8	96.5	14.0	999.2	429.6	0.00	0.00	999.2	429.6	07/17/81
46	651.9	713.8	515.7	74.8	96.5	14.0	1026.2	441.2	0.00	0.00	1026.2	441.2	07/17/81

TABLE 8 (Continued)
QUINOLINE ENTHALPY DATA
517.1 kPa (75 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
47	651.8	713.6	517.1	75.0	371.6	53.9	1020.6	438.8	0.16	0.07	1020.8	438.9	06/04/81
48	658.8	726.2	517.1	75.0	96.5	14.0	1033.7	444.4	0.00	0.00	1033.7	444.4	07/14/81
49	663.9	735.4	517.1	75.0	96.5	14.0	1048.8	450.9	0.00	0.00	1048.8	450.9	07/04/81

TABLE 9
QUINOLINE ENTHALPY DATA
689.5 kPa (100 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
50	370.1	206.5	686.0	99.5	247.5	35.9	108.4	46.6	0.09	0.04	108.5	46.6	05/28/81
51	403.2	266.0	688.3	99.9	282.0	40.9	181.9	78.2	0.11	0.05	182.0	78.2	05/28/81
52	427.3	309.5	688.8	99.9	302.7	43.9	224.5	96.5	0.12	0.05	224.6	96.6	05/28/81
53	454.6	358.6	688.8	99.9	295.8	42.9	278.0	119.5	0.11	0.05	278.1	119.5	05/28/81
54	485.8	414.7	685.3	99.4	302.7	43.9	340.8	146.5	0.12	0.05	340.9	146.6	05/28/81
55	524.1	483.7	686.0	99.5	309.6	44.9	423.8	182.2	0.12	0.05	423.9	182.3	05/28/81
56	552.6	535.0	688.8	99.9	302.7	43.9	483.3	207.8	0.12	0.05	483.5	207.9	05/29/81
57	557.4	543.6	685.3	99.4	301.3	43.7	499.4	214.7	0.12	0.05	499.5	214.8	05/28/81
58	565.6	558.4	688.8	99.9	371.6	53.9	518.5	222.9	0.16	0.07	518.6	223.0	05/29/81
59	571.6	569.2	685.3	99.4	295.8	42.9	531.7	228.6	0.11	0.05	531.8	228.6	05/28/81
60	575.5	576.3	685.3	99.4	302.7	43.9	543.8	233.8	0.12	0.05	543.9	233.9	05/29/81
61	581.3	586.7	689.5	100.0	117.2	17.0	556.8	239.4	0.01	0.00	556.9	239.4	06/26/81
62	584.2	591.8	686.0	99.5	302.7	43.9	563.8	242.4	0.12	0.05	563.9	242.5	05/28/81
63	588.0	598.8	688.8	99.9	371.6	53.9	575.5	247.4	0.16	0.07	575.6	247.5	05/29/81
64	591.4	604.8	688.8	99.9	302.7	43.9	585.0	251.5	0.12	0.05	585.1	251.6	05/28/81

TABLE 9 (Continued)
QUINOLINE ENTHALPY DATA
689.5 kPa (100 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
65	593.7	609.0	688.8	99.9	302.7	43.9	588.5	253.0	0.12	0.05	588.6	253.1	05/28/81
66	596.5	614.0	686.0	99.5	110.3	16.0	598.0	257.1	0.01	0.00	598.0	257.1	06/30/81
67	599.9	620.2	687.4	99.7	117.2	17.0	602.9	259.2	0.01	0.00	602.9	259.2	06/26/81
68	601.5	623.1	688.8	99.9	124.1	18.0	607.1	261.0	0.01	0.01	607.1	261.0	06/19/81
69	605.7	630.6	688.8	99.9	371.6	53.9	623.6	268.1	0.16	0.07	623.8	268.2	06/19/81
70	605.9	631.0	689.5	100.0	117.2	17.0	625.0	268.7	0.01	0.00	625.0	268.7	06/25/81
71	607.1	633.1	687.4	99.7	96.5	14.0	623.4	268.0	0.00	0.00	623.4	268.0	07/16/81
72	612.3	642.4	692.9	100.5	131.0	19.0	650.8	279.8	0.02	0.01	650.8	279.8	08/12/81
73	613.4	644.4	690.2	100.1	131.0	19.0	662.2	284.7	0.02	0.01	662.2	284.7	08/12/81
74	613.4	644.5	687.4	99.7	96.5	14.0	680.4	292.5	0.00	0.00	680.4	292.5	07/16/81
75	613.7	644.9	689.5	100.0	131.0	19.0	672.9	289.3	0.02	0.01	672.9	289.3	08/12/81
76	614.0	645.6	699.9	100.2	96.5	14.0	676.6	290.9	0.00	0.00	676.6	290.9	07/16/81
77	615.5	648.2	688.1	99.8	310.3	45.0	742.2	319.1	0.12	0.05	742.3	319.2	08/12/81
78	615.5	648.3	689.5	100.0	310.3	45.0	733.6	315.4	0.12	0.05	733.7	315.5	08/12/81
79	616.3	649.6	689.5	100.0	96.5	14.0	807.4	347.1	0.00	0.00	807.4	347.1	07/15/81

TABLE 9 (Continued)
QUINOLINE ENTHALPY DATA
689.5 kPa (100 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
80	616.4	649.9	689.5	100.0	131.0	19.0	939.5	403.9	0.02	0.01	939.5	403.9	08/12/81
81	616.6	650.2	689.5	100.0	96.5	14.0	813.4	349.7	0.00	0.00	813.4	349.7	07/15/81
82	616.7	650.3	689.5	100.0	310.3	45.0	743.9	319.8	0.12	0.05	744.0	319.9	08/12/81
83	616.8	650.5	692.9	100.5	96.5	14.0	718.7	309.0	0.00	0.00	718.7	309.0	07/16/81
84	616.8	650.5	689.5	100.0	96.5	14.0	838.5	360.5	0.00	0.00	838.5	360.5	07/16/81
85	617.2	651.3	689.5	100.0	310.3	45.0	792.2	340.6	0.12	0.05	792.4	340.7	08/12/81
86	617.3	651.4	690.9	100.2	317.2	46.0	923.2	396.9	0.13	0.05	923.3	397.0	07/29/81
87	617.6	652.0	692.9	100.5	100.0	14.5	861.3	370.3	0.00	0.00	861.3	370.3	07/16/81
88	617.8	652.3	689.5	100.0	303.4	44.0	825.0	354.7	0.12	0.05	825.2	354.8	08/12/81
89	617.8	652.4	690.9	100.2	96.5	14.0	857.6	368.7	0.00	0.00	857.6	368.7	07/16/81
90	617.9	652.6	689.5	100.0	324.1	47.0	951.8	409.2	0.13	0.06	951.9	409.3	07/29/81
91	621.2	658.4	689.5	100.0	324.1	47.0	959.0	412.3	0.13	0.06	959.1	412.4	07/29/81
92	627.0	668.9	689.5	100.0	117.2	17.0	966.9	415.7	0.01	0.00	966.9	415.7	06/26/81
93	627.1	669.1	686.0	99.5	96.5	14.0	962.7	413.9	0.00	0.00	962.7	413.9	07/15/81
94	628.9	672.3	687.4	99.7	117.2	17.0	965.8	415.2	0.01	0.00	965.8	415.2	06/29/81

TABLE 9 (Continued)
QUINOLINE ENTHALPY DATA
689.5 kPa (100 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
95	629.2	672.4	686.0	99.5	103.4	15.0	971.3	417.6	0.00	0.00	971.3	417.6	06/30/81
96	630.8	675.8	690.9	100.2	565.4	82.0	974.1	418.8	0.27	0.12	974.4	418.9	07/27/81
97	631.2	676.4	689.5	100.0	255.1	37.0	970.6	417.3	0.09	0.04	970.7	417.3	06/25/81
98	631.6	677.2	684.6	99.3	213.7	31.0	971.1	417.5	0.07	0.03	971.2	417.5	06/29/81
99	632.8	679.3	689.5	100.0	275.8	40.0	966.5	415.5	0.10	0.04	966.6	415.5	06/29/81
100	636.7	686.3	681.9	98.9	288.9	41.9	975.8	419.5	0.11	0.05	975.9	419.5	07/01/81
101	636.7	686.3	682.6	99.0	289.6	42.0	975.5	419.4	0.11	0.05	975.6	419.4	07/01/81
102	636.9	686.7	687.4	99.7	565.4	82.0	990.4	425.8	0.27	0.12	990.7	425.9	07/27/81
103	637.0	687.0	686.0	99.5	96.5	14.0	990.2	425.7	0.00	0.00	990.2	425.7	07/14/81
104	638.6	689.8	689.5	100.0	324.1	47.0	992.0	426.5	0.13	0.06	992.2	426.6	07/29/81
105	641.5	695.1	686.0	99.5	117.2	17.0	989.7	425.5	0.01	0.00	989.7	425.5	06/29/81
106	646.2	703.5	688.8	99.9	451.6	65.5	992.3	426.6	0.20	0.09	992.5	426.7	05/29/81
107	647.4	705.6	690.9	100.2	96.5	14.0	1008.3	433.5	0.00	0.00	1008.3	433.5	07/16/81
108	651.7	713.3	688.8	99.9	288.9	41.9	1002.7	431.1	0.11	0.05	1002.8	431.1	05/27/81
109	656.1	721.3	683.8	99.9	288.9	41.9	1010.4	434.4	0.11	0.05	1010.5	434.4	05/27/81

TABLE 10
QUINOLINE ENTHALPY DATA
1034.2 kPa (150 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
115	554.4	538.3	1027.3	149.0	896.3	130.0	498.9	214.5	0.47	0.20	499.4	214.7	07/01/81
116	576.5	578.1	1034.2	150.0	530.9	77.0	546.4	234.9	0.25	0.11	546.6	235.0	07/07/81
117	591.8	605.5	1028.7	149.2	882.5	128.0	583.6	250.9	0.46	0.20	584.1	251.1	07/01/81
118	595.2	611.7	1027.3	149.0	517.1	75.0	583.4	250.8	0.24	0.10	583.6	250.9	07/10/81
119	601.8	623.5	1030.8	149.5	679.1	127.5	605.9	260.5	0.46	0.20	606.4	260.7	07/01/81
120	602.2	624.3	1037.7	150.5	827.4	120.0	604.1	259.7	0.42	0.18	604.5	259.9	07/01/81
121	604.9	629.2	1034.2	150.0	592.9	86.6	607.3	261.1	0.29	0.12	607.6	261.2	07/06/81
122	611.9	641.8	1037.7	150.5	489.5	71.0	623.1	267.9	0.23	0.10	623.4	268.0	07/14/81
123	614.8	647.0	1037.7	150.5	489.5	71.0	633.4	272.3	0.23	0.10	633.6	272.4	07/14/81
124	618.9	654.4	1030.8	149.5	524.0	76.0	638.3	274.4	0.25	0.11	638.5	274.5	07/10/81
125	621.1	658.3	1034.2	150.0	789.4	114.5	640.6	275.4	0.40	0.17	641.0	275.6	06/30/81
126	624.4	664.3	1033.5	149.9	530.9	77.0	654.8	281.5	0.25	0.11	655.0	281.6	07/06/81
127	625.3	665.9	1027.3	149.0	386.1	56.0	658.7	283.2	0.17	0.07	658.9	283.3	07/07/81
128	626.1	667.3	1032.8	149.8	396.2	56.6	659.0	283.3	0.17	0.07	659.1	283.4	07/07/81
129	629.9	674.2	1029.4	149.3	527.4	76.5	667.6	287.0	0.25	0.11	667.8	287.1	07/07/81

TABLE 9 (Continued)
QUINOLINE ENTHALPY DATA
689.5 kPa (100 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
110	656.5	722.1	689.5	100.0	137.9	20.0	1016.5	437.0	0.02	0.01	1016.5	437.0	06/29/81
111	657.1	723.1	692.9	100.5	124.1	18.0	1022.5	439.6	0.01	0.01	1022.5	439.6	06/29/81
112	656.5	725.6	686.0	99.5	117.2	17.0	1017.9	437.6	0.01	0.00	1017.9	437.6	06/29/81
113	661.5	731.0	690.9	100.2	96.5	14.0	1037.4	446.0	0.00	0.00	1037.4	446.0	07/16/81
114	664.2	735.9	689.5	100.0	96.5	14.0	1039.7	447.0	0.00	0.00	1039.7	447.0	07/16/81

TABLE 10 (Continued)
QUINOLINE ENTHALPY DATA
1034.2 kPa (150 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
130	630.2	674.6	1035.5	150.2	544.7	79.0	664.5	285.7	0.26	0.11	664.8	285.8	07/08/81
131	630.4	675.1	1027.3	149.0	527.4	76.5	666.6	286.6	0.25	0.11	666.9	286.7	07/07/81
132	633.0	679.8	1034.2	150.0	544.7	79.0	679.9	292.3	0.26	0.11	680.1	292.4	07/08/81
133	633.8	681.1	1034.2	150.0	682.6	99.0	681.8	293.1	0.34	0.15	682.1	293.2	08/13/81
134	633.8	681.1	1030.8	149.5	524.0	76.0	685.7	294.8	0.25	0.11	686.0	294.9	07/10/81
135	637.7	688.1	1034.2	150.0	682.6	99.0	705.7	303.4	0.34	0.15	706.0	303.5	08/13/81
136	637.9	688.5	1034.2	150.0	137.9	20.0	702.5	302.0	0.02	0.01	702.5	302.0	08/13/81
137	643.4	698.4	1030.8	149.5	661.9	96.0	859.9	369.7	0.33	0.14	860.3	369.8	07/23/81
138	643.7	699.0	1030.8	149.5	630.9	91.5	868.3	373.3	0.31	0.13	868.6	373.4	07/24/81
139	643.9	699.3	1030.8	149.5	658.4	95.5	849.2	365.1	0.33	0.14	849.5	365.2	07/23/81
140	644.2	699.8	1034.2	150.0	682.6	99.0	773.4	332.5	0.34	0.15	773.7	332.6	08/13/81
141	644.0	699.6	1032.8	149.8	661.9	96.0	886.9	381.3	0.33	0.14	887.2	381.4	07/23/81
142	644.2	699.8	1034.2	150.0	634.3	92.0	922.3	396.5	0.31	0.13	922.6	396.6	08/03/81
143	644.3	700.0	1034.2	150.0	634.3	92.0	933.0	401.1	0.31	0.13	933.3	401.2	08/03/81
144	644.5	700.5	1034.2	150.0	661.9	96.0	955.3	410.7	0.33	0.14	955.6	410.8	07/29/81

TABLE 10 (Continued)
QUINOLINE ENTHALPY DATA
1034.2 kPa (150 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	MO/DAY/YR
145	644.6	700.6	1034.2	150.0	684.0	99.2	912.5	392.3	0.34	0.15	912.8	392.4	07/30/81
146	644.8	700.9	1030.8	149.5	661.9	96.0	915.3	393.5	0.33	0.14	915.6	393.6	07/23/81
147	644.8	701.0	1027.3	149.0	665.3	96.5	937.6	403.1	0.33	0.14	937.9	403.2	07/27/81
148	644.9	701.1	1034.2	150.0	634.3	92.0	893.9	384.3	0.31	0.13	894.2	384.4	07/24/81
149	644.9	701.2	1034.2	150.0	689.5	100.0	813.6	349.6	0.34	0.15	814.0	349.9	08/13/81
150	645.3	701.8	1034.2	150.0	661.9	96.0	954.6	410.4	0.33	0.14	954.9	410.5	07/23/81
151	645.3	701.9	1034.2	150.0	586.1	85.0	848.3	364.7	0.28	0.12	848.6	364.8	07/30/81
152	645.5	702.2	1039.0	150.7	875.6	127.0	959.9	412.7	0.45	0.19	960.4	412.9	07/01/81
153	645.6	702.4	1034.2	150.0	634.3	92.0	956.0	411.0	0.31	0.13	956.3	411.1	08/03/81
154	645.8	702.8	1032.8	149.8	520.6	75.5	988.8	425.1	0.25	0.11	989.0	425.2	07/06/81
155	646.1	703.3	1027.3	149.0	786.0	114.0	974.1	418.8	0.40	0.17	974.5	419.0	07/27/81
156	646.2	703.4	1034.2	150.0	634.3	92.0	974.4	418.9	0.31	0.13	974.7	419.0	08/03/81
157	646.8	704.6	1040.4	150.9	630.9	91.5	1001.6	430.6	0.31	0.13	1001.9	430.7	07/23/81
158	647.5	705.9	1025.9	148.8	661.9	96.0	998.6	429.3	0.33	0.14	998.9	429.4	07/30/81
159	647.9	706.5	1034.2	150.0	634.3	92.0	999.0	429.5	0.31	0.13	999.3	429.6	08/03/81

TABLE 10 (Continued)
QUINOLINE ENTHALPY DATA
1034.2 kPa (150 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
160	646.4	703.9	1034.2	150.0	717.1	104.0	1006.5	432.7	0.36	0.15	1006.8	432.9	07/29/81
161	653.0	715.7	1034.2	150.0	627.4	91.0	1008.1	433.4	0.31	0.13	1008.4	433.5	08/03/81
162	649.7	709.8	1035.6	150.2	675.6	127.0	1014.8	436.3	0.45	0.19	1015.3	436.5	07/27/81
163	657.1	723.1	1034.2	150.0	896.3	130.0	1014.1	436.0	0.47	0.20	1014.6	436.2	08/13/81
164	658.5	725.7	1034.2	150.0	951.5	138.0	1017.9	437.6	0.50	0.21	1018.4	437.8	07/27/81
165	659.7	727.8	1034.2	150.0	730.8	106.0	1023.2	439.9	0.37	0.16	1023.6	440.1	07/29/81
166	665.7	738.5	1034.2	150.0	723.9	105.0	1017.4	437.4	0.36	0.16	1017.8	437.6	07/29/81
167	660.7	729.5	1034.2	150.0	668.8	97.0	1017.6	437.5	0.33	0.14	1018.0	437.6	07/24/81
168	661.0	730.2	1034.2	150.0	882.5	128.0	1029.3	442.5	0.46	0.20	1029.7	442.7	07/27/81
169	662.2	732.2	1028.7	149.2	496.4	72.0	1022.0	439.4	0.23	0.10	1022.3	439.5	07/08/81
170	662.3	732.4	1034.2	150.0	649.5	94.2	1026.2	441.2	0.32	0.14	1026.6	441.3	07/10/81
171	662.4	732.6	1028.7	149.2	241.3	35.0	1026.2	441.2	0.08	0.04	1026.3	441.2	07/30/81
172	662.5	732.8	1028.7	149.2	503.3	73.0	1025.3	440.8	0.24	0.10	1025.5	440.9	07/08/81

TABLE 11
QUINOLINE ENTHALPY DATA
1379.0 kPa (200 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
173	438.5	324.6	1372.1	199.0	909.4	131.9	246.8	106.1	0.47	0.20	247.3	106.3	06/03/81
174	464.9	377.1	1385.2	200.9	1123.2	162.9	292.8	125.9	0.60	0.26	293.4	126.2	06/03/81
175	478.0	400.7	1378.3	199.9	1123.2	162.9	321.9	138.4	0.60	0.26	322.5	138.7	06/03/81
176	493.6	428.8	1379.3	199.9	1116.3	161.9	353.6	152.0	0.59	0.26	354.1	152.3	06/03/81
177	504.4	446.2	1374.8	199.4	1116.3	161.9	381.5 [†]	164.0	0.59	0.26	382.1	164.3	06/03/81
178	523.8	483.1	1378.3	199.9	1116.3	161.9	419.6	180.4	0.59	0.26	420.2	180.7	06/03/81
179	532.4	498.6	1379.3	199.9	971.5	140.9	442.6	190.3	0.51	0.22	443.1	190.5	06/08/81
180	542.1	516.1	1379.3	199.9	1005.9	145.9	464.3	199.6	0.53	0.23	464.8	199.8	06/10/81
181	543.6	518.8	1372.1	199.0	992.2	143.9	461.0	198.2	0.52	0.22	461.5	198.4	06/09/81
182	552.9	535.5	1382.4	200.5	1116.3	161.9	483.6	207.9	0.59	0.26	484.2	208.2	06/03/81
183	569.7	565.8	1378.3	199.9	1019.7	147.9	523.3	225.0	0.54	0.23	523.9	225.2	06/09/81
184	580.0	584.4	1378.3	199.9	971.5	140.9	540.8	232.5	0.51	0.22	541.3	232.7	06/08/81
185	583.8	591.1	1378.3	199.9	1130.1	163.9	549.2	236.1	0.60	0.26	549.8	236.4	06/03/81
186	596.2	613.4	1378.3	199.9	1019.7	147.9	583.1	250.7	0.54	0.23	583.7	250.9	06/09/81
187	598.5	617.7	1378.3	199.9	978.4	141.9	586.8	252.3	0.51	0.22	587.4	252.5	06/08/81

TABLE 11 (Continued)
QUINOLINE ENTHALPY DATA
1379.0 kPa (200 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
188	601.8	623.6	1381.7	200.4	1012.8	146.9	604.8	260.0	0.53	0.23	605.3	260.2	06/10/81
189	602.4	624.7	1378.3	199.9	978.4	141.9	597.3	256.8	0.51	0.22	597.8	257.0	06/08/81
190	620.4	657.1	1378.3	199.9	978.4	141.9	642.7	276.3	0.51	0.22	643.2	276.5	06/08/81
191	624.8	664.9	1378.3	199.9	1033.5	149.9	658.3	283.0	0.55	0.23	658.8	283.2	06/09/81
192	626.9	668.7	1379.0	200.0	1048.0	152.0	664.5	285.7	0.55	0.24	665.1	285.9	08/04/81
193	631.4	676.9	1374.8	199.4	919.8	133.4	674.8	290.1	0.48	0.21	675.3	290.3	06/10/81
194	634.6	682.6	1381.7	200.4	923.2	133.9	678.3	291.6	0.48	0.21	678.7	291.8	06/10/81
195	639.2	690.8	1374.8	199.4	923.2	133.9	695.7	299.1	0.48	0.21	696.2	299.3	06/10/81
196	639.4	691.2	1379.0	200.0	1041.1	151.0	696.6	299.5	0.55	0.24	697.2	299.7	08/04/81
197	641.5	695.1	1378.3	199.9	978.4	141.9	701.8	301.7	0.51	0.22	702.3	301.9	06/08/81
198	643.3	698.3	1378.3	199.9	1047.3	151.9	701.1	301.4	0.55	0.24	701.6	301.6	06/09/81
199	647.2	705.2	1375.5	199.5	999.1	144.9	721.3	310.1	0.53	0.23	721.8	310.3	06/09/81
200	652.9	715.5	1378.3	199.9	1047.3	151.9	742.0	319.6	0.55	0.24	742.5	319.2	06/09/81
201	656.1	721.3	1378.3	199.9	999.1	144.9	765.7	329.2	0.53	0.23	766.2	329.4	06/10/81
202	656.3	725.2	1378.3	199.9	1061.1	153.9	787.1	338.4	0.56	0.24	787.7	338.6	06/10/81

TABLE 11 (Continued)
QUINCLINE ENTHALPY DATA
1379.0 kPa (200 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
203	659.8	728.0	1374.8	199.4	1074.9	155.9	808.3	347.5	0.57	0.24	808.9	347.7	06/10/81
204	661.3	730.7	1385.2	200.9	1030.8	149.5	813.4	349.7	0.54	0.23	813.9	349.9	06/09/81
205	661.3	730.7	1379.0	200.0	1061.8	154.0	831.3	357.4	0.56	0.24	831.9	357.6	08/04/81
206	662.0	731.9	1381.7	200.4	1030.8	149.5	830.1	356.9	0.54	0.23	830.7	357.1	06/09/81
207	663.2	734.1	1379.0	200.0	1048.0	152.0	884.1	380.1	0.55	0.24	884.7	380.3	08/04/81

TABLE 12
QUINOLINE ENTHALPY DATA
3799.0 kPa (551 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
208	483.4	410.4	3805.9	552.0	3557.7	516.0	335.2	144.1	2.02	0.87	337.2	145.0	08/05/81
209	490.3	422.8	3792.1	550.0	3557.7	516.0	348.2	149.7	2.02	0.87	350.2	150.6	08/05/81
210	506.6	452.2	3799.0	551.0	3564.6	517.0	384.3	165.2	2.03	0.87	386.3	166.1	08/05/81
211	509.9	458.1	3799.0	551.0	3564.6	517.0	391.5	168.3	2.03	0.87	393.5	169.2	08/05/81
212	520.8	477.7	3799.0	551.0	3564.6	517.0	411.2	176.8	2.03	0.87	413.3	177.7	08/05/81
213	534.5	502.4	3792.1	550.0	3564.6	517.0	444.3	191.0	2.03	0.87	446.3	191.9	08/05/81
214	546.9	524.7	3799.0	551.0	3564.6	517.0	471.7	202.8	2.03	0.87	473.7	203.7	08/05/81
215	567.6	562.0	3799.0	551.0	3564.6	517.0	518.5	222.9	2.03	0.87	520.5	223.8	08/05/81
216	598.0	616.7	3805.9	552.0	3606.0	523.0	598.9	257.5	2.05	0.88	601.0	258.4	08/05/81
217	613.7	645.0	3792.1	550.0	3530.1	512.0	629.2	270.5	2.01	0.86	631.2	271.4	08/10/81
218	619.8	655.9	3792.1	550.0	3530.1	512.0	645.5	277.5	2.01	0.86	647.5	278.4	08/10/81
219	634.6	682.6	3792.1	550.0	3543.9	514.0	673.8	289.7	2.01	0.87	675.9	290.6	08/10/81
220	653.1	715.9	3792.1	550.0	3543.9	514.0	719.4	309.3	2.01	0.87	721.4	310.2	08/10/81
221	654.4	718.2	3799.0	551.0	3530.1	512.0	714.1	307.0	2.01	0.86	716.1	307.9	08/10/81
222	658.4	725.5	3792.1	550.0	3530.1	512.0	737.3	317.0	2.01	0.86	739.3	317.9	08/10/81

TABLE 12 (Continued)
QUINOLINE ENTHALPY DATA
3799.0 kPa (551 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPLRIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
223	662.4	732.7	3792.1	550.0	3530.1	512.0	747.6	321.4	2.01	0.86	749.6	322.3	08/10/81
224	663.8	735.1	3799.0	551.0	3530.1	512.0	753.4	323.9	2.01	0.86	755.4	324.8	08/10/81

TABLE 13
QUINOLINE ENTHALPY DATA
10342.1 kPa (1500 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
225	565.8	558.8	10342.1	1500.0	10287.0	1492.0	501.7	215.7	5.97	2.57	507.7	218.3	08/10/81
226	615.5	648.3	10342.1	1500.0	10121.5	1468.0	628.3	270.1	5.87	2.52	634.1	272.6	08/10/81
227	618.0	652.8	10342.1	1500.0	9928.5	1440.0	637.1	273.9	5.76	2.47	642.8	276.4	08/11/81
228	624.9	665.1	10342.1	1500.0	9969.8	1446.0	651.0	279.9	5.78	2.49	656.8	282.4	08/11/81
229	629.6	673.6	10335.2	1499.0	10121.5	1468.0	656.4	282.2	5.87	2.52	662.3	284.7	08/10/81
230	631.7	677.3	10342.1	1500.0	10176.7	1476.0	666.9	286.7	5.90	2.54	672.8	289.2	08/10/81
231	640.8	693.8	10342.1	1500.0	9969.8	1446.0	689.9	296.6	5.78	2.49	695.7	299.1	08/11/81
232	647.6	706.0	10342.1	1500.0	9969.8	1446.0	704.5	302.9	5.78	2.49	710.3	305.4	08/11/81
233	649.2	708.9	10335.2	1499.0	10038.8	1456.0	709.2	304.9	5.82	2.50	715.0	307.4	08/11/81
234	652.3	714.4	10335.2	1499.0	10031.9	1455.0	719.7	309.4	5.82	2.50	725.5	311.9	08/11/81
235	661.3	730.6	10342.1	1500.0	10087.0	1463.0	749.4	322.2	5.85	2.51	755.3	324.7	08/11/81
236	662.1	732.1	10335.2	1499.0	10080.1	1462.0	749.7	322.3	5.85	2.51	755.5	324.8	08/11/81

TABLE 14
ENTHALPY DATA FOR THE 80 MOLE% m-CRESOL MIXTURE
413.7 kPa (60 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	451.6	353.2	413.7	60.0	296.5	43.0	324.8	144.0	0.14	0.06	335.0	144.0	08/12/82
1	457.2	363.2	413.7	60.0	303.4	44.0	350.9	150.9	0.14	0.06	351.1	150.9	08/16/82
2	483.4	410.4	413.7	60.0	303.4	44.0	413.4	177.7	0.14	0.06	413.6	177.8	08/12/82
2	485.5	414.3	413.7	60.0	296.5	43.0	427.1	183.6	0.14	0.06	427.3	183.7	08/16/82
3	522.3	444.4	413.7	60.0	289.6	42.0	463.6	199.3	0.13	0.06	463.7	199.4	08/12/82
3	509.4	457.3	413.7	60.0	286.1	41.5	486.5	209.2	0.13	0.06	486.7	209.2	08/16/82
4	517.2	471.2	413.7	60.0	275.8	40.0	510.7	219.5	0.12	0.05	510.8	219.6	08/11/82
5	529.1	492.7	413.7	60.0	275.8	40.0	543.6	233.7	0.12	0.05	543.7	233.7	08/12/82
4	534.0	501.5	413.7	60.0	282.7	41.0	567.3	243.9	0.13	0.06	567.4	244.0	08/16/82
5	543.9	519.4	413.7	60.0	282.7	41.0	638.6	274.6	0.13	0.06	638.7	274.6	08/16/82
7	546.6	524.2	410.2	59.5	282.7	41.0	700.3	301.1	0.13	0.06	700.5	301.1	08/12/82
1	546.7	524.4	410.2	59.5	262.0	38.0	673.1	289.4	0.11	0.05	673.2	289.4	08/11/82
6	550.2	530.7	413.7	60.0	275.8	40.0	781.4	335.9	0.12	0.05	781.5	336.0	08/16/82
7	551.1	532.3	412.0	59.8	275.8	40.0	793.1	341.0	0.12	0.05	793.2	341.0	08/16/82
4	551.6	533.3	413.7	60.0	275.8	40.0	827.5	355.8	0.12	0.05	827.6	355.8	08/12/82

TABLE 14 (Continued)
 ENTHALPY DATA FOR THE 80 MOLE% m-CRESOL
 413.7 kPa (60 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
2	551.7	533.3	413.7	60.0	262.0	38.0	831.8	357.6	0.11	0.05	831.9	357.7	08/11/82
8	555.0	539.3	413.7	60.0	282.7	41.0	910.5	391.4	0.13	0.06	910.6	391.5	08/16/82
10	557.2	543.2	413.7	60.0	275.8	40.0	958.1	411.9	0.12	0.05	958.2	411.9	08/16/82
9	558.1	544.9	413.7	60.0	275.8	40.0	972.9	418.3	0.12	0.05	973.0	418.3	08/16/82
3	558.5	545.6	413.7	60.0	275.8	40.0	981.3	421.9	0.12	0.05	981.4	421.9	08/11/82
4	559.8	546.0	413.7	60.0	279.2	40.5	994.5	427.5	0.13	0.05	994.6	427.6	08/11/82
11	560.4	549.0	413.7	60.0	275.8	40.0	994.0	427.3	0.12	0.05	994.1	427.4	08/16/82
12	565.1	557.5	413.7	60.0	275.8	40.0	1013.2	435.6	0.12	0.05	1013.3	435.6	08/16/82
6	568.8	564.2	413.7	60.0	289.6	42.0	1021.6	439.2	0.13	0.06	1021.7	439.3	08/11/82
13	570.9	568.0	417.1	60.5	275.8	40.0	1021.0	439.0	0.12	0.05	1021.1	439.0	08/16/82
8	585.3	593.8	415.4	60.3	634.0	92.0	1052.0	452.3	0.38	0.16	1052.4	452.5	08/11/82
6	587.6	598.1	417.1	60.5	330.9	48.0	1055.5	453.8	0.16	0.07	1055.7	453.9	08/17/82
9	596.0	613.2	415.4	60.3	289.6	42.0	1063.4	457.2	0.13	0.06	1063.6	457.3	08/11/82
6	623.9	663.3	413.7	60.0	272.3	39.5	1129.9	485.8	0.12	0.05	1130.0	485.8	08/06/82
11	626.3	667.6	413.7	60.0	289.6	42.0	1131.6	486.5	0.13	0.06	1131.8	486.6	08/11/82

TABLE 14 (Continued)
 ENTHALPY DATA FOR THE 80 MOLE% m-CRESOL MIXTURE
 413.7 kPa (60 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
10	628.7	672.0	412.0	59.8	317.2	46.0	1146.0	492.7	0.15	0.07	1146.2	492.8	08/17/82
9	632.2	678.3	413.7	60.0	268.9	39.0	1141.8	490.9	0.12	0.05	1141.9	490.9	06/06/82
13	642.9	697.5	415.4	60.3	313.7	45.5	1169.2	502.7	0.15	0.06	1169.3	502.7	08/17/82
9	647.8	706.3	413.7	60.0	243.0	35.3	1175.2	505.3	0.10	0.04	1175.3	505.3	08/06/82

TABLE 15
 ENTHALPY DATA FOR THE 80 MOLE% m-CRESOL MIXTURE
 689.5 kPa (100 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
2	427.8	310.4	691.2	100.3	460.2	66.8	286.0	123.0	0.25	0.11	286.2	123.1	07/30/82
3	462.8	373.4	689.5	100.0	461.9	67.0	370.3	159.5	0.26	0.11	371.2	159.6	07/30/82
4	488.1	419.0	689.5	100.0	461.9	67.0	424.7	182.6	0.26	0.11	425.0	182.7	07/30/82
1	506.7	452.4	689.5	100.0	537.8	78.0	483.0	207.7	0.31	0.13	483.3	207.8	08/02/82
5	516.7	470.4	689.5	100.0	460.2	66.8	508.8	218.7	0.25	0.11	509.0	218.8	07/30/82
2	536.9	506.8	689.5	100.0	541.2	78.5	558.9	240.3	0.31	0.13	559.2	240.4	08/02/82
6	541.3	514.7	689.5	100.0	487.8	70.8	573.0	246.4	0.27	0.12	573.3	246.5	07/30/82
7	547.1	525.1	689.5	100.0	529.2	76.8	586.9	252.3	0.30	0.13	587.2	252.4	07/30/82
3	552.7	535.2	689.5	100.0	548.1	79.5	603.6	259.5	0.32	0.14	604.0	259.7	08/02/82
8	561.9	551.7	689.5	100.0	558.5	81.0	630.1	270.9	0.32	0.14	630.5	271.1	07/30/82
6	565.1	557.4	689.5	100.0	558.5	81.0	645.5	277.5	0.32	0.14	645.8	277.6	08/03/82
7	570.0	566.3	689.5	100.0	558.5	81.0	673.1	289.4	0.32	0.14	673.4	289.5	08/02/82
8	573.4	572.5	480.9	69.8	558.5	81.0	710.3	305.4	0.32	0.14	710.6	305.5	08/02/82
4	576.3	577.6	689.5	100.0	555.0	80.5	759.5	326.5	0.32	0.14	759.8	326.7	08/02/82
9	577.7	580.1	687.8	99.8	534.3	77.5	774.7	333.1	0.31	0.13	775.0	333.2	07/30/82

TABLE 15 (Continued)
 ENTHALPY DATA FOR THE 80 MOLE% m-CFESOL MIXTURE
 689.5 kPa (100 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
10	581.1	586.1	689.5	100.0	561.9	81.5	873.3	375.4	0.33	0.14	873.6	375.6	07/30/82
11	583.1	590.0	689.5	100.0	565.4	82.0	942.2	405.1	0.33	0.14	942.5	405.2	07/30/82
9	583.7	591.4	689.5	100.0	561.9	81.5	959.6	412.5	0.33	0.14	959.9	412.7	08/02/82
1	587.3	597.4	689.5	100.0	574.0	83.3	1025.8	441.0	0.34	0.14	1026.1	441.1	08/03/82
10	589.9	602.1	689.5	100.0	563.6	81.8	1042.0	448.0	0.33	0.14	1042.4	448.1	08/02/82
1	592.0	605.9	689.5	100.0	610.2	88.5	1048.6	450.8	0.36	0.16	1048.9	451.0	08/04/82
1	592.6	606.9	689.5	100.0	563.2	81.3	1055.4	453.8	0.33	0.14	1055.7	453.9	08/05/82
2	594.9	611.1	689.5	100.0	610.2	88.5	1059.1	455.3	0.36	0.16	1059.4	455.5	08/04/82
4	604.9	629.1	689.5	100.0	568.8	82.5	1083.5	465.8	0.33	0.14	1083.8	465.9	08/06/82
5	616.3	649.7	689.5	100.0	568.8	82.5	1108.4	476.5	0.33	0.14	1108.7	476.7	08/06/82
4	618.2	653.1	687.8	99.8	579.2	84.0	1100.3	473.0	0.34	0.15	1100.6	473.2	08/03/82
2	625.0	665.2	689.5	100.0	556.6	80.8	1124.0	483.2	0.32	0.14	1124.4	483.4	08/03/82
5	625.4	666.0	689.5	100.0	582.6	84.5	1122.5	482.6	0.34	0.15	1122.9	482.7	08/03/82
7	627.6	670.0	689.5	100.0	586.1	85.0	1129.1	485.4	0.34	0.15	1129.4	485.6	08/03/82
6	629.0	670.0	689.5	100.0	586.1	85.0	1127.0	484.5	0.34	0.15	1127.3	484.7	08/03/82

TABLE 15 (Continued)
 ENTHALPY DATA FOR THE 80 MOLE% m-CRESOL MIXTURE
 689.5 kPa (100 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
9	642.0	696.0	689.5	100.0	587.8	85.3	1159.0	498.3	0.35	0.15	1159.3	498.4	08/03/82
10	651.0	712.1	691.2	100.3	589.5	85.5	1175.7	505.4	0.35	0.15	1176.0	505.6	08/03/82

TABLE 16
 ENTHALPY DATA FOR THE 80 MOLE% m-CRESOL MIXTURE
 10342.1 kPa (1500 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	358.1	185.0	10355.9	1502.0	10176.7	1476.0	122.3	52.6	1.15	3.08	129.4	55.6	08/09/82
1	396.1	253.3	10321.5	1497.0	10073.2	1461.0	208.8	89.8	1.08	3.04	215.9	92.8	08/10/82
20	426.0	307.1	10328.3	1498.0	10135.3	1470.0	275.7	118.5	7.12	3.06	282.8	121.6	08/09/82
3	511.4	450.8	10342.1	1500.0	10162.9	1474.0	498.2	209.9	7.14	3.07	495.4	213.0	08/07/82
4	522.1	480.2	10342.1	1500.0	10162.9	1474.0	518.8	223.0	7.14	3.07	525.9	226.1	08/09/82
4	525.1	485.5	10328.3	1498.0	10097.6	1463.0	524.1	225.3	7.09	3.05	531.2	228.4	08/10/82
6	541.2	514.4	10342.1	1500.0	10162.9	1474.0	569.2	244.7	7.14	3.07	576.4	247.8	08/09/82
5	553.1	535.9	10328.3	1498.0	10087.0	1463.0	594.5	255.6	7.09	3.05	601.6	258.7	08/10/82
6	580.8	585.8	10328.3	1498.0	10087.0	1463.0	659.2	283.4	7.09	3.05	666.3	286.5	08/10/82
7	592.9	607.6	10328.3	1498.0	10087.0	1463.0	696.2	299.3	7.09	3.05	703.3	302.4	08/10/82
8	605.4	630.1	10328.3	1498.0	10087.0	1463.0	729.5	313.6	7.09	3.05	736.6	316.7	08/10/82
9	620.5	657.2	10321.5	1497.0	10087.0	1463.0	772.5	332.1	7.09	3.05	779.6	335.2	08/10/82
10	630.8	686.6	10321.5	1497.0	10087.0	1463.0	828.3	356.1	7.09	3.05	835.4	359.1	08/10/82

TABLE 17
ENTHALPY DATA FOR THE 66.7 MOLE% m-CRESOL MIXTURE
206.8 kPa (30 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	MO/DAY/YR
1	420.4	297.0	210.3	30.5	165.5	24.0	256.2	110.2	0.04	0.02	256.3	110.2	08/26/82
1	425.8	306.8	206.8	30.0	213.7	31.0	266.4	114.5	0.08	0.03	266.5	114.6	09/07/82
1	462.3	372.4	206.8	30.0	137.9	20.0	352.1	151.4	0.03	0.01	352.1	151.4	09/02/82
2	481.0	406.1	208.6	30.3	165.5	24.0	408.4	175.6	0.04	0.02	408.5	175.6	09/07/82
3	485.2	413.7	206.8	30.0	144.8	21.0	423.5	182.1	0.03	0.01	423.5	182.1	08/26/82
4	489.9	422.1	206.8	30.0	151.7	22.0	432.9	186.1	0.03	0.01	432.9	186.1	08/26/82
2	496.7	434.5	206.8	30.0	144.8	21.0	461.0	198.2	0.03	0.01	461.0	198.2	09/02/82
1	501.9	443.8	210.3	30.5	131.0	19.0	470.3	202.2	0.02	0.01	470.3	202.2	08/31/82
2	508.2	455.1	206.8	30.0	144.8	21.0	497.3	213.8	0.03	0.01	497.4	213.8	08/31/82
3	512.3	462.5	209.6	30.3	141.3	20.5	521.7	224.3	0.03	0.01	521.7	224.3	09/02/82
3	518.9	474.4	205.1	29.8	165.5	24.0	570.0	245.1	0.04	0.02	570.1	245.1	08/31/82
3	522.1	480.1	206.8	30.0	148.2	21.5	680.0	292.4	0.03	0.01	680.1	292.4	09/07/82
5	525.7	486.5	206.8	30.0	165.5	24.0	758.2	326.0	0.04	0.02	758.2	326.0	08/26/82
4	526.4	487.8	206.8	30.0	148.2	21.5	822.1	353.4	0.03	0.01	822.1	353.5	09/07/82
1	526.6	488.3	210.3	30.5	151.7	22.0	815.1	350.4	0.03	0.01	815.2	350.5	08/27/82

TABLE 17 (Continued)
 ENTHALPY DATA FOR THE 66.7 MOLE% m-CRESOL MIXTURE
 206.8 kPa (30 PSIA)

ROW	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
6	527.5	489.7	210.3	30.5	137.9	20.0	800.6	344.2	0.03	0.01	800.6	344.2	08/26/82
4	527.9	490.5	208.6	30.3	165.5	24.0	789.1	339.2	0.04	0.02	789.1	339.3	08/31/82
4	527.9	490.5	206.8	30.0	144.8	21.0	862.0	370.6	0.03	0.01	862.0	370.6	09/02/82
5	528.4	491.4	206.8	30.0	165.5	24.0	895.1	384.8	0.04	0.02	895.1	384.8	08/31/82
6	529.8	494.0	206.8	30.0	151.7	22.0	942.7	405.3	0.03	0.01	942.7	405.3	09/07/82
5	530.6	495.5	217.3	30.5	151.7	22.0	937.8	403.2	0.03	0.01	937.9	403.2	09/02/82
5	531.5	497.0	206.8	30.0	148.2	21.5	943.4	405.6	0.03	0.01	943.4	405.6	09/07/82
2	532.1	498.0	213.7	31.0	137.9	20.0	936.3	402.5	0.03	0.01	936.3	402.5	08/27/82
9	542.0	516.0	203.4	29.5	151.7	22.0	960.6	413.0	0.03	0.01	960.7	413.0	09/07/82
4	543.5	518.6	213.7	31.0	131.0	19.0	968.8	416.5	0.02	0.01	968.8	416.5	09/18/82
6	553.8	537.2	220.6	32.0	137.9	20.0	997.3	428.8	0.03	0.01	997.3	428.8	08/31/82
11	559.2	546.8	205.1	29.8	151.7	22.0	1007.2	433.0	0.03	0.01	1007.3	433.1	09/07/82
8	565.3	557.9	210.3	30.5	124.1	18.0	1015.9	436.8	0.02	0.01	1015.9	436.8	09/18/82
7	577.3	579.5	212.0	30.8	124.1	18.0	1036.4	445.6	0.02	0.01	1036.4	445.6	08/31/82
8	584.5	532.3	220.6	32.0	131.0	19.0	1048.3	450.7	0.02	0.01	1048.3	450.7	08/31/82

TABLE 17 (Continued)
 ENTHALPY DATA FOR THE 66.7 MOLE% m-CRESOL MIXTURE
 206.8 kPa (30 PSIA)

PUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
7	591.2	604.4	206.8	30.0	158.6	23.0	1064.7	457.7	0.04	0.02	1064.8	457.8	09/02/82
9	600.2	620.6	220.6	32.0	124.1	18.0	1084.2	466.1	0.02	0.01	1084.2	466.1	08/31/82
10	610.4	633.0	213.7	31.0	131.0	19.0	1110.3	477.3	0.02	0.01	1110.3	477.3	08/31/82
8	630.3	674.9	213.7	31.0	151.7	22.0	1145.9	492.7	0.03	0.01	1146.0	492.7	09/02/82
11	632.2	678.3	210.3	30.5	155.1	22.5	1152.2	495.4	0.04	0.02	1152.3	495.4	09/02/82
10	640.1	703.2	210.3	30.5	158.6	23.0	1184.2	509.1	0.04	0.02	1184.3	509.1	09/02/82

TABLE 18
ENTHALPY DATA FOR THE 66.7 MOLE% m-CRESOL MIXTURE
689.5 kPa (100 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
2	348.3	167.2	689.5	100.0	441.3	64.0	100.0	43.0	0.23	0.10	100.2	43.1	08/24/82
1	348.4	167.4	689.5	100.0	489.5	71.0	101.8	43.8	0.27	0.11	102.0	43.9	08/25/82
2	351.5	173.0	692.9	100.5	510.2	74.0	110.2	47.4	0.28	0.12	110.5	47.5	08/25/82
2	382.9	225.5	692.9	100.5	530.9	77.0	171.2	73.6	0.30	0.13	171.5	73.7	08/23/82
4	391.0	244.1	687.3	99.9	517.1	75.0	198.4	85.3	0.29	0.12	198.7	85.4	08/25/82
5	409.2	277.0	691.2	100.3	530.9	77.0	233.5	100.4	0.30	0.13	233.8	100.5	08/15/82
1	432.7	313.2	692.9	100.5	565.4	82.0	282.4	121.4	0.32	0.14	282.7	121.5	08/19/82
6	446.8	344.6	692.9	100.5	530.9	77.0	319.6	137.4	0.30	0.13	319.9	137.5	08/25/82
2	469.7	385.8	692.9	100.5	561.9	81.5	370.2	159.2	0.32	0.14	370.6	159.3	08/19/82
3	487.3	417.4	689.5	100.0	551.6	80.0	419.2	180.2	0.31	0.13	419.5	180.4	08/19/82
4	506.4	451.9	689.5	100.0	551.6	80.0	474.7	204.1	0.31	0.13	475.0	204.2	08/19/82
5	524.4	484.2	689.5	100.0	544.7	79.0	514.5	221.2	0.30	0.13	514.8	221.3	08/19/82
1	530.4	495.1	689.5	100.0	296.5	43.0	529.6	227.7	0.13	0.06	529.8	227.8	08/20/82
2	546.4	523.9	689.5	100.0	303.4	44.0	564.7	242.8	0.14	0.06	564.9	242.8	08/20/82
3	552.4	534.6	687.8	99.8	303.4	44.0	589.6	253.5	0.14	0.06	589.8	253.6	08/20/82

TABLE 18 (Continued)
 ENTHALPY DATA FOR THE 66.7 MOLE% m-CRESOL MIXTURE
 689.5 kPa (100 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
5	557.5	543.8	692.9	100.5	303.4	44.0	593.5	255.1	0.14	0.06	593.6	255.2	08/20/82
6	573.7	567.5	691.2	100.3	306.8	44.5	636.1	273.5	0.14	0.06	636.3	273.6	08/20/82
7	571.9	569.7	689.5	100.0	586.1	85.0	654.5	281.4	0.33	0.14	654.8	281.5	08/24/82
8	581.2	586.5	691.2	100.3	586.1	85.0	725.3	311.8	0.33	0.14	725.7	312.0	08/24/82
5	583.8	591.1	689.5	100.0	579.2	84.0	794.9	341.8	0.33	0.14	795.2	341.9	08/24/82
6	585.3	593.9	689.5	100.0	579.2	84.0	821.0	352.9	0.33	0.14	821.3	353.1	08/24/82
8	587.4	597.6	689.5	100.0	306.8	44.5	869.8	374.0	0.14	0.06	869.9	374.0	08/20/82
9	588.2	599.1	691.2	100.3	306.8	44.5	883.0	379.6	0.14	0.06	883.2	379.7	08/20/82
3	589.6	601.6	689.5	100.0	565.4	82.0	957.1	411.5	0.32	0.14	957.4	411.6	08/23/82
10	590.9	603.9	689.5	100.0	592.9	86.0	978.4	420.6	0.34	0.15	978.7	420.8	08/24/82
4	591.5	605.1	689.5	100.0	565.4	82.0	1004.3	431.8	0.32	0.14	1004.6	431.9	08/23/82
10	593.0	607.8	689.5	100.0	310.3	45.0	1011.8	435.0	0.14	0.06	1011.9	435.1	08/20/82
11	598.9	618.3	686.0	99.5	310.3	45.0	1052.0	452.3	0.14	0.06	1052.2	452.3	08/20/82
5	604.3	628.1	687.8	99.8	565.4	82.0	1063.9	457.4	0.32	0.14	1064.3	457.6	08/23/82
12	605.9	631.0	555.0	80.5	313.7	45.5	1063.2	457.1	0.15	0.06	1063.3	457.1	08/20/82

TABLE 18 (Continued)
 ENTHALPY DATA FOR THE 66.7 MOLE% *n*-CRESOL MIXTURE
 689.5 kPa (100 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
13	614.5	646.4	692.9	100.5	313.7	45.5	1083.9	466.0	0.15	0.06	1084.0	466.1	08/20/82
6	623.5	662.6	689.5	100.0	572.3	83.0	1105.0	475.1	0.32	0.14	1105.4	475.2	08/23/82
13	645.3	701.8	689.5	100.0	599.8	87.0	1159.8	498.6	0.34	0.15	1160.2	498.8	08/24/82
14	658.6	725.8	644.7	79.0	310.3	45.0	1187.4	510.5	0.14	0.06	1187.5	510.5	08/24/82

TABLE 19
ENTHALPY DATA FOR THE 66.7 MOLE% m-CRESOL MIXTURE
10342.1 kPa (1500 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	371.0	208.0	10342.1	1500.0	10162.9	1474.0	154.5	66.4	6.93	2.98	161.4	69.4	09/09/82
2	385.2	233.6	10342.1	1500.0	10073.2	1461.0	175.0	75.2	6.87	2.95	181.8	78.2	09/16/82
2	409.2	276.8	10342.1	1500.0	10073.2	1461.0	221.2	95.1	6.87	2.95	228.1	98.1	09/14/82
3	425.6	306.4	10349.0	1501.0	10100.8	1465.0	263.2	113.2	6.89	2.96	270.1	116.1	09/14/82
4	447.1	345.2	10342.1	1500.0	10100.8	1465.0	322.6	138.7	6.89	2.96	329.4	141.6	09/14/82
4	455.6	360.4	10335.2	1499.0	10093.9	1464.0	341.9	147.0	6.88	2.96	348.7	149.9	09/16/82
5	472.3	390.4	10342.1	1500.0	10100.8	1465.0	378.2	162.6	6.89	2.96	385.1	165.6	09/14/82
6	491.9	425.8	10342.1	1500.0	10107.7	1466.0	427.6	183.8	6.89	2.96	434.5	186.8	09/14/82
5	501.3	442.7	10342.1	1500.0	10121.5	1468.0	446.8	192.1	6.90	2.97	453.7	195.1	09/16/82
7	514.5	466.4	10342.1	1500.0	10142.2	1471.0	497.9	209.7	6.92	2.97	494.8	212.7	09/14/82
6	526.8	488.7	10328.3	1498.0	10114.6	1467.0	521.5	224.2	6.90	2.96	528.4	227.2	09/16/82
8	534.3	502.1	10342.1	1500.0	10107.7	1466.0	534.1	229.6	6.89	2.96	541.0	232.6	09/14/82
9	541.6	515.2	10342.1	1500.0	10149.1	1472.0	556.6	239.3	6.92	2.98	563.6	242.3	09/16/82
7	548.3	527.3	10321.5	1497.0	10100.8	1465.0	579.2	249.0	6.89	2.96	586.1	252.0	09/16/82
10	570.6	567.5	10328.3	1498.0	10126.4	1469.0	632.5	271.9	6.91	2.97	639.4	274.9	09/16/82

TABLE 19 (Continued)
 ENTHALPY DATA FOR THE 66.7 MOLE% m-CRESOL MIXTURE
 10342.1 kPa (1500 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
10	622.6	625.1	10328.3	1498.0	10149.1	1472.0	776.0	309.5	6.92	2.98	726.9	312.5	09/16/82
11	626.2	667.5	10307.7	1495.0	10121.5	1468.0	782.1	336.2	6.90	2.97	789.0	339.2	09/16/82
12	649.4	709.3	10335.2	1499.0	10162.9	1474.0	849.5	365.2	6.93	2.98	856.5	368.2	06/19/82

TABLE 20
ENTHALPY DATA FOR THE 50 MOLE% m-CRESOL MIXTURE
206.8 kPa (30 PSIA)

ROW	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	A	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	445.5	342.2	206.8	30.0	137.9	20.0	302.1	129.9	0.02	0.01	302.1	129.9	11/04/82
2	446.4	343.8	206.8	30.0	137.9	20.0	301.9	129.8	0.02	0.01	301.9	129.8	11/04/82
3	490.2	422.7	203.4	29.5	144.8	21.0	409.0	175.8	0.03	0.01	409.0	175.8	11/04/82
4	505.5	450.2	199.9	29.0	165.5	24.0	459.5	197.5	0.04	0.02	459.5	197.5	11/02/82
5	507.4	453.0	215.5	31.3	151.7	22.0	463.7	199.4	0.03	0.01	463.7	199.4	11/02/82
3	514.7	466.8	206.8	30.0	137.9	20.0	476.5	204.9	0.02	0.01	476.5	204.9	11/05/82
9	521.8	479.6	213.7	31.0	137.9	20.0	501.8	215.7	0.02	0.01	501.8	215.7	11/02/82
2	524.3	484.0	206.8	30.0	158.6	23.0	505.2	217.2	0.04	0.02	505.2	217.2	10/28/82
6	525.4	486.0	206.8	30.0	137.9	20.0	515.4	221.6	0.02	0.01	515.4	221.6	11/04/82
4	526.3	487.6	201.7	29.3	137.9	20.0	537.5	231.1	0.02	0.01	537.5	231.1	11/04/82
10	526.9	488.7	217.2	31.5	137.9	20.0	532.1	228.8	0.02	0.01	532.1	228.8	11/02/82
7	527.2	489.4	205.1	29.8	137.9	20.0	527.2	226.6	0.02	0.01	527.2	226.6	11/04/82
8	529.5	493.4	210.3	30.5	137.9	20.0	558.3	240.0	0.02	0.01	558.3	240.0	11/04/82
3	530.6	495.4	217.2	31.5	155.1	22.5	541.9	233.0	0.04	0.02	542.0	233.0	10/28/82
9	531.1	496.4	210.3	30.5	137.9	20.0	592.6	254.8	0.02	0.01	592.6	254.8	11/04/82

TABLE 20 (Continued)
 ENTHALPY DATA FOR THE 50 MOLE% m-CRESOL MIXTURE
 206.8 kPa (30 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
10	531.7	497.4	210.3	30.5	137.9	20.0	650.7	279.7	0.02	0.01	650.7	279.8	11/04/82
4	532.6	499.0	208.6	30.3	137.9	20.0	625.4	268.9	0.02	0.01	625.4	268.9	11/05/82
8	533.3	500.3	203.4	29.5	137.9	20.0	727.3	312.7	0.02	0.01	727.3	312.7	11/02/82
6	535.1	503.5	218.9	31.8	137.9	20.0	734.3	315.7	0.02	0.01	734.3	315.7	11/05/82
7	536.7	506.3	203.4	29.5	144.3	21.0	873.7	375.6	0.03	0.01	873.8	375.7	11/02/82
7	537.0	507.0	205.1	29.8	137.9	20.0	819.9	352.5	0.02	0.01	819.9	352.5	11/05/82
4	543.4	518.4	217.2	31.5	151.7	22.0	935.9	402.4	0.03	0.01	935.9	402.4	10/28/82
1	550.4	531.1	210.3	30.5	175.8	25.5	944.8	406.2	0.05	0.02	944.8	406.2	10/28/82
5	552.4	534.6	213.7	31.0	151.7	22.0	953.9	410.1	0.03	0.01	953.9	410.1	10/28/82
6	562.7	553.1	213.7	31.0	137.9	20.0	965.7	415.2	0.02	0.01	965.7	415.2	10/28/82
7	570.5	567.2	213.7	31.0	137.9	20.0	979.3	421.0	0.02	0.01	979.3	421.0	10/28/82
8	584.0	591.5	213.7	31.0	137.9	20.0	1017.7	437.5	0.02	0.01	1017.8	437.6	10/28/82
9	596.4	513.6	220.6	32.0	137.9	20.0	1043.2	448.5	0.02	0.01	1043.2	448.5	10/28/82
10	606.3	531.7	220.6	32.0	137.9	20.0	1055.7	453.9	0.02	0.01	1055.8	453.9	10/28/82
8	614.0	545.5	210.3	30.5	131.0	19.0	1073.3	461.4	0.02	0.01	1073.3	461.4	10/27/82

TABLE 20 (Continued)
 ENTHALPY DATA FOR THE 50 MOLE% m-CRESOL MIXTURE
 206.8 kPa (30 PSIA)

ROW	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY	PRESSURE CORRECTION		CORRECTED ENTHALPY	DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG BTU/LB	KJ/KG	BTU/LB	KJ/KG BTU/LB	MO/DAY/YR
9	616.9	650.8	217.2	31.5	137.9	20.0	1077.9 463.4	0.02	0.01	1077.9 463.4	10/27/82
12	625.5	666.2	222.4	32.3	137.9	20.0	1099.7 472.8	0.02	0.01	1099.7 472.8	10/28/82
10	628.7	671.9	213.7	31.0	134.4	19.5	1112.8 478.4	0.02	0.01	1112.9 478.4	10/27/82
11	639.6	691.5	213.7	31.0	131.0	19.0	1129.5 485.6	0.02	0.01	1129.5 485.6	10/27/82

TABLE 21
ENTHALPY DATA FOR THE 50 MOLE% m-CRESOL MIXTURE
689.5 kPa (100 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	350.9	171.9	689.5	100.0	572.3	84.0	106.9	46.0	0.18	0.08	107.1	46.0	10/29/82
2	360.5	189.2	689.5	100.0	503.3	73.0	119.4	51.3	0.27	0.11	119.6	51.4	11/01/82
3	361.6	191.2	689.5	100.0	503.3	73.0	127.3	54.7	0.27	0.11	127.5	54.8	11/01/82
2	363.5	194.6	689.5	100.0	386.1	56.0	129.5	55.7	0.19	0.08	129.7	55.8	10/29/82
1	363.9	195.4	689.5	100.0	496.4	72.0	128.4	55.2	0.26	0.11	128.6	55.3	11/05/82
3	368.2	203.1	689.5	100.0	420.6	61.0	138.1	59.4	0.21	0.09	138.3	59.5	10/29/82
4	370.4	207.1	692.9	100.5	510.2	74.0	140.3	61.6	0.27	0.12	143.6	61.7	11/04/82
6	374.3	214.0	689.5	100.0	517.1	75.0	154.3	66.4	0.28	0.12	154.6	66.5	11/01/82
5	374.8	214.9	699.8	101.5	517.1	75.0	155.5	66.8	0.28	0.12	155.8	67.0	11/01/82
4	377.9	220.6	692.9	100.5	599.8	87.0	157.9	67.8	0.33	0.14	158.1	68.0	10/29/82
2	383.1	229.9	687.8	99.8	503.3	73.0	169.2	72.7	0.27	0.11	169.5	72.9	11/05/82
7	393.7	246.9	689.5	100.0	510.2	74.0	191.3	82.3	0.27	0.12	191.6	82.4	11/01/82
1	405.7	270.7	689.5	100.0	524.0	76.0	214.0	92.0	0.28	0.12	214.2	92.1	11/02/82
5	411.5	281.0	684.3	99.3	455.1	66.0	234.1	100.6	0.23	0.10	234.3	100.7	10/29/82
6	430.7	315.6	689.5	100.0	461.9	67.0	272.2	117.6	0.24	0.10	272.5	117.1	10/29/82

TABLE 21 (Continued)
 ENTHALPY DATA FOR THE 50 MOLE% m-CRESOL MIXTURE
 689.5 kPa (100 PSIA)

ROW	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
7	447.4	345.7	689.5	100.0	460.8	68.0	311.2	133.8	0.24	0.10	311.5	133.9	10/29/82
8	463.6	374.8	689.5	100.0	482.0	70.0	350.4	150.6	0.25	0.11	350.7	150.8	10/29/82
2	468.1	383.0	687.8	99.8	524.0	76.0	363.7	156.4	0.28	0.12	364.0	156.5	11/02/82
3	479.7	403.8	689.5	100.0	527.4	76.5	386.3	166.1	0.29	0.12	386.6	166.2	11/02/82
1	522.7	481.2	689.5	100.0	620.5	90.0	494.6	212.6	0.34	0.15	494.9	212.8	10/26/82
1	545.5	522.2	689.5	100.0	517.1	75.0	552.6	237.6	0.28	0.12	552.9	237.7	10/27/82
2	575.8	576.7	691.2	100.3	524.0	76.0	633.5	272.4	0.28	0.12	633.8	272.5	10/27/82
2	585.2	593.6	689.5	100.0	627.4	91.0	663.9	285.4	0.35	0.15	664.3	285.6	10/26/82
3	594.0	609.6	689.5	100.0	503.3	73.0	743.2	319.5	0.27	0.11	743.4	319.6	10/27/82
3	596.8	614.6	696.4	101.0	620.5	90.0	766.7	329.6	0.34	0.15	767.1	329.8	10/26/82
4	598.3	617.3	691.2	100.3	530.9	77.0	902.0	387.8	0.28	0.12	902.3	387.9	10/27/82
5	600.3	620.9	689.5	100.0	530.9	77.0	992.1	426.5	0.28	0.12	992.3	426.6	10/27/82
5	604.5	628.5	696.4	101.0	620.5	90.0	1032.4	443.9	0.34	0.15	1032.8	444.0	10/26/82
6	612.1	642.1	689.5	100.0	524.0	76.0	1074.8	462.1	0.28	0.12	1075.1	462.2	10/27/82
6	617.5	651.8	699.8	101.5	606.7	88.0	1066.2	458.4	0.33	0.14	1066.5	458.5	10/26/82

TABLE 21 (Continued)
 ENTHALPY DATA FOR THE 50 MOLE% m-CRESOL MIXTURE
 689.5 kPa (100 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
7	619.5	655.3	689.5	100.0	530.9	77.0	1073.2	461.4	0.29	0.12	1073.5	461.5	10/27/82
8	634.4	682.3	686.0	99.5	572.3	83.0	1104.9	475.9	0.31	0.13	1105.2	475.1	10/26/82
9	637.7	688.2	689.5	100.0	572.3	83.0	1109.7	477.1	0.31	0.13	1110.0	477.2	10/26/82
10	646.1	703.3	691.2	100.3	572.3	83.0	1132.8	487.0	0.31	0.13	1133.1	487.2	10/26/82
11	652.4	714.7	692.9	100.5	579.2	84.0	1147.2	493.2	0.32	0.14	1147.5	493.3	10/26/82
12	656.8	726.2	692.9	100.5	572.3	83.0	1154.2	496.2	0.31	0.13	1154.5	496.3	10/26/82

TABLE 22
ENTHALPY DATA FOR THE 50 MOLE% m-CRESOL MIXTURE
979.1 kPa (142 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	615.3	647.9	979.1	142.0	151.7	22.0	843.7	362.7	0.03	0.01	843.7	362.7	05/17/82
2	619.1	654.6	979.1	142.0	137.9	20.0	935.0	402.0	0.02	0.01	935.0	402.0	05/17/82
2	620.1	656.6	975.6	141.5	96.5	14.0	979.6	421.1	0.00	0.00	979.6	421.1	05/26/82
4	622.2	660.2	979.1	142.0	96.5	14.0	1037.0	445.8	0.00	0.00	1037.0	445.8	05/26/82
3	622.6	661.0	979.1	142.0	137.9	20.0	1037.0	445.8	0.02	0.01	1037.0	445.8	05/17/82
4	627.0	669.0	979.1	142.0	137.9	20.0	1082.7	465.5	0.02	0.01	1082.7	465.5	05/17/82
5	628.5	671.7	982.5	142.5	96.5	14.0	1089.5	468.4	0.00	0.00	1089.5	468.4	05/26/82
5	631.9	677.8	979.1	142.0	137.9	20.0	1091.4	469.2	0.02	0.01	1091.5	469.2	05/17/82
6	637.8	698.4	979.1	142.0	144.8	21.0	1108.2	476.4	0.03	0.01	1108.2	476.4	05/17/82
7	642.9	697.5	979.1	142.0	144.8	21.0	1120.1	481.6	0.03	0.01	1120.1	481.6	05/17/82
9	652.1	714.1	975.6	141.5	144.8	21.0	1144.3	492.0	0.03	0.01	1144.3	492.0	05/17/82
10	660.1	728.6	979.1	142.0	144.8	21.0	1156.3	497.1	0.03	0.01	1156.4	497.2	05/17/82
11	663.5	734.5	979.1	142.0	144.8	21.0	1163.4	500.2	0.03	0.01	1163.4	500.2	05/17/82

TABLE 23
ENTHALPY DATA FOR THE 50 MOLE% m-CRESOL MIXTURE
1185.9 kPa (172 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	MO/DAY/YR
1	418.8	294.2	1185.9	172.0	158.6	23.0	242.2	104.1	0.04	0.02	242.2	104.1	05/13/82
5	517.0	470.9	1192.8	173.0	151.7	22.0	473.2	205.6	0.03	0.01	478.3	205.6	05/13/82
4	517.7	472.2	1192.8	173.0	144.8	21.0	480.3	206.5	0.03	0.01	480.3	206.5	05/13/82
6	590.3	502.8	1189.3	172.5	158.6	23.0	660.8	284.1	0.04	0.02	660.8	284.1	05/13/82
7	590.5	503.3	1189.3	172.5	158.6	23.0	665.9	286.3	0.04	0.02	665.9	286.3	05/13/82
1	618.8	554.2	1182.5	171.5	158.6	23.0	777.5	334.2	0.04	0.02	777.5	334.3	05/14/82
2	625.4	566.0	1189.3	172.5	158.6	23.0	830.8	357.2	0.04	0.02	830.8	357.2	05/14/82
9	627.6	570.1	1196.2	173.5	165.5	24.0	849.3	365.1	0.04	0.02	849.4	365.2	05/13/82
8	628.2	571.1	1192.8	173.0	165.5	24.0	861.5	370.4	0.04	0.02	861.6	370.4	05/13/82
10	628.7	571.9	1185.9	172.0	165.5	24.0	885.6	380.8	0.04	0.02	885.7	380.8	05/13/82
11	630.3	574.8	1185.9	172.0	158.6	23.0	907.7	390.2	0.04	0.02	907.7	390.2	05/13/82
1	630.6	575.4	1185.9	172.0	255.1	37.0	921.0	396.0	0.10	0.04	921.1	396.0	05/20/82
20	632.1	578.1	1185.9	172.0	158.6	23.0	955.3	410.7	0.04	0.02	955.3	410.7	05/13/82
12	633.9	581.4	1185.9	172.0	158.6	23.0	1003.7	431.5	0.04	0.02	1003.7	431.5	05/13/82
2	634.5	582.4	1185.9	172.0	255.1	37.0	1022.9	439.8	0.10	0.04	1023.0	439.8	05/20/82

TABLE 23 (Continued)
 ENTHALPY DATA FOR THE 50 MOLE% m-CRESOL MIXTURE
 1185.9 kPa (172 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	MO/DAY/YR
3	634.5	682.4	1189.3	172.5	255.1	37.0	1045.8	449.6	0.10	0.04	1045.9	449.6	05/20/82
13	635.4	684.1	1185.9	172.0	158.6	23.0	1061.9	456.6	0.04	0.02	1062.0	456.6	05/13/82
15	636.2	685.5	1185.9	172.0	158.6	23.0	1082.5	465.4	0.04	0.02	1082.5	465.4	05/13/82
13	637.4	686.8	1185.9	172.0	158.6	23.0	1095.7	471.1	0.04	0.02	1095.7	471.1	05/17/82
14	637.8	688.3	1185.9	172.0	158.6	23.0	1095.5	471.0	0.04	0.02	1095.5	471.0	05/17/82
4	642.9	697.5	1185.9	172.0	255.1	37.0	1112.5	478.3	0.10	0.04	1112.6	478.3	05/20/82
1	646.0	706.7	1185.9	172.0	220.6	32.0	1124.2	483.3	0.08	0.03	1124.2	483.3	05/19/82
17	646.4	707.5	1182.5	171.5	151.7	22.0	1129.3	485.5	0.03	0.01	1129.4	485.5	05/13/82
12	650.4	711.1	1185.9	172.0	158.6	23.0	1124.8	483.6	0.04	0.02	1124.8	483.6	05/17/82
18	657.0	723.0	1185.9	172.0	158.6	23.0	1141.0	490.5	0.04	0.02	1141.0	490.6	05/13/82
3	662.7	733.2	1185.9	172.0	220.6	32.0	1156.6	497.0	0.08	0.03	1156.1	497.0	05/19/82
19	668.6	743.9	1185.9	172.0	158.6	23.0	1164.6	500.7	0.04	0.02	1164.6	500.7	05/13/82

TABLE 24
ENTHALPY DATA FOR THE 50 MOLE% m-CRESOL MIXTURE
1379.0 kPa (200 PSIA)

PON	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	495.6	432.3	1379.0	200.0	158.6	23.0	423.6	182.1	0.04	0.02	423.6	182.1	06/24/82
2	513.7	474.1	1379.0	200.0	179.3	26.0	463.9	208.0	0.05	0.02	463.9	208.1	05/18/82
3	527.2	489.2	1379.0	200.0	179.3	26.0	496.0	213.3	0.05	0.02	496.1	213.3	05/18/82
1	539.0	510.5	1379.0	200.0	137.9	20.0	522.1	224.5	0.02	0.01	522.1	224.5	02/12/82
2	539.1	510.7	1379.0	200.0	131.9	19.0	524.3	225.4	0.02	0.01	524.3	225.4	02/12/82
3	558.3	546.3	1389.3	201.5	131.0	19.0	578.3	248.6	0.02	0.01	578.3	248.6	02/12/82
4	580.1	584.5	1385.8	201.0	131.0	19.0	633.8	272.5	0.02	0.01	633.8	272.5	02/12/82
5	584.4	592.3	1385.8	201.0	131.0	19.0	644.5	277.1	0.02	0.01	644.5	277.1	02/12/82
7	603.5	626.7	1379.0	200.0	165.5	24.0	695.7	299.1	0.04	0.02	695.7	299.1	06/23/82
6	610.9	639.9	1392.7	202.0	131.0	19.0	716.3	308.0	0.02	0.01	716.3	308.8	02/12/82
2	619.2	654.9	1379.0	200.0	406.3	59.0	741.2	318.6	0.20	0.09	741.2	318.7	06/01/82
3	627.9	670.5	1379.0	200.0	172.4	25.0	784.3	337.2	0.05	0.02	784.4	337.2	06/25/82
1	628.7	671.9	1379.0	200.0	165.5	24.0	790.5	339.8	0.04	0.02	790.5	339.9	06/25/82
3	632.7	679.2	1379.0	200.0	413.7	60.0	800.6	344.2	0.21	0.09	800.8	344.3	06/01/82
2	634.1	681.7	1375.5	199.5	289.6	42.0	815.4	350.5	0.12	0.05	815.5	350.6	06/02/82

TABLE 24 (Continued)
 ENTHALPY DATA FOR THE 50 MOLE% m-CRESOL MIXTURE
 1379.0 kPa (200 PSIA)

ROW	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
4	637.4	687.7	1379.0	200.0	168.9	24.5	857.8	368.8	0.04	0.02	857.9	368.8	06/25/82
2	637.6	688.1	1379.0	200.0	425.6	61.0	885.9	386.9	0.21	0.09	886.1	386.9	06/28/82
3	639.8	692.0	1379.0	200.0	427.5	62.0	903.2	388.2	0.22	0.09	903.2	388.3	06/28/82
2	640.3	692.8	1379.0	200.0	406.8	59.0	920.5	395.7	0.20	0.09	920.7	395.8	06/29/82
1	641.7	695.3	1392.7	202.0	406.8	59.0	916.2	393.9	0.20	0.09	916.5	394.0	06/29/82
1	642.1	696.1	1375.5	199.5	324.1	47.0	964.1	414.5	0.15	0.06	964.2	414.5	06/30/82
2	643.1	697.8	1382.4	200.5	448.2	65.0	955.5	410.8	0.23	0.10	955.8	410.9	06/30/82
4	644.4	700.2	1379.0	200.0	289.6	42.0	975.4	419.4	0.12	0.05	975.6	419.4	06/02/82
5	644.6	700.5	1375.5	199.5	165.5	24.0	1021.0	438.9	0.04	0.02	1021.0	439.0	06/25/82
6	645.0	701.3	1379.0	200.0	172.4	25.0	1033.4	444.3	0.05	0.02	1033.5	444.3	06/25/82
4	645.1	701.6	1379.0	200.0	427.5	62.0	1025.3	440.8	0.22	0.09	1025.5	440.9	06/28/82
4	646.2	703.4	1379.0	200.0	448.2	65.0	1102.5	474.0	0.23	0.10	1102.7	474.1	06/30/82
1	646.3	703.6	1379.0	200.0	365.4	53.0	1097.6	471.9	0.17	0.08	1097.8	472.0	07/01/82
5	646.4	703.8	1379.0	200.0	303.4	44.0	1030.8	443.2	0.13	0.06	1030.9	443.2	06/02/82
3	646.4	703.8	1372.1	199.0	441.3	64.0	1042.0	448.0	0.22	0.10	1042.2	448.1	06/29/82

TABLE 24 (Continued)
 ENTHALPY DATA FOR THE 50 MOLE% m-CRESOL MIXTURE
 1379.0 kPa (200 PSIA)

ROW	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
3	647.6	796.0	1379.0	200.0	440.2	65.0	1060.2	459.2	0.23	0.10	1068.4	459.3	06/30/82
5	651.8	713.6	1379.0	200.0	440.2	65.0	1129.0	485.4	0.23	0.10	1129.3	485.5	06/30/82
5	652.7	715.2	1379.0	200.0	427.5	62.0	1125.3	483.8	0.22	0.09	1125.5	483.9	06/28/82
6	656.9	722.7	1302.4	200.5	440.2	65.0	1134.8	487.9	0.23	0.10	1135.1	488.0	06/30/82
10	657.9	724.6	1379.0	200.0	431.0	63.0	1143.2	491.5	0.02	0.01	1143.3	491.5	02/12/82
3	659.3	727.1	1375.5	199.5	365.4	53.0	1134.0	487.5	0.17	0.08	1134.2	487.6	07/01/82
7	659.9	728.1	1302.4	200.5	440.2	65.0	1136.2	488.5	0.23	0.10	1136.5	488.6	06/30/82
4	663.1	733.9	1379.0	200.0	434.4	63.0	1151.0	495.2	0.22	0.09	1152.0	495.3	05/19/82
8	663.8	735.2	1379.0	200.0	440.2	65.0	1150.1	494.5	0.23	0.10	1150.4	494.6	06/30/82
6	669.0	744.5	1379.0	200.0	461.9	67.0	1150.1	498.7	0.24	0.10	1160.3	498.9	05/19/82
4	669.2	744.8	1379.0	200.0	365.4	53.0	1159.8	498.6	0.17	0.08	1160.0	498.7	07/01/82

TABLE 25
ENTHALPY DATA FOR THE 50 MOLE % m-CRESOL MIXTURE
10342.1 kPa (1500 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
3	390.4	243.0	10342.1	1500.0	8783.9	1274.0	185.7	79.8	5.75	2.47	191.4	82.3	01/29/82
5	396.1	253.2	10340.4	1507.0	9114.9	1322.0	192.2	82.6	5.97	2.57	198.1	85.2	01/29/82
8	429.2	312.8	10342.1	1500.0	9114.9	1322.0	256.7	110.4	5.97	2.57	262.7	112.9	01/29/82
9	442.4	336.7	10342.1	1500.0	9114.9	1322.0	280.7	120.7	5.97	2.57	286.7	123.3	01/29/82
11	461.0	370.1	10342.1	1500.0	9114.9	1322.0	334.0	143.6	5.97	2.57	339.9	146.2	01/29/82
12	486.8	416.6	10369.7	1504.0	9114.9	1322.0	397.2	170.7	5.97	2.57	403.1	173.3	01/29/82
1	568.2	563.1	10360.8	1494.0	9597.5	1392.0	596.0	256.2	6.29	2.70	602.3	258.9	02/06/82
2	590.3	602.9	10342.1	1500.0	9514.8	1380.0	648.8	278.9	6.23	2.68	655.0	281.6	02/06/82
3	606.0	631.0	10342.1	1500.0	9514.8	1380.0	697.5	299.9	6.23	2.68	703.7	302.6	02/06/82
4	619.2	654.0	10342.1	1500.0	9514.8	1380.0	730.9	314.2	6.23	2.68	737.1	316.9	02/06/82
5	631.8	677.5	10342.1	1500.0	9514.8	1380.0	758.2	326.0	6.23	2.68	764.4	328.6	02/06/82
6	641.2	694.5	10342.1	1500.0	9514.8	1380.0	790.1	339.7	6.23	2.68	796.4	342.4	02/06/82
7	652.3	714.4	10355.9	1502.0	9526.6	1382.0	816.6	351.1	6.24	2.68	822.8	353.7	02/06/82
8	653.5	725.7	10342.1	1500.0	9487.2	1376.0	833.3	358.2	6.22	2.67	839.5	360.9	02/06/82

TABLE 26
ENTHALPY DATA FOR THE 33.3 MOLE% m-CRESOL MIXTURE
206.8 kPa (30 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	453.2	356.0	217.7	31.0	151.7	22.0	304.6	131.0	0.03	0.01	304.6	131.0	09/30/82
3	465.1	377.5	217.3	30.5	165.5	24.0	334.3	143.7	0.04	0.02	334.4	143.7	09/21/82
4	472.0	389.8	217.3	30.5	165.5	24.0	343.7	147.8	0.04	0.02	343.7	147.8	09/21/82
2	490.6	423.3	206.6	30.3	151.7	22.0	392.3	168.7	0.03	0.01	392.4	168.7	09/30/82
5	493.3	433.0	206.8	30.0	144.8	21.0	418.2	179.8	0.03	0.01	418.2	179.8	09/21/82
3	507.3	453.5	206.8	30.0	151.7	22.0	441.5	189.8	0.03	0.01	441.5	189.8	09/30/82
6	517.2	471.3	206.8	30.0	137.9	20.0	479.9	206.3	0.02	0.01	479.9	206.3	09/21/82
4	522.5	480.7	206.8	30.0	151.7	22.0	507.4	218.2	0.03	0.01	507.5	218.2	09/30/82
5	526.4	487.8	206.8	30.0	141.3	20.5	536.8	230.6	0.03	0.01	536.8	230.6	09/30/82
6	532.3	498.5	210.3	30.5	144.3	21.0	597.0	256.7	0.03	0.01	597.0	256.7	09/30/82
7	532.9	499.6	210.3	30.5	151.7	22.0	589.9	253.6	0.03	0.01	589.9	253.6	09/21/82
1	534.5	502.4	206.8	30.0	137.9	20.0	703.6	302.5	0.02	0.01	703.6	302.5	10/04/82
8	535.8	504.8	210.3	30.5	151.7	22.0	647.2	278.2	0.03	0.01	647.2	278.2	09/21/82
7	536.2	505.4	210.3	30.5	144.3	21.0	776.8	333.9	0.03	0.01	776.8	333.9	09/30/82
1	537.9	508.5	206.8	30.0	137.9	20.0	883.6	379.9	0.02	0.01	883.6	379.9	10/02/82

TABLE 26 (Continued)
 ENTHALPY DATA FOR THE 33.3 MOLE% m-CRESOL MIXTURE
 206.8 kPa (30 PSIA)

ROW	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
2	538.2	509.1	210.3	30.5	137.9	20.0	825.6	355.0	0.02	0.01	825.7	355.0	10/04/82
8	538.6	509.8	210.3	30.5	144.8	21.0	883.5	379.6	0.03	0.01	883.6	379.9	09/30/82
9	539.0	511.5	210.3	30.5	148.2	21.5	848.5	364.6	0.03	0.01	848.6	364.8	09/21/82
4	540.3	512.9	208.6	30.3	137.9	20.0	895.2	384.9	0.02	0.01	895.2	384.9	10/04/82
3	540.8	513.8	206.8	30.0	137.9	20.0	893.7	384.2	0.02	0.01	893.8	384.3	10/04/82
2	542.5	516.8	206.8	30.0	144.8	21.0	895.5	385.0	0.03	0.01	895.6	385.0	10/02/82
5	546.3	523.7	206.8	30.0	137.9	20.0	904.3	388.8	0.02	0.01	904.3	388.8	10/04/82
6	550.4	531.0	206.8	30.0	137.9	20.0	914.3	393.1	0.02	0.01	914.4	393.1	10/04/82
11	550.6	531.3	208.6	30.3	144.8	21.0	906.9	389.9	0.03	0.01	906.9	389.9	09/21/82
3	574.4	574.3	210.3	30.5	144.8	21.0	958.1	411.9	0.03	0.01	958.2	411.9	10/02/82
4	584.1	591.7	208.6	30.3	144.8	21.0	978.5	420.7	0.03	0.01	978.5	420.7	10/02/82
7	585.7	594.5	206.8	30.0	137.9	20.0	980.0	421.3	0.02	0.01	980.0	421.3	10/04/82
5	595.4	612.1	206.8	30.0	144.8	21.0	1000.2	430.0	0.03	0.01	1000.3	430.0	10/02/82
6	605.3	629.8	205.1	29.8	144.8	21.0	1019.5	438.3	0.03	0.01	1019.5	438.3	10/02/82
8	625.8	666.8	205.1	29.8	144.8	21.0	1058.0	454.9	0.03	0.01	1058.0	454.9	10/02/82

TABLE 26 (Continued)
 ENTHALPY DATA FOR THE 33.3 MOLE% m-CRESOL MIXTURE
 206.8 kPa (30 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	kPa	PSIA	kPa	PSIA	KJ/KG BTU/LB	KJ/KG BTU/LB	KJ/KG BTU/LB	KJ/KG BTU/LB	KJ/KG BTU/LB	KJ/KG BTU/LB	
9	640.4	693.1	206.8	30.0	148.2	21.5	1086.7	467.2	0.03	0.01	1086.8	467.2	10/02/82
10	640.1	707.0	213.7	31.0	148.2	21.5	1110.3	477.3	0.03	0.01	1110.3	477.3	10/02/82

TABLE 27
ENTHALPY DATA FOR THE 33.3 MOLE% m-CRESOL MIXTURE
689.5 kPa (100 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	351.8	173.6	689.5	100.0	551.6	80.0	99.5	42.8	0.29	0.12	99.8	42.9	10/06/82
2	368.8	204.1	689.5	100.0	558.5	81.0	135.2	58.1	0.29	0.12	135.5	58.2	10/06/82
3	381.6	227.3	689.5	100.0	558.5	81.0	158.0	67.9	0.29	0.12	158.3	68.0	10/06/82
4	400.3	260.8	691.2	100.3	565.4	82.0	195.0	83.8	0.29	0.13	195.3	84.0	10/06/82
1	405.9	271.0	689.5	100.0	579.2	84.0	200.6	86.3	0.30	0.13	201.0	86.4	09/23/82
5	410.0	278.4	689.5	100.0	565.4	82.0	215.3	92.5	0.29	0.13	215.5	92.7	10/06/82
2	423.6	302.8	691.2	100.3	592.9	86.0	241.0	103.6	0.31	0.13	241.3	103.8	09/23/82
3	435.4	324.0	691.2	100.3	606.7	88.0	267.5	115.0	0.32	0.14	267.8	115.1	09/23/82
4	455.1	359.5	689.5	100.0	613.6	89.0	310.5	133.5	0.33	0.14	310.8	133.6	09/23/82
5	479.4	403.3	689.5	100.0	620.5	90.0	362.6	155.9	0.33	0.14	362.9	156.0	09/23/82
7	524.9	485.2	689.5	100.0	620.5	90.0	471.2	202.5	0.33	0.14	471.3	202.6	09/23/82
8	535.2	503.7	689.5	100.0	620.5	90.0	492.8	211.9	0.33	0.14	493.1	212.0	09/23/82
9	544.8	528.2	692.9	100.5	634.3	92.0	520.5	230.6	0.34	0.15	536.8	230.8	09/23/82
10	553.1	535.9	689.5	100.0	634.3	92.0	542.6	233.3	0.34	0.15	543.0	233.4	09/23/82
11	557.1	543.0	689.5	100.0	630.9	91.5	552.4	237.5	0.34	0.14	552.7	237.6	09/23/82

TABLE 27 (Continued)
 ENTHALPY DATA FOR THE 33.3 MOLE% m-CRESOL MIXTURE
 689.5 kPa (100 PSIA)

PUMP	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	562.5	552.9	689.5	100.0	606.7	88.0	567.6	244.0	0.32	0.14	568.0	244.2	09/28/82
12	566.1	559.3	689.5	100.0	620.5	90.0	575.3	247.3	0.33	0.14	575.7	247.5	09/23/82
13	578.2	581.1	689.5	100.0	627.4	91.0	604.2	259.8	0.33	0.14	604.5	259.9	09/23/82
2	582.7	589.2	689.5	100.0	606.7	88.0	640.1	275.2	0.32	0.14	640.4	275.3	09/28/82
3	589.5	601.3	689.5	100.0	630.9	91.5	630.3	292.5	0.34	0.14	630.7	292.6	09/28/82
4	590.8	603.8	689.5	100.0	634.3	92.0	683.5	293.8	0.34	0.15	683.8	294.0	09/28/82
5	596.9	614.8	689.5	100.0	634.3	92.0	752.1	323.3	0.34	0.15	752.4	323.5	06/28/82
6	600.7	621.6	689.5	100.0	634.3	92.0	829.4	356.6	0.34	0.15	829.7	356.7	09/28/82
7	603.6	626.8	689.5	100.0	634.3	92.0	929.0	403.7	0.34	0.15	929.3	403.8	06/28/82
11	605.9	630.9	689.5	100.0	634.3	92.0	996.1	426.3	0.34	0.15	996.5	426.4	09/28/82
8	607.7	634.2	689.5	100.0	634.3	92.0	1002.6	431.0	0.34	0.15	1003.0	431.2	09/28/82
12	615.1	647.5	689.5	100.0	638.1	94.0	1025.1	440.7	0.35	0.15	1025.5	440.9	09/28/82
9	615.9	649.0	689.5	100.0	620.5	90.0	1021.2	439.0	0.33	0.14	1021.5	439.2	10/04/82
13	624.8	664.9	689.5	100.0	638.1	94.0	1041.3	447.7	0.35	0.15	1041.7	447.8	06/28/82
9	629.2	672.8	689.5	100.0	620.5	90.0	1054.3	453.3	0.33	0.14	1054.6	453.4	10/04/82

TABLE 27 (Continued)
 ENTHALPY DATA FOR THE 33.3 MOLE% m-CRESOL MIXTURE
 689.5 kPa (100 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
11	641.7	695.3	689.5	100.0	634.3	92.0	1075.4	462.3	0.34	0.15	1075.8	462.5	10/02/82
12	649.4	709.3	689.5	100.0	634.3	92.0	1094.1	470.4	0.34	0.15	1094.5	470.5	10/02/82
13	655.9	721.0	689.5	100.0	634.3	92.0	1101.0	473.3	0.34	0.15	1101.4	473.5	10/02/82
14	660.0	728.4	689.5	100.0	634.3	92.0	1114.6	479.2	0.34	0.15	1115.0	479.3	10/02/82

TABLE 28
ENTHALPY DATA FOR THE 33.3 MOLE% m-CRESOL MIXTURE
10342.1 kPa (1500 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	358.9	130.4	10307.7	1495.0	10183.0	1477.0	105.2	47.0	5.41	2.76	115.7	49.7	10/05/82
6	368.2	273.1	10342.1	1500.0	10287.0	1492.0	130.9	56.3	6.48	2.79	137.4	59.1	10/06/82
7	380.3	224.9	10342.1	1500.0	10314.6	1496.0	152.9	65.7	6.50	2.79	159.3	68.5	10/06/82
9	397.1	255.0	10342.1	1500.0	10321.5	1497.0	181.6	78.1	6.50	2.80	188.1	80.9	10/06/82
9	407.0	272.9	10342.1	1500.0	10314.6	1496.0	202.9	87.2	6.50	2.79	209.4	90.0	10/06/82
2	417.2	291.3	10335.2	1499.0	10293.9	1493.0	228.0	98.0	6.49	2.79	234.5	100.8	10/05/82
3	424.1	303.8	10328.3	1498.0	10280.1	1491.0	246.5	106.0	6.48	2.78	253.0	108.8	10/05/82
4	442.3	336.5	10321.5	1497.0	10252.5	1487.0	282.7	121.5	6.46	2.78	289.1	124.3	10/05/82
5	472.7	391.3	10328.3	1498.0	10273.2	1490.0	353.6	152.0	6.47	2.78	360.1	154.8	10/05/82
6	492.3	426.4	10328.3	1498.0	10287.0	1492.0	393.5	169.2	6.48	2.79	400.0	172.0	10/05/82
1	504.4	446.2	10342.1	1500.0	10342.1	1500.0	425.2	182.8	6.52	2.80	431.8	185.6	10/07/82
7	517.6	472.0	10342.1	1500.0	10300.0	1494.0	455.6	195.9	6.49	2.79	462.1	198.7	10/05/82
2	527.0	488.9	10328.3	1498.0	10342.1	1500.0	475.8	204.6	6.52	2.80	482.3	207.4	10/07/82
3	532.6	498.9	10328.3	1498.0	10321.5	1497.0	490.4	210.0	6.50	2.80	494.9	212.8	10/07/82
8	538.1	509.0	10342.1	1500.0	10307.7	1495.0	504.6	216.9	6.49	2.79	511.1	219.7	10/05/82

TABLE 28 (Continued)
 ENTHALPY DATA FOR THE 33.3 MOLE% m-CRESOL MIXTURE
 10342.1 kPa (1500 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
9	555.6	540.5	10342.1	1500.0	10307.7	1495.0	545.0	234.3	6.49	2.79	551.5	237.1	10/05/82
4	562.5	588.8	10342.1	1500.0	10335.2	1499.0	614.5	264.2	6.51	2.80	621.0	267.0	10/07/82
10	583.9	591.4	10342.1	1500.0	10304.2	1494.5	616.3	264.9	6.49	2.79	622.8	267.7	10/05/82
5	595.5	612.3	10342.1	1500.0	10342.1	1500.0	642.6	276.3	6.52	2.80	649.1	279.1	10/07/82
6	606.8	632.6	10342.1	1500.0	10342.1	1500.0	672.3	289.0	6.52	2.80	678.8	291.8	10/07/82
7	614.9	647.2	10342.1	1500.0	10342.1	1500.0	687.0	295.4	6.52	2.80	693.5	298.2	10/07/82
9	622.8	661.4	10342.1	1500.0	10342.1	1500.0	718.9	309.1	6.52	2.80	725.4	311.9	10/07/82
9	631.5	677.0	10342.1	1500.0	10342.1	1500.0	724.5	315.8	6.52	2.80	741.1	318.6	10/07/82
10	643.4	698.4	10342.1	1500.0	10342.1	1500.0	767.9	330.2	6.52	2.80	774.4	332.9	10/07/82
11	650.8	711.7	10342.1	1500.0	10342.1	1500.0	795.9	342.2	6.52	2.80	802.4	345.0	10/07/82
12	658.7	726.0	10342.1	1500.0	10342.1	1500.0	825.6	354.9	6.52	2.80	832.1	357.7	10/07/82

TABLE 29
ENTHALPY DATA FOR THE 20 MOLE% m-CRESOL MIXTURE
206.8 kPa (30 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/Lb	KJ/KG	BTU/Lb	KJ/KG	BTU/Lb	
1	487.5	417.9	210.3	30.5	144.3	21.0	368.4	158.4	0.03	0.01	368.4	158.4	07/13/82
2	487.9	418.6	212.0	30.8	137.9	20.0	369.6	158.9	0.02	0.01	369.6	158.9	07/13/82
3	503.4	446.4	206.8	30.0	137.9	20.0	405.5	174.3	0.02	0.01	405.5	174.3	07/13/82
1	511.8	461.5	210.3	30.5	137.9	20.0	431.4	185.5	0.02	0.01	431.4	185.5	07/14/82
1	522.0	479.8	206.8	30.0	151.7	22.0	464.4	199.7	0.03	0.01	464.4	199.7	07/15/82
2	525.5	486.3	206.8	30.0	151.7	22.0	477.1	205.1	0.03	0.01	477.1	205.1	07/15/82
4	531.8	497.6	210.3	30.5	131.0	19.0	510.0	219.3	0.02	0.01	510.0	219.3	07/13/82
6	533.9	501.4	210.3	30.5	137.9	20.0	533.0	229.1	0.02	0.01	533.0	229.2	07/13/82
3	535.4	504.1	210.3	30.5	220.6	32.0	560.0	240.7	0.07	0.03	560.0	240.8	07/14/82
5	537.9	508.6	206.8	30.0	124.1	18.0	691.6	297.3	0.01	0.01	691.6	297.3	07/13/82
4	539.1	510.7	210.3	30.5	151.7	22.0	771.7	331.8	0.03	0.01	771.7	331.8	07/15/82
7	542.2	516.3	203.4	29.5	151.7	22.0	834.4	358.7	0.03	0.01	834.4	358.7	07/15/82
8	543.5	518.6	210.3	30.5	151.7	22.0	843.1	362.5	0.03	0.01	843.1	362.5	07/15/82
9	545.7	522.6	206.8	30.0	151.7	22.0	854.8	367.5	0.03	0.01	854.8	367.5	07/15/82
5	555.5	540.3	206.8	30.0	137.9	20.0	884.3	380.2	0.02	0.01	884.3	380.2	07/14/82

TABLE 29 (Continued)
 ENTHALPY DATA FOR THE 20 MOLE% m-CRESOL MIXTURE
 206.8 kPa (30 PSIA)

PUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	A	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
2	562.9	553.5	206.8	30.0	137.9	20.0	890.9	383.0	0.02	0.01	890.9	383.0	07/16/82
4	572.2	570.2	210.3	30.5	144.8	21.0	917.0	394.2	0.03	0.01	917.0	394.2	07/16/82
5	579.0	582.6	210.3	30.5	144.8	21.0	920.6	395.8	0.03	0.01	920.6	395.8	07/16/82
6	581.1	586.3	210.3	30.5	137.9	20.0	923.4	397.0	0.02	0.01	923.4	397.0	07/16/82
7	591.2	604.6	210.3	30.5	131.7	19.0	946.5	406.9	0.02	0.01	946.5	406.9	07/14/82
8	610.2	649.5	210.3	30.5	117.2	17.0	1001.0	430.7	0.01	0.00	1001.9	430.7	07/14/82
9	617.6	652.1	206.8	30.0	199.9	29.0	1002.2	430.9	0.06	0.03	1002.3	430.9	12/09/82
9	626.6	668.2	210.3	30.5	117.2	17.0	1023.0	439.8	0.01	0.00	1023.1	439.8	07/14/82
10	639.7	691.7	209.6	30.3	199.9	29.0	1045.1	449.3	0.06	0.03	1045.1	449.3	12/09/82
10	648.7	707.9	210.3	30.5	110.3	16.0	1066.3	458.4	0.01	0.00	1066.3	458.4	07/14/82
11	649.4	709.3	209.6	30.3	193.1	28.0	1067.5	458.9	0.06	0.02	1067.5	459.0	12/09/82
11	658.2	725.1	210.3	30.5	110.3	16.0	1089.2	468.3	0.01	0.00	1089.3	468.3	07/14/82

TABLE 30
ENTHALPY DATA FOR THE 20 MOLE% m-CRESOL MIXTURE
689.5 kPa (100 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
2	330.0	148.7	689.5	100.0	579.2	84.0	70.4	30.3	0.29	0.13	70.7	30.4	12/10/82
1	338.4	149.5	689.5	100.0	579.2	84.0	67.0	28.8	0.29	0.13	67.3	28.9	12/10/82
3	347.4	165.6	686.0	99.5	579.2	84.0	86.4	37.1	0.29	0.13	86.7	37.3	12/10/82
4	351.8	173.6	689.5	100.0	579.2	84.0	94.8	40.8	0.29	0.13	95.1	40.9	12/10/82
5	361.5	191.4	687.8	99.8	579.2	84.0	110.0	47.3	0.29	0.13	110.3	47.4	12/10/82
6	375.8	216.7	689.5	100.0	586.1	85.0	138.8	59.7	0.30	0.13	139.1	59.8	12/10/82
1	416.2	289.5	686.0	99.5	589.5	85.5	212.6	91.4	0.30	0.13	212.9	91.5	07/19/82
7	426.0	307.2	691.2	100.3	586.1	85.0	238.4	102.5	0.30	0.13	238.7	102.6	12/10/82
2	443.2	333.2	689.5	100.0	585.5	85.5	268.2	115.3	0.30	0.13	268.5	115.4	07/19/82
3	467.0	380.9	687.8	99.8	592.9	86.0	320.0	137.6	0.30	0.13	320.3	137.7	07/19/82
8	510.3	458.9	689.5	100.0	634.3	92.0	419.0	180.1	0.33	0.14	419.3	180.3	07/22/82
5	523.1	481.8	687.8	99.8	592.9	86.0	445.1	191.4	0.30	0.13	445.4	191.5	07/19/82
6	549.2	528.9	687.8	99.8	599.8	87.0	500.5	215.2	0.31	0.13	500.8	215.3	07/19/82
9	571.8	569.5	689.5	100.0	634.3	92.0	559.8	240.7	0.33	0.14	560.1	240.8	07/22/82
1	579.0	582.6	696.4	101.0	613.6	89.0	581.2	249.9	0.32	0.14	581.5	250.0	12/09/82

TABLE 30 (Continued)
 ENTHALPY DATA FOR THE 20 MOLE% m-CRESOL MIXTURE
 689.5 kPa (100 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
7	585.1	584.5	686.0	99.5	599.8	87.0	582.8	250.6	0.31	0.13	583.1	250.7	07/19/82
7	590.3	602.9	689.5	100.0	579.2	84.0	604.5	259.9	0.29	0.13	604.8	260.0	07/16/82
8	599.3	612.6	689.5	100.0	606.7	88.0	659.4	283.5	0.31	0.13	659.7	283.6	07/19/82
9	600.5	621.1	686.0	99.5	599.8	87.0	667.8	287.1	0.31	0.13	668.1	287.2	07/19/82
8	603.1	625.8	686.0	99.5	579.2	84.0	684.8	294.4	0.29	0.13	685.0	294.5	07/16/82
9	603.8	627.1	689.5	100.0	582.6	84.5	691.6	297.4	0.30	0.13	691.9	297.5	07/16/82
10	605.8	630.7	689.5	100.0	606.7	88.0	752.7	323.6	0.31	0.13	753.0	323.7	07/19/82
10	607.2	633.3	689.5	100.0	582.6	84.5	781.0	335.8	0.30	0.13	781.3	335.9	07/16/82
11	609.4	637.3	689.5	100.0	606.7	88.0	889.3	382.3	0.31	0.13	889.6	382.5	07/19/82
3	609.7	637.8	682.6	99.0	620.5	90.0	938.4	403.5	0.32	0.14	938.7	403.6	12/09/82
11	610.9	640.0	692.9	100.5	579.2	84.0	919.5	395.3	0.29	0.13	919.8	395.4	07/16/82
12	612.8	643.4	689.5	100.0	586.1	85.0	948.2	407.7	0.30	0.13	948.5	407.8	07/16/82
12	617.1	651.1	692.9	100.5	606.7	88.0	971.3	417.6	0.31	0.13	971.7	417.7	07/19/82
4	619.6	655.6	689.5	100.0	620.5	90.0	991.9	426.5	0.32	0.14	992.3	426.6	12/09/82
8	620.9	657.9	687.8	99.8	599.8	87.0	998.2	429.1	0.31	0.13	998.5	429.3	12/10/82

TABLE 30 (Continued)
 ENTHALPY DATA FOR THE 20 MOLE% m-CRESOL MIXTURE
 689.5 kPa (100 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
13	621.8	659.5	692.9	100.5	131.0	19.0	989.3	425.3	0.02	0.01	989.4	425.3	07/19/82
5	623.5	662.7	689.5	100.0	627.4	91.0	995.9	428.2	0.32	0.14	996.2	428.3	12/09/82
9	623.8	663.2	687.8	99.8	599.8	87.0	1001.5	430.6	0.31	0.13	1001.8	430.7	12/10/82
16	628.5	671.6	687.8	99.8	606.7	88.0	1000.5	430.2	0.31	0.13	1000.9	430.3	07/19/82
10	633.0	679.7	689.5	100.0	634.3	92.0	1017.3	437.3	0.33	0.14	1017.6	437.5	07/22/82
10	636.3	685.7	689.5	100.0	599.8	87.0	1022.4	439.6	0.31	0.13	1022.7	439.7	12/10/82
17	638.2	689.1	689.5	100.0	606.7	88.0	1017.6	437.5	0.31	0.13	1017.9	437.6	07/19/82
6	640.4	693.1	689.5	100.0	627.4	91.0	1034.1	444.6	0.32	0.14	1034.4	444.7	12/09/82
13	642.3	695.9	689.5	100.0	579.2	84.0	1033.9	444.5	0.29	0.13	1034.2	444.6	07/16/82
11	651.0	712.0	689.5	100.0	634.3	92.0	1051.1	451.9	0.33	0.14	1051.4	452.0	07/22/82
7	657.2	722.9	689.5	100.0	629.5	90.0	1067.1	458.8	0.32	0.14	1067.4	458.9	12/09/82
15	657.4	723.6	692.9	100.5	586.1	85.0	1068.5	459.4	0.30	0.13	1068.7	459.5	07/16/82
12	663.1	734.0	689.5	100.0	634.3	92.0	1073.2	461.4	0.33	0.14	1073.6	461.5	07/22/82
8	663.7	735.0	689.5	100.0	627.4	91.0	1081.9	465.1	0.32	0.14	1082.2	465.3	12/09/82

TABLE 31
 ENTHALPY DATA FOR THE 20 MOLE% m-CRESOL MIXTURE
 10342.1 kPa (1500 PSIA)

RUN	INLET TEMPERATURE		INLET PRESSURE		OUTLET PRESSURE		EXPERIMENTAL ENTHALPY		PRESSURE CORRECTION		CORRECTED ENTHALPY		DATE
	K	F	KPa	PSIA	KPa	PSIA	KJ/KG	BTU/LB	KJ/KG	BTU/LB	KJ/KG	BTU/LB	
1	433.3	320.2	10314.6	1496.0	10259.4	1488.0	245.0	105.3	6.26	2.69	251.3	108.0	07/21/82
2	479.0	402.5	10342.1	1500.0	10259.4	1488.0	342.4	147.2	6.26	2.69	348.6	149.9	07/21/82
7	492.5	426.9	10328.3	1498.0	10245.6	1486.0	370.6	159.3	6.25	2.69	376.9	162.0	07/22/82
2	532.2	498.4	10342.1	1500.0	10259.4	1488.0	461.7	198.5	6.26	2.69	467.9	201.2	07/22/82
3	546.8	524.6	10342.1	1500.0	10259.4	1488.0	490.8	211.0	6.26	2.69	497.1	213.7	07/22/82
4	560.9	550.0	10342.1	1500.0	10259.4	1488.0	524.8	225.6	6.26	2.69	531.0	228.3	07/21/82
5	566.3	559.7	10342.1	1500.0	10259.4	1488.0	542.2	233.1	6.26	2.69	548.4	235.8	07/21/82
6	600.7	621.6	10342.1	1500.0	10259.4	1488.0	617.7	265.6	6.26	2.69	624.0	268.3	07/21/82
7	617.1	651.1	10335.2	1499.0	10252.5	1487.0	668.3	287.3	6.25	2.69	674.5	290.0	07/21/82
8	632.6	678.9	10335.2	1499.0	10252.5	1487.0	713.2	306.6	6.25	2.69	719.4	309.3	07/21/82
9	650.4	711.0	10321.5	1497.0	10238.7	1485.0	765.3	329.0	6.24	2.68	771.5	331.7	07/21/82

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APPENDIX A REVISION I

STATEMENT OF WORK

Phase Equilibrium and Enthalpy Data for Coal
Liquefaction and Solvent Recovery Areas

Abstract

This proposal is for a four task program, spread over approximately two years, encompassing vapor-liquid equilibrium (VLE) and enthalpy data measurements on coal-derived liquids and pure compounds. The experiments will provide verification of current design conditions for the SRC-I Demonstration Plant and data for developing reliable VLE and enthalpy correlations.

The VLE program is primarily directed at improving design correlations for the Hydrogen Recovery Section. The enthalpy program addresses data uncertainty around several heat-recovery, heat-exchange units in the Hydrogen Recovery Section and the reboiler of the Process Solvent Column.

Program Justification

Vapor-Liquid Equilibrium Program

A specific experimental phase-equilibrium program is proposed which will provide checks at the current process design conditions in the Hydrogen Recovery Section of the SRC-I Demonstration Plant and data that can be correlated for use in process design and simulation studies at different processing conditions.

The process check points must be augmented by other information because any change in the process, such as severity of the reaction in the dissolver or a temperature change in a separator in the Hydrogen Recovery Section, will render the check points of no value at the new conditions because they do not supply any information amenable to generalization in a correlation. Consequently, other specific experiments relative to liquids from Kentucky #9 coal which can be correlated for use at various conditions in the Hydrogen Recovery Section are also proposed.

The impact of knowledge, or lack thereof, of phase equilibria focuses on four areas in the Hydrogen Recovery Section.

1. Hydrogen K values are important in all parts of the Hydrogen Recovery Section to determine losses and to determine feed composition to the Hydrogen Purification Unit.
2. Methane, ethane, and propane K values are important in the overhead part of the Hydrogen Recovery Section because of the need for sufficient auto-refrigeration later in the Hydrogen Purification Unit.
3. Water K values (vapor/organic phase) and distribution of water between the organic and aqueous phases are important because these determine the water flow rates and the water loading in the process-solvent column.

Task 3: Enthalpy ProgramTask 3.1: Process Check Points

Enthalpy-temperature measurements will be conducted on four different coal-derived liquid samples corresponding to four specific points in the SRC-I flowsheet.

Task 3.1.1: Bottoms from HP Flash Drum

<u>Component</u>	<u>Experimental conditions</u>	<u>Comments</u>
Liquid bottoms from Wilsonville V-110	750-600°F, 1500 psia	Liquid phase enthalpies. Pressure effect will be small.

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1. The acquisition, preparation, and characterization of the liquid sample from Wilsonville will be the responsibility of ICRC and is described in Task 1.2.
 2. The liquid sample which encounters the highest temperature in the calorimeter will be shipped to ICRC for detailed characterization as described in Task 4.3. The sample must be stored and shipped under nitrogen.

Task 3.1.2: HP Flash Drum Overhead

<u>Component</u>	<u>Experimental conditions</u>	<u>Comments</u>
Oil product from	750-400°F, 1500 psia	Sensible heat and phase change
Wilsonville V-105	750-400°F, 1700 psia	

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- Note 1 from Task 3.1.1 applies.
 - Note 2 from Task 3.1.1 applies.

Task 3.1.3: Second Stage MP Flash Drum Overhead

<u>Component</u>	<u>Experimental conditions</u>	<u>Comments</u>
Liquid 1.3 H	600-200°F, 105 psia	Sensible heat and phase change
Boiling range 350-800°F	600-200°F, 75 psia	

-
- Liquid 1.3 H will be supplied by ICRC. Its preparation and characterization are described in Task 1.2.4.
 - Note 1 from Task 3.1.1 applies.

Task 3.1.4: Process Solvent Column Reboiler

<u>Condition</u>	<u>Experimental Condition</u>	<u>Comments</u>
Wilsonville	650-400°F, 30 psia	Sensible heat and phase change
Process Solvent	650-400°F, 40 psia	

-
- Note 1 from Task 3.1.1 applies.

Task 3.2: Correlation Check Points

Enthalpy-temperature measurements will be made on four 50°F boiling range liquid cuts at the specified conditions.

<u>Component</u>	<u>Experimental condition</u>	<u>Comments</u>
700-750°F cut	750-500°F, 1500 psia 750-500°F, 100 psia	Liquid phase, sensible heat and phase change
600-650°F cut	750-500°F, 1500 psia 750-500°F, 100 psia	Liquid phase, sensible heat and phase change
500-550°F cut	750-400°F, 1500 psia 750-400°F, 100 psia	Liquid phase, sensible heat and phase change
400-450°F cut	750-200°F, 1500 psia 750-200°F, 100 psia	Sensible heat and phase change

1. Note 1 from Task 3.1.1 applies.

Task 3.3: Mixtures of Heteroatom Compounds

Temperature-enthalpy measurements¹ will be conducted on the following mixtures of heteroatom compounds.

<u>Component</u>	<u>Comments</u>
Quinoline	Base
Decalin	Cyclic saturate
m-Cresol/Quinoline ²	Acid/Base

-
- The recommended temperature range for all experiments is 750 to 200°F. Two pressure levels are recommended: 2000 psia and 100 psia or whatever pressure level will include the phase change conveniently.
 - Mixtures of 0.2, 0.33, 0.5, 0.67, and 0.8 (molar) are recommended.