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NORMAL BUTANE : PROVISIONAL THERMODYNAMIC FUNCTIONS FROM 135 TO 700 K AT PRESSURES TO 700 BAR

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Boulder, Colorado 80303

Prepared for :

Gas Research Institute
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Luther H. Hodges, Jr., Under Secretary
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NATIONAL BUREAU OF STANDARDS, Ernest Ambler, Director

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NORMAL BUTANE: PROVISIONAL THERMODYNAMIC FUNCTIONS FROM 135 TO 700 K AT PRESSURES TO 700 BAR

Robert D. Goodwin

Thermophysical properties of n-butane are tabulated at integral temperatures along isobars over the entire range of fluid states. Results for the compressed liquid, from the triple- to the boiling-point, have been estimated by use of the highly-constrained, nonanalytic equation of state, because experimental P- -T data are lacking in this region. Only available, published physical properties data are used in this work.

Key words: Densities; enthalpies; entropies; equation of state; internal energies; isobars; isochores; isotherms; Joule-Thomson inversion; latent heats of vaporization; melting line; n-butane; orthobaric densities; specific heats; speeds of sound; vapor pressures.

1. INTRODUCTION

Normal butane not only is a bulk fuel and chemical substance of importance, but also is a component of liquefied natural gas. For computation of properties of these mixtures, a knowledge of the pure component properties is essential. The present report is fourth in the series on pure components. Properties of methane were given in NBS Technical Note 653 (April, 1974); of ethane in NBS Technical Note 684 (August, 1976); and of propane in NBSIR 77-860 (July, 1977).

The following work on normal butane provides background on available physical properties data. Tables of derived thermodynamic functions may serve engineering needs until such time as new physical data justify a revision of the computations.

Whereas no P-ρ-T compressibility data exist for compressed liquid at temperatures roughly below the boiling point (-0.5°C), this region now has been covered by data estimated via the highly-constrained equation of state used here.

Background on normal butane is given both by the recent work of Das, Reed, and Eubank [11], and by the Bibliography of References prepared by the Data Center of this laboratory [8].

Symbols and units for this report are listed in Appendix A. The density-temperature diagram of n-butane is presented in fig. 1. The upper, left corner of fig. 1 gives the freezing liquid line.

Note that in some tables, especially nos. 2 through 5, sources of data are identified in the heading, but some data have been omitted, as seen via the "ID" of data listed.

2. PHYSICAL PROPERTIES

2.1 Fixed-Point Values

These values are listed in table 1.

(a) The Triple Point. The temperature is adopted from Das, Reed, and Eubank [11]. The pressure is obtained from our vapor-pressure eq. (2). The liquid density is assigned for consistency with data in eq. (3). The vapor density is obtained from our saturated-vapor densities eq. (4).

(b) The Boiling Point. The temperature is from our vapor-pressure eq. (2) at a pressure of 1 atm = 1.01325 bar. Liquid and vapor densities are from eqs. (3) and (4).

(c) The Critical Point. The temperature is adopted from Das, Reed, and Eubank [11]. The pressure is from our vapor-pressure eq. (2). The density of 3.90 mol/L was selected to obtain a well-behaved critical isotherm. Reported values range from 3.80 [17], through 3.92 mol/L [11].

2.2 Melting Line and Vapor Pressures

(a) The Melting Line. Pressures from about two to ten kilobars were reported by Reeves, Scott, and Babb [29] only as constants for the Simon eq. (1). In present work we use the triple-point temperature and pressure from table 1,

$$P = P_t + P_o \cdot [(T/T_t)^{\varepsilon} - 1] \quad , \qquad (1)$$

where P_o = 3634 bar, and ε = 2.210.

(b) The Vapor Pressures. Data used for adjusting eq. (2) appear in table 2. Many inconsistent data have been eliminated, along with those references. Data at ID = 40 have been derived via thermal loops, as described in [15], using the saturated liquid specific heat data of Aston [1] from the triple- to the boiling-point; the heat of vaporization at the normal boiling point [1]; the ideal gas thermofunctions formulated in section 2.6; the virial equation formulated in section 2.4; and, for the minor contribution of $V \cdot dP$ to ΔH on the saturated liquid path, we also used preliminary vapor-pressure and saturated liquid densities equations. The procedure also has been described by Yarbrough and Tsai [41].

The arguments for eq. (2) are -

$$x(T) \equiv T/T_c, \qquad u(T) \equiv (1 - 1/x) \quad ,$$

$$\ell n(P) = a + b \cdot u + c \cdot x + d \cdot x^2 + e \cdot x^3 + f \cdot x \cdot (1 - x)^{\varepsilon} \quad , \qquad (2)$$

where P is in bar, ε = 1.85, and -

a =	14.4503 7296	d =	41.8982 1096
b =	9.5087 8339	e =	-16.7612 9646
c =	-35.9507 2289	f =	11.7075 8279

Exponent ε was selected for a best "fit" of P-ρ-T data under the constraint that, at the critical point, the slope of the critical isochore, from the equation of state, be equal to the slope of the vapor-pressure equation,

$\partial P/\partial T = dP_\sigma/dT$. The fit of present vapor-pressure data is totally insensitive to values $1.1 \leq \epsilon \leq 1.95$, but the critical-point slope is dependent on the value of ϵ. The present slope at the critical point is $dP_\sigma/dT = 0.6313$ bar/K.

The last column of table (2) gives the experimental residual -

$$\ell n(P_{exp}/P_t)/\ell n(P_c/P_t) - (1 - T_t/T)/(1 - T_t/T_c) \quad ,$$

which is the deviation from the basic form, $\ell n(P) = a - b/T$, when constrained to the end-points.

2.3 The Orthobaric Densities

(a) Saturated Liquid Densities. Data in table 3 have been selected for consistency, and the data of Sliwinski are given a double weighting. The variables for eq. (3) are -

$$x(T) \equiv (T_c - T)/(T_c - T_t), \; y(\rho) \equiv (\rho_\ell - \rho_c)/(\rho_t - \rho_c) \quad ,$$

$$y = x + (x^\epsilon - x)\,[a + b \cdot x^2 + c \cdot x^3] \quad , \qquad (3)$$

where $\epsilon = 0.35$, and -

$a = 0.8023\ 7800$ $\qquad$ $c = 0.0573\ 5302$

$b = -0.1390\ 5376$

The experimental residual in the last column of table 4 is -

$$(y_{exp} - x)/(x^\epsilon - x) \quad .$$

A plot of this residual shows the form of polynomial needed for eq. (3).

(b) Saturated Vapor Densities. Data in table 4 have been selected for self-consistency. Those at ID = 40 are derived from our vapor-pressure and virial equations. We formulate the compressibility-factor for saturated vapor, by use of our vapor-pressure equation, such that $Z_\sigma(T)$ approaches unity as $\rho \to 0$, (hence $T_\sigma(\rho) \to 0$). Subscripts are omitted because we refer always to saturated vapor and to the vapor pressure. Let $A_0 \equiv (Z_c - 1)$ where Z_c is value of the compressibility-factor at the critical point, and define the arguments -

$$\Pi(T) \equiv P_\sigma(T)/P_c, \quad x(T) \equiv T/T_c, \quad u(T) \equiv (1 - x) \quad ,$$

when saturated vapor densities, $d_g \equiv P/(Z \cdot R \cdot T)$, are given by -

$$Z = 1 + A_o \cdot \Pi \cdot x^{-2} \cdot f(x) \quad , \tag{4}$$

$$f(x) \equiv 1 + a \cdot u^{\varepsilon} + b \cdot u + c \cdot \exp(-\eta/u) \quad ,$$

where $\varepsilon = 0.35$, $\eta = 2.6$, and -

$a = -0.8707\ 5081$ $\qquad$ $c = 99.1655\ 115$

$b = 1.1493\ 4828$

The next-to-last column in table 4 gives the experimental residual -

$$F(Z) \equiv (Z_{exp} - 1) \cdot x^2/(A_o \cdot \Pi) \quad .$$

2.4 The Virial Equation

The truncated virial equation,

$$Pv/RT = 1 + B(x) \cdot \rho + \ldots \tag{5a}$$

has been used for synthesizing P-ρ-T data, and for thermal-loop computations. The reduced variables are $\rho \equiv d/d_c$, $x \equiv T/T_c$, where -

$$B(x) = B_1 + B_2/x + B_3/x^3 \quad , \tag{5b}$$

$B_1 = 0.368\ 4160$ $\qquad$ $B_3 = -0.663\ 4100$

$B_2 = -0.962\ 3142$

The first part of table 5 gives data used for adjusting (5b). Excluded data weighted zero appear at the end of table 5. Many of the authors given at the head of table 5 are referenced in the two monographs given here [12,26], and are excluded from our list of references.

2.5 The Equation of State

Figure 2 shows the P-T regions covered by P-ρ-T data of Beattie, et al. (1939), [3]; of Kay (1940), [20]; and of Olds, et al. (1944), [24]. Earlier data of Sage, Webster, and Lacey (1937), [34] are excluded, as they are superseded by those of Olds, et al.

The nonanalytic equation of state used here has only three least-squares coefficients, as described in detail elsewhere [15,16]. In addition, there are

four non-linear parameters, and about twelve constants appear in the vapor-pressure and orthobaric-densities equations. Because it is constrained to the liquid-vapor coexistence boundary, we have extrapolated the equation to cover the entire compressed liquid region down to the triple-point temperature (135 K): see fig. 1.

For any density (isochore) up to the triple-point liquid density, the coexistence temperature, $T_\sigma(\rho)$, is obtained by iteration from equations for the orthobaric densities, according as $\rho \gtrless \rho_c$. The vapor pressure, $P_\sigma[T_\sigma(\rho)]$ thus is a function of density, and the equation of state has the form -

$$P - P_\sigma(\rho) = \rho R^* \cdot [T - T_\sigma(\rho)] + \rho^2 R^* T_c \cdot F(\rho,T) \quad , \tag{6}$$

$$F(\rho,T) \equiv B(\rho) \cdot \Phi(\rho,T) + C(\rho) \cdot \Psi(\rho,T) \quad , \tag{6a}$$

where ρ is reduced density, and $R^* \equiv R\, d_c$ has the dimension of bar/K, Appendix A. The constraint in eq. (6) is illustrated by fig. 3.

The temperature-dependent functions in (6a) are -

$$\Phi(\rho,T) \equiv x^{1/2} \cdot \ell n\, [T/T_\sigma(\rho)] \quad , \tag{6b}$$

$$\Psi(\rho,T) \equiv \psi(\rho,T) - \psi_\sigma(\rho) \quad , \tag{6c}$$

where $\psi_\sigma(\rho)$ is obtained from $\psi(\rho,T)$ merely by replacing T with $T_\sigma(\rho)$,

$$\psi(\rho,T) \equiv \delta \cdot \exp[\varepsilon \cdot (1-x)] + (1-\delta) \cdot [1-\omega + \omega \cdot \ell n(\omega)] \quad . \tag{6d}$$

The parameter, $0 \leq \delta \leq 1$, in (6d) is for relative weighting of the analytic and nonanalytic parts, and -

$$\omega(\rho,T) \equiv [1 - \Theta(\rho)/T] \quad , \tag{6e}$$

where $\Theta(\rho)$ is a locus of temperatures inside the coexistence envelope -

$$(\rho) \equiv T_\sigma(\rho) \cdot \exp[-\alpha \cdot f(\rho)] \quad ,$$

$$f(\rho) \equiv |\rho - 1|^3/(\rho_t - 1)^3 \quad , \tag{6f}$$

and ρ_t is reduced density at the liquid triple point.

The density-dependent coefficients in (6a) are -

$$B(\rho) \equiv B_1 + B_2 \cdot \exp(\beta \cdot \rho) \quad , \tag{6g}$$

$$C(\rho) \equiv C_1 \cdot (\rho - 1) \cdot \exp[-\gamma \cdot \rho^4] \quad . \tag{6h}$$

Parameters and coefficients of (6) for n-butane are -

$\alpha = 1, \quad \beta = 0.8, \quad \gamma = 0.3, \quad \delta = 2/3, \quad \varepsilon = 3,$

$B_1 = 0.3542\ 7006\ 233 \qquad C_1 = 0.4219\ 2906\ 133$

$B_2 = 0.2662\ 8373\ 954$

Values for α, β, γ, δ, ε were adjusted for a best "fit" of P-ρ-T data and/or a well-behaved critical isotherm.

Table 6 gives behavior of coefficients $B(\rho)$, $C(\rho)$ as a function of density, and Table 7 gives behavior along the critical isotherm. Table 8 summarizes data and deviations of the three authors, and table 9 gives deviations for each of the 802 P-ρ-T data used. Whereas the deviations in general are greater than for methane, ethane, or propane, we nevertheless have a smooth and consistent representation by means of the present, highly-constrained equation of state, which, in addition, yields a maximum in the specific heats, $C_V(\rho,T)$, at the critical point.

2.6 The Ideal Gas Functions

We have developed a formulation of the spectroscopic specific heats, $C_p^o(T)$, of Chen, et al. [5] -

$$C_p^o/R - 4 = [a + b/x + c/x^2 + d/x^3 + e/x^4] \cdot \exp(-\varepsilon/x) \quad , \tag{7}$$

where $x \equiv T/100$, $\varepsilon = 2.37$, and -

a =	41.110 973	d =	-170.730 596
b =	-139.304 011	e =	40.032 171
c =	257.297 067		

Table 10 shows the "fit" of data used. In this table, the values for $(H^o-H^o_o)$ and for S^o are obtained by numerical integration in either direction, starting at T = 300 K. Table 11 gives interpolated values at integral temperatures.

2.7 The Heats of Vaporization

Table 12 shows the "fit" of data. Those at ID = 40 we derived via thermal loops (section 2.2b). Those at ID = 41 are from the Clapeyron equation. The formulation of these data in kilojoules/mol uses argument $x(T) \equiv (T_c - T)/(T_c - T_t)$,

$$Q_{vap} = a \cdot x + (x^{\varepsilon} - x) \cdot [b + c \cdot x/x^{\varepsilon} + d \cdot x], \text{ kJ/mol} \quad , \qquad (8)$$

where $\varepsilon = 0.30$, and -

a =	28.725 885	c =	40.071 066
b =	18.498 277	d =	-37.359 808

The uncertainty of at least one percent in Q_{vap} at the higher temperatures will produce similar uncertainties in compressed liquid thermofunctions at these temperatures, because we use Q_{vap} to compute across the "dome."

2.8 Saturated Liquid Specific Heats

Specific heats $C_{\sigma,\ell}(T)$, along the saturated liquid path, are needed as a base to compute specific heats, $C_v(\rho,T)$, $C_p(\rho,T)$, in compressed liquid states.

We have used the ideal gas function $S^o(T)$, the equation of state, and the heats of vaporization to compute $S_\ell(T)$ along the saturated liquid path at integral temperatures from the triple- to the critical-point. These are represented in J/mol/K by use of $x \equiv T/T_c$ -

$$S_\ell(T) = A_1 + A_2 \cdot (1-x)^{\varepsilon} + A_3 \cdot \ell n(x) + \sum_{i=4}^{6} A_i \cdot x^{i-3} \quad , \qquad (9)$$

where $\varepsilon = 1/2$, and -

A_1 = 253.592 2114 A_4 = 62.390 9664

A_2 = - 35.142 5285 A_5 = -51.400 0625

A_3 = 92.427 4005 A_6 = 31.120 4971

Maximum deviations are 0.01 percent, and the rms deviation is less than 0.01 percent.

The specific heats follow from the relation $C_{\sigma,\ell}(T) = T \cdot dS_\ell/dT$, in J/mol/K -

$$C_{\sigma,\ell}(T) = -\varepsilon \cdot A_2 \cdot x/(1-x)^{1-\varepsilon} + A_3 + \sum_{i=4}^{6} (i-3) \cdot A_i \cdot x^{i-3} \quad . \quad (10)$$

3. COMPUTATIONAL METHODS

The numerical values for E and H in this report are based on the arbitrarily assigned value, E = 0 at the liquid triple-point, obtained by use of the spectroscopic data with E_0^o = 22580.9 J/mol. Specific heats of Aston and Messerly [1] could be integrated to give the solid at T = 0 as reference state.

Whereas results will be given along isobars, the computations, generally, proceed along isotherms by use of the equation of state.

3.1 The Homogeneous Domain

The homogeneous domain of fig. 1 includes all regions which can be attained along isotherms starting at zero density without crossing the vapor-liquid "dome," and without passing very close to the critical point at $T > T_c$.

We start our computations with ideal gas thermodynamic functions at zero density, and then integrate along isotherms by use of the equation of state in the following relations,

$$\Delta E = \int [P - T \cdot (\partial P/\partial T)] \cdot d\rho/\rho^2 \quad , \quad (11)$$

$$\Delta C_v = - T \cdot \int (\partial^2 P/\partial T^2) \cdot d\rho/\rho^2 \quad , \quad (12)$$

$$\Delta S = R \cdot \ell n[P^o/(\rho RT)] + \int [R - (\partial P/\partial T)/\rho] \cdot d\rho/\rho \quad . \quad (13)$$

Equation (13) is for use with initial entropies in hypothetical ideal gas states at P^o = 1 atm. For all other initial states, i.e., the saturated liquid, we use -

$$\Delta S = -\int (\partial P/\partial T)\cdot d\rho/\rho^2 \quad . \tag{13a}$$

In each (ρ,T) state, reached by above integrations, we compute -

$$H = E + P\cdot v \quad , \tag{14}$$

$$C_p = C_v + T\cdot(\partial P/\partial T)^2/(\partial P/\partial \rho)/\rho^2 \quad , \tag{15}$$

$$W^2 = C_p\cdot(\partial P/\partial \rho)/C_v \quad . \tag{16}$$

3.2 The Saturated Liquid

At temperatures from the triple point up to the critical point, we first obtain thermofunctions for the saturated vapor via eqs. (11) through (14). We then use eq. (8) for the heat of vaporization, Q_{vap}, to compute -

$$\Delta H = -Q, \qquad \Delta S = \Delta H/T \quad , \tag{17}$$

noting that the free energy of vaporization, $\Delta F \equiv \Delta H - T\cdot\Delta S$, thus is zero. Having obtained H for the saturated liquid, we compute $E = H - P\cdot v$.

The single-phase specific heat, $C_v(\rho,T)_\sigma$, at the saturated liquid boundary is obtained via eq. (10) for $C_{\sigma,\ell}(T)$ and the thermodynamic relation,

$$C_v(\rho,T)_\sigma = C_{\sigma,\ell}(T) + T\cdot(\partial P/\partial T)\cdot(d\rho_\ell/dT)/\rho_\ell^2 \quad , \tag{18}$$

where ρ_ℓ is density of the saturated liquid. Values for $C_p(\rho,T)$ and $W(\rho,T)$ on this boundary follow from eqs. (15) and (16). For liquid at the boiling point we have obtained -

T_b = 272.6377 K, H_b = 16 728.4 J/mol,
E_b = 16 718.6 J/mol, S_b = 218.565 J/mol/K.

Equation (18) approaches the difference of two infinities as $T \to T_c$. In present work, $C_v(\rho,T)_\sigma$ from eq. (18) becomes irregular at temperatures roughly above 400 K. We therefore use the following formulation for $C_v(\rho,T)_\sigma$, J/mol/K, at the saturated liquid boundary, at temperatures from 355 K to the critical, wherein $x \equiv T/T_c$ -

$$(C_v)_\sigma = a + b \cdot x + c \cdot x^2 \cdot \ell n\,[1 + \varepsilon/(1 - x)] \qquad (19)$$

where,

$\varepsilon = 53.0$ $\qquad$ $b = 18.92882$

$a = 68.86999$ $\qquad$ $c = 6.85538$

These constants are from fitting derived data at $140 \leq T \leq 340$ K.

3.3 The Compressed Liquid

Starting with above values for E, S, and C_v on the saturated liquid boundary, we use eqs. (11), (12), and (13a) to integrate along isotherms, and then obtain H, C_p, and W via eqs. (14), (15), and (16).

4. TESTS AND COMMENTS

In earlier work (methane, ethane, propane) we validated the computations by comparisons of derived and experimental specific heats, and speeds of sound. For n-butane, no experimental data have been discovered for specific heats (except in ideal gas states), or for speeds of sound, (except for those of Rao [28], which for ethane were found to be wrong).

In present work, therefore, we rely heavily on the highly-constrained character of the equation of state. The use of P-ρ-T data from different laboratories usually greatly diminishes the precision of the "fit" of these data, because they never are exactly consistent. In present work this "fit," table 9, probably could be much improved by use of only one set of P-ρ-T data.

The orthobaric densities must be consistent with P-ρ-T data for a good "fit" with the present equation of state. In present work, accuracy of the saturated vapor densities is not of the desired accuracy.

Because compressed liquid properties are obtained by use of the heats of vaporization to cross the "dome" of fig. 1, we may expect small discontinuities at the critical temperature along isobars at $P > P_c$. Figure 4 shows that this discontinuity is very small at P = 50 bar. The steep slope, $\partial H/\partial T$, at T slightly above T_c, coressponds to the well-known maximum in C_p in this region.

Because our specific heats have <u>not</u> been computed as $C_p = (\partial H/\partial T)_p$ in table 19, we give in table 13 a comparison of values $\Delta H/\Delta T$ with the tabulated specific heats along the P = 50 bar isobar. Agreement is satisfactory for engineering applications, and also supports the consistency of our computations.

As a test of our thermal computations, we give in table 14 a comparison of our enthalpy differences, along the 480 K isotherm, with those of Das, et al. [11]. With pressures increasing from 1 to 700 atm, differences of the derived results increase from a fraction of one percent to over two percent.

Finally, because we have extrapolated results in table 19 for the compressed liquid to temperatures below the minimum (300 K) of experimental P-ρ-T data (except for the saturated liquid densities), we present in fig. 5 a comparison with propane for enthalpies (on arbitrary bases) along the 500 bar isobar. For reduced temperatures below 0.7, the n-butane results are extrapolated. It is seen that they are a monotonic continuation of results at the higher temperatures.

5. TABLES OF PHYSICAL AND THERMODYNAMIC PROPERTIES

5.1 Calculated P-ρ-T Isochores and Isotherms

Tables 15 and 16 give a selection of isochores and isotherms computed by equation of state (6). These are essential to examine behavior of the P(ρ,T) surface. They are a useful supplement to the isobars of table 19 for interpolating P-ρ-T values and their derivatives.

5.2 The Joule-Thomson Inversion Locus

Table 17 gives the P-ρ-T locus of the J.-T. inversion, $(\partial T/\partial P)_H = 0$, obtained from equation of state (6) under the condition $T\,(\partial P/\partial T) = \rho\,(\partial P/\partial \rho)$. This table has been computed to temperatures well above those of P-ρ-T data, to show approach to a maximum in P-T coordinates.

5.3 Thermophysical Properties of the Saturated Fluid

Table 18 gives physical and thermodynamic properties of saturated liquid n-butane computed by methods of section 3. Column headings are interpreted on the first page of this table.

5.4 Thermophysical Properties Along Selected Isobars

Table 19 gives physical and thermodynamic properties on isobars, computed by methods of section 3. Explanations for this table are given on the first page. This table is extrapolated below the minimum temperature (300 K), and above the maximum pressure (≈ 400 bar) of most of the P-ρ-T data used for adjusting the equation of state.

6. ACKNOWLEDGMENTS

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APPENDIX A. Symbols and Units

Subscripts c and t refer to critical and liquid triple points.

Subscripts g and ℓ refer to saturated vapor and liquid.

Subscript σ refers to liquid-vapor coexistence

Superscript o refers to ideal gas states.

$\alpha, \beta, \gamma, \delta, \varepsilon$	non-linear parameters in equations
A_0	$(Z_c - 1)$ for eq. (4)
$B(\rho)$, $C(\rho)$	density-dependent coefficients in the equation of state
B^*	dimensionless second virial coefficient, eq. (5a)
$B(x)$	second virial coefficient
$C_v(\rho,T)$	molal heat capacity at constant volume, (J/mol)/K
$C_p(\rho,T)$	molal heat capacity at constant pressure, (J/mol)/K
$C_\sigma(T)$	molal heat capacity for saturated liquid, (J/mol)/K
d	density, mol/L
$E(\rho,T)$	the internal energy, J/mol
E_0^o	22,580.9 J/mol (arbitrary)
$f(\rho)$	used in the definition of $\Theta(\rho)$
$F(\rho,T)$	definition in the equation of state
$H(\rho,T)$	the enthalpy, J/mol
H_0^o	enthalpy for ideal gas at T = 0
J	the joule, 1 N-m
L	the liter, 10^{-3} m^3
mol	58.1243 grams of butane (C^{12} = 12 scale)
P	pressure in bars, 1 bar = $10^5 N/m^2$, (1 atm = 1.01325 bar)
P_0	constant for the Simon eq. (1)
$P_\sigma(T)$	the vapor pressure, bar
$P_\sigma(\rho)$	$P_\sigma[T_\sigma(\rho)]$, vapor pressure as function of density
$\Phi(\rho,T)$	function in the equation of state
$\Psi(\rho,T)$	function in the equation of state
Q_{vap}	ΔH_{vap}, the heat of vaporization, J/mol
R	the gas constant, 8.3145 (J/mol)/K, 0.083145 (bar-L/mol)/K
R^*	$(0.083145) \cdot d_c$, bar/K
ρ	d/d_c, density reduced at the critical point
$S(\rho,T)$	the entropy, (J/mol)/K
T	temperature, K

$T_\sigma(\rho)$	liquid-vapor coexistence temperature, K
$\Theta(\rho)$	defined locus of temperatures, for $\Psi(\rho,T)$
v	1/d, molal volume, L/mol
$\omega(\rho,T)$	[1 - $\Theta(\rho)/T$] for $\Psi(\rho,T)$
$W(\rho,T)$	the speed of sound, meters/second
Z	P/[d•R•T], the "compressibility factor"
Z_c	value of Z at the critical point
Z_{exp}	experimental (not calculated) value of Z
x(T)	T/T_c for the equation of state
x(T)	variously defined for other equations
$x_\sigma(\rho)$	$T_\sigma(\rho)/T_c$, reduced temperature at coexistence, for the equation of state.

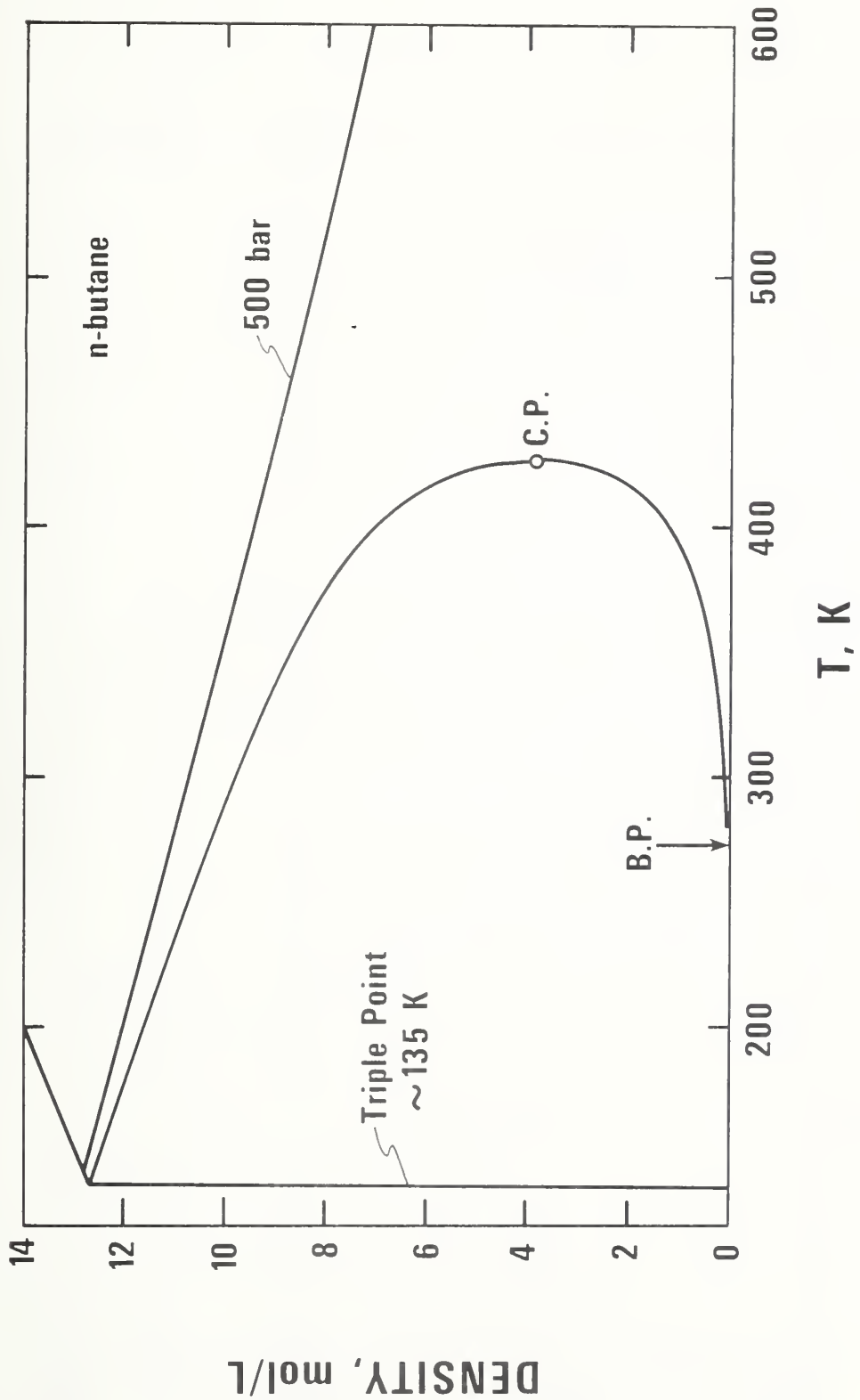

Figure 1. The density-temperature diagram of n-butane.

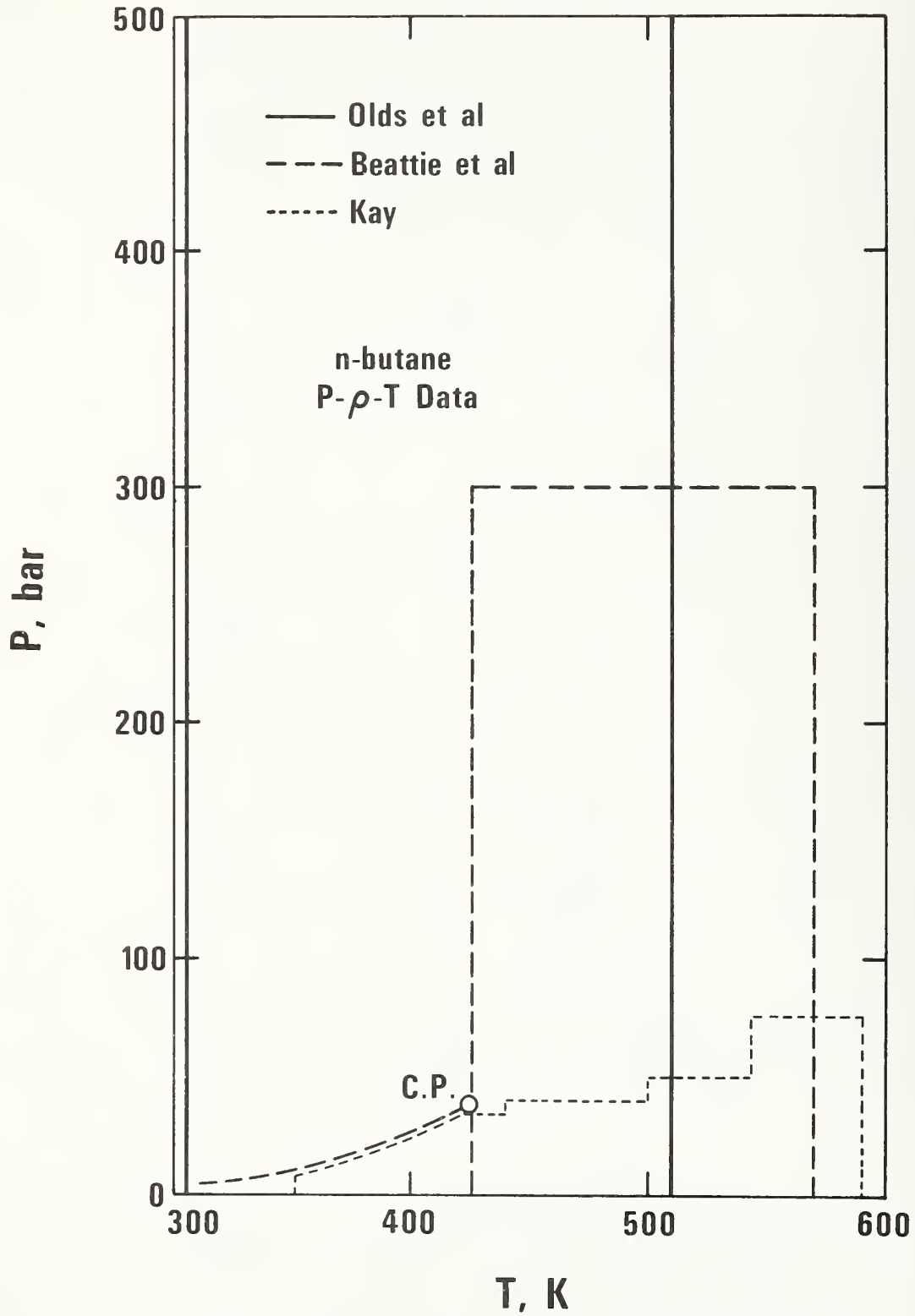

Figure 2. The P-T locus of P-ρ-T data for n-butane.

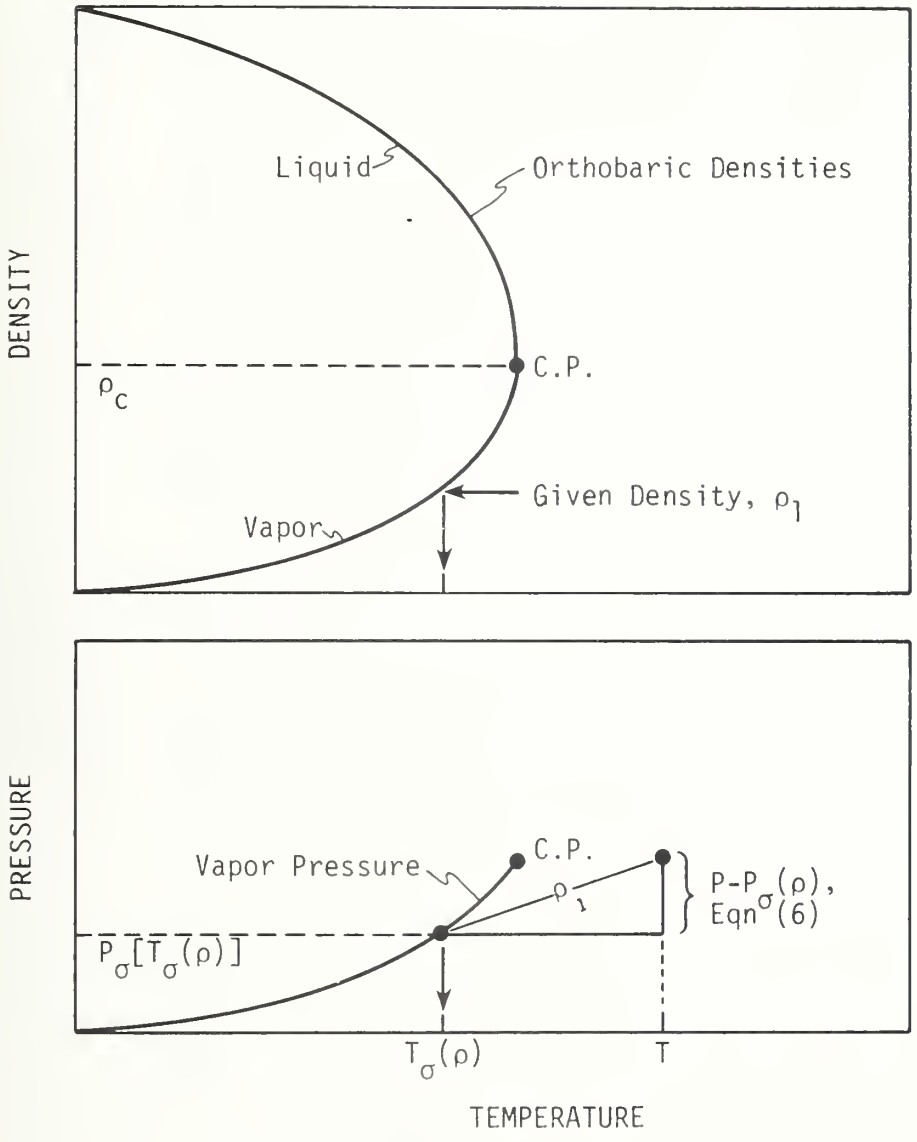

Figure 3. Illustration for the equation of state.

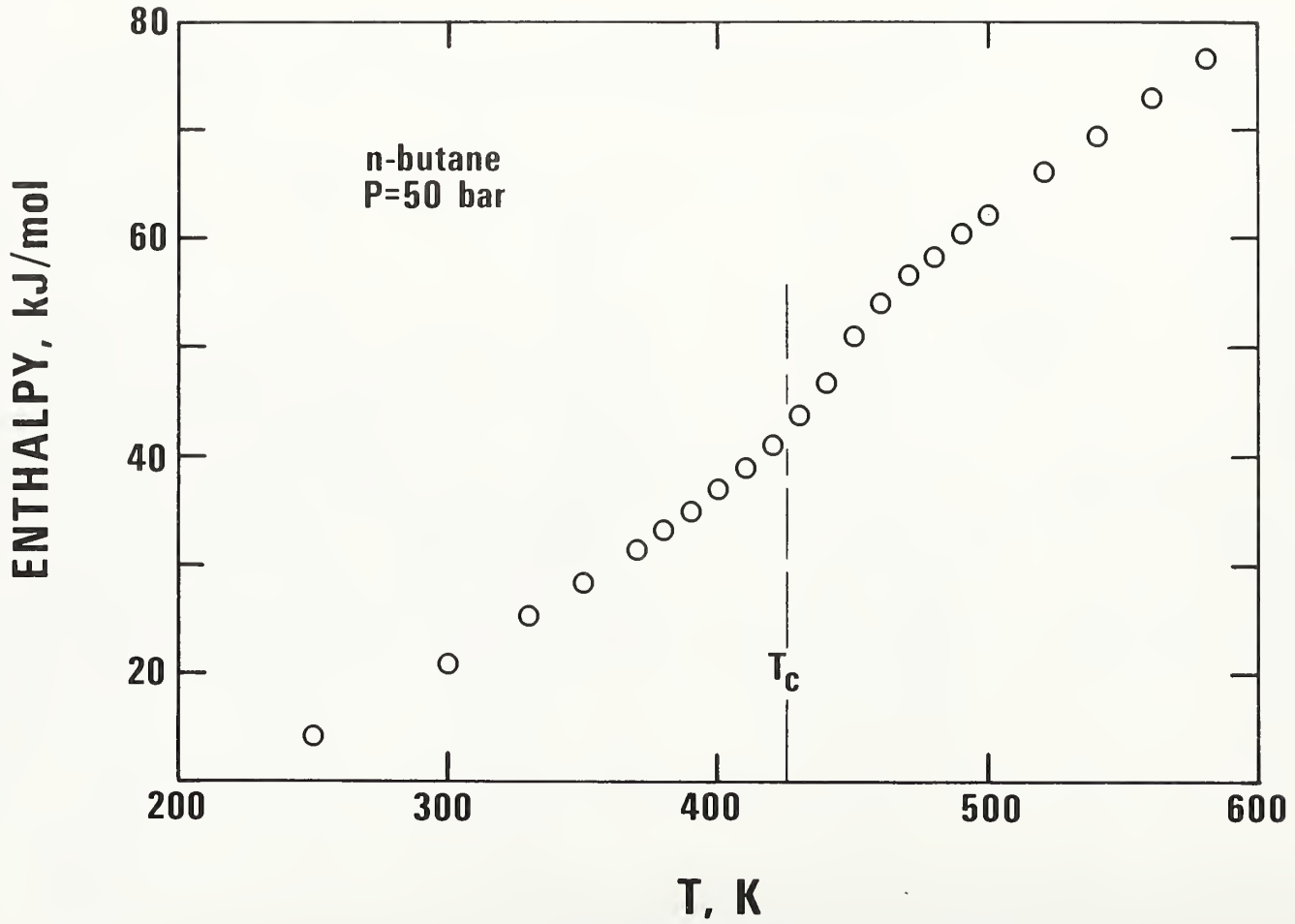

Figure 4. Plot of calculated enthalpy at 50 bar.

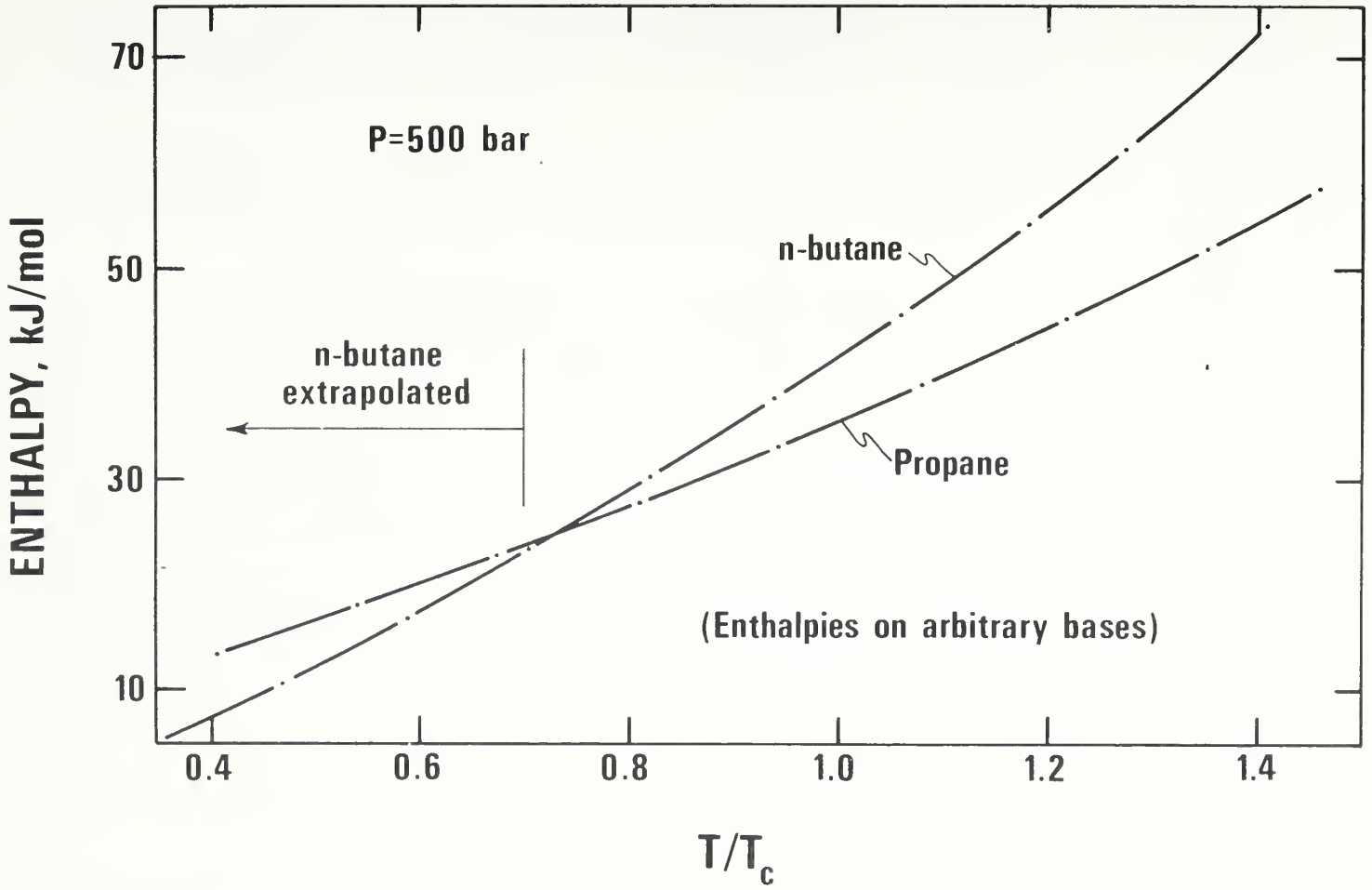

Figure 5. Comparison of n-butane and propane enthalpies at P = 500 bar.

Table 1. Fixed-Point Values for n-butane

	Triple Point	Boiling Point	Critical Point
Temperature, K	134.86	272.638	425.16
Pressure, bar	$6.738\ 10^{-6}$	1.01325	37.9612
Density, mol/L			
Vapor	$6.009\ 10^{-7}$	0.04662	3.90
Liquid	12.650	10.3415	3.90

Table 2. Vapor pressures of n-butane.

N-BUTANE VAPOR PRESSURES, EPP = 1.850

(1)ASTON, (2)BEATTIE, (10)DANA, (19)KAY, (29)SAGE,WEBSTER,LACEY, (35)WACKHER, (37)YOUNG, (95)SEIBERT,(96)CARRUTH,(97)HIRATA,(98)TICKNER,(99)DELAPLACE, (40)RDG THERMALOOPS.

TTRP =134.860, TCRT = 425.160
PTRP = .67378E-05, PCRT = 37.961199, DPSDT = .63131

14.45037296 9.50878339 -35.95072288 41.89821095 -16.76129645 11.70758278

ID	WT	T,K	U	X	P,BAR	CALCD	PCNT	DPS/DT	RESID.
40	1.000	134.860	-2.15260	.31720	.67437E-05	.67378E-05	.09	.128E-05	.00006
40	1.000	140.000	-2.03686	.32929	.17216E-04	.17213E-04	.02	.301E-05	.00658
40	1.000	145.000	-1.93214	.34105	.39908E-04	.39918E-04	-.03	.646E-05	.01202
40	1.000	150.000	-1.83440	.35281	.86893E-04	.86938E-04	-.05	.130E-04	.01667
40	1.000	155.000	-1.74297	.36457	.17884E-03	.17895E-03	-.06	.249E-04	.02063
40	1.000	160.000	-1.65725	.37633	.34986E-03	.35006E-03	-.06	.453E-04	.02398
40	1.000	165.000	-1.57673	.38809	.65366E-03	.65399E-03	-.05	.789E-04	.02678
40	1.000	170.000	-1.50094	.39985	.11714E-02	.11719E-02	-.04	.132E-03	.02911
40	1.000	175.000	-1.42949	.41161	.20212E-02	.20216E-02	-.02	.213E-03	.03101
40	1.000	180.000	-1.36200	.42337	.33690E-02	.33692E-02	-.00	.333E-03	.03252
40	1.000	185.000	-1.29816	.43513	.54411E-02	.54404E-02	.01	.505E-03	.03371
40	1.000	190.000	-1.23768	.44689	.85368E-02	.85348E-02	.02	.745E-03	.03459
40	1.000	195.000	-1.18031	.45865	.13044E-01	.13039E-01	.03	.107E-02	.03520
1	1.000	195.107	-1.17911	.45890	.13200E-01	.13154E-01	.35	.108E-02	.03541
40	1.000	200.000	-1.12580	.47041	.19449E-01	.19441E-01	.04	.151E-02	.03558
40	1.000	205.000	-1.07395	.48217	.28356E-01	.28345E-01	.04	.208E-02	.03575
40	1.000	210.000	-1.02457	.49393	.40497E-01	.40481E-01	.04	.281E-02	.03574
1	1.000	212.668	-.99917	.50021	.48340E-01	.48574E-01	-.48	.327E-02	.03533
40	1.000	215.000	-.97749	.50569	.56740E-01	.56720E-01	.03	.372E-02	.03556
40	1.000	220.000	-.93255	.51745	.78102E-01	.78083E-01	.02	.486E-02	.03524
40	1.000	225.000	-.88960	.52921	.10576E+00	.10575E+00	.01	.625E-02	.03479
1	1.000	226.276	-.87894	.53221	.11411E+00	.11398E+00	.12	.665E-02	.03473
40	1.000	230.000	-.84852	.54097	.14106E+00	.14106E+00	-.00	.792E-02	.03424
40	1.000	235.000	-.80919	.55273	.18550E+00	.18553E+00	-.01	.992E-02	.03359
1	1.000	235.822	-.80289	.55467	.19409E+00	.19383E+00	.14	.103E-01	.03357
40	1.000	240.000	-.77150	.56449	.24076E+00	.24083E+00	-.03	.123E-01	.03285
40	1.000	245.000	-.73535	.57625	.30869E+00	.30882E+00	-.04	.150E-01	.03204
1	1.000	246.511	-.72471	.57981	.33268E+00	.33217E+00	.15	.159E-01	.03192
40	1.000	250.000	-.70064	.58801	.39131E+00	.39153E+00	-.06	.182E-01	.03118
40	1.000	255.000	-.66729	.59977	.49080E+00	.49112E+00	-.07	.218E-01	.03026
1	1.000	256.204	-.65946	.60261	.51832E+00	.51789E+00	.08	.227E-01	.03013
40	1.000	260.000	-.63523	.61153	.60950E+00	.60996E+00	-.08	.259E-01	.02930
1	1.000	262.267	-.62110	.61687	.67106E+00	.67084E+00	.03	.279E-01	.02892
40	1.000	265.000	-.60438	.62329	.74991E+00	.75053E+00	-.08	.305E-01	.02830
1	1.000	266.789	-.59362	.62750	.80656E+00	.80660E+00	-.01	.322E-01	.02799
40	1.000	270.000	-.57467	.63506	.91469E+00	.91547E+00	-.09	.356E-01	.02728
1	1.000	270.397	-.57235	.63599	.92943E+00	.92970E+00	-.03	.360E-01	.02723
1	1.000	272.027	-.56293	.63982	.98952E+00	.98992E+00	-.04	.379E-01	.02699
1	1.000	272.806	-.55847	.64165	.10193E+01	.10198E+01	-.05	.387E-01	.02672
29	1.000	294.260	-.44484	.69212	.21580E+01	.21558E+01	.10	.691E-01	.02219
29	1.000	327.590	-.29784	.77051	.55660E+01	.55700E+01	-.07	.141E+00	.01485
97	1.000	333.130	-.27626	.78354	.64017E+01	.63934E+01	.13	.156E+00	.01383
97	1.000	336.420	-.26378	.79128	.69357E+01	.69230E+01	.18	.166E+00	.01318

Table 2. Continued

N-BUTANE VAPOR PRESSURES, EPP = 1.850

ID	WT	T,K	U	X	P,BAR	CALCD	PCNT	DPS/DT	RESID.
19	1.000	336.480	-.26355	.79142	.68950E+01	.69330E+01	-.55	.166E+00	.01270
97	1.000	340.940	-.24702	.80191	.76916E+01	.77026E+01	-.14	.179E+00	.01205
97	1.000	343.070	-.23928	.80692	.80878E+01	.80915E+01	-.05	.186E+00	.01169
29	1.000	344.260	-.23500	.80972	.83420E+01	.83150E+01	.32	.190E+00	.01169
97	1.000	344.710	-.23338	.81078	.83836E+01	.84007E+01	-.20	.191E+00	.01126
19	1.000	345.650	-.23003	.81299	.86180E+01	.85818E+01	.42	.194E+00	.01148
2	1.000	348.140	-.22123	.81884	.90790E+01	.90753E+01	.04	.202E+00	.01074
97	1.000	348.660	-.21941	.82007	.91476E+01	.91809E+01	-.36	.204E+00	.01038
97	1.000	348.990	-.21826	.82084	.92571E+01	.92484E+01	.09	.205E+00	.01061
97	1.000	352.640	-.20565	.82943	.99917E+01	.10020E+02	-.28	.218E+00	.00966
19	1.000	353.870	-.20146	.83232	.10342E+02	.10290E+02	.51	.222E+00	.00993
97	1.000	355.080	-.19736	.83517	.10550E+02	.10561E+02	-.10	.226E+00	.00931
97	1.000	357.020	-.19086	.83973	.10981E+02	.11006E+02	-.23	.233E+00	.00886
97	1.000	359.020	-.18422	.84444	.11475E+02	.11479E+02	-.04	.240E+00	.00862
29	1.000	360.930	-.17796	.84893	.12024E+02	.11945E+02	.66	.247E+00	.00871
97	1.000	361.140	-.17727	.84942	.11995E+02	.11997E+02	-.02	.248E+00	.00824
19	1.000	361.210	-.17704	.84959	.12066E+02	.12015E+02	.43	.249E+00	.00851
97	1.000	363.450	-.16979	.85485	.12579E+02	.12581E+02	-.02	.257E+00	.00782
97	1.000	365.700	-.16259	.86015	.13144E+02	.13169E+02	-.19	.266E+00	.00730
97	1.000	366.620	-.15967	.86231	.13399E+02	.13416E+02	-.12	.270E+00	.00718
97	1.000	367.850	-.15580	.86520	.13746E+02	.13750E+02	-.03	.274E+00	.00703
19	1.000	367.980	-.15539	.86551	.13790E+02	.13786E+02	.03	.275E+00	.00704
97	1.000	369.620	-.15026	.86937	.14225E+02	.14242E+02	-.12	.282E+00	.00666
2	1.000	373.140	-.13941	.87765	.15290E+02	.15260E+02	.20	.296E+00	.00626
97	1.000	373.580	-.13807	.87868	.15385E+02	.15391E+02	-.04	.298E+00	.00604
19	1.000	373.980	-.13685	.87962	.15513E+02	.15510E+02	.02	.300E+00	.00601
97	1.000	375.040	-.13364	.88211	.15785E+02	.15831E+02	-.29	.305E+00	.00563
97	1.000	377.240	-.12703	.88729	.16505E+02	.16511E+02	-.04	.314E+00	.00543
19	1.000	379.430	-.12052	.89244	.17237E+02	.17210E+02	.15	.324E+00	.00520
19	1.000	384.710	-.10514	.90486	.18961E+02	.18987E+02	-.14	.349E+00	.00419
97	1.000	385.710	-.10228	.90721	.19319E+02	.19338E+02	-.10	.354E+00	.00406
19	1.000	389.370	-.09192	.91582	.20684E+02	.20666E+02	.09	.372E+00	.00364
97	1.000	391.010	-.08734	.91968	.21239E+02	.21283E+02	-.21	.381E+00	.00321
97	1.000	396.090	-.07339	.93163	.23251E+02	.23285E+02	-.15	.408E+00	.00256
2	1.000	398.140	-.06787	.93645	.24207E+02	.24133E+02	.31	.419E+00	.00258
97	1.000	401.300	-.05946	.94388	.25465E+02	.25488E+02	-.09	.438E+00	.00194
2	1.000	423.140	-.00477	.99525	.36730E+02	.36714E+02	.04	.606E+00	.00010

NP = 80, RMSPCT = .186

Table 3. Densities of saturated liquid.

N-BUTANE SATURATED LIQUID DENSITIES, EL = .350

(7)COFFIN, (8)CONNOLLY, (10)DANA, (15)FOEHR, (19)KAY, (25)OLDS, (29)SAGE,
(32)SLIWINSKI, (33)TC-NGAA, (90)HAYNES, (91)ORRIT, (92)MCCLUNE, (93)VANDERVET.

TTRP =134.860, TCRT = 425.160, DTRP = 12.650, DCRT = 3.900

.802377995 -.139053759 .057353024

ID	WT	T,K	X	MOL/L	CALCD	PCNT	DDS/DT	RESID.
90	1.000	135.075	.99926	12.652	12.647	.04	-.01602	1.94230
91	1.000	138.041	.98904	12.595	12.599	-.03	-.01603	.65721
90	1.000	140.075	.98204	12.571	12.566	.03	-.01604	.76376
91	1.000	142.049	.97524	12.532	12.535	-.02	-.01604	.70447
92	1.000	143.150	.97144	12.514	12.517	-.03	-.01605	.70406
90	1.000	145.075	.96481	12.492	12.486	.05	-.01605	.75371
91	1.000	147.788	.95547	12.441	12.443	-.01	-.01606	.71825
92	1.000	148.150	.95422	12.435	12.437	-.02	-.01607	.71747
90	1.000	150.075	.94759	12.409	12.406	.03	-.01607	.73796
92	1.000	153.150	.93700	12.357	12.356	.00	-.01609	.72799
91	1.000	153.204	.93681	12.354	12.356	-.02	-.01609	.72173
90	1.000	155.075	.93037	12.330	12.325	.04	-.01610	.73960
92	1.000	158.150	.91977	12.276	12.276	.00	-.01611	.72931
91	1.000	158.587	.91827	12.266	12.269	-.03	-.01611	.72280
90	1.000	160.075	.91314	12.248	12.245	.03	-.01612	.73729
92	1.000	163.150	.90255	12.196	12.195	.00	-.01614	.73218
91	1.000	164.010	.89959	12.179	12.181	-.02	-.01614	.72763
90	1.000	165.075	.89592	12.163	12.164	-.01	-.01615	.73058
92	1.000	168.150	.88533	12.116	12.115	.02	-.01617	.73610
91	1.000	169.522	.88060	12.092	12.092	-.01	-.01618	.73244
90	1.000	170.075	.87869	12.084	12.083	.00	-.01618	.73467
92	1.000	173.150	.86810	12.035	12.034	.01	-.01620	.73756
91	1.000	174.926	.86198	12.003	12.005	-.01	-.01622	.73394
91	1.000	180.442	.84298	11.915	11.915	-.01	-.01626	.73707
91	1.000	186.368	.82257	11.817	11.819	-.01	-.01632	.73888
91	1.000	191.789	.80390	11.728	11.730	-.02	-.01638	.74000
91	1.000	197.248	.78509	11.636	11.641	-.04	-.01644	.74083
91	1.000	204.288	.76084	11.522	11.524	-.03	-.01654	.74488
91	1.000	208.227	.74727	11.458	11.459	-.01	-.01660	.74743
91	1.000	213.846	.72792	11.362	11.366	-.03	-.01669	.74844
91	1.000	219.353	.70895	11.271	11.274	-.02	-.01679	.75157
91	1.000	224.970	.68960	11.174	11.179	-.05	-.01690	.75185
33	1.000	226.820	.68322	11.143	11.148	-.04	-.01694	.75326
90	1.000	230.000	.67227	11.091	11.094	-.02	-.01701	.75551
33	1.000	333.150	.31695	9.108	9.107	.02	-.02316	.79068
91	1.000	233.391	.66059	11.034	11.036	-.02	-.01709	.75728
33	1.000	235.870	.65205	10.992	10.993	-.01	-.01715	.75842
33	1.000	238.650	.64247	10.942	10.946	-.03	-.01723	.75834
7	1.000	238.750	.64213	10.946	10.944	.02	-.01723	.76111
7	1.000	240.350	.63662	10.918	10.916	.02	-.01727	.76175
91	1.000	241.557	.63246	10.892	10.895	-.03	-.01730	.75935
7	1.000	242.950	.62766	10.870	10.871	-.01	-.01734	.76104
91	1.000	247.215	.61297	10.793	10.797	-.04	-.01747	.76145
33	1.000	247.760	.61109	10.791	10.787	.03	-.01749	.76514
7	1.000	248.550	.60837	10.779	10.774	.05	-.01751	.76626
91	1.000	252.249	.59563	10.702	10.709	-.06	-.01763	.76207

Table 3. Continued

N-BUTANE SATURATED LIQUID DENSITIES, EL = .350

ID	WT	T,K	X	MOL/L	CALCD	PCNT	DDS/DT	RESID.
7	1.000	254.150	.58908	10.679	10.675	.03	-.01769	.76760
33	1.000	255.370	.58488	10.662	10.653	.08	-.01774	.77009
33	1.000	255.430	.58467	10.658	10.652	.05	-.01774	.76902
91	1.000	258.254	.57494	10.597	10.602	-.05	-.01784	.76498
7	1.000	258.750	.57323	10.596	10.593	.03	-.01786	.76885
7	1.000	262.650	.55980	10.531	10.523	.07	-.01801	.77221
91	1.000	263.785	.55589	10.496	10.503	-.06	-.01805	.76633
7	1.000	266.450	.54671	10.462	10.455	.07	-.01816	.77342
33	1.000	266.480	.54661	10.464	10.454	.09	-.01816	.77441
91	1.000	269.401	.53654	10.393	10.401	-.07	-.01829	.76801
7	1.000	269.650	.53569	10.405	10.396	.09	-.01830	.77511
7	1.000	272.350	.52639	10.357	10.347	.10	-.01842	.77654
7	1.000	274.450	.51915	10.319	10.308	.11	-.01852	.77761
91	1.000	274.973	.51735	10.289	10.298	-.09	-.01854	.76934
33	1.000	277.150	.50985	10.259	10.258	.01	-.01865	.77431
7	1.000	281.650	.49435	10.199	10.173	.25	-.01888	.78543
93	1.000	283.150	.48918	10.130	10.145	-.15	-.01896	.76988
32	2.000	283.200	.48901	10.145	10.144	.01	-.01896	.77619
7	1.000	286.850	.47644	10.090	10.075	.16	-.01916	.78317
7	1.000	288.650	.47024	10.054	10.040	.14	-.01927	.78311
93	1.000	288.710	.47003	10.023	10.039	-.15	-.01927	.77167
90	1.000	288.706	.47004	10.033	10.039	-.06	-.01927	.77517
33	1.000	288.710	.47003	10.047	10.039	.09	-.01927	.78092
90	1.000	290.000	.46559	10.007	10.014	-.07	-.01935	.77529
7	1.000	291.950	.45887	9.987	9.976	.11	-.01947	.78286
8	1.000	293.150	.45474	9.960	9.953	.07	-.01954	.78168
15	1.000	293.150	.45474	9.963	9.953	.11	-.01954	.78295
93	1.000	293.150	.45474	9.944	9.953	-.08	-.01954	.77585
32	2.000	293.190	.45460	9.949	9.952	-.03	-.01955	.77796
7	1.000	296.450	.44337	9.905	9.888	.17	-.01976	.78627
8	1.000	298.150	.43751	9.862	9.854	.08	-.01987	.78332
93	1.000	298.150	.43751	9.846	9.854	-.08	-.01987	.77763
7	1.000	299.650	.43235	9.832	9.824	.08	-.01998	.78401
33	1.000	299.820	.43176	9.822	9.821	.01	-.01999	.78155
90	1.000	300.000	.43114	9.810	9.817	-.07	-.02000	.77861
7	1.000	302.450	.42270	9.774	9.768	.06	-.02018	.78400
32	2.000	303.150	.42029	9.752	9.754	-.02	-.02023	.78138
93	1.000	303.150	.42029	9.746	9.754	-.08	-.02023	.77940
7	1.000	305.650	.41168	9.710	9.703	.07	-.02042	.78537
93	1.000	308.150	.40307	9.641	9.652	-.11	-.02062	.77991
25	1.000	310.930	.39349	9.586	9.594	-.09	-.02085	.78143
33	1.000	310.930	.39349	9.597	9.594	.03	-.02085	.78526
32	2.000	313.120	.38595	9.545	9.548	-.04	-.02104	.78376
93	1.000	313.150	.38584	9.538	9.548	-.10	-.02105	.78174
93	1.000	318.150	.36862	9.435	9.441	-.07	-.02151	.78426
33	1.000	322.040	.35522	9.363	9.357	.06	-.02189	.78939
32	2.000	323.120	.35150	9.327	9.333	-.06	-.02201	.78569
93	1.000	323.150	.35140	9.328	9.332	-.04	-.02201	.78632
19	1.000	325.040	.34488	9.309	9.291	.20	-.02221	.79443
32	2.000	333.110	.31709	9.102	9.108	-.06	-.02316	.78846
19	1.000	336.480	.30548	9.045	9.029	.18	-.02360	.79620
32	2.000	343.080	.28274	8.863	8.870	-.07	-.02455	.79045
25	1.000	344.260	.27868	8.833	8.841	-.09	-.02474	.79030

Table 3. Continued

N-BUTANE SATURATED LIQUID DENSITIES, EL = .350

ID	WT	T,K	X	MOL/L	CALCD	PCNT	DDS/DT	RESID.
19	1.000	345.650	.27389	8.827	8.806	.23	-.02496	.79966
32	2.000	353.090	.24826	8.606	8.616	-.11	-.02628	.79171
19	1.000	353.870	.24557	8.618	8.595	.26	-.02643	.80181
19	1.000	361.310	.21994	8.414	8.393	.25	-.02803	.80273
32	2.000	363.110	.21374	8.330	8.342	-.14	-.02847	.79296
19	1.000	367.980	.19697	8.215	8.200	.18	-.02976	.80203
32	2.000	368.100	.19656	8.186	8.197	-.13	-.02979	.79415
19	1.000	373.980	.17630	8.031	8.016	.18	-.03162	.80279
25	1.000	377.590	.16386	7.899	7.900	-.02	-.03292	.79852
19	1.000	379.430	.15753	7.854	7.839	.20	-.03364	.80400
19	1.000	384.710	.13934	7.670	7.655	.19	-.03603	.80445
19	1.000	389.370	.12329	7.493	7.481	.16	-.03859	.80418
19	1.000	393.760	.10816	7.314	7.306	.12	-.04157	.80360
19	1.000	402.040	.07964	6.931	6.931	-.00	-.04956	.80151
19	1.000	405.870	.06645	6.730	6.731	-.02	-.05508	.80129
19	1.000	409.320	.05456	6.529	6.530	-.02	-.06186	.80142
19	1.000	412.870	.04234	6.292	6.294	-.03	-.07195	.80126
19	1.000	415.980	.03162	6.046	6.050	-.07	-.08579	.80056
19	1.000	419.260	.02032	5.743	5.731	.22	-.11242	.80852
19	1.000	422.320	.00978	5.330	5.307	.43	-.17726	.81626

NP = 119, RMSPCT = .098

Table 4. Densities of saturated vapor.

N-BUTANE SATURATED VAPOR DENSITIES, NF = 3. E = .35, EGX = 2.60

(10)DANA, (19)KAY, (25)OLDS, (29)SAGE/W/L, (32)SLIWINSKI, (35)DAS/R/E, (40)VIRIAL/VAPRES.

TTRP = 134.860, TCRT = 425.160, DGAT = .6008947E-06, DCRT = 3.9000

-.8707508107E+00 .1149348281E+01 .9916551152E+02
0. 0. 0.

ID	WT	T,K	MOL/L	CALCD	PCNT	Z,XPT	Z,CALC	F(Z)	DDS/DT
40	1.000	190.000	.54108E-03	.54107E-03	.00	.99849	.99851	1.85566	.445E-04
40	1.000	200.000	.11724E-02	.11724E-02	.01	.99717	.99724	1.68535	.853E-04
40	1.000	210.000	.23292E-02	.23293E-02	-.01	.99540	.99532	1.45366	.151E-03
40	1.000	220.000	.42995E-02	.43007E-02	-.03	.99285	.99258	1.28373	.250E-03
40	1.000	230.000	.74560E-02	.74592E-02	-.04	.98931	.98888	1.16205	.390E-03
40	1.000	240.000	.12259E-01	.12264E-01	-.04	.98451	.98409	1.07354	.580E-03
40	1.000	250.000	.19256E-01	.19258E-01	-.01	.97819	.97806	1.00885	.829E-03
40	1.000	260.000	.29084E-01	.29070E-01	.05	.97014	.97061	.95915	.115E-02
40	1.000	270.000	.42472E-01	.42411E-01	.14	.96016	.96155	.91940	.154E-02
32	1.000	293.190	.92000E-01	.91577E-01	.46	.92871	.93300	.85270	.279E-02
29	1.000	294.260	.94800E-01	.94604E-01	.21	.92946	.93139	.82111	.286E-02
32	1.000	303.150	.12320E+00	.12288E+00	.26	.91457	.91695	.80116	.351E-02
10	1.000	305.150	.13010E+00	.13007E+00	.03	.91319	.91343	.77712	.367E-02
25	1.000	310.930	.15280E+00	.15271E+00	.06	.90214	.90266	.76938	.417E-02
29	1.000	310.930	.15311E+00	.15271E+00	.26	.90031	.90266	.78374	.417E-02
32	1.000	313.120	.16160E+00	.16206E+00	-.29	.90092	.89835	.74273	.437E-02
32	1.000	323.120	.20990E+00	.21073E+00	-.39	.88049	.87703	.72826	.539E-02
19	1.000	325.040	.22050E+00	.22129E+00	-.36	.87575	.87262	.72900	.561E-02
29	1.000	327.590	.23720E+00	.23597E+00	.52	.86213	.86662	.76980	.591E-02
32	1.000	333.110	.26930E+00	.27049E+00	-.44	.85676	.85300	.72083	.661E-02
32	1.000	343.080	.34170E+00	.34340E+00	-.49	.83034	.82623	.71508	.806E-02
25	1.000	344.260	.35170E+00	.35303E+00	-.38	.82598	.82287	.71882	.826E-02
29	1.000	344.260	.35580E+00	.35303E+00	.79	.81646	.82287	.75814	.826E-02
32	1.000	353.090	.43130E+00	.43274E+00	-.33	.79907	.79642	.71751	.985E-02
19	1.000	361.210	.51810E+00	.51963E+00	-.29	.77216	.76989	.71703	.116E-01
32	1.000	363.110	.54260E+00	.54213E+00	.09	.76268	.76335	.72580	.121E-01
19	1.000	367.980	.60080E+00	.60403E+00	-.54	.74998	.74596	.71170	.134E-01
32	1.000	368.100	.60650E+00	.60564E+00	.14	.74447	.74552	.72612	.134E-01
19	1.000	384.710	.87360E+00	.87532E+00	-.20	.67947	.67813	.72410	.196E-01
19	1.000	389.370	.97010E+00	.97253E+00	-.25	.65803	.65638	.72706	.222E-01
19	1.000	393.760	.10748E+01	.10761E+01	-.12	.63515	.63438	.73353	.251E-01
19	1.000	398.150	.11933E+01	.11941E+01	-.07	.61102	.61059	.74036	.288E-01
19	1.000	402.040	.13173E+01	.13140E+01	.25	.58622	.58767	.75088	.330E-01
19	1.000	405.870	.14524E+01	.14504E+01	.14	.56218	.56297	.75856	.384E-01
19	1.000	409.320	.15957E+01	.15938E+01	.12	.53775	.53838	.76856	.451E-01
25	1.000	410.930	.16692E+01	.16696E+01	-.02	.52604	.52593	.77312	.491E-01
19	1.000	412.870	.17720E+01	.17702E+01	.10	.50940	.50992	.78214	.549E-01
19	1.000	415.980	.19594E+01	.19602E+01	-.04	.48143	.48123	.79706	.683E-01
19	1.000	419.260	.22157E+01	.22209E+01	-.23	.44591	.44487	.81957	.936E-01
19	1.000	422.320	.25850E+01	.25816E+01	.13	.39904	.39957	.85758	.154E+00

NP = 40, RMSPCT = .28

Table 5. Second virial coefficients.

N-BUTANE SECOND VIRIAL COEFFICIENTS, EV = 3.00

(2)BEATTIE(1939), (3)BEATTIE(1942), (4)BOTTOMLEY(1964), (5)BOTTOMLEY(1977), (19)KAY, (25)OLDS, (26)GUNN, (27)JONES, (28)KAPALLO, (29)SAGE/WEBSTER/LACEY, (30)KRETSCHNER, (31)MCGLASHAN, (32)TRIPP, (33)STREIN, (35)DAS.

.36841601 -.96231418 -.66340997

ID	WT	T,K	X	B(T)	B*	CALC	DIF	PCT
28	1.000	244.00	.574	-1230.00	-4.797	-4.813	.016	.34
4	1.000	273.06	.642	-897.00	-3.498	-3.631	.132	3.65
28	1.000	273.40	.643	-923.00	-3.600	-3.620	.020	.55
35	1.000	280.00	.659	-902.00	-3.518	-3.412	-.106	-3.10
28	1.000	282.30	.664	-862.00	-3.362	-3.344	-.018	-.53
32	1.000	283.16	.666	-846.00	-3.299	-3.319	.020	.59
32	1.000	283.16	.666	-862.00	-3.362	-3.319	-.043	-1.29
32	1.000	283.16	.666	-862.00	-3.362	-3.319	-.043	-1.29
32	1.000	283.16	.666	-881.00	-3.436	-3.319	-.117	-3.52
35	1.000	290.00	.682	-825.00	-3.218	-3.130	-.088	-2.80
33	1.000	296.10	.697	-743.00	-2.898	-2.975	.077	2.58
28	1.000	297.00	.699	-758.00	-2.956	-2.953	-.004	-.12
4	1.000	297.14	.699	-735.00	-2.867	-2.949	.083	2.80
35	1.000	300.00	.706	-757.00	-2.952	-2.881	-.071	-2.47
32	1.000	303.04	.713	-745.00	-2.906	-2.811	-.094	-3.36
32	1.000	303.04	.713	-715.00	-2.789	-2.811	.023	.81
32	1.000	303.04	.713	-691.00	-2.695	-2.811	.116	4.14
32	1.000	303.04	.713	-695.00	-2.711	-2.811	.101	3.58
28	1.000	305.60	.719	-718.00	-2.800	-2.754	-.046	-1.67
33	1.000	309.50	.728	-661.00	-2.578	-2.671	.093	3.48
25	1.000	310.94	.732	-707.60	-2.760	-2.641	-.119	-4.50
28	1.000	312.00	.734	-674.00	-2.629	-2.619	-.009	-.36
35	1.000	320.00	.753	-644.00	-2.512	-2.464	-.048	-1.94
28	1.000	321.00	.755	-635.00	-2.477	-2.445	-.031	-1.27
32	1.000	323.21	.760	-599.00	-2.336	-2.405	.069	2.88
32	1.000	323.21	.760	-602.00	-2.348	-2.405	.057	2.39
32	1.000	323.21	.760	-619.00	-2.414	-2.405	-.009	-.37
32	1.000	323.21	.760	-641.00	-2.500	-2.405	-.095	-3.93
4	1.000	323.16	.760	-606.00	-2.363	-2.406	.043	1.78
4	1.000	325.68	.766	-595.00	-2.321	-2.362	.041	1.74
33	1.000	334.60	.787	-555.70	-2.167	-2.213	.046	2.08
35	1.000	340.00	.800	-554.00	-2.161	-2.130	-.030	-1.43
25	1.000	344.27	.810	-544.20	-2.122	-2.068	-.055	-2.65
26	1.000	344.30	.810	-505.70	-1.972	-2.067	.095	4.60
4	1.000	346.46	.815	-522.00	-2.036	-2.037	.001	.04
33	1.000	353.10	.831	-489.20	-1.908	-1.947	.039	1.99
35	1.000	360.00	.847	-481.00	-1.876	-1.859	-.017	-.90
27	1.000	368.25	.866	-443.49	-1.730	-1.762	.032	1.84
27	1.000	368.25	.866	-444.20	-1.732	-1.762	.030	1.68
4	1.000	370.86	.873	-449.00	-1.751	-1.733	-.018	-1.06
27	1.000	373.22	.878	-427.53	-1.667	-1.707	.040	2.32
27	1.000	373.22	.878	-429.50	-1.675	-1.707	.032	1.87
33	1.000	374.20	.880	-431.80	-1.684	-1.696	.012	.73

Table 5. Continued

N-BUTANE SECOND VIRIAL COEFFICIENTS, EV = 3.00

ID	WT	T,K	X	B(T)	B*	CALC	DIF	PCT
25	1.000	377.60	.888	-433.21	-1.690	-1.661	-.029	-1.74
26	1.000	377.60	.888	-424.90	-1.657	-1.661	.004	.21
27	1.000	378.18	.890	-418.30	-1.631	-1.655	.023	1.40
27	1.000	378.18	.890	-418.00	-1.630	-1.655	.024	1.48
35	1.000	380.00	.894	-421.00	-1.642	-1.636	-.006	-.36
33	1.000	393.80	.927	-385.90	-1.505	-1.504	-.001	-.06
4	1.000	397.34	.935	-389.00	-1.517	-1.473	-.044	-3.01
27	1.000	398.14	.937	-370.02	-1.443	-1.466	.023	1.55
27	1.000	398.14	.937	-376.00	-1.466	-1.466	-.001	-.04
35	1.000	400.00	.941	-371.00	-1.447	-1.450	.003	.20
26	1.000	410.90	.967	-353.60	-1.379	-1.361	-.018	-1.33
25	1.000	410.94	.967	-358.02	-1.396	-1.361	-.036	-2.62
33	1.000	413.00	.972	-345.90	-1.349	-1.345	-.004	-.31
35	1.000	420.00	.988	-329.00	-1.283	-1.293	.010	.75
27	1.000	423.14	.996	-325.61	-1.270	-1.270	.000	.04
27	1.000	423.14	.996	-326.10	-1.272	-1.270	-.001	-.12
2	1.000	423.16	.996	-328.75	-1.282	-1.270	-.012	-.94
3	1.000	423.16	.996	-328.70	-1.282	-1.270	-.012	-.92
4	1.000	426.37	1.003	-331.00	-1.291	-1.248	-.043	-3.45
26	1.000	427.60	1.006	-322.10	-1.256	-1.239	-.017	-1.35
33	1.000	433.30	1.020	-314.30	-1.226	-1.201	-.024	-2.02
35	1.000	440.00	1.035	-294.00	-1.147	-1.159	.012	1.06
25	1.000	444.27	1.045	-289.98	-1.131	-1.133	.002	.18
26	1.000	444.30	1.045	-293.40	-1.144	-1.133	-.012	-1.02
2	1.000	448.16	1.054	-286.14	-1.116	-1.110	-.006	-.54
3	1.000	448.16	1.054	-287.30	-1.120	-1.110	-.011	-.95
27	1.000	448.18	1.055	-286.24	-1.116	-1.110	-.007	-.59
27	1.000	448.18	1.055	-284.80	-1.111	-1.110	-.001	-.08
26	1.000	460.90	1.084	-272.20	-1.062	-1.039	-.022	-2.16
35	1.000	470.00	1.106	-250.00	-.975	-.992	.017	1.74
33	1.000	472.80	1.112	-253.30	-.988	-.978	-.009	-.96
2	1.000	473.16	1.113	-252.71	-.986	-.977	-.009	-.91
3	1.000	473.16	1.113	-254.20	-.991	-.977	-.015	-1.50
27	1.000	473.21	1.113	-255.50	-.996	-.976	-.020	-2.05
27	1.000	473.21	1.113	-256.30	-1.000	-.976	-.023	-2.37
25	1.000	477.60	1.124	-237.28	-.925	-.955	.030	3.14
26	1.000	477.60	1.124	-245.90	-.959	-.955	-.004	-.38
33	1.000	498.00	1.172	-220.30	-.859	-.865	.006	.69
2	1.000	498.16	1.172	-223.37	-.871	-.865	-.007	-.77
3	1.000	498.16	1.172	-224.50	-.876	-.865	-.011	-1.28
27	1.000	498.20	1.172	-228.48	-.891	-.864	-.027	-3.09
27	1.000	498.20	1.172	-228.70	-.892	-.864	-.028	-3.19
35	1.000	500.00	1.176	-215.00	-.839	-.857	.018	2.16
26	1.000	510.90	1.202	-199.90	-.780	-.814	.034	4.22
25	1.000	510.94	1.202	-198.83	-.775	-.814	.038	4.72
2	1.000	523.16	1.231	-198.19	-.773	-.769	-.004	-.51
3	1.000	523.16	1.231	-198.10	-.773	-.769	-.004	-.47
35	1.000	530.00	1.247	-186.00	-.725	-.745	.020	2.67
35	1.000	560.00	1.318	-161.00	-.628	-.652	.024	3.68
2	1.000	573.16	1.349	-154.09	-.601	-.616	.015	2.38
3	1.000	573.16	1.349	-157.40	-.614	-.616	.002	.28
5	0.000	316.18	.744	-612.30	-2.388	-2.536	.148	5.85
5	0.000	341.49	.804	-518.90	-2.024	-2.108	.084	4.00
5	0.000	341.54	.804	-503.60	-1.964	-2.107	.143	6.80

Table 5. Continued

N-BUTANE SECOND VIRIAL COEFFICIENTS, EV = 3.00

ID	WT	T,K	X	B(T)	B*	CALC	DIF	PCT
5	0.000	341.75	.804	-512.00	-1.997	-2.104	.107	5.11
5	0.000	341.83	.804	-513.30	-2.002	-2.103	.101	4.81
5	0.000	367.09	.864	-432.90	-1.688	-1.775	.087	4.90
5	0.000	367.13	.864	-432.30	-1.686	-1.775	.089	5.00
5	0.000	367.83	.865	-435.30	-1.698	-1.767	.069	3.91
5	0.000	367.99	.866	-429.70	-1.676	-1.765	.089	5.05
5	0.000	396.39	.933	-368.60	-1.438	-1.481	.043	2.94
5	0.000	396.46	.933	-367.60	-1.434	-1.480	.047	3.16
5	0.000	396.60	.933	-363.80	-1.419	-1.479	.060	4.08
5	0.000	427.88	1.007	-303.80	-1.185	-1.238	.053	4.26
5	0.000	427.88	1.007	-306.50	-1.195	-1.238	.042	3.41
5	0.000	462.69	1.089	-248.60	-.970	-1.030	.060	5.84
5	0.000	462.86	1.089	-246.60	-.962	-1.029	.067	6.51
5	0.000	463.32	1.090	-243.90	-.951	-1.026	.075	7.32
5	0.000	498.81	1.174	-213.90	-.834	-.862	.028	3.21
5	0.000	498.98	1.174	-201.40	-.785	-.861	.076	8.79
5	0.000	537.16	1.264	-167.10	-.652	-.722	.070	9.68
5	0.000	537.32	1.264	-160.50	-.626	-.721	.095	13.19
5	0.000	537.38	1.264	-158.10	-.617	-.721	.104	14.46
5	0.000	579.46	1.363	-125.90	-.491	-.599	.108	18.05
5	0.000	580.48	1.366	-124.60	-.486	-.597	.111	18.54
19	0.000	310.94	.732	-742.80	-2.897	-2.641	-.256	-9.69
19	0.000	338.72	.797	-585.19	-2.282	-2.149	-.133	-6.18
19	0.000	366.49	.862	-502.69	-1.960	-1.782	-.178	-10.01
19	0.000	394.27	.928	-421.99	-1.646	-1.500	-.146	-9.73
19	0.000	422.05	.993	-333.38	-1.300	-1.278	-.022	-1.73
19	0.000	449.83	1.058	-294.38	-1.148	-1.100	-.048	-4.34
19	0.000	477.60	1.124	-257.05	-1.002	-.955	-.047	-4.93
19	0.000	505.38	1.189	-223.67	-.872	-.835	-.037	-4.42
19	0.000	533.16	1.254	-201.37	-.785	-.735	-.051	-6.89
19	0.000	560.94	1.320	-182.51	-.712	-.649	-.063	-9.64
19	0.000	588.72	1.385	-168.29	-.656	-.576	-.080	-13.97
29	0.000	310.94	.732	-660.61	-2.576	-2.641	.065	2.44
29	0.000	327.60	.771	-616.33	-2.404	-2.329	-.075	-3.23
29	0.000	344.27	.810	-567.57	-2.214	-2.068	-.146	-7.05
29	0.000	360.94	.849	-523.67	-2.042	-1.848	-.195	-10.53
29	0.000	377.60	.888	-501.54	-1.956	-1.661	-.295	-17.79
29	0.000	394.27	.928	-472.28	-1.842	-1.500	-.342	-22.81
30	0.000	303.16	.713	-761.00	-2.968	-2.808	-.159	-5.68
31	0.000	296.40	.697	-720.00	-2.808	-2.967	.159	5.36
31	0.000	307.50	.724	-667.00	-2.601	-2.713	.112	4.12
31	0.000	318.20	.749	-619.00	-2.414	-2.498	.083	3.34
31	0.000	328.90	.774	-568.00	-2.215	-2.306	.091	3.96
31	0.000	337.80	.795	-533.00	-2.079	-2.164	.085	3.92
31	0.000	348.40	.820	-501.00	-1.954	-2.010	.056	2.78
31	0.000	358.40	.843	-466.00	-1.817	-1.879	.062	3.28
31	0.000	368.40	.867	-440.00	-1.716	-1.760	.044	2.52
31	0.000	377.90	.889	-410.00	-1.599	-1.658	.059	3.53
31	0.000	387.60	.912	-383.00	-1.494	-1.561	.068	4.33
31	0.000	400.40	.942	-353.00	-1.377	-1.446	.070	4.82
31	0.000	413.40	.973	-322.00	-1.256	-1.342	.086	6.40

NP = 94, RMSPCT = 2.11

Table 6. Coefficients of the equation of state.

EQUATION OF STATE, COEFFICIENTS

DGAT = .600894721E-06
DTRP = 12.6500, TTRP = 134.860, PTRP = .673776550E-05
DCRT = 3.9000, TCRT = 425.160, PCRT = 37.961199413

AL = 1.000, BE = .800, GA = .300
DE = .667, EP = 3.000, ER = 0.000, IX = 4

.35427006233 .26628373954 0.00000000000 0.00000000000
.42192906133

MOL/L	TSAT	THETA	PSAT	B	C
.5	359.489	339.005	11.593	.6493	-.36781
1.0	390.588	376.624	21.123	.6812	-.31334
1.5	407.126	398.811	28.145	.7165	-.25795
2.0	416.549	412.306	32.935	.7556	-.20133
2.5	421.756	420.032	35.886	.7990	-.14398
3.0	424.266	423.805	37.403	.8470	-.08766
3.5	425.085	425.044	37.914	.9002	-.03562
4.0	425.159	425.158	37.960	.9592	.00776
4.5	424.904	424.767	37.800	1.0245	.03814
5.0	423.737	422.896	37.077	1.0969	.05292
5.5	421.096	418.530	35.498	1.1771	.05284
6.0	416.555	410.837	32.938	1.2660	.04232
6.5	409.803	399.192	29.441	1.3645	.02779
7.0	400.627	383.201	25.194	1.4736	.01491
7.5	388.886	362.724	20.487	1.5945	.00643
8.0	374.499	337.886	15.667	1.7284	.00219
8.5	357.430	309.094	11.102	1.8768	.00057
9.0	337.699	277.035	7.137	2.0413	.00011
9.5	315.399	242.668	4.037	2.2235	.00002
10.0	290.716	207.168	1.921	2.4254	.00000
10.5	263.947	171.846	.719	2.6491	.00000
11.0	235.482	138.017	.190	2.8969	.00000
11.5	205.764	106.854	.030	3.1716	.00000
12.0	175.223	79.263	.002	3.4759	.00000
12.5	144.214	55.804	.000	3.8130	.00000

BOILING POINT, N-BUTANE

TB = 272.63768
DG = .0466166
DL = 10.34148

TABLE 7. Calculated $P(\rho)$ critical isotherm

The following page gives a high-resolution examination of the critical isotherm of propane as computed by equation of state (6). Column headings have the following interpretations--

D/DC $\equiv$ d/d_c, density reduced at the critical point.
TS/TC $\equiv$ $T_\sigma(\rho)/T_c$, reduced coexistence temperature.
PS/PC $\equiv$ $P_\sigma(\rho)/P_c$, reduced coexistence pressure.
P/PC $\equiv$ P/P_c, pressure reduced at the critical point.
DP/DR $\equiv$ $\partial P/\partial\rho$ slope of the critical isotherm, bar*.

The last five columns give the density-dependence of functions used in the calculation of above derivatives from the equation of state, where $R \equiv \rho \equiv d/d_t$ is density reduced at the liquid triple point--

DTS/DR $\equiv$ $dT_\sigma(\rho)/d\rho$, K.
DTH/DR $\equiv$ $d\,\Theta(\rho)/d\rho$, K.
DPS/DR $\equiv$ $dP_\sigma(\rho)/d\rho$, bar.
DXB/DR $\equiv$ $\partial\,\Phi(\rho,T)/\partial\rho$.
DXC/DR $\equiv$ $\partial\,\Psi(\rho,T)/\partial\rho$.

*Note: $\rho \equiv d/d_t$, density reduced at the liquid triple-point.

Table 7. Calculated P(ρ) critical isotherm.

THE CRITICAL ISOTHERM

TC = 425.16, DC = 3.90, PC = 37.9611994. AT THE C.P., DPS/DT = .63131, DP/DT = .63131

D/DC	TS/TC	PS/PC	P/PC	DP/DR	DTS/DR	DTH/DR	DPS/DR	DXB/DR	DXC/DR
.75	.9973183423	.9812918577	.9952973060	9.448726475	44.91508	67.65547	27.64868	-.10593	.38705
.76	.9976311318	.9834511470	.9960195714	8.352065952	41.37785	62.35195	25.53763	-.09755	.36044
.77	.9979187719	.9854418255	.9966562077	7.339614251	37.97865	57.25532	23.49676	-.08951	.33455
.78	.9981822640	.9872696678	.9972139540	6.408893819	34.71775	52.36636	21.52795	-.08181	.30940
.79	.9984226133	.9889406085	.9976993439	5.557322160	31.59581	47.68624	19.63325	-.07443	.28499
.80	.9986408309	.9904607540	.9981186967	4.782199797	28.61388	43.21643	17.81484	-.06739	.26135
.81	.9988379370	.9918363918	.9984781072	4.080698558	25.77333	38.95871	16.07500	-.06069	.23849
.82	.9990149625	.9930739978	.9987834350	3.449850743	23.07579	34.91506	14.41607	-.05433	.21646
.83	.9991729508	.9941802396	.9990402927	2.886539861	20.52307	31.08764	12.84042	-.04831	.19526
.84	.9993129592	.9951619769	.9992540335	2.387493663	18.11709	27.47865	11.35040	-.04264	.17495
.85	.9994360587	.9960262558	.9994297385	1.949280309	15.85977	24.09029	9.94825	-.03732	.15556
.86	.9995433340	.9967802997	.9995722034	1.568308495	13.75294	20.92459	8.63608	-.03236	.13713
.87	.9996358823	.9974314930	.9996859259	1.240832325	11.79821	17.98339	7.41574	-.02776	.11970
.88	.9997148116	.9979873602	.9997750937	.962961633	9.99685	15.26813	6.28880	-.02352	.10331
.89	.9997812373	.9984555385	.9998435731	.730678255	8.34971	12.77979	5.25647	-.01964	.08799
.90	.9998362790	.9988437451	.9998948996	.539858499	6.85705	10.51879	4.31950	-.01613	.07380
.91	.9998810562	.9991597392	.9999322706	.386301742	5.51852	8.48487	3.47815	-.01298	.06076
.92	.9999166828	.9994112799	.9999585402	.265764696	4.33301	6.67701	2.73216	-.01019	.04890
.93	.9999442623	.9996060814	.9999762174	.174000522	3.29865	5.09340	2.08070	-.00776	.03826
.94	.9999648814	.9997517668	.9999874679	.106801548	2.41277	3.73143	1.52234	-.00568	.02885
.95	.9999796050	.9998558225	.9999941184	.060044105	1.67196	2.58773	1.05515	-.00393	.02070
.96	.9999895539	.9999261480	.9999976849	.029549322	1.06643	1.65254	.67312	-.00251	.01376
.97	.9999955292	.9999683902	.9999992970	.011954699	.60470	.93439	.38171	-.00142	.00821
.98	.9999986376	.9999903669	.9999998689	.003346604	.27465	.42118	.17338	-.00065	.00399
.99	.9999998621	.9999990248	.9999999945	.000305257	.06077	.09740	.03837	-.00014	.00099
1.00	1.0000000000	1.0000000000	1.0000000000	-.000000000	.00000	.00000	.00000	-.00000	0.00000
1.01	.9999998310	.9999988052	1.0000000069	.000385442	-.07590	-.11254	-.04792	.00018	-.00123
1.02	.9999982732	.9999877911	1.0000001704	.004332361	-.34381	-.49034	-.21704	.00081	-.00496
1.03	.9999943315	.9999599229	1.0000009241	.015504159	-.74438	-1.07407	-.46988	.00175	-.01003
1.04	.9999871072	.9999088521	1.0000029941	.037657458	-1.26957	-1.85567	-.80130	.00299	-.01627
1.05	.9999756157	.9998276267	1.0000074525	.075029022	-1.92053	-2.83629	-1.21194	.00452	-.02353
1.06	.9999589613	.9997099335	1.0000157102	.131963275	-2.69287	-4.01152	-1.69893	.00633	-.03200
1.07	.9999362772	.9995496732	1.0000295402	.213034597	-3.58302	-5.37775	-2.25983	.00843	-.04131
1.08	.9999067206	.9993409310	1.0000510968	.323065011	-4.58788	-6.93184	-2.89251	.01079	-.05149
1.09	.9998694699	.9990779579	1.0000829366	.467140938	-5.70473	-8.67103	-3.59501	.01342	-.06247
1.10	.9998237220	.9987551591	1.0001280405	.650628875	-6.93107	-10.59276	-4.36548	.01631	-.07423
1.11	.9997686913	.9983670862	1.0001898373	.879189890	-8.26461	-12.69465	-5.20217	.01944	-.08670
1.12	.9997036085	.9979084322	1.0002722279	1.158792875	-9.70320	-14.97446	-6.10333	.02283	-.09985
1.13	.9996277191	.9973740292	1.0003796106	1.495726504	-11.24479	-17.43003	-7.06728	.02646	-.11365
1.14	.9995402835	.9967588465	1.0005169083	1.896609818	-12.88743	-20.05927	-8.09233	.03033	-.12806
1.15	.9994405758	.9960579906	1.0006895947	2.368401398	-14.62922	-22.86014	-9.17679	.03443	-.14305
1.16	.9993278837	.9952667057	1.0009037230	2.918407050	-16.46833	-25.83063	-10.31895	.03876	-.15861
1.17	.9992015080	.9943803747	1.0011659540	3.554285964	-18.40296	-28.96876	-11.51710	.04332	-.17469
1.18	.9990607623	.9933945210	1.0014835849	4.284055285	-20.43137	-32.27256	-12.76950	.04810	-.19128
1.19	.9989049729	.9923048101	1.0018645788	5.116093061	-22.55184	-35.74006	-14.07438	.05310	-.20836
1.20	.9987334785	.9911070521	1.0023175941	6.059139533	-24.76265	-39.36928	-15.42996	.05832	-.22589
1.21	.9985456300	.9897972035	1.0028520133	7.122296748	-27.06214	-43.15827	-16.83441	.06374	-.24388
1.22	.9983407904	.9883713701	1.0034779730	8.315026469	-29.44865	-47.10503	-18.28589	.06938	-.26229
1.23	.9981183346	.9868258091	1.0042063929	9.647146405	-31.92052	-51.20757	-19.78250	.07522	-.28110
1.24	.9978776495	.9851569316	1.0050490039	11.128824740	-34.47614	-55.46387	-21.32235	.08126	-.30031
1.25	.9976181338	.9833613049	1.0060183771	12.770573025	-37.11388	-59.87191	-22.90349	.08750	-.31989

TABLE 8. Summary of P-ρ-T data

ID	Authors	Range of the Data			Relative Deviations in Percent		
		d, mol/L	T, K	P, bar	NP	rms Δd/d	mean ΔP/P
1	Virial eq. (5a)	0.1	300 - 700	2 - 6	41	0.14	0.10
3	Beattie, [3]	0.5 - 8.5	423 - 573	15 - 335	115	0.91	0.88
19	Kay, [20]	0.1 - 8.8	310 - 589	2 - 83	437	0.63	0.55
25	Olds, [24]	0.03 - 10.9	311 - 511	1 - 689	209	0.29	1.14
					802	0.54	0.79

Table 9. Comparisons with P-ρ-T data.

N-BUTANE PVT DATA VS. EQUATION OF STATE.
(1)VIRIAL, (3)BEATTIE, (19)KAY, (25)OLDS, (29)SAGE/M/L.

ID	PN	WT	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,PCT
1	1	1.00	300.000	.1000	.0995	.51	2.310	2.321	-.48
1	2	1.00	310.000	.1000	.0996	.40	2.402	2.411	-.38
1	3	1.00	320.000	.1000	.0997	.32	2.493	2.500	-.30
1	4	1.00	330.000	.1000	.0997	.25	2.583	2.589	-.24
1	5	1.00	340.000	.1000	.0998	.20	2.673	2.677	-.19
1	6	1.00	350.000	.1000	.0998	.15	2.762	2.766	-.15
1	7	1.00	360.000	.1000	.0999	.12	2.851	2.854	-.11
1	8	1.00	370.000	.1000	.0999	.09	2.939	2.942	-.09
1	9	1.00	380.000	.1000	.0999	.07	3.027	3.029	-.07
1	10	1.00	390.000	.1000	.0999	.06	3.115	3.116	-.05
1	11	1.00	400.000	.1000	.1000	.05	3.202	3.204	-.04
1	12	1.00	410.000	.1000	.1000	.04	3.289	3.291	-.04
1	13	1.00	420.000	.1000	.1000	.03	3.376	3.377	-.03
1	14	1.00	430.000	.1000	.1000	.03	3.463	3.464	-.03
1	15	1.00	440.000	.1000	.1000	.03	3.550	3.551	-.03
1	16	1.00	450.000	.1000	.1000	.03	3.636	3.637	-.02
1	17	1.00	460.000	.1000	.1000	.03	3.722	3.723	-.03
1	18	1.00	470.000	.1000	.1000	.03	3.808	3.809	-.03
1	19	1.00	480.000	.1000	.1000	.03	3.894	3.895	-.03
1	20	1.00	490.000	.1000	.1000	.03	3.980	3.981	-.03
1	21	1.00	500.000	.1000	.1000	.04	4.066	4.067	-.04
1	22	1.00	510.000	.1000	.1000	.04	4.152	4.153	-.04
1	23	1.00	520.000	.1000	.1000	.04	4.237	4.239	-.04
1	24	1.00	530.000	.1000	.1000	.05	4.322	4.325	-.05
1	25	1.00	540.000	.1000	.0999	.05	4.408	4.410	-.05
1	26	1.00	550.000	.1000	.0999	.06	4.493	4.496	-.06
1	27	1.00	560.000	.1000	.0999	.06	4.578	4.581	-.06
1	28	1.00	570.000	.1000	.0999	.07	4.663	4.666	-.06
1	29	1.00	580.000	.1000	.0999	.07	4.748	4.752	-.07
1	30	1.00	590.000	.1000	.0999	.08	4.834	4.837	-.07
1	31	1.00	600.000	.1000	.0999	.08	4.918	4.922	-.08
1	32	1.00	610.000	.1000	.0999	.08	5.003	5.008	-.08
1	33	1.00	620.000	.1000	.0999	.09	5.088	5.093	-.09
1	34	1.00	630.000	.1000	.0999	.09	5.173	5.178	-.09
1	35	1.00	640.000	.1000	.0999	.10	5.258	5.263	-.10
1	36	1.00	650.000	.1000	.0999	.10	5.343	5.348	-.10
1	37	1.00	660.000	.1000	.0999	.11	5.427	5.433	-.11
1	38	1.00	670.000	.1000	.0999	.11	5.512	5.518	-.11
1	39	1.00	680.000	.1000	.0999	.12	5.597	5.603	-.12
1	40	1.00	690.000	.1000	.0999	.12	5.681	5.688	-.12
1	41	1.00	700.000	.1000	.0999	.13	5.766	5.773	-.12

NP = 41, DNRMSPCT = .143, PMEANDIF = .004, PMEANPCT = .098

Table 9. Continued

N-BUTANE PVT DATA VS. EQUATION OF STATE.
(1)VIRIAL, (3)BEATTIE, (19)KAY, (25)OLDS, (29)SAGE/W/L.

ID	PN	WT	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,PCT
3	42	.50	423.150	.5000	.4997	.06	14.875	14.881	-.05
3	43	.50	448.150	.5000	.4999	.03	16.121	16.124	-.02
3	44	.50	473.150	.5000	.4996	.08	17.337	17.348	-.07
3	45	.50	498.150	.5000	.4996	.09	18.542	18.557	-.08
3	46	.50	523.150	.5000	.4996	.08	19.738	19.752	-.07
3	47	.50	548.150	.5000	.4996	.07	20.924	20.937	-.07
3	48	.50	573.150	.5000	.4996	.07	22.099	22.113	-.07
3	49	.50	423.150	1.0000	1.0000	.00	25.007	25.007	-.00
3	50	.50	448.150	1.0000	.9998	.02	27.864	27.869	-.02
3	51	.50	473.150	1.0000	.9993	.07	30.641	30.657	-.05
3	52	.50	498.150	1.0000	.9988	.12	33.356	33.387	-.09
3	53	.50	523.150	1.0000	.9983	.17	36.021	36.071	-.14
3	54	.50	548.150	1.0000	.9991	.09	38.686	38.715	-.07
3	55	.50	573.150	1.0000	.9993	.07	41.300	41.327	-.07
3	56	.50	423.150	1.5000	1.5004	-.03	31.350	31.346	.01
3	57	.50	448.150	1.5000	1.5004	-.03	36.153	36.147	.02
3	58	.50	473.150	1.5000	1.4979	.14	40.753	40.790	-.09
3	59	.50	498.150	1.5000	1.4975	.17	45.262	45.315	-.12
3	60	.50	523.150	1.5000	1.4965	.23	49.659	49.747	-.18
3	61	.50	548.150	1.5000	1.4977	.15	54.037	54.103	-.12
3	62	.50	573.150	1.5000	1.4984	.11	58.343	58.396	-.09
3	63	.50	423.150	2.0000	1.9991	.04	34.846	34.850	-.01
3	64	.50	448.150	2.0000	2.0032	-.16	41.857	41.828	.07
3	65	.50	473.150	2.0000	1.9975	.12	48.514	48.548	-.07
3	66	.50	498.150	2.0000	1.9954	.23	55.009	55.091	-.15
3	67	.50	523.150	2.0000	1.9967	.17	61.423	61.497	-.12
3	68	.50	548.150	2.0000	1.9967	.17	67.705	67.793	-.13
3	69	.50	573.150	2.0000	1.9980	.10	73.937	73.998	-.08
3	70	.50	423.150	2.5000	2.4892	.43	36.406	36.425	-.05
3	71	.50	448.150	2.5000	2.5059	-.24	45.748	45.710	.08
3	72	.50	473.150	2.5000	2.4982	.07	54.634	54.654	-.04
3	73	.50	498.150	2.5000	2.4962	.15	63.328	63.387	-.09
3	74	.50	523.150	2.5000	2.4955	.18	71.870	71.959	-.12
3	75	.50	548.150	2.5000	2.4995	.02	80.391	80.404	-.02
3	76	.50	573.150	2.5000	2.5017	-.07	88.791	88.743	.05
3	77	.50	448.150	3.0000	3.0101	-.34	48.525	48.476	.10
3	78	.50	473.150	3.0000	3.0038	-.13	59.772	59.735	.06
3	79	.50	498.150	3.0000	3.0039	-.13	70.857	70.800	.08
3	80	.50	523.150	3.0000	3.0047	-.16	81.810	81.720	.11
3	81	.50	548.150	3.0000	3.0112	-.37	92.793	92.522	.29
3	82	.50	573.150	3.0000	3.0140	-.47	103.635	103.226	.39
3	83	.50	448.150	3.5000	3.5071	-.20	50.744	50.713	.06
3	84	.50	473.150	3.5000	3.5106	-.30	64.493	64.395	.15
3	85	.50	498.150	3.5000	3.5185	-.53	78.233	77.964	.34
3	86	.50	523.150	3.5000	3.5213	-.61	91.871	91.445	.46
3	87	.50	548.150	3.5000	3.5305	-.87	105.631	104.852	.74
3	88	.50	573.150	3.5000	3.5341	-.97	119.260	118.196	.89
3	89	.50	448.150	4.0000	3.9834	.42	52.861	52.940	-.15
3	90	.50	448.150	4.0000	3.9899	.25	52.892	52.940	-.09
3	91	.50	473.150	4.0000	4.0234	-.58	69.519	69.275	.35
3	92	.50	473.150	4.0000	4.0117	-.29	69.397	69.275	.18
3	93	.50	498.150	4.0000	4.0424	-1.06	86.329	85.630	.81
3	94	.50	498.150	4.0000	4.0295	-.74	86.116	85.630	.56
3	95	.50	523.150	4.0000	4.0526	-1.32	103.189	101.991	1.16
3	96	.50	523.150	4.0000	4.0385	-.96	102.865	101.991	.85

Table 9. Continued

N-BUTANE PVT DATA VS. EQUATION OF STATE.
(1)VIRIAL, (3)BEATTIE, (19)KAY, (25)OLDS, (29)SAGE/W/L.

ID	PN	WT	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,PCT
3	97	.50	548.150	4.0000	4.0612	-1.53	120.141	118.352	1.49
3	98	.50	548.150	4.0000	4.0495	-1.24	119.797	118.352	1.21
3	99	.50	573.150	4.0000	4.0658	-1.65	137.062	134.706	1.72
3	100	.50	573.150	4.0000	4.0546	-1.37	136.657	134.706	1.43
3	101	.50	448.150	4.5000	4.4595	.90	55.354	55.599	-.44
3	102	.50	473.150	4.5000	4.5062	-.14	75.143	75.062	.11
3	103	.50	498.150	4.5000	4.5327	-.73	95.367	94.695	.70
3	104	.50	523.150	4.5000	4.5465	-1.03	115.754	114.444	1.13
3	105	.50	548.150	4.5000	4.5587	-1.30	136.383	134.276	1.55
3	106	.50	573.150	4.5000	4.5632	-1.40	156.932	154.164	1.76
3	107	.50	425.160	5.0000	4.9378	1.24	38.260	38.346	-.22
3	108	.50	448.150	5.0000	4.9623	.75	59.072	59.428	-.60
3	109	.50	448.150	5.0000	4.9446	1.11	58.910	59.428	-.88
3	110	.50	473.150	5.0000	5.0107	-.21	83.046	82.846	.24
3	111	.50	473.150	5.0000	4.9900	.20	82.661	82.846	-.22
3	112	.50	498.150	5.0000	5.0384	-.77	107.638	106.556	1.00
3	113	.50	498.150	5.0000	5.0209	-.42	107.141	106.556	.55
3	114	.50	523.150	5.0000	5.0546	-1.09	132.533	130.471	1.56
3	115	.50	523.150	5.0000	5.0379	-.76	131.895	130.471	1.08
3	116	.50	548.150	5.0000	5.0658	-1.32	157.652	154.533	1.98
3	117	.50	548.150	5.0000	5.0487	-.97	156.831	154.533	1.47
3	118	.50	573.150	5.0000	5.0743	-1.49	182.952	178.704	2.32
3	119	.50	573.150	5.0000	5.0548	-1.10	181.818	178.704	1.71
3	120	.50	425.160	5.5000	5.4433	1.03	39.669	39.966	-.75
3	121	.50	448.150	5.5000	5.4547	.82	65.041	65.769	-1.12
3	122	.50	473.150	5.5000	5.4912	.16	94.101	94.349	-.26
3	123	.50	498.150	5.5000	5.5158	-.29	123.900	123.265	.51
3	124	.50	523.150	5.5000	5.5323	-.59	154.105	152.417	1.10
3	125	.50	548.150	5.5000	5.5438	-.80	184.553	181.741	1.52
3	126	.50	573.150	5.5000	5.5523	-.95	215.174	211.188	1.85
3	127	.50	425.160	6.0000	5.9440	.93	43.975	44.754	-1.77
3	128	.50	448.150	6.0000	5.9478	.87	75.305	76.750	-1.92
3	129	.50	473.150	6.0000	5.9699	.50	110.677	111.967	-1.17
3	130	.50	498.150	6.0000	5.9908	.15	146.942	147.472	-.36
3	131	.50	523.150	6.0000	6.0046	-.08	183.510	183.179	.18
3	132	.50	548.150	6.0000	6.0155	-.26	220.382	219.026	.62
3	133	.50	573.150	6.0000	6.0231	-.38	257.325	254.969	.92
3	134	.50	425.160	6.5000	6.4424	.89	54.047	55.756	-3.16
3	135	.50	448.150	6.5000	6.4446	.85	92.885	95.461	-2.77
3	136	.50	473.150	6.5000	6.4578	.65	136.171	138.902	-2.01
3	137	.50	498.150	6.5000	6.4720	.43	180.207	182.524	-1.29
3	138	.50	523.150	6.5000	6.4831	.26	224.556	226.262	-.76
3	139	.50	548.150	6.5000	6.4914	.13	269.048	270.068	-.38
3	140	.50	573.150	6.5000	6.4982	.03	313.662	313.906	-.08
3	141	.50	425.160	7.0000	6.9461	.77	74.241	77.212	-4.00
3	142	.50	448.150	7.0000	6.9473	.75	122.188	126.140	-3.23
3	143	.50	473.150	7.0000	6.9555	.64	175.161	179.457	-2.45
3	144	.50	498.150	7.0000	6.9645	.51	228.640	232.830	-1.83
3	145	.50	523.150	7.0000	6.9712	.41	282.200	286.216	-1.42
3	146	.50	548.150	7.0000	6.9751	.36	335.588	339.581	-1.19
3	147	.50	425.160	7.5000	7.4534	.62	110.404	114.770	-3.95
3	148	.50	448.150	7.5000	7.4568	.58	169.507	174.581	-2.99
3	149	.50	473.150	7.5000	7.4591	.55	233.767	239.609	-2.50
3	150	.50	498.150	7.5000	7.4659	.45	298.848	304.584	-1.92
3	151	.50	523.150	7.5000	7.4680	.43	363.281	369.473	-1.70
3	152	.50	425.160	8.0000	7.9615	.48	170.337	176.128	-3.40

Table 9. Continued

N-BUTANE PVT DATA VS. EQUATION OF STATE.
(1)VIRIAL, (3)BEATTIE, (19)KAY, (25)OLDS, (29)SAGE/W/L.

ID	PN	WT	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,PCT
3	153	.50	448.150	8.0000	7.9653	.43	242.663	248.873	-2.56
3	154	.50	473.150	8.0000	7.9618	.48	319.893	327.867	-2.49
3	155	.50	425.160	8.5000	8.4658	.40	264.134	272.070	-3.00
3	156	.50	448.150	8.5000	8.4670	.39	351.618	360.420	-2.50

NP = 115, DNRMSPCT = .912, PMEANDIF = 1.397, PMEANPCT = .882

Table 9. Continued

N-BUTANE PVT DATA VS. EQUATION OF STATE.
(1)VIRIAL, (3)BEATTIE, (19)KAY, (25)OLDS, (29)SAGE/W/L.

ID	PN	WT	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,PCT
19	157	.50	310.928	.0787	.0784	.44	1.924	1.932	-.42
19	158	.50	338.706	.0787	.0785	.33	2.117	2.123	-.32
19	159	.50	366.483	.0787	.0786	.18	2.310	2.314	-.17
19	160	.50	394.261	.0787	.0785	.29	2.496	2.503	-.29
19	161	.50	422.039	.0787	.0787	.09	2.689	2.691	-.09
19	162	.50	449.817	.0787	.0786	.14	2.875	2.879	-.14
19	163	.50	477.594	.0787	.0784	.39	3.054	3.066	-.39
19	164	.50	505.372	.0787	.0784	.39	3.241	3.253	-.38
19	165	.50	533.150	.0787	.0785	.37	3.427	3.439	-.36
19	166	.50	560.928	.0787	.0783	.53	3.606	3.625	-.53
19	167	.50	588.706	.0787	.0784	.49	3.792	3.811	-.49
19	168	.50	310.928	.0848	.0843	.54	2.062	2.072	-.51
19	169	.50	338.706	.0848	.0846	.19	2.275	2.279	-.18
19	170	.50	366.483	.0848	.0844	.41	2.475	2.485	-.40
19	171	.50	394.261	.0848	.0848	.02	2.689	2.689	-.02
19	172	.50	422.039	.0848	.0849	-.10	2.896	2.893	.10
19	173	.50	449.817	.0848	.0846	.22	3.089	3.096	-.22
19	174	.50	477.594	.0848	.0846	.27	3.289	3.297	-.26
19	175	.50	505.372	.0848	.0845	.29	3.489	3.499	-.29
19	176	.50	533.150	.0848	.0844	.49	3.682	3.700	-.49
19	177	.50	560.928	.0848	.0844	.48	3.882	3.900	-.48
19	178	.50	588.706	.0848	.0843	.64	4.075	4.101	-.63
19	179	.50	310.928	.0919	.0915	.35	2.227	2.234	-.33
19	180	.50	338.706	.0919	.0917	.23	2.455	2.460	-.22
19	181	.50	366.483	.0919	.0916	.33	2.675	2.684	-.32
19	182	.50	394.261	.0919	.0915	.36	2.896	2.906	-.35
19	183	.50	422.039	.0919	.0918	.12	3.123	3.127	-.12
19	184	.50	449.817	.0919	.0916	.31	3.337	3.347	-.30
19	185	.50	477.594	.0919	.0915	.45	3.551	3.566	-.44
19	186	.50	505.372	.0919	.0915	.37	3.771	3.785	-.36
19	187	.50	533.150	.0919	.0914	.46	3.985	4.003	-.45
19	188	.50	560.928	.0919	.0914	.53	4.199	4.221	-.52
19	189	.50	588.706	.0919	.0913	.58	4.413	4.438	-.58
19	190	.50	310.928	.1002	.0997	.48	2.413	2.424	-.45
19	191	.50	338.706	.1002	.1001	.13	2.668	2.671	-.12
19	192	.50	366.483	.1002	.1000	.25	2.910	2.917	-.24
19	193	.50	394.261	.1002	.0999	.30	3.151	3.160	-.29
19	194	.50	422.039	.1002	.1001	.09	3.399	3.402	-.09
19	195	.50	449.817	.1002	.0999	.27	3.634	3.643	-.26
19	196	.50	477.594	.1002	.0998	.39	3.868	3.883	-.39
19	197	.50	505.372	.1002	.0999	.32	4.109	4.122	-.31
19	198	.50	533.150	.1002	.0998	.40	4.344	4.361	-.39
19	199	.50	560.928	.1002	.0996	.61	4.571	4.599	-.60
19	200	.50	588.706	.1002	.0997	.50	4.813	4.836	-.49
19	201	.50	310.928	.1102	.1099	.32	2.641	2.648	-.29
19	202	.50	338.706	.1102	.1100	.22	2.916	2.923	-.21
19	203	.50	366.483	.1102	.1097	.50	3.178	3.194	-.48
19	204	.50	394.261	.1102	.1100	.26	3.454	3.463	-.25
19	205	.50	422.039	.1102	.1100	.20	3.723	3.730	-.19
19	206	.50	449.817	.1102	.1099	.28	3.985	3.996	-.28
19	207	.50	477.594	.1102	.1101	.17	4.254	4.261	-.16
19	208	.50	505.372	.1102	.1098	.36	4.509	4.525	-.35
19	209	.50	533.150	.1102	.1097	.51	4.764	4.788	-.50
19	210	.50	560.928	.1102	.1097	.49	5.026	5.051	-.49
19	211	.50	588.706	.1102	.1096	.60	5.281	5.313	-.59

Table 9. Continued

N-BUTANE PVT DATA VS. EQUATION OF STATE.
(1)VIRIAL, (3)BEATTIE, (19)KAY, (25)OLDS, (29)SAGE/W/L.

ID	PN	WT	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,PCT
19	212	.50	310.928	.1225	.1221	.33	2.910	2.918	-.30
19	213	.50	338.706	.1225	.1223	.19	3.220	3.225	-.17
19	214	.50	366.483	.1225	.1220	.38	3.516	3.529	-.36
19	215	.50	394.261	.1225	.1222	.27	3.820	3.830	-.26
19	216	.50	422.039	.1225	.1223	.13	4.123	4.128	-.13
19	217	.50	449.817	.1225	.1221	.29	4.413	4.425	-.28
19	218	.50	477.594	.1225	.1220	.40	4.702	4.721	-.39
19	219	.50	505.372	.1225	.1221	.33	4.999	5.015	-.33
19	220	.50	533.150	.1225	.1220	.39	5.288	5.309	-.38
19	221	.50	560.928	.1225	.1220	.42	5.578	5.601	-.42
19	222	.50	588.706	.1225	.1218	.56	5.861	5.893	-.56
19	223	.50	310.928	.1378	.1371	.52	3.234	3.249	-.47
19	224	.50	338.706	.1378	.1373	.38	3.585	3.598	-.35
19	225	.50	366.483	.1378	.1373	.33	3.930	3.942	-.31
19	226	.50	394.261	.1378	.1375	.20	4.275	4.283	-.19
19	227	.50	422.039	.1378	.1375	.19	4.613	4.621	-.18
19	228	.50	449.817	.1378	.1374	.28	4.944	4.957	-.27
19	229	.50	477.594	.1378	.1372	.46	5.268	5.291	-.45
19	230	.50	505.372	.1378	.1373	.34	5.605	5.624	-.33
19	231	.50	533.150	.1378	.1372	.45	5.929	5.956	-.44
19	232	.50	560.928	.1378	.1372	.42	6.260	6.286	-.41
19	233	.50	588.706	.1378	.1371	.43	6.584	6.616	-.48
19	234	.50	338.706	.1575	.1572	.15	4.061	4.066	-.13
19	235	.50	366.483	.1575	.1571	.25	4.454	4.464	-.23
19	236	.50	394.261	.1575	.1569	.38	4.840	4.857	-.36
19	237	.50	422.039	.1575	.1570	.28	5.233	5.247	-.27
19	238	.50	449.817	.1575	.1569	.40	5.612	5.634	-.38
19	239	.50	477.594	.1575	.1571	.22	6.005	6.018	-.22
19	240	.50	505.372	.1575	.1571	.26	6.385	6.401	-.26
19	241	.50	533.150	.1575	.1569	.38	6.757	6.782	-.37
19	242	.50	560.928	.1575	.1569	.37	7.136	7.162	-.36
19	243	.50	588.706	.1575	.1568	.44	7.508	7.541	-.43
19	244	.50	338.706	.1837	.1835	.14	4.668	4.674	-.13
19	245	.50	366.483	.1837	.1837	.02	5.143	5.144	-.02
19	246	.50	394.261	.1837	.1831	.33	5.592	5.609	-.31
19	247	.50	422.039	.1837	.1833	.26	6.054	6.068	-.24
19	248	.50	449.817	.1837	.1831	.36	6.502	6.524	-.34
19	249	.50	477.594	.1837	.1834	.19	6.964	6.976	-.18
19	250	.50	505.372	.1837	.1832	.30	7.405	7.426	-.29
19	251	.50	533.150	.1837	.1834	.19	7.860	7.874	-.18
19	252	.50	560.928	.1837	.1831	.32	8.294	8.320	-.31
19	253	.50	588.706	.1837	.1829	.43	8.729	8.765	-.42
19	254	.50	338.706	.1968	.1963	.28	4.957	4.970	-.25
19	255	.50	366.483	.1968	.1965	.20	5.468	5.478	-.18
19	256	.50	394.261	.1968	.1963	.26	5.964	5.978	-.24
19	257	.50	422.039	.1968	.1964	.21	6.460	6.473	-.20
19	258	.50	449.817	.1968	.1962	.32	6.943	6.964	-.30
19	259	.50	477.594	.1968	.1963	.26	7.433	7.451	-.24
19	260	.50	505.372	.1968	.1965	.17	7.922	7.935	-.16
19	261	.50	533.150	.1968	.1961	.40	8.384	8.416	-.39
19	262	.50	560.928	.1968	.1963	.26	8.874	8.896	-.25
19	263	.50	588.706	.1968	.1962	.35	9.342	9.374	-.34
19	264	.50	338.706	.2120	.2119	.06	5.302	5.305	-.06
19	265	.50	366.483	.2120	.2116	.18	5.847	5.856	-.17
19	266	.50	394.261	.2120	.2115	.25	6.385	6.399	-.23
19	267	.50	422.039	.2120	.2116	.21	6.922	6.936	-.19

Table 9. Continued

N-BUTANE PVT DATA VS. EQUATION OF STATE.
(1)VIRIAL, (3)BEATTIE, (19)KAY, (25)OLDS, (29)SAGE/W/L.

ID	PN	WT	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,PCT
19	268	.50	449.817	.2120	.2114	.29	7.446	7.467	-.28
19	269	.50	477.594	.2120	.2119	.04	7.991	7.994	-.04
19	270	.50	505.372	.2120	.2119	.03	8.515	8.518	-.03
19	271	.50	533.150	.2120	.2118	.07	9.032	9.038	-.07
19	272	.50	560.928	.2120	.2118	.08	9.549	9.557	-.08
19	273	.50	588.706	.2120	.2114	.29	10.046	10.074	-.28
19	274	.50	338.706	.2297	.2290	.28	5.674	5.688	-.24
19	275	.50	366.483	.2297	.2293	.17	6.281	6.291	-.16
19	276	.50	394.261	.2297	.2293	.16	6.874	6.884	-.14
19	277	.50	422.039	.2297	.2289	.33	7.446	7.469	-.31
19	278	.50	449.817	.2297	.2292	.21	8.032	8.048	-.20
19	279	.50	477.594	.2297	.2295	.05	8.618	8.622	-.05
19	280	.50	505.372	.2297	.2300	-.13	9.205	9.193	.13
19	281	.50	533.150	.2297	.2299	-.11	9.770	9.760	.10
19	282	.50	560.928	.2297	.2294	.10	10.315	10.324	-.09
19	283	.50	588.706	.2297	.2292	.19	10.866	10.886	-.18
19	284	.50	338.706	.2505	.2509	-.14	6.136	6.129	.12
19	285	.50	366.483	.2505	.2504	.04	6.791	6.794	-.04
19	286	.50	394.261	.2505	.2503	.11	7.439	7.447	-.10
19	287	.50	422.039	.2505	.2502	.14	8.081	8.091	-.12
19	288	.50	449.817	.2505	.2502	.15	8.715	8.727	-.14
19	289	.50	477.594	.2505	.2507	-.06	9.363	9.358	.05
19	290	.50	505.372	.2505	.2511	-.22	10.004	9.984	.20
19	291	.50	533.150	.2505	.2510	-.19	10.625	10.606	.18
19	292	.50	560.928	.2505	.2505	.00	11.225	11.225	-.00
19	293	.50	588.706	.2505	.2502	.15	11.825	11.841	-.14
19	294	.50	338.706	.2756	.2755	.04	6.640	6.642	-.03
19	295	.50	366.483	.2756	.2756	-.02	7.384	7.383	.02
19	296	.50	394.261	.2756	.2750	.21	8.094	8.109	-.18
19	297	.50	422.039	.2756	.2756	-.01	8.825	8.824	.01
19	298	.50	449.817	.2756	.2757	-.05	9.535	9.531	.05
19	299	.50	477.594	.2756	.2766	-.38	10.266	10.230	.35
19	300	.50	505.372	.2756	.2766	-.38	10.963	10.924	.35
19	301	.50	533.150	.2756	.2762	-.23	11.638	11.613	.22
19	302	.50	560.928	.2756	.2758	-.08	12.307	12.298	.08
19	303	.50	588.706	.2756	.2752	.14	12.962	12.980	-.14
19	304	.50	338.706	.3062	.3074	-.39	7.267	7.244	.31
19	305	.50	366.483	.3062	.3065	-.09	8.088	8.081	.08
19	306	.50	394.261	.3062	.3057	.15	8.887	8.899	-.13
19	307	.50	422.039	.3062	.3064	-.05	9.708	9.703	.05
19	308	.50	449.817	.3062	.3066	-.11	10.508	10.497	.10
19	309	.50	477.594	.3062	.3072	-.32	11.314	11.281	.29
19	310	.50	505.372	.3062	.3072	-.31	12.093	12.059	.29
19	311	.50	533.150	.3062	.3069	-.23	12.859	12.830	.22
19	312	.50	560.928	.3062	.3065	-.10	13.610	13.598	.09
19	313	.50	588.706	.3062	.3058	.14	14.341	14.361	-.14
19	314	.50	366.483	.3445	.3455	-.29	8.942	8.921	.24
19	315	.50	394.261	.3445	.3446	-.03	9.860	9.857	.03
19	316	.50	422.039	.3445	.3451	-.16	10.790	10.775	.14
19	317	.50	449.817	.3445	.3459	-.40	11.721	11.679	.36
19	318	.50	477.594	.3445	.3458	-.39	12.617	12.572	.36
19	319	.50	505.372	.3445	.3459	-.41	13.507	13.456	.37
19	320	.50	533.150	.3445	.3457	-.37	14.382	14.333	.34
19	321	.50	560.928	.3445	.3453	-.23	15.237	15.204	.22
19	322	.50	588.706	.3445	.3444	.04	16.065	16.071	-.04
19	323	.50	366.483	.3937	.3951	-.37	9.977	9.947	.29

Table 9. Continued

N-BUTANE PVT DATA VS. EQUATION OF STATE.
(1)VIRIAL, (3)BEATTIE, (19)KAY, (25)OLDS, (29)SAGE/W/L.

ID	PN	WT	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,PCT
19	324	.50	394.261	.3937	.3942	-.14	11.052	11.040	.11
19	325	.50	422.039	.3937	.3944	-.19	12.128	12.108	.16
19	326	.50	449.817	.3937	.3943	-.15	13.176	13.159	.13
19	327	.50	477.594	.3937	.3954	-.44	14.251	14.195	.40
19	328	.50	505.372	.3937	.3960	-.57	15.299	15.220	.52
19	329	.50	533.150	.3937	.3963	-.66	16.334	16.235	.61
19	330	.50	560.928	.3937	.3958	-.52	17.327	17.242	.49
19	331	.50	588.706	.3937	.3959	-.56	18.340	18.243	.53
19	332	.50	366.483	.4593	.4615	-.48	11.266	11.225	.36
19	333	.50	394.261	.4593	.4599	-.14	12.548	12.535	.11
19	334	.50	422.039	.4593	.4598	-.11	13.824	13.812	.09
19	335	.50	449.817	.4593	.4603	-.22	15.093	15.064	.19
19	336	.50	477.594	.4593	.4609	-.35	16.347	16.296	.31
19	337	.50	505.372	.4593	.4617	-.52	17.595	17.513	.47
19	338	.50	533.150	.4593	.4619	-.57	18.816	18.717	.52
19	339	.50	560.928	.4593	.4622	-.64	20.029	19.911	.59
19	340	.50	588.706	.4593	.4616	-.49	21.194	21.097	.46
19	341	.50	366.483	.5011	.5049	-.76	12.052	11.985	.56
19	342	.50	394.261	.5011	.5024	-.26	13.465	13.438	.20
19	343	.50	422.039	.5011	.5025	-.28	14.886	14.852	.23
19	344	.50	449.817	.5011	.5024	-.26	16.272	16.236	.22
19	345	.50	477.594	.5011	.5030	-.39	17.657	17.597	.34
19	346	.50	505.372	.5011	.5037	-.53	19.030	18.940	.47
19	347	.50	533.150	.5011	.5034	-.47	20.353	20.267	.42
19	348	.50	560.928	.5011	.5031	-.41	21.663	21.582	.37
19	349	.50	588.706	.5011	.5028	-.34	22.960	22.887	.32
19	350	.50	366.483	.5512	.5546	-.63	12.900	12.843	.44
19	351	.50	394.261	.5512	.5521	-.17	14.493	14.474	.13
19	352	.50	422.039	.5512	.5521	-.17	16.079	16.057	.14
19	353	.50	449.817	.5512	.5529	-.32	17.651	17.603	.27
19	354	.50	477.594	.5512	.5536	-.44	19.195	19.122	.38
19	355	.50	533.150	.5512	.5543	-.56	22.208	22.096	.50
19	356	.50	560.928	.5512	.5543	-.57	23.683	23.560	.52
19	357	.50	588.706	.5512	.5532	-.37	25.097	25.011	.34
19	358	.50	394.261	.6124	.6143	-.31	15.706	15.671	.23
19	359	.50	422.039	.6124	.6145	-.34	17.513	17.466	.27
19	360	.50	449.817	.6124	.6148	-.39	19.278	19.217	.32
19	361	.50	477.594	.6124	.6150	-.42	21.008	20.933	.36
19	362	.50	505.372	.6124	.6154	-.49	22.718	22.621	.43
19	363	.50	533.150	.6124	.6154	-.49	24.394	24.288	.43
19	364	.50	560.928	.6124	.6150	-.42	26.035	25.937	.38
19	365	.50	588.706	.6124	.6143	-.31	27.648	27.570	.28
19	366	.50	394.261	.6890	.6888	.03	17.058	17.061	-.02
19	367	.50	422.039	.6890	.6903	-.20	19.161	19.132	.15
19	368	.50	449.817	.6890	.6909	-.29	21.194	21.146	.23
19	369	.50	477.594	.6890	.6915	-.36	23.187	23.117	.30
19	370	.50	505.372	.6890	.6915	-.36	25.131	25.054	.31
19	371	.50	533.150	.6890	.6923	-.48	27.076	26.962	.42
19	372	.50	560.928	.6890	.6919	-.42	28.958	28.849	.38
19	373	.50	588.706	.6890	.6915	-.37	30.821	30.716	.33
19	374	.50	394.261	.7874	.7894	-.25	18.712	18.681	.17
19	375	.50	422.039	.7874	.7889	-.20	21.153	21.123	.14
19	376	.50	449.817	.7874	.7886	-.15	23.518	23.490	.12
19	377	.50	477.594	.7874	.7895	-.26	25.855	25.801	.21
19	378	.50	505.372	.7874	.7907	-.42	28.165	28.067	.35
19	379	.50	533.150	.7874	.7917	-.54	30.440	30.298	.47

Table 9. Continued

N-BUTANE PVT DATA VS. EQUATION OF STATE.
(1)VIRIAL, (3)BEATTIE, (19)KAY, (25)OLDS, (29)SAGE/W/L.

ID	PN	WT	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,PCT
19	380	.50	560.928	.7874	.7924	-.63	32.681	32.500	.56
19	381	.50	588.706	.7874	.7927	-.67	34.887	34.678	.60
19	382	.50	394.261	.9186	.9175	.13	20.546	20.562	-.07
19	383	.50	422.039	.9186	.9198	-.12	23.546	23.526	.08
19	384	.50	449.817	.9186	.9232	-.50	26.483	26.386	.36
19	385	.50	477.594	.9186	.9240	-.58	29.303	29.171	.45
19	386	.50	505.372	.9186	.9232	-.50	32.026	31.896	.41
19	387	.50	533.150	.9186	.9222	-.39	34.688	34.574	.33
19	388	.50	560.928	.9186	.9191	-.06	37.232	37.214	.05
19	389	.50	588.706	.9186	.9167	.21	39.748	39.822	-.19
19	390	.50	394.261	1.0021	1.0053	-.32	21.636	21.598	.17
19	391	.50	422.039	1.0021	1.0021	.01	24.911	24.912	-.01
19	392	.50	449.817	1.0021	1.0023	-.02	28.103	28.100	.01
19	393	.50	477.594	1.0021	1.0039	-.18	31.240	31.197	.14
19	394	.50	505.372	1.0021	1.0036	-.15	34.267	34.226	.12
19	395	.50	533.150	1.0021	1.0032	-.11	37.232	37.199	.09
19	396	.50	560.928	1.0021	1.0035	-.14	40.176	40.128	.12
19	397	.50	588.706	1.0021	1.0031	-.10	43.058	43.020	.09
19	398	.50	422.039	1.1024	1.1018	.05	26.428	26.436	-.03
19	399	.50	449.817	1.1024	1.1022	.01	30.027	30.029	-.01
19	400	.50	477.594	1.1024	1.1033	-.08	33.536	33.515	.06
19	401	.50	505.372	1.1024	1.1051	-.25	36.990	36.918	.19
19	402	.50	533.150	1.1024	1.1050	-.24	40.334	40.256	.19
19	403	.50	560.928	1.1024	1.1034	-.09	43.575	43.541	.08
19	404	.50	588.706	1.1024	1.1014	.09	46.746	46.784	-.08
19	405	.50	422.039	1.2248	1.2217	.26	28.062	28.102	-.14
19	406	.50	449.817	1.2248	1.2250	-.01	32.212	32.210	.01
19	407	.50	477.594	1.2248	1.2273	-.20	36.239	36.187	.14
19	408	.50	505.372	1.2248	1.2274	-.21	40.127	40.064	.16
19	409	.50	533.150	1.2248	1.2292	-.35	43.989	43.863	.29
19	410	.50	560.928	1.2248	1.2283	-.28	47.712	47.599	.24
19	411	.50	588.706	1.2248	1.2252	-.03	51.297	51.284	.03
19	412	.50	422.039	1.3779	1.3710	.50	29.827	29.902	-.25
19	413	.50	449.817	1.3779	1.3780	-.00	34.681	34.680	.00
19	414	.50	477.594	1.3779	1.3810	-.22	39.355	39.295	.15
19	415	.50	505.372	1.3779	1.3791	-.09	43.816	43.788	.06
19	416	.50	533.150	1.3779	1.3795	-.11	48.229	48.186	.09
19	417	.50	560.928	1.3779	1.3789	-.07	52.538	52.508	.06
19	418	.50	588.706	1.3779	1.3792	-.09	56.813	56.768	.08
19	419	.50	422.039	1.4505	1.4500	.03	30.647	30.652	-.01
19	420	.50	449.817	1.4505	1.4547	-.29	35.818	35.758	.17
19	421	.50	477.594	1.4505	1.4550	-.31	40.769	40.683	.21
19	422	.50	505.372	1.4505	1.4517	-.09	45.505	45.477	.06
19	423	.50	533.150	1.4505	1.4502	.02	50.159	50.167	-.02
19	424	.50	560.928	1.4505	1.4506	-.01	54.779	54.776	.01
19	425	.50	588.706	1.4505	1.4508	-.02	59.329	59.317	.02
19	426	.50	422.039	1.5311	1.5265	.30	31.371	31.413	-.13
19	427	.50	449.817	1.5311	1.5334	-.16	36.921	36.889	.09
19	428	.50	477.594	1.5311	1.5346	-.23	42.230	42.167	.15
19	429	.50	505.372	1.5311	1.5325	-.09	47.333	47.300	.07
19	430	.50	533.150	1.5311	1.5327	-.11	52.366	52.322	.08
19	431	.50	560.928	1.5311	1.5313	-.01	57.261	57.255	.01
19	432	.50	588.706	1.5311	1.5313	-.01	62.122	62.114	.01
19	433	.50	422.039	1.6211	1.6151	.37	32.130	32.178	-.15
19	434	.50	449.817	1.6211	1.6252	-.25	38.128	38.076	.14
19	435	.50	477.594	1.6211	1.6267	-.34	43.851	43.755	.22

Table 9. Continued

N-BUTANE PVT DATA VS. EQUATION OF STATE.
(1)VIRIAL, (3)BEATTIE, (19)KAY, (25)OLDS, (29)SAGE/W/L.

ID	PN	WT	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,PCT
19	436	.50	505.372	1.6211	1.6237	-.16	49.332	49.276	.11
19	437	.50	533.150	1.6211	1.6238	-.16	54.744	54.676	.13
19	438	.50	560.928	1.6211	1.6213	-.01	59.984	59.978	.01
19	439	.50	588.706	1.6211	1.6187	.15	65.121	65.202	-.12
19	440	.50	422.039	1.7224	1.7135	.52	32.874	32.937	-.19
19	441	.50	449.817	1.7224	1.7325	-.58	39.438	39.320	.30
19	442	.50	477.594	1.7224	1.7274	-.29	45.540	45.458	.18
19	443	.50	505.372	1.7224	1.7262	-.22	51.504	51.425	.15
19	444	.50	533.150	1.7224	1.7239	-.08	57.295	57.259	.06
19	445	.50	560.928	1.7224	1.7246	-.13	63.053	62.988	.10
19	446	.50	588.706	1.7224	1.7237	-.07	68.672	68.631	.06
19	447	.50	422.039	1.8373	1.8205	.91	33.577	33.678	-.30
19	448	.50	449.817	1.8373	1.8427	-.30	40.679	40.620	.14
19	449	.50	477.594	1.8373	1.8422	-.27	47.367	47.290	.16
19	450	.50	505.372	1.8373	1.8393	-.11	53.814	53.772	.08
19	451	.50	533.150	1.8373	1.8378	-.03	60.122	60.110	.02
19	452	.50	560.928	1.8373	1.8370	.01	66.328	66.334	-.01
19	453	.50	588.706	1.8373	1.8372	.00	72.464	72.465	-.00
19	454	.50	422.039	1.9685	1.9450	1.19	34.267	34.382	-.34
19	455	.50	449.817	1.9685	1.9768	-.42	42.058	41.976	.19
19	456	.50	477.594	1.9685	1.9707	-.11	49.298	49.266	.06
19	457	.50	505.372	1.9685	1.9710	-.13	56.399	56.351	.09
19	458	.50	533.150	1.9685	1.9691	-.03	63.294	63.280	.02
19	459	.50	560.928	1.9685	1.9685	-.00	70.085	70.085	.00
19	460	.50	588.706	1.9685	1.9690	-.03	76.808	76.790	.02
19	461	.50	422.039	2.1199	2.1013	.88	34.956	35.027	-.20
19	462	.50	449.817	2.1199	2.1298	-.46	43.471	43.385	.20
19	463	.50	477.594	2.1199	2.1247	-.22	51.469	51.404	.13
19	464	.50	505.372	2.1199	2.1194	.03	59.191	59.202	-.02
19	465	.50	533.150	2.1199	2.1220	-.10	66.879	66.831	.07
19	466	.50	560.928	2.1199	2.1236	-.17	74.429	74.328	.14
19	467	.50	588.706	2.1199	2.1270	-.33	81.944	81.717	.28
19	468	.50	422.039	2.2966	2.2697	1.17	35.508	35.580	-.20
19	469	.50	449.817	2.2966	2.2974	-.04	44.850	44.844	.01
19	470	.50	477.594	2.2966	2.3003	-.16	53.779	53.731	.09
19	471	.50	505.372	2.2966	2.2995	-.13	62.432	62.381	.08
19	472	.50	533.150	2.2966	2.3008	-.18	70.947	70.852	.13
19	473	.50	560.928	2.2966	2.3005	-.17	79.290	79.183	.14
19	474	.50	436.428	2.5054	2.4888	.66	41.369	41.440	-.17
19	475	.50	455.150	2.5054	2.5030	.09	48.263	48.281	-.04
19	476	.50	474.428	2.5054	2.5048	.02	55.158	55.165	-.01
19	477	.50	494.094	2.5054	2.5048	.02	62.053	62.061	-.01
19	478	.50	513.983	2.5054	2.5063	-.04	68.948	68.931	.02
19	479	.50	533.983	2.5054	2.5095	-.17	75.842	75.750	.12
19	480	.50	554.150	2.5054	2.5126	-.29	82.737	82.551	.22
19	481	.50	434.317	2.7559	2.7122	1.59	41.369	41.499	-.32
19	482	.50	450.817	2.7559	2.7467	.34	48.263	48.319	-.11
19	483	.50	467.706	2.7559	2.7555	.02	55.158	55.162	-.01
19	484	.50	484.983	2.7559	2.7555	.01	62.053	62.057	-.01
19	485	.50	502.594	2.7559	2.7527	.12	68.948	68.998	-.07
19	486	.50	519.817	2.7559	2.7628	-.25	75.842	75.712	.17
19	487	.50	537.039	2.7559	2.7728	-.61	82.737	82.365	.45
19	488	.50	432.650	3.0621	3.0086	1.75	41.369	41.469	-.24
19	489	.50	447.039	3.0621	3.0646	-.08	48.263	48.252	.02
19	490	.50	461.983	3.0621	3.0576	.15	55.158	55.191	-.06
19	491	.50	476.983	3.0621	3.0597	.08	62.053	62.077	-.04

Table 9. Continued

N-BUTANE PVT DATA VS. EQUATION OF STATE.
(1)VIRIAL, (3)BEATTIE, (19)KAY, (25)OLDS, (29)SAGE/W/L.

ID	PN	WT	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,PCT
19	492	.50	491.983	3.0621	3.0657	-.12	68.948	68.901	.07
19	493	.50	507.039	3.0621	3.0713	-.30	75.842	75.695	.19
19	494	.50	522.317	3.0621	3.0723	-.33	82.737	82.542	.24
19	495	.50	431.150	3.4449	3.5518	-3.10	41.369	41.251	.28
19	496	.50	444.094	3.4449	3.4387	.18	48.263	48.285	-.05
19	497	.50	456.928	3.4449	3.4380	.20	55.158	55.200	-.08
19	498	.50	469.594	3.4449	3.4529	-.23	62.053	61.984	.11
19	499	.50	482.261	3.4449	3.4639	-.55	68.948	68.735	.31
19	500	.50	494.983	3.4449	3.4706	-.75	75.842	75.487	.47
19	501	.50	507.706	3.4449	3.4765	-.92	82.737	82.214	.63
19	502	.50	430.761	3.6745	3.7728	-2.68	41.369	41.271	.24
19	503	.50	443.039	3.6745	3.6103	1.75	48.263	48.478	-.44
19	504	.50	454.650	3.6745	3.6557	.51	55.158	55.265	-.19
19	505	.50	466.261	3.6745	3.6770	-.07	62.053	62.033	.03
19	506	.50	477.706	3.6745	3.6992	-.67	68.948	68.688	.38
19	507	.50	489.261	3.6745	3.7089	-.94	75.842	75.392	.59
19	508	.50	500.928	3.6745	3.7120	-1.02	82.737	82.148	.71
19	509	.50	441.650	3.9370	3.8663	1.80	48.263	48.491	-.47
19	510	.50	452.150	3.9370	3.9291	.20	55.158	55.201	-.08
19	511	.50	462.983	3.9370	3.9277	.24	62.053	62.126	-.12
19	512	.50	473.539	3.9370	3.9441	-.18	68.948	68.875	.11
19	513	.50	483.928	3.9370	3.9626	-.65	75.842	75.516	.43
19	514	.50	494.428	3.9370	3.9703	-.85	82.737	82.229	.61
19	515	.50	438.372	4.5932	4.5567	.79	48.263	48.402	-.29
19	516	.50	446.928	4.5932	4.5839	.20	55.158	55.216	-.11
19	517	.50	455.428	4.5932	4.5963	-.07	62.053	62.025	.04
19	518	.50	463.872	4.5932	4.6044	-.25	68.948	68.821	.18
19	519	.50	472.428	4.5932	4.6011	-.17	75.842	75.733	.14
19	520	.50	480.817	4.5932	4.6058	-.27	82.737	82.532	.25
19	521	.50	433.039	5.5118	5.4476	1.17	48.263	48.845	-1.21
19	522	.50	439.150	5.5118	5.4634	.88	55.158	55.740	-1.06
19	523	.50	445.206	5.5118	5.4745	.68	62.053	62.611	-.90
19	524	.50	451.261	5.5118	5.4800	.58	68.948	69.515	-.82
19	525	.50	457.428	5.5118	5.4765	.64	75.842	76.574	-.96
19	526	.50	463.261	5.5118	5.4890	.41	82.737	83.275	-.65
19	527	.50	417.039	6.1242	6.0835	.66	34.474	34.962	-1.42
19	528	.50	426.983	6.1242	6.0602	1.05	48.263	49.424	-2.41
19	529	.50	431.594	6.1242	6.0767	.78	55.158	56.170	-1.83
19	530	.50	436.428	6.1242	6.0745	.81	62.053	63.261	-1.95
19	531	.50	440.928	6.1242	6.0902	.56	68.948	69.880	-1.35
19	532	.50	445.872	6.1242	6.0805	.71	75.842	77.170	-1.75
19	533	.50	450.428	6.1242	6.0893	.57	82.737	83.901	-1.41
19	534	.50	413.706	6.4845	6.4213	.97	34.474	35.765	-3.75
19	535	.50	422.039	6.4845	6.4210	.98	48.263	49.953	-3.50
19	536	.50	425.928	6.4845	6.4363	.74	55.158	56.594	-2.60
19	537	.50	429.872	6.4845	6.4453	.60	62.053	63.341	-2.08
19	538	.50	433.928	6.4845	6.4471	.58	68.948	70.289	-1.95
19	539	.50	438.039	6.4845	6.4459	.60	75.842	77.341	-1.98
19	540	.50	442.039	6.4845	6.4492	.54	82.737	84.212	-1.78
19	541	.50	403.261	6.8897	6.9086	-.27	27.579	26.978	2.18
19	542	.50	407.039	6.8897	6.8859	.06	34.474	34.608	-.39
19	543	.50	414.317	6.8897	6.8631	.39	48.263	49.333	-2.22
19	544	.50	418.150	6.8897	6.8445	.66	55.158	57.100	-3.52
19	545	.50	421.539	6.8897	6.8479	.61	62.053	63.972	-3.09
19	546	.50	424.928	6.8897	6.8508	.57	68.948	70.849	-2.76
19	547	.50	428.206	6.8897	6.8576	.47	75.842	77.505	-2.19

Table 9. Continued

N-BUTANE PVT DATA VS. EQUATION OF STATE.
(1)VIRIAL, (3)BEATTIE, (19)KAY, (25)OLDS, (29)SAGE/W/L.

ID	PN	WT	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,PCT
19	548	.50	431.483	6.8897	6.8636	.38	82.737	84.165	-1.73
19	549	.50	394.817	7.3491	7.3583	-.13	27.579	27.090	1.77
19	550	.50	397.761	7.3491	7.3525	-.05	34.474	34.284	.55
19	551	.50	403.706	7.3491	7.3400	.12	48.263	48.816	-1.14
19	552	.50	406.817	7.3491	7.3292	.27	55.158	56.424	-2.30
19	553	.50	409.872	7.3491	7.3212	.38	62.053	63.900	-2.98
19	554	.50	413.039	7.3491	7.3099	.53	68.948	71.649	-3.92
19	555	.50	415.928	7.3491	7.3090	.55	75.842	78.720	-3.79
19	556	.50	419.094	7.3491	7.2989	.68	82.737	86.472	-4.51
19	557	.50	388.817	7.6025	7.6156	-.17	27.579	26.696	3.20
19	558	.50	391.483	7.6025	7.6105	-.11	34.474	33.912	1.63
19	559	.50	396.539	7.6025	7.6113	-.12	48.263	47.594	1.39
19	560	.50	399.261	7.6025	7.6050	-.03	55.158	54.963	.35
19	561	.50	401.817	7.6025	7.6046	-.03	62.053	61.881	.28
19	562	.50	404.261	7.6025	7.6078	-.07	68.948	68.500	.65
19	563	.50	407.150	7.6025	7.5969	.07	75.842	76.323	-.63
19	564	.50	410.872	7.6025	7.5611	.54	82.737	86.404	-4.43
19	565	.50	381.872	7.8740	7.8760	-.03	27.579	27.405	.63
19	566	.50	384.094	7.8740	7.8782	-.05	34.474	34.102	1.08
19	567	.50	388.706	7.8740	7.8768	-.04	48.263	48.001	.54
19	568	.50	390.928	7.8740	7.8788	-.06	55.158	54.699	.83
19	569	.50	392.872	7.8740	7.8890	-.19	62.053	60.561	2.40
19	570	.50	395.206	7.8740	7.8873	-.17	68.948	67.595	1.96
19	571	.50	397.761	7.8740	7.8792	-.07	75.842	75.299	.72
19	572	.50	401.150	7.8740	7.8480	.33	82.737	85.515	-3.36
19	573	.50	373.150	8.1656	8.1649	.01	27.579	27.658	-.29
19	574	.50	375.261	8.1656	8.1627	.04	34.474	34.795	-.93
19	575	.50	378.928	8.1656	8.1748	-.11	48.263	47.192	2.22
19	576	.50	380.928	8.1656	8.1757	-.12	55.158	53.953	2.18
19	577	.50	382.594	8.1656	8.1858	-.25	62.053	59.588	3.97
19	578	.50	384.817	8.1656	8.1804	-.18	68.948	67.101	2.68
19	579	.50	387.150	8.1656	8.1723	-.08	75.842	74.990	1.12
19	580	.50	390.317	8.1656	8.1428	.28	82.737	85.696	3.58
19	581	.50	367.594	8.4797	8.4862	-.08	48.263	47.310	1.98
19	582	.50	369.261	8.4797	8.4896	-.12	55.158	53.686	2.67
19	583	.50	370.928	8.4797	8.4928	-.15	62.053	60.061	3.21
19	584	.50	372.594	8.4797	8.4959	-.19	68.948	66.437	3.64
19	585	.50	374.594	8.4797	8.4909	-.13	75.842	74.087	2.31
19	586	.50	377.039	8.4797	8.4753	.05	82.737	83.437	-.85
19	587	.50	349.483	8.8189	8.8196	-.01	27.579	27.443	.49
19	588	.50	351.039	8.8189	8.8201	-.01	34.474	34.248	.65
19	589	.50	353.706	8.8189	8.8316	-.14	48.263	45.915	4.87
19	590	.50	355.094	8.8189	8.8358	-.19	55.158	51.991	5.74
19	591	.50	356.483	8.8189	8.8399	-.24	62.053	58.067	6.42
19	592	.50	359.594	8.8189	8.8402	-.24	75.842	71.677	5.49
19	593	.50	361.650	8.8189	8.8293	-.12	82.737	80.668	2.50

NP = 437, DNRMSPCT = .632, PMEANDIF = .261, PMEANPCT = .550

Table 9. Continued

N-BUTANE PVT DATA VS. EQUATION OF STATE.
(1)VIRIAL, (3)BEATTIE, (19)KAY, (25)OLDS, (29)SAGE/W/L.

ID	PN	WT	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,PCT
25	594	1.00	310.928	.0272	.0272	-.02	.689	.689	.02
25	595	1.00	344.261	.0244	.0244	-.08	.689	.689	.08
25	596	1.00	377.594	.0222	.0222	-.11	.689	.689	.11
25	597	1.00	410.928	.0203	.0204	-.12	.689	.689	.12
25	598	1.00	444.261	.0188	.0188	-.13	.689	.689	.13
25	599	1.00	477.594	.0174	.0175	-.13	.689	.689	.13
25	600	1.00	510.928	.0163	.0163	-.12	.689	.689	.12
25	601	1.00	310.928	.0403	.0403	.09	1.013	1.014	-.08
25	602	1.00	344.261	.0361	.0361	-.01	1.013	1.013	.01
25	603	1.00	377.594	.0327	.0328	-.06	1.013	1.013	.06
25	604	1.00	410.928	.0300	.0300	-.10	1.013	1.012	.09
25	605	1.00	444.261	.0277	.0277	-.12	1.013	1.012	.12
25	606	1.00	477.594	.0257	.0257	-.12	1.013	1.012	.12
25	607	1.00	510.928	.0240	.0240	-.12	1.013	1.012	.12
25	608	1.00	310.928	.0555	.0554	.19	1.379	1.381	-.18
25	609	1.00	344.261	.0495	.0495	.06	1.379	1.380	-.06
25	610	1.00	377.594	.0448	.0448	-.01	1.379	1.379	.01
25	611	1.00	410.928	.0410	.0410	-.06	1.379	1.378	.06
25	612	1.00	444.261	.0377	.0378	-.10	1.379	1.378	.10
25	613	1.00	477.594	.0350	.0351	-.12	1.379	1.377	.12
25	614	1.00	510.928	.0327	.0327	-.11	1.379	1.377	.11
25	615	1.00	310.928	.0849	.0846	.34	2.068	2.075	-.32
25	616	1.00	344.261	.0754	.0752	.20	2.068	2.072	-.19
25	617	1.00	377.594	.0679	.0679	.09	2.068	2.070	-.09
25	618	1.00	410.928	.0619	.0619	.02	2.068	2.069	-.02
25	619	1.00	444.261	.0569	.0570	-.06	2.068	2.067	.06
25	620	1.00	477.594	.0526	.0528	-.47	2.068	2.059	.46
25	621	1.00	510.928	.0492	.0492	-.09	2.068	2.067	.09
25	622	1.00	310.928	.1156	.1152	.41	2.758	2.768	-.38
25	623	1.00	344.261	.1020	.1017	.29	2.758	2.765	-.27
25	624	1.00	377.594	.0915	.0914	.19	2.758	2.763	-.18
25	625	1.00	410.928	.0832	.0831	.07	2.758	2.760	-.06
25	626	1.00	444.261	.0764	.0764	-.01	2.758	2.758	.01
25	627	1.00	477.594	.0706	.0707	-.06	2.758	2.756	.06
25	628	1.00	510.928	.0658	.0658	-.07	2.758	2.756	.07
25	629	1.00	344.261	.1576	.1571	.35	4.137	4.150	-.32
25	630	1.00	377.594	.1403	.1399	.31	4.137	4.149	-.29
25	631	1.00	410.928	.1268	.1266	.16	4.137	4.143	-.16
25	632	1.00	444.261	.1159	.1158	.04	4.137	4.138	-.04
25	633	1.00	477.594	.1069	.1069	-.04	4.137	4.135	.03
25	634	1.00	510.928	.0993	.0994	-.06	4.137	4.134	.06
25	635	1.00	344.261	.2806	.2806	.01	6.895	6.895	-.01
25	636	1.00	377.594	.2451	.2441	.39	6.895	6.919	-.35
25	637	1.00	410.928	.2185	.2179	.25	6.895	6.911	-.23
25	638	1.00	444.261	.1979	.1977	.06	6.895	6.899	-.06
25	639	1.00	477.594	.1814	.1815	-.03	6.895	6.893	.02
25	640	1.00	510.928	.1679	.1680	-.04	6.895	6.892	.04
25	641	1.00	377.594	.3927	.3916	.28	10.342	10.366	-.23
25	642	1.00	410.928	.3429	.3419	.28	10.342	10.367	-.24
25	643	1.00	444.261	.3065	.3063	.05	10.342	10.347	-.05
25	644	1.00	477.594	.2786	.2788	-.07	10.342	10.335	.07
25	645	1.00	510.928	.2564	.2566	-.08	10.342	10.334	.08
25	646	1.00	377.594	.5665	.5673	-.14	13.790	13.776	.10
25	647	1.00	410.928	.4810	.4797	.28	13.790	13.822	-.23
25	648	1.00	444.261	.4228	.4229	-.02	13.790	13.787	.02

Table 9. Continued

N-BUTANE PVT DATA VS. EQUATION OF STATE.
(1)VIRIAL, (3)BEATTIE, (19)KAY, (25)OLDS, (29)SAGE/W/L.

ID	PN	WT	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,PCT
25	649	1.00	477.594	.3809	.3813	-.11	13.790	13.775	.10
25	650	1.00	510.928	.3483	.3488	-.14	13.790	13.771	.13
25	651	1.00	310.928	9.6394	9.6414	-.02	17.237	16.642	3.45
25	652	1.00	344.261	8.8871	8.8917	-.05	17.237	16.410	4.80
25	653	1.00	377.594	7.9079	7.9072	.01	17.237	17.291	-.32
25	654	1.00	410.928	.6372	.6356	.25	17.237	17.270	-.19
25	655	1.00	444.261	.5485	.5489	-.07	17.237	17.227	.06
25	656	1.00	477.594	.4886	.4894	-.16	17.237	17.213	.14
25	657	1.00	510.928	.4437	.4446	-.20	17.237	17.206	.18
25	658	1.00	310.928	9.6529	9.6530	-.00	20.684	20.664	.10
25	659	1.00	344.261	8.9072	8.9106	-.04	20.684	20.064	3.00
25	660	1.00	377.594	7.9466	7.9474	-.01	20.684	20.619	.32
25	661	1.00	410.928	.8190	.8173	.20	20.684	20.713	-.14
25	662	1.00	444.261	.6855	.6863	-.12	20.684	20.665	.09
25	663	1.00	477.594	.6029	.6039	-.17	20.684	20.655	.14
25	664	1.00	510.928	.5429	.5444	-.26	20.684	20.636	.23
25	665	1.00	310.928	9.6766	9.6757	.01	27.579	27.866	-1.04
25	666	1.00	344.261	8.9477	8.9472	.01	27.579	27.670	-.33
25	667	1.00	377.594	8.0230	8.0221	.01	27.579	27.662	-.30
25	668	1.00	410.928	1.3363	1.3399	-.28	27.579	27.544	.13
25	669	1.00	444.261	1.0058	1.0078	-.20	27.579	27.540	.14
25	670	1.00	477.594	.8540	.8555	-.18	27.579	27.540	.14
25	671	1.00	510.928	.7552	.7570	-.24	27.579	27.524	.20
25	672	1.00	310.928	9.7004	9.6979	.03	34.474	35.283	-2.35
25	673	1.00	344.261	8.9827	8.9825	.00	34.474	34.519	-.13
25	674	1.00	377.594	8.0913	8.0906	.01	34.474	34.543	-.20
25	675	1.00	410.928	6.6407	6.6365	.06	34.474	34.583	-.32
25	676	1.00	444.261	1.4256	1.4301	-.32	34.474	34.411	.18
25	677	1.00	477.594	1.1435	1.1454	-.16	34.474	34.432	.12
25	678	1.00	510.928	.9874	.9897	-.23	34.474	34.409	.19
25	679	1.00	310.928	9.7244	9.7196	.05	41.369	42.919	-3.75
25	680	1.00	344.261	9.0180	9.0165	.02	41.369	41.685	-.77
25	681	1.00	377.594	8.1560	8.1540	.02	41.369	41.585	-.52
25	682	1.00	410.928	6.8760	6.8601	.23	41.369	41.955	-1.42
25	683	1.00	444.261	2.0566	2.0724	-.77	41.369	41.240	.31
25	684	1.00	477.594	1.4856	1.4873	-.11	41.369	41.337	.08
25	685	1.00	510.928	1.2436	1.2458	-.18	41.369	41.312	.14
25	686	1.00	310.928	9.7692	9.7616	.08	55.158	57.707	-4.62
25	687	1.00	344.261	9.0834	9.0810	.03	55.158	55.695	-.97
25	688	1.00	377.594	8.2760	8.2685	.09	55.158	56.114	-1.73
25	689	1.00	410.928	7.1918	7.1649	.37	55.158	56.659	-2.72
25	690	1.00	444.261	4.9602	4.9157	.90	55.158	55.501	-.62
25	691	1.00	477.594	2.4071	2.4113	-.18	55.158	55.106	.09
25	692	1.00	510.928	1.8437	1.8424	.07	55.158	55.184	-.05
25	693	1.00	344.261	9.1467	9.1414	.06	68.948	70.194	-1.81
25	694	1.00	377.594	8.3791	8.3702	.11	68.948	70.232	-1.86
25	695	1.00	410.928	7.4103	7.3843	.35	68.948	70.827	-2.73
25	696	1.00	444.261	5.9382	5.9049	.56	68.948	69.744	-1.16
25	697	1.00	477.594	3.6721	3.7053	-.91	68.948	68.597	.51
25	698	1.00	510.928	2.5582	2.5656	-.29	68.948	68.817	.19
25	699	1.00	310.928	9.8636	9.8503	.14	86.184	91.103	-5.71
25	700	1.00	344.261	9.2109	9.2121	-.01	86.184	85.880	.35
25	701	1.00	377.594	8.4954	8.4836	.14	86.184	88.101	-2.22
25	702	1.00	410.928	7.6214	7.5984	.30	86.184	88.287	-2.44
25	703	1.00	444.261	6.4921	6.4417	.78	86.184	88.372	-2.54
25	704	1.00	477.594	4.9292	4.9569	-.56	86.184	85.648	.62

Table 9. Continued

N-BUTANE PVT DATA VS. EQUATION OF STATE,
(1)VIRIAL, (3)BEATTIE, (19)KAY, (25)OLDS, (29)SAGE/W/L.

ID	PN	WT	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,PCT
25	705	1.00	510.928	3.5327	3.5759	-1.22	86.184	85.432	.87
25	706	1.00	344.261	9.2854	9.2781	.08	103.421	105.385	-1.90
25	707	1.00	377.594	8.5987	8.5850	.16	103.421	105.889	-2.39
25	708	1.00	410.928	7.7960	7.7724	.30	103.421	106.007	-2.50
25	709	1.00	444.261	6.8317	6.7826	.72	103.421	106.422	-2.90
25	710	1.00	477.594	5.6266	5.6239	.05	103.421	103.511	-.09
25	711	1.00	510.928	4.3717	4.4430	-1.63	103.421	101.778	1.59
25	712	1.00	310.928	9.9563	9.9405	.16	120.658	127.007	-5.26
25	713	1.00	344.261	9.3484	9.3401	.09	120.658	123.032	-1.97
25	714	1.00	377.594	8.6937	8.6771	.19	120.658	123.923	-2.71
25	715	1.00	410.928	7.9466	7.9202	.33	120.658	124.016	-2.78
25	716	1.00	444.261	7.0827	7.0375	.64	120.658	124.179	-2.92
25	717	1.00	477.594	6.0663	6.0511	.25	120.658	121.390	-.61
25	718	1.00	510.928	4.9998	5.0573	-1.15	120.658	118.752	1.58
25	719	1.00	310.928	10.0033	9.9828	.20	137.895	146.466	-6.22
25	720	1.00	344.261	9.4058	9.3986	.08	137.895	140.083	-1.59
25	721	1.00	377.594	8.7767	8.7616	.17	137.895	141.129	-2.35
25	722	1.00	410.928	8.0723	8.0493	.29	137.895	141.208	-2.40
25	723	1.00	444.261	7.2811	7.2430	.52	137.895	141.457	-2.58
25	724	1.00	477.594	6.3809	6.3663	.23	137.895	138.805	-.66
25	725	1.00	510.928	5.4518	5.4947	-.79	137.895	135.965	1.40
25	726	1.00	310.928	10.0838	10.0627	.21	172.369	181.888	-5.52
25	727	1.00	344.261	9.5195	9.5066	.14	172.369	176.713	-2.52
25	728	1.00	377.594	8.9245	8.9126	.13	172.369	175.320	-1.71
25	729	1.00	410.928	8.2909	8.2680	.28	172.369	176.405	-2.34
25	730	1.00	444.261	7.5983	7.5664	.42	172.369	176.322	-2.29
25	731	1.00	477.594	6.8419	6.8266	.22	172.369	173.738	-.79
25	732	1.00	510.928	6.0850	6.0984	-.22	172.369	171.435	.54
25	733	1.00	310.928	10.1544	10.1371	.17	206.843	215.197	-4.04
25	734	1.00	344.261	9.6192	9.6048	.15	206.843	212.169	-2.58
25	735	1.00	377.594	9.0535	9.0449	.10	206.843	209.243	-1.16
25	736	1.00	410.928	8.4745	8.4501	.29	206.843	211.890	-2.44
25	737	1.00	444.261	7.8449	7.8187	.33	206.843	210.865	-1.94
25	738	1.00	477.594	7.1787	7.1644	.20	206.843	208.510	-.81
25	739	1.00	510.928	6.5167	6.5212	-.07	206.843	206.421	.20
25	740	1.00	310.928	10.2260	10.2067	.19	241.316	251.244	-4.11
25	741	1.00	344.261	9.7073	9.6948	.13	241.316	246.301	-2.07
25	742	1.00	377.594	9.1710	9.1631	.09	241.316	243.782	-1.02
25	743	1.00	410.928	8.6257	8.6069	.22	241.316	245.761	-1.84
25	744	1.00	444.261	8.0488	8.0266	.28	241.316	245.361	-1.68
25	745	1.00	477.594	7.4423	7.4325	.13	241.316	242.726	-.58
25	746	1.00	510.928	6.8436	6.8482	-.07	241.316	240.766	.23
25	747	1.00	310.928	10.2870	10.2722	.14	275.790	283.893	-2.94
25	748	1.00	344.261	9.7866	9.7782	.09	275.790	279.411	-1.31
25	749	1.00	377.594	9.2729	9.2700	.03	275.790	276.764	-.35
25	750	1.00	410.928	8.7600	8.7450	.17	275.790	279.798	-1.45
25	751	1.00	444.261	8.2266	8.2040	.27	275.790	280.537	-1.72
25	752	1.00	477.594	7.6638	7.6552	.11	275.790	277.236	-.52
25	753	1.00	510.928	7.1083	7.1155	-.10	275.790	274.775	.37
25	754	1.00	310.928	10.3450	10.3340	.11	310.264	316.547	-2.02
25	755	1.00	344.261	9.8636	9.8558	.08	310.264	313.891	-1.17
25	756	1.00	377.594	9.3738	9.3678	.06	310.264	312.468	-.71
25	757	1.00	410.928	8.8785	8.8685	.11	310.264	313.216	-.95
25	758	1.00	444.261	8.3766	8.3591	.21	310.264	314.415	-1.34
25	759	1.00	477.594	7.8560	7.8460	.13	310.264	312.216	-.63
25	760	1.00	510.928	7.3334	7.3417	-.11	310.264	308.911	.44

Table 9. Continued

N-BUTANE PVT DATA VS. EQUATION OF STATE.
(1)VIRIAL, (3)BEATTIE, (19)KAY, (25)OLDS, (29)SAGE/W/L.

ID	PN	WT	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,PCT
25	761	1.00	310.928	10.4035	10.3927	.10	344.738	351.314	-1.91
25	762	1.00	344.261	9.9347	9.9284	.06	344.738	347.834	-.90
25	763	1.00	377.594	9.4639	9.4581	.06	344.738	347.070	-.68
25	764	1.00	410.928	8.9886	8.9805	.09	344.738	347.338	-.75
25	765	1.00	444.261	8.5164	8.4972	.23	344.738	349.841	-1.48
25	766	1.00	477.594	8.0230	8.0130	.12	344.738	346.936	-.64
25	767	1.00	510.928	7.5257	7.5376	-.16	344.738	342.504	.65
25	768	1.00	310.928	10.5147	10.5017	.12	413.685	422.369	-2.10
25	769	1.00	344.261	10.0764	10.0614	.15	413.685	421.950	-2.00
25	770	1.00	377.594	9.6293	9.6203	.09	413.685	417.789	-.99
25	771	1.00	410.928	9.1863	9.1777	.09	413.685	416.941	-.79
25	772	1.00	444.261	8.7544	8.7350	.22	413.685	419.891	-1.50
25	773	1.00	477.594	8.3059	8.2955	.13	413.685	416.503	-.68
25	774	1.00	510.928	7.8471	7.8650	-.23	413.685	409.512	1.01
25	775	1.00	310.928	10.6119	10.6013	.10	482.633	490.315	-1.59
25	776	1.00	344.261	10.1995	10.1810	.18	482.633	493.936	-2.34
25	777	1.00	377.594	9.7727	9.7633	.10	482.633	487.468	-1.00
25	778	1.00	410.928	9.3642	9.3479	.17	482.633	489.753	-1.48
25	779	1.00	444.261	8.9594	8.9359	.26	482.633	491.413	-1.82
25	780	1.00	477.594	8.5454	8.5294	.19	482.633	487.800	-1.07
25	781	1.00	510.928	8.1175	8.1322	-.18	482.633	478.496	.86
25	782	1.00	310.928	10.7025	10.6931	.09	551.581	558.971	-1.34
25	783	1.00	344.261	10.3178	10.2897	.27	551.581	570.472	-3.42
25	784	1.00	377.594	9.9097	9.8913	.19	551.581	562.073	-1.90
25	785	1.00	410.928	9.5195	9.4979	.23	551.581	562.196	-1.92
25	786	1.00	444.261	9.1285	9.1100	.20	551.581	559.456	-1.43
25	787	1.00	477.594	8.7406	8.7292	.13	551.581	555.791	-.76
25	788	1.00	510.928	8.3512	8.3581	-.08	551.581	549.314	.41
25	789	1.00	310.928	10.7947	10.7783	.15	620.528	634.379	-2.23
25	790	1.00	344.261	10.4193	10.3895	.29	620.528	642.205	-3.49
25	791	1.00	377.594	10.0324	10.0075	.25	620.528	636.131	-2.51
25	792	1.00	410.928	9.6563	9.6322	.25	620.528	633.652	-2.11
25	793	1.00	444.261	9.2885	9.2640	.26	620.528	632.264	-1.89
25	794	1.00	477.594	8.9159	8.9039	.13	620.528	625.503	-.81
25	795	1.00	510.928	8.5534	8.5537	-.00	620.528	620.416	.02
25	796	1.00	310.928	10.8757	10.8579	.16	689.476	705.487	-2.32
25	797	1.00	344.261	10.5147	10.4818	.31	689.476	715.265	-3.74
25	798	1.00	377.594	10.1469	10.1139	.32	689.476	712.038	-3.27
25	799	1.00	410.928	9.7900	9.7539	.37	689.476	711.186	-3.15
25	800	1.00	444.261	9.4445	9.4021	.45	689.476	712.070	-3.28
25	801	1.00	477.594	9.0864	9.0591	.30	689.476	702.377	-1.87
25	802	1.00	510.928	8.7295	8.7262	.04	689.476	690.877	-.20

NP = 209, DNRMSPCT = .287, PMEANDIF = 2.842, PMEANPCT = 1.138

NP = 802, DNRMSPCT = .540, PMEANDIF = 1.390, PMEANPCT = .785

Table 10. Comparisons with data for ideal gas functions.

N-BUTANE IDEAL GAS FUNCTIONS, JOULES,MOLES,KELVINS

T,K	HZ-HZZ	CALCD	PCNT	SZ	CALCD	PCNT	CPZ	CALCD	PCNT
50.00	1718.0	1750.3	-1.88	198.363	198.892	-.27	38.07	38.08	-.01
100.00	4048.9	4041.8	.17	229.994	229.925	.03	55.35	55.34	.03
150.00	7142.7	7143.6	-.01	254.689	254.915	-.01	67.32	67.37	-.07
200.00	10736.1	10733.0	.03	275.516	275.505	.00	76.44	76.33	.14
273.15	16883.5	16881.3	.01	301.583	301.574	.00	92.30	92.40	-.11
298.15	19267.0	19268.1	-.01	309.909	309.931	-.01	98.49	98.59	-.10
300.00	19450.6	19450.9	-.00	310.536	310.542	-.00	98.95	99.05	-.10
400.00	30636.9	30632.2	.02	342.544	342.533	.00	124.77	124.54	.18
500.00	44333.7	44299.9	.08	373.004	372.932	.02	148.66	148.37	.19
600.00	60259.6	60207.1	.09	401.999	401.877	.03	169.28	169.26	.01
700.00	78096.5	78054.9	.05	429.446	429.354	.02	187.02	187.23	-.11
800.00	97584.3	97567.5	.02	455.428	455.386	.01	202.38	202.63	-.12
900.00	118507.2	118509.3	-.00	480.072	480.037	.01	215.73	215.88	-.07
1000.00	140674.4	140684.2	-.01	503.419	503.390	.01	227.36	227.35	.00
1100.00	163928.3	163930.2	-.00	525.552	525.538	.00	237.48	237.35	.06
1200.00	188124.4	188113.2	.01	546.640	546.574	.01	246.27	246.13	.06

Table 11. Interpolated ideal gas functions.

N-BUTANE IDEAL GAS FUNCTIONS, JOULES,MOLES,KELVINS

T,K	EZ-EZZ	HZ-HZZ	SZ	CVZ	CPZ
130.0	4753.0	5833.9	245.551	55.17	63.48
140.0	5315.1	6479.1	250.331	57.20	65.51
150.0	5896.4	7143.6	254.915	59.05	67.37
160.0	6495.8	7826.1	259.319	60.82	69.13
170.0	7112.7	8526.2	263.563	62.56	70.88
180.0	7747.1	9243.7	267.663	64.32	72.64
190.0	8399.4	9979.1	271.639	66.14	74.45
200.0	9070.1	10733.0	275.505	68.02	76.33
210.0	9760.0	11506.0	279.276	69.98	78.29
220.0	10469.9	12299.1	282.965	72.02	80.33
230.0	11200.6	13112.9	286.583	74.14	82.45
240.0	11952.9	13948.4	290.138	76.34	84.65
250.0	12727.6	14806.2	293.639	78.61	86.92
260.0	13525.2	15687.0	297.094	80.94	89.25
270.0	14346.5	16591.4	300.507	83.32	91.64
280.0	15191.9	17519.9	303.883	85.76	94.07
290.0	16061.8	18473.0	307.227	88.23	96.55
300.0	16956.6	19450.9	310.542	90.74	99.05
310.0	17876.6	20454.1	313.831	93.27	101.58
320.0	18822.0	21482.6	317.097	95.82	104.13
330.0	19792.9	22536.7	320.340	98.38	106.69
340.0	20789.5	23616.4	323.563	100.94	109.26
350.0	21811.8	24721.8	326.767	103.51	111.82
360.0	22859.7	25852.9	329.953	106.07	114.39
370.0	23933.2	27009.6	333.122	108.63	116.95
380.0	25032.3	28191.8	336.275	111.18	119.49
390.0	26156.7	29399.4	339.412	113.71	122.02
400.0	27306.4	30632.2	342.533	116.22	124.54
410.0	28481.1	31890.1	345.639	118.72	127.04
420.0	29680.7	33172.8	348.730	121.20	129.51
430.0	30905.0	34480.2	351.806	123.65	131.96
440.0	32153.6	35812.0	354.867	126.07	134.39
450.0	33426.4	37167.9	357.914	128.48	136.79
460.0	34723.0	38547.7	360.947	130.85	139.16
470.0	36043.3	39951.1	363.965	133.19	141.51
480.0	37386.8	41377.8	366.969	135.51	143.83
490.0	38753.4	42827.5	369.958	137.80	146.11
500.0	40142.7	44299.9	372.932	140.06	148.37
510.0	41554.4	45794.8	375.893	142.28	150.60
520.0	42988.2	47311.8	378.838	144.48	152.79
530.0	44443.9	48850.6	381.769	146.64	154.96
540.0	45921.0	50410.9	384.686	148.78	157.09
550.0	47419.4	51992.4	387.588	150.88	159.20
560.0	48938.6	53594.7	390.475	152.96	161.27
570.0	50478.4	55217.7	393.347	155.00	163.32
580.0	52038.5	56861.0	396.205	157.01	165.33
590.0	53618.6	58524.2	399.048	159.00	167.31
600.0	55218.4	60207.1	401.877	160.95	169.26
610.0	56837.5	61909.4	404.690	162.87	171.19
620.0	58475.8	63630.8	407.489	164.77	173.08
630.0	60132.8	65371.0	410.274	166.63	174.95
640.0	61808.4	67129.6	413.043	168.47	176.78
650.0	63502.1	68906.6	415.798	170.28	178.59
660.0	65213.9	70701.4	418.539	172.06	180.37
670.0	66943.3	72514.0	421.264	173.81	182.13
680.0	68690.0	74343.9	423.975	175.54	183.86
690.0	70454.0	76191.0	426.672	177.24	185.56
700.0	72234.8	78054.9	429.354	178.91	187.23

Table 12. The heats of vaporization.

N-BUTANE HEATS OF VAPORIZATION, E = .300

(10)DANA, (11)DAS/KULOOR, (29)SAGE/W/L, (35)DAS/R/E,
(40)RDG THERMALOOPS, (41)CLAPEYRON.

.28725885E+02 .18498277E+02 .40071066E+02
-.37359808E+02 0. 0.

ID	WT	T,K	KJ/MOL	CALCD	PCNT
40	1.000	134.860	28.746	28.726	.07
40	.998	140.000	28.499	28.481	.06
40	.995	150.000	28.022	28.013	.03
40	.992	160.000	27.553	27.553	.00
40	.988	170.000	27.090	27.099	-.03
40	.984	180.000	26.635	26.651	-.06
40	.979	190.000	26.186	26.206	-.07
40	.974	200.000	25.742	25.762	-.08
40	.969	210.000	25.301	25.319	-.07
40	.963	220.000	24.861	24.873	-.05
40	.957	230.000	24.417	24.423	-.03
40	.950	240.000	23.965	23.966	-.01
40	.943	250.000	23.503	23.499	.02
40	.934	260.000	23.024	23.020	.02
40	.925	270.000	22.524	22.524	-.00
11	.922	272.660	22.389	22.389	-.00
10	.920	274.970	22.252	22.271	-.09
10	.919	275.520	22.182	22.243	-.27
10	.915	279.730	22.009	22.023	-.06
11	.914	280.000	22.016	22.009	.03
35	.091	280.000	22.037	22.009	.13
10	.909	284.940	21.768	21.746	.10
10	.908	285.790	21.749	21.700	.23
11	.902	290.000	21.481	21.469	.05
35	.090	290.000	21.548	21.469	.37
10	.902	290.480	21.515	21.443	.34
10	.895	295.310	21.240	21.172	.32
10	.892	297.480	21.092	21.047	.21
11	.889	300.000	20.887	20.901	-.07
35	.089	300.000	21.037	20.901	.65
11	.873	310.000	20.251	20.298	-.23
35	.087	310.000	20.510	20.298	1.05
11	.855	320.000	19.581	19.653	-.37
35	.085	320.000	19.933	19.653	1.42
11	.833	330.000	18.903	18.959	-.30
35	.083	330.000	19.255	18.959	1.56
11	.807	340.000	18.184	18.206	-.12
35	.081	340.000	18.477	18.206	1.49
11	.776	350.000	17.405	17.382	.13
35	.078	350.000	17.569	17.382	1.07
11	.737	360.000	16.552	16.471	.49
35	.074	360.000	16.564	16.471	.56
11	.688	370.000	15.573	15.452	.78
35	.069	370.000	15.443	15.452	-.06
11	.623	380.000	14.447	14.294	1.07

Table 12. Continued

N-BUTANE HEATS OF VAPORIZATION, E = .300

ID	WT	T,K	KJ/MOL	CALCD	PCNT
35	.062	380.000	14.209	14.294	-.59
11	.536	390.000	13.138	12.950	1.45
35	.054	390.000	12.837	12.950	-.87
11	.414	400.000	11.506	11.340	1.46
35	.041	400.000	11.209	11.340	-1.16
35	.034	405.000	10.251	10.388	-1.32
11	.247	410.000	9.263	9.288	-.27
35	.025	410.000	9.184	9.288	-1.12
35	.016	415.000	7.895	7.960	-.82
11	.104	420.000	6.138	6.187	-.79
35	.010	420.000	5.916	6.187	-4.38
29	0.000	294.260	21.479	21.231	1.17
29	0.000	310.930	20.382	20.240	.70
29	0.000	327.590	19.120	19.132	-.06
29	0.000	344.260	17.712	17.865	-.86
29	0.000	360.930	16.094	16.381	-1.75
29	0.000	377.590	14.096	14.588	-3.37
29	0.000	394.260	11.622	12.304	-5.54
41	.998	140.000	28.516	28.481	.12
41	.995	150.000	28.029	28.013	.06
41	.991	160.000	27.550	27.553	-.01
41	.986	170.000	27.081	27.099	-.07
41	.982	180.000	26.623	26.651	-.10
41	.977	190.000	26.173	26.206	-.12
41	.971	200.000	25.731	25.762	-.12
41	.966	210.000	25.293	25.319	-.10
41	.959	220.000	24.856	24.873	-.07
41	.952	230.000	24.418	24.423	-.02
41	.945	240.000	23.976	23.966	.04
41	.936	250.000	23.525	23.499	.11
41	.927	260.000	23.061	23.020	.18
41	.917	270.000	22.578	22.524	.24
41	.905	280.000	22.069	22.009	.27
41	.892	290.000	21.528	21.469	.27
41	.876	300.000	20.947	20.901	.22
41	.859	310.000	20.320	20.298	.11
41	.839	320.000	19.642	19.653	-.06
41	.815	330.000	18.909	18.959	-.27
41	.786	340.000	18.116	18.206	-.50
41	.751	350.000	17.258	17.382	-.71
41	.708	360.000	16.326	16.471	-.88
41	.653	370.000	15.305	15.452	-.95
41	.581	380.000	14.168	14.294	-.88
41	.484	390.000	12.872	12.950	-.60
41	.349	400.000	11.331	11.340	-.08
41	.163	410.000	9.351	9.288	.67
41	.004	420.000	6.242	6.187	.89

NP = 85, RMSPCT = .38

TABLE 13. Consistency of specific heats, J/mol/K, at P = 50 bar

Average Temperature T	Range ΔT	Enthalpy Slope ΔH/ΔT	Tabulated Specific Heat C_p
150	20	113.6	113.2
200	20	119.4	119.7
250	20	128.1	127.8
300	20	139.5	139.3
350	20	156.9	157.3
400	20	192.9	196.2
450	20	360.8	356.4
500	30	183.2	184.4
600	40	181.3	181.2

TABLE 14. Comparison of enthalpy differences at T = 480 K

P, atm	$\partial H/\partial P$*	-ΔH, J/mol		
		This Work**	Ref. [11]	Diff., %
1	- 89.1	0	0	
20	-101.8	1769	1758	-0.6
40	-135.9	4149	4138	-0.3
60	-184.8	7457	7480	+0.3
100	- 43.3	11814	11899	0.7
200	- 5.2	13368	13531	1.2
300	+ 0.4	13540	13738	1.5
400	2.7	13357	13584	1.7
500	3.9	13008	13264	2.0
600	4.7	12565	12850	2.3
700	5.2	12061	12377	2.6

* $\partial H/\partial P = [1 - T\cdot(\partial P/\partial T)/(\partial P/\partial \rho)/\rho]\cdot 100/\rho$, J/mol/bar.

**Adjusted from bar to atm.

TABLE 15. Calculated P(T) isochores

The following pages give P(T) along isochores, as computed by the equation of state. The third column DP/DD is the isotherm slope $(\partial P/\partial \rho)$ in units of the bar and mol/L. The last two columns give the isochore slopes and curvatures $\partial P/\partial T$, $\partial^2 P/\partial T^2$, in units of the bar and K.

These tables show that the isochore curvatures are qualitatively consistent with a maximum in the specific heat $C_V(\rho,T)$ at the critical point.

Table 15. Calculated P(T) isochores.

THE ISOCHORE AT .50 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
359.489	11.593	16.813	.0537	-.00009
360.000	11.620	16.881	.0536	-.00009
368.000	12.046	17.929	.0530	-.00007
376.000	12.468	18.953	.0524	-.00006
384.000	12.885	19.957	.0519	-.00006
392.000	13.299	20.945	.0515	-.00005
400.000	13.710	21.918	.0511	-.00005
408.000	14.117	22.879	.0508	-.00004
416.000	14.522	23.828	.0504	-.00004
424.000	14.924	24.767	.0501	-.00004
432.000	15.324	25.696	.0498	-.00003
440.000	15.721	26.616	.0496	-.00003
448.000	16.117	27.528	.0493	-.00003
456.000	16.510	28.432	.0491	-.00003
464.000	16.902	29.329	.0489	-.00003
472.000	17.292	30.220	.0487	-.00002
480.000	17.681	31.104	.0485	-.00002
488.000	18.068	31.983	.0483	-.00002
496.000	18.453	32.856	.0481	-.00002
504.000	18.838	33.724	.0479	-.00002
512.000	19.221	34.587	.0478	-.00002
520.000	19.602	35.445	.0477	-.00002
528.000	19.983	36.299	.0475	-.00002
536.000	20.363	37.149	.0474	-.00002
544.000	20.741	37.996	.0473	-.00001
552.000	21.119	38.838	.0472	-.00001
560.000	21.496	39.678	.0470	-.00001
568.000	21.872	40.514	.0469	-.00001
576.000	22.247	41.347	.0469	-.00001
584.000	22.621	42.177	.0468	-.00001
592.000	22.995	43.005	.0467	-.00001
600.000	23.368	43.830	.0466	-.00001
608.000	23.741	44.652	.0465	-.00001
616.000	24.113	45.473	.0464	-.00001
624.000	24.484	46.291	.0464	-.00001
632.000	24.854	47.107	.0463	-.00001
640.000	25.225	47.921	.0462	-.00001
648.000	25.594	48.733	.0462	-.00001
656.000	25.964	49.543	.0461	-.00001
664.000	26.332	50.352	.0461	-.00001
672.000	26.701	51.159	.0460	-.00001
680.000	27.069	51.965	.0460	-.00001
688.000	27.436	52.769	.0459	-.00001
696.000	27.803	53.571	.0459	-.00001

Table 15. Continued

THE ISOCHORE AT 1.00 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
390.588	21.123	11.130	.1231	-.00032
392.000	21.297	11.363	.1227	-.00030
400.000	22.269	12.645	.1206	-.00023
408.000	23.227	13.883	.1189	-.00020
416.000	24.172	15.091	.1174	-.00017
424.000	25.106	16.274	.1161	-.00015
432.000	26.030	17.436	.1149	-.00014
440.000	26.945	18.580	.1139	-.00013
448.000	27.852	19.708	.1129	-.00012
456.000	28.752	20.822	.1120	-.00011
464.000	29.644	21.923	.1112	-.00010
472.000	30.530	23.012	.1104	-.00009
480.000	31.411	24.090	.1097	-.00009
488.000	32.285	25.158	.1090	-.00008
496.000	33.155	26.217	.1084	-.00008
504.000	34.019	27.267	.1078	-.00007
512.000	34.879	28.308	.1072	-.00007
520.000	35.735	29.342	.1067	-.00006
528.000	36.586	30.369	.1062	-.00006
536.000	37.434	31.388	.1057	-.00006
544.000	38.278	32.402	.1053	-.00005
552.000	39.119	33.410	.1049	-.00005
560.000	39.957	34.412	.1045	-.00005
568.000	40.791	35.409	.1041	-.00004
576.000	41.623	36.400	.1038	-.00004
584.000	42.452	37.387	.1035	-.00004
592.000	43.278	38.370	.1032	-.00004
600.000	44.103	39.349	.1029	-.00004
608.000	44.924	40.323	.1026	-.00003
616.000	45.744	41.294	.1023	-.00003
624.000	46.562	42.261	.1021	-.00003
632.000	47.377	43.225	.1018	-.00003
640.000	48.191	44.185	.1016	-.00003
648.000	49.003	45.143	.1014	-.00003
656.000	49.813	46.097	.1012	-.00002
664.000	50.622	47.049	.1010	-.00002
672.000	51.429	47.998	.1008	-.00002
680.000	52.235	48.945	.1006	-.00002
688.000	53.040	49.889	.1005	-.00002
696.000	53.843	50.831	.1003	-.00002

Table 15. Continued

THE ISOCHORE AT 2.00 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
416.549	32.935	3.490	.2944	-.00173
424.000	35.093	4.954	.2860	-.00080
432.000	37.359	6.433	.2807	-.00057
440.000	39.588	7.873	.2766	-.00046
448.000	41.787	9.289	.2732	-.00039
456.000	43.960	10.688	.2703	-.00035
464.000	46.112	12.072	.2676	-.00031
472.000	48.243	13.445	.2653	-.00028
480.000	50.356	14.807	.2631	-.00026
488.000	52.453	16.159	.2611	-.00024
496.000	54.534	17.504	.2592	-.00022
504.000	56.601	18.841	.2575	-.00021
512.000	58.655	20.171	.2559	-.00019
520.000	60.696	21.494	.2544	-.00018
528.000	62.726	22.812	.2530	-.00017
536.000	64.745	24.124	.2517	-.00016
544.000	66.754	25.431	.2505	-.00015
552.000	68.754	26.733	.2494	-.00014
560.000	70.744	28.031	.2483	-.00013
568.000	72.726	29.324	.2472	-.00012
576.000	74.700	30.613	.2463	-.00012
584.000	76.667	31.898	.2454	-.00011
592.000	78.626	33.179	.2445	-.00011
600.000	80.579	34.458	.2437	-.00010
608.000	82.525	35.732	.2429	-.00009
616.000	84.465	37.004	.2422	-.00009
624.000	86.399	38.273	.2415	-.00009
632.000	88.328	39.538	.2408	-.00008
640.000	90.252	40.801	.2402	-.00008
648.000	92.171	42.062	.2396	-.00007
656.000	94.085	43.320	.2390	-.00007
664.000	95.995	44.575	.2384	-.00007
672.000	97.900	45.828	.2379	-.00006
680.000	99.802	47.079	.2374	-.00006
688.000	101.699	48.328	.2370	-.00006
696.000	103.593	49.575	.2365	-.00005

Table 15. Continued

THE ISOCHORE AT 3.00 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
424.266	37.403	.406	.4843	-.01257
432.000	41.049	1.840	.4656	-.00098
440.000	44.748	3.307	.4596	-.00061
448.000	48.408	4.789	.4554	-.00047
456.000	52.037	6.285	.4520	-.00039
464.000	55.640	7.794	.4490	-.00034
472.000	59.222	9.314	.4464	-.00031
480.000	62.784	10.844	.4441	-.00028
488.000	66.328	12.383	.4419	-.00026
496.000	69.855	13.931	.4400	-.00024
504.000	73.367	15.485	.4381	-.00022
512.000	76.866	17.047	.4365	-.00020
520.000	80.351	18.615	.4349	-.00019
528.000	83.824	20.189	.4334	-.00018
536.000	87.285	21.768	.4320	-.00017
544.000	90.736	23.352	.4307	-.00016
552.000	94.176	24.940	.4294	-.00015
560.000	97.607	26.532	.4282	-.00014
568.000	101.028	28.128	.4271	-.00014
576.000	104.441	29.728	.4261	-.00013
584.000	107.845	31.331	.4251	-.00012
592.000	111.242	32.936	.4241	-.00012
600.000	114.631	34.545	.4232	-.00011
608.000	118.013	36.155	.4223	-.00011
616.000	121.388	37.768	.4215	-.00010
624.000	124.756	39.383	.4207	-.00010
632.000	128.119	41.000	.4199	-.00009
640.000	131.475	42.618	.4192	-.00009
648.000	134.826	44.238	.4185	-.00009
656.000	138.171	45.859	.4178	-.00008
664.000	141.511	47.481	.4172	-.00008
672.000	144.846	49.105	.4165	-.00008
680.000	148.176	50.729	.4160	-.00007
688.000	151.501	52.354	.4154	-.00007
696.000	154.822	53.979	.4148	-.00007

Table 15. Continued

THE ISOCHORE AT 3.90 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
425.160	37.961	0.000	.6313	0.00000
432.000	42.279	1.268	.6313	-.00000
440.000	47.330	2.878	.6313	-.00001
448.000	52.380	4.552	.6312	-.00001
456.000	57.429	6.274	.6311	-.00001
464.000	62.478	8.035	.6310	-.00001
472.000	67.525	9.829	.6309	-.00002
480.000	72.572	11.652	.6308	-.00002
488.000	77.618	13.502	.6306	-.00002
496.000	82.662	15.376	.6304	-.00002
504.000	87.705	17.270	.6303	-.00002
512.000	92.746	19.185	.6301	-.00003
520.000	97.786	21.117	.6299	-.00003
528.000	102.824	23.066	.6296	-.00003
536.000	107.860	25.030	.6294	-.00003
544.000	112.894	27.009	.6292	-.00003
552.000	117.926	29.000	.6289	-.00003
560.000	122.957	31.003	.6287	-.00003
568.000	127.985	33.018	.6284	-.00003
576.000	133.011	35.043	.6281	-.00003
584.000	138.034	37.077	.6278	-.00004
592.000	143.056	39.120	.6275	-.00004
600.000	148.075	41.172	.6272	-.00004
608.000	153.092	43.231	.6269	-.00004
616.000	158.106	45.297	.6266	-.00004
624.000	163.118	47.370	.6263	-.00004
632.000	168.128	49.448	.6260	-.00004
640.000	173.135	51.532	.6257	-.00004
648.000	178.139	53.621	.6254	-.00004
656.000	183.141	55.715	.6251	-.00004
664.000	188.140	57.814	.6247	-.00004
672.000	193.136	59.916	.6244	-.00004
680.000	198.130	62.022	.6241	-.00004
688.000	203.121	64.131	.6237	-.00004
696.000	208.110	66.243	.6234	-.00004

Table 15. Continued

THE ISOCHORE AT 5.00 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
423.737	37.077	.997	.8858	.01185
424.000	37.311	1.098	.8885	.00916
432.000	44.542	3.914	.9126	.00151
440.000	51.884	6.718	.9221	.00097
448.000	59.288	9.550	.9288	.00075
456.000	66.741	12.407	.9343	.00062
464.000	74.234	15.287	.9388	.00053
472.000	81.761	18.187	.9428	.00047
480.000	89.318	21.105	.9463	.00041
488.000	96.901	24.040	.9494	.00037
496.000	104.508	26.990	.9522	.00033
504.000	112.136	29.953	.9548	.00030
512.000	119.784	32.928	.9570	.00027
520.000	127.448	35.914	.9591	.00024
528.000	135.129	38.911	.9610	.00022
536.000	142.823	41.917	.9626	.00020
544.000	150.530	44.931	.9642	.00018
552.000	158.249	47.953	.9655	.00016
560.000	165.979	50.982	.9668	.00015
568.000	173.717	54.018	.9679	.00013
576.000	181.465	57.059	.9689	.00012
584.000	189.220	60.106	.9698	.00011
592.000	196.981	63.157	.9706	.00009
600.000	204.749	66.212	.9713	.00008
608.000	212.521	69.271	.9719	.00007
616.000	220.299	72.334	.9724	.00006
624.000	228.080	75.400	.9729	.00005
632.000	235.865	78.468	.9733	.00005
640.000	243.653	81.539	.9736	.00004
648.000	251.443	84.611	.9739	.00003
656.000	259.235	87.686	.9741	.00002
664.000	267.028	90.761	.9743	.00002
672.000	274.823	93.838	.9744	.00001
680.000	282.618	96.916	.9744	.00000
688.000	290.414	99.994	.9744	-.00000
696.000	298.209	103.073	.9744	-.00001

Table 15. Continued

THE ISOCHORE AT 6.00 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
416.555	32.938	9.196	1.3647	.00259
424.000	43.154	13.865	1.3784	.00140
432.000	54.221	18.759	1.3879	.00101
440.000	65.354	23.597	1.3951	.00082
448.000	76.540	28.397	1.4011	.00069
456.000	87.770	33.170	1.4062	.00060
464.000	99.038	37.921	1.4107	.00052
472.000	110.340	42.652	1.4146	.00046
480.000	121.671	47.365	1.4181	.00041
488.000	133.029	52.063	1.4212	.00037
496.000	144.410	56.747	1.4240	.00033
504.000	155.812	61.417	1.4265	.00029
512.000	167.233	66.075	1.4287	.00026
520.000	178.671	70.720	1.4307	.00023
528.000	190.124	75.354	1.4325	.00021
536.000	201.590	79.977	1.4340	.00018
544.000	213.068	84.590	1.4354	.00016
552.000	224.556	89.192	1.4366	.00014
560.000	236.054	93.785	1.4377	.00012
568.000	247.559	98.368	1.4386	.00011
576.000	259.071	102.942	1.4394	.00009
584.000	270.589	107.507	1.4400	.00008
592.000	282.111	112.064	1.4406	.00006
600.000	293.638	116.612	1.4410	.00005
608.000	305.168	121.152	1.4414	.00004
616.000	316.700	125.683	1.4416	.00003
624.000	328.233	130.207	1.4418	.00001
632.000	339.768	134.723	1.4418	.00000
640.000	351.303	139.231	1.4418	-.00000
648.000	362.837	143.732	1.4418	-.00001
656.000	374.371	148.226	1.4416	-.00002
664.000	385.903	152.713	1.4414	-.00003
672.000	397.434	157.192	1.4412	-.00004
680.000	408.962	161.664	1.4409	-.00004
688.000	420.488	166.130	1.4405	-.00005
696.000	432.010	170.589	1.4401	-.00005

Table 15. Continued

THE ISOCHORE AT 7.00 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
400.627	25.194	35.085	2.1143	.00063
408.000	40.799	41.685	2.1184	.00049
416.000	57.761	48.782	2.1219	.00040
424.000	74.748	55.829	2.1248	.00033
432.000	91.756	62.834	2.1271	.00027
440.000	108.781	69.803	2.1291	.00022
448.000	125.821	76.739	2.1308	.00019
456.000	142.872	83.645	2.1321	.00015
464.000	159.934	90.523	2.1332	.00012
472.000	177.003	97.375	2.1340	.00009
480.000	194.076	104.202	2.1347	.00007
488.000	211.157	111.007	2.1351	.00004
496.000	228.239	117.789	2.1354	.00002
504.000	245.323	124.549	2.1355	.00000
512.000	262.407	131.290	2.1355	-.00001
520.000	279.490	138.011	2.1353	-.00003
528.000	296.572	144.713	2.1350	-.00004
536.000	313.650	151.397	2.1346	-.00006
544.000	330.725	158.063	2.1341	-.00007
552.000	347.796	164.712	2.1335	-.00008
560.000	364.861	171.345	2.1328	-.00009
568.000	381.920	177.961	2.1320	-.00010
576.000	398.972	184.562	2.1311	-.00011
584.000	416.017	191.147	2.1301	-.00012
592.000	433.054	197.718	2.1291	-.00013
600.000	450.083	204.274	2.1280	-.00014
608.000	467.103	210.816	2.1269	-.00015
616.000	484.113	217.344	2.1257	-.00015
624.000	501.114	223.859	2.1245	-.00016
632.000	518.104	230.360	2.1232	-.00017
640.000	535.084	236.849	2.1218	-.00017
648.000	552.053	243.324	2.1204	-.00018
656.000	569.011	249.787	2.1190	-.00018
664.000	585.957	256.238	2.1175	-.00018
672.000	602.892	262.677	2.1160	-.00019
680.000	619.814	269.104	2.1145	-.00019
688.000	636.724	275.519	2.1130	-.00020
696.000	653.621	281.923	2.1114	-.00020

Table 15. Continued

THE ISOCHORE AT 8.00 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
374.499	15.667	90.105	3.1670	.00010
376.000	20.421	91.984	3.1672	.00009
384.000	45.761	101.984	3.1677	.00005
392.000	71.103	111.959	3.1679	.00001
400.000	96.446	121.912	3.1678	-.00003
408.000	121.787	131.843	3.1674	-.00006
416.000	147.124	141.753	3.1668	-.00009
424.000	172.456	151.642	3.1660	-.00012
432.000	197.779	161.510	3.1649	-.00014
440.000	223.094	171.359	3.1637	-.00016
448.000	248.399	181.187	3.1623	-.00018
456.000	273.691	190.996	3.1608	-.00020
464.000	298.971	200.786	3.1591	-.00022
472.000	324.236	210.556	3.1572	-.00024
480.000	349.486	220.307	3.1553	-.00025
488.000	374.720	230.040	3.1532	-.00027
496.000	399.937	239.753	3.1510	-.00028
504.000	425.137	249.448	3.1488	-.00029
512.000	450.317	259.125	3.1464	-.00030
520.000	475.479	268.784	3.1439	-.00031
528.000	500.620	278.424	3.1414	-.00032
536.000	525.741	288.047	3.1388	-.00033
544.000	550.841	297.652	3.1362	-.00034
552.000	575.920	307.239	3.1335	-.00034
560.000	600.977	316.808	3.1307	-.00035
568.000	626.011	326.360	3.1279	-.00036
576.000	651.022	335.895	3.1250	-.00036
584.000	676.010	345.413	3.1221	-.00037
592.000	700.975	354.914	3.1191	-.00037

Table 15. Continued

THE ISOCHORE AT 9.00 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
337.699	7.137	190.740	4.7027	.00001
340.000	17.958	195.069	4.7027	-.00001
344.000	36.769	202.590	4.7026	-.00005
348.000	55.579	210.105	4.7023	-.00008
352.000	74.387	217.613	4.7020	-.00011
356.000	93.194	225.114	4.7015	-.00014
360.000	111.999	232.609	4.7009	-.00016
364.000	130.801	240.097	4.7001	-.00019
368.000	149.600	247.579	4.6993	-.00022
372.000	168.395	255.053	4.6984	-.00024
376.000	187.187	262.521	4.6974	-.00026
380.000	205.975	269.982	4.6963	-.00029
384.000	224.757	277.436	4.6951	-.00031
388.000	243.535	284.883	4.6939	-.00033
392.000	262.308	292.323	4.6925	-.00035
396.000	281.076	299.756	4.6911	-.00036
400.000	299.837	307.181	4.6896	-.00038
404.000	318.592	314.600	4.6881	-.00040
408.000	337.342	322.011	4.6864	-.00041
412.000	356.084	329.415	4.6848	-.00043
416.000	374.820	336.812	4.6830	-.00044
420.000	393.548	344.202	4.6812	-.00046
424.000	412.269	351.584	4.6794	-.00047
428.000	430.983	358.960	4.6774	-.00048
432.000	449.689	366.327	4.6755	-.00050
436.000	468.387	373.688	4.6735	-.00051
440.000	487.077	381.041	4.6714	-.00052
444.000	505.758	388.387	4.6693	-.00053
448.000	524.431	395.725	4.6672	-.00054
452.000	543.096	403.056	4.6650	-.00055
456.000	561.751	410.380	4.6628	-.00056
460.000	580.398	417.696	4.6606	-.00057
464.000	599.036	425.005	4.6583	-.00058
468.000	617.664	432.307	4.6560	-.00058
472.000	636.284	439.601	4.6536	-.00059
476.000	654.893	446.888	4.6512	-.00060
480.000	673.493	454.168	4.6488	-.00061
484.000	692.084	461.440	4.6464	-.00061
488.000	710.664	468.705	4.6439	-.00062

Table 15. Continued

THE ISOCHORE AT 10.00 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
290.716	1.921	362.073	7.0845	.00000
292.000	11.018	365.904	7.0845	-.00002
296.000	39.355	377.826	7.0843	-.00009
300.000	67.692	389.733	7.0838	-.00016
304.000	96.025	401.625	7.0830	-.00022
308.000	124.355	413.501	7.0820	-.00028
312.000	152.681	425.361	7.0807	-.00034
316.000	181.001	437.205	7.0792	-.00040
320.000	209.314	449.034	7.0776	-.00045
324.000	237.621	460.847	7.0757	-.00050
328.000	265.919	472.643	7.0736	-.00054
332.000	294.209	484.424	7.0713	-.00058
336.000	322.490	496.189	7.0689	-.00063
340.000	350.760	507.937	7.0663	-.00067
344.000	379.020	519.670	7.0636	-.00070
348.000	407.269	531.387	7.0607	-.00074
352.000	435.506	543.087	7.0577	-.00077
356.000	463.730	554.771	7.0545	-.00080
360.000	491.942	566.439	7.0513	-.00083
364.000	520.140	578.092	7.0479	-.00086
368.000	548.325	589.728	7.0444	-.00089
372.000	576.495	601.348	7.0407	-.00092
376.000	604.650	612.952	7.0370	-.00094
380.000	632.791	624.540	7.0332	-.00096
384.000	660.916	636.111	7.0293	-.00099
388.000	689.026	647.667	7.0253	-.00101
392.000	717.119	659.207	7.0213	-.00103

Table 15. Continued

THE ISOCHORE AT 11.00 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
235.482	.190	638.500	10.9560	.00000
236.000	5.865	641.069	10.9560	-.00002
238.000	27.777	650.982	10.9559	-.00011
240.000	49.688	660.884	10.9556	-.00020
242.000	71.599	670.776	10.9551	-.00028
244.000	93.509	680.657	10.9544	-.00036
246.000	115.417	690.528	10.9536	-.00044
248.000	137.323	700.388	10.9527	-.00051
250.000	159.227	710.238	10.9516	-.00058
252.000	181.129	720.077	10.9504	-.00065
254.000	203.029	729.905	10.9490	-.00072
256.000	224.925	739.724	10.9475	-.00079
258.000	246.819	749.531	10.9459	-.00085
260.000	268.709	759.329	10.9441	-.00091
262.000	290.595	769.115	10.9422	-.00097
264.000	312.477	778.892	10.9402	-.00103
266.000	334.356	788.658	10.9381	-.00108
268.000	356.230	798.414	10.9359	-.00114
270.000	378.099	808.159	10.9336	-.00119
272.000	399.964	817.894	10.9311	-.00124
274.000	421.824	827.619	10.9286	-.00129
276.000	443.678	837.333	10.9260	-.00133
278.000	465.527	847.038	10.9233	-.00138
280.000	487.371	856.732	10.9205	-.00142
282.000	509.209	866.415	10.9176	-.00147
284.000	531.042	876.089	10.9146	-.00151
286.000	552.868	885.752	10.9116	-.00155
288.000	574.688	895.406	10.9084	-.00159
290.000	596.501	905.049	10.9052	-.00162
292.000	618.308	914.682	10.9019	-.00166
294.000	640.109	924.305	10.8986	-.00170
296.000	661.903	933.918	10.8951	-.00173
298.000	683.690	943.521	10.8916	-.00176
300.000	705.469	953.114	10.8881	-.00180

Table 15. Continued

THE ISOCHORE AT 12.00 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
175.223	.002	1086.262	17.6195	.00000
176.000	13.694	1093.128	17.6195	-.00010
178.000	48.933	1110.778	17.6190	-.00036
180.000	84.170	1128.395	17.6181	-.00061
182.000	119.405	1145.979	17.6166	-.00085
184.000	154.636	1163.530	17.6147	-.00108
186.000	189.863	1181.048	17.6123	-.00129
188.000	225.085	1198.535	17.6095	-.00150
190.000	260.301	1215.989	17.6063	-.00170
192.000	295.510	1233.411	17.6027	-.00189
194.000	330.711	1250.801	17.5987	-.00207
196.000	365.905	1268.160	17.5944	-.00225
198.000	401.089	1285.487	17.5898	-.00241
200.000	436.263	1302.784	17.5848	-.00257
202.000	471.428	1320.049	17.5795	-.00272
204.000	506.581	1337.284	17.5739	-.00287
206.000	541.723	1354.487	17.5680	-.00301
208.000	576.853	1371.661	17.5618	-.00314
210.000	611.970	1388.804	17.5554	-.00327
212.000	647.074	1405.917	17.5487	-.00340
214.000	682.165	1423.001	17.5418	-.00351
216.000	717.242	1440.055	17.5347	-.00363

THE ISOCHORE AT 12.65 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
134.860	.000	1548.106	24.8035	.00000
136.000	28.276	1563.786	24.8033	-.00037
137.000	53.079	1577.520	24.8028	-.00068
138.000	77.881	1591.233	24.8020	-.00098
139.000	102.683	1604.926	24.8009	-.00127
140.000	127.483	1618.599	24.7994	-.00156
141.000	152.282	1632.253	24.7977	-.00183
142.000	177.079	1645.887	24.7958	-.00210
143.000	201.873	1659.501	24.7935	-.00236
144.000	226.666	1673.096	24.7911	-.00262
145.000	251.455	1686.671	24.7883	-.00286
146.000	276.242	1700.227	24.7853	-.00310
147.000	301.026	1713.764	24.7821	-.00333
148.000	325.806	1727.282	24.7787	-.00356
149.000	350.583	1740.781	24.7750	-.00378
150.000	375.356	1754.261	24.7711	-.00399
151.000	400.125	1767.722	24.7670	-.00420
152.000	424.890	1781.165	24.7627	-.00440
153.000	449.651	1794.589	24.7582	-.00460
154.000	474.406	1807.995	24.7535	-.00479
155.000	499.157	1821.382	24.7486	-.00497
156.000	523.904	1834.751	24.7436	-.00515
157.000	548.645	1848.102	24.7383	-.00533
158.000	573.380	1861.435	24.7329	-.00550
159.000	598.110	1874.750	24.7273	-.00566
160.000	622.835	1888.047	24.7216	-.00582
161.000	647.553	1901.326	24.7157	-.00598
162.000	672.266	1914.587	24.7096	-.00613
163.000	696.973	1927.831	24.7034	-.00628

TABLE 16. Calculated $P(\rho)$ isotherms

The following pages give $P(\rho)$ isotherms, as computed by the equation of state (6). The third column DP/DD is the isotherm slope $(\partial P/\partial \rho)$ in units of the bar and mol/L. The last two columns give the isochore slopes and curvatures, DP/DT $\equiv (\partial P/\partial T)$, D2P/DT2 $\equiv (\partial^2 P/\partial T^2)$ in units of the bar and kelvins.

These tables show that $\partial P/\partial \rho$ is non-negative, and that it increases monotonically with density.

Table 16. Calculated P(ρ) isotherms.

THE ISOTHERM AT 140.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.000	.000	11.640	.0000	-.000000
12.568	.000	1478.044	23.7032	.000000
12.570	3.535	1481.952	23.7342	-.000043
12.580	18.438	1498.416	23.8643	-.000225
12.590	33.505	1515.052	23.9954	-.000409
12.600	48.740	1531.862	24.1272	-.000595
12.610	64.144	1548.848	24.2599	-.000783
12.620	79.718	1566.012	24.3935	-.000973
12.630	95.465	1583.357	24.5279	-.001166
12.640	111.386	1600.885	24.6633	-.001360
12.650	127.483	1618.599	24.7994	-.001557
12.660	143.758	1636.501	24.9365	-.001756
12.670	160.214	1654.594	25.0745	-.001958
12.680	176.851	1672.880	25.2134	-.002161
12.690	193.672	1691.362	25.3532	-.002368
12.700	210.678	1710.042	25.4939	-.002576
12.710	227.873	1728.923	25.6355	-.002787
12.720	245.257	1748.008	25.7781	-.003000
12.730	262.833	1767.300	25.9216	-.003216
12.740	280.603	1786.802	26.0660	-.003434
12.750	298.569	1806.516	26.2115	-.003654

THE ISOTHERM AT 160.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.000	.000	13.300	.0000	-.000000
12.246	.000	1239.169	19.9760	.000000
12.260	17.337	1257.505	20.1206	-.000161
12.280	42.754	1284.337	20.3308	-.000397
12.300	68.714	1311.685	20.5436	-.000638
12.320	95.225	1339.560	20.7590	-.000884
12.340	122.300	1367.975	20.9770	-.001136
12.360	149.948	1396.941	21.1976	-.001393
12.380	178.181	1426.473	21.4210	-.001656
12.400	207.011	1456.584	21.6470	-.001925
12.420	236.448	1487.288	21.8758	-.002200
12.440	266.506	1518.598	22.1075	-.002481
12.460	297.196	1550.530	22.3420	-.002768
12.480	328.532	1583.100	22.5794	-.003061
12.500	360.525	1616.323	22.8198	-.003361
12.520	393.189	1650.214	23.0632	-.003667
12.540	426.538	1684.793	23.3096	-.003979
12.560	460.585	1720.074	23.5591	-.004299
12.580	495.344	1756.076	23.8118	-.004625
12.600	530.833	1792.820	24.0676	-.004959
12.620	567.063	1830.324	24.3267	-.005299
12.640	604.052	1868.607	24.5891	-.005647
12.660	641.813	1907.689	24.8549	-.006003
12.680	680.364	1947.593	25.1241	-.006366
12.700	719.722	1988.341	25.3967	-.006737

Table 16. Continued

THE ISOTHERM AT 180.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.000	.003	14.945	.0000	-.000000
11.922	.003	1042.451	16.9502	.000000
11.940	18.494	1061.412	17.0989	-.000134
11.960	39.941	1083.346	17.2700	-.000290
11.980	61.830	1105.671	17.4431	-.000450
12.000	84.170	1128.395	17.6181	-.000613
12.020	106.969	1151.526	17.7951	-.000779
12.040	130.234	1175.074	17.9741	-.000949
12.060	153.974	1199.046	18.1552	-.001122
12.080	178.199	1223.452	18.3384	-.001300
12.100	202.915	1248.300	18.5237	-.001481
12.120	228.134	1273.602	18.7111	-.001666
12.140	253.862	1299.366	18.9007	-.001854
12.160	280.111	1325.602	19.0925	-.002047
12.180	306.890	1352.321	19.2866	-.002244
12.200	334.207	1379.534	19.4829	-.002445
12.220	362.074	1407.251	19.6816	-.002650
12.240	390.501	1435.483	19.8825	-.002859
12.260	419.497	1464.244	20.0858	-.003073
12.280	449.074	1493.543	20.2916	-.003291
12.300	479.243	1523.394	20.4997	-.003514
12.320	510.014	1553.810	20.7104	-.003741
12.340	541.399	1584.803	20.9235	-.003973
12.360	573.410	1616.388	21.1392	-.004210
12.380	606.059	1648.577	21.3575	-.004451
12.400	639.357	1681.385	21.5784	-.004698
12.420	673.318	1714.827	21.8020	-.004950
12.440	707.955	1748.919	22.0283	-.005207

Table 16. Continued

THE ISOTHERM AT 200.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.001	.019	16.542	.0001	-.000000
11.595	.019	876.932	14.4508	.000000
11.600	4.233	881.173	14.4840	-.000025
11.620	22.035	899.051	14.6235	-.000129
11.640	40.197	917.229	14.7645	-.000235
11.660	58.726	935.711	14.9070	-.000343
11.680	77.628	954.505	15.0511	-.000454
11.700	96.908	973.616	15.1968	-.000567
11.720	116.575	993.049	15.3440	-.000682
11.740	136.633	1012.812	15.4929	-.000800
11.760	157.089	1032.910	15.6434	-.000920
11.780	177.951	1053.350	15.7955	-.001043
11.800	199.226	1074.138	15.9494	-.001169
11.820	220.919	1095.282	16.1049	-.001296
11.840	243.039	1116.788	16.2621	-.001427
11.860	265.593	1138.664	16.4211	-.001560
11.880	288.588	1160.917	16.5819	-.001696
11.900	312.032	1183.554	16.7444	-.001835
11.920	335.933	1206.583	16.9088	-.001977
11.940	360.298	1230.013	17.0749	-.002121
11.960	385.136	1253.850	17.2430	-.002268
11.980	410.455	1278.104	17.4129	-.002419
12.000	436.263	1302.784	17.5848	-.002572
12.020	462.569	1327.897	17.7585	-.002729
12.040	489.382	1353.453	17.9343	-.002888
12.060	516.711	1379.462	18.1120	-.003051
12.080	544.564	1405.932	18.2918	-.003217
12.100	572.951	1432.874	18.4736	-.003386
12.120	601.882	1460.298	18.6574	-.003559
12.140	631.366	1488.214	18.8434	-.003735
12.160	661.414	1516.633	19.0315	-.003915
12.180	692.035	1545.565	19.2218	-.004098

Table 16. Continued

THE ISOTHERM AT 220.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.004	.078	18.037	.0004	-.000000
11.263	.078	735.202	12.3563	.000000
11.280	12.954	748.013	12.4561	-.000062
11.300	28.064	762.990	12.5723	-.000134
11.320	43.476	778.206	12.6896	-.000208
11.340	59.194	793.666	12.8082	-.000283
11.360	75.224	809.374	12.9281	-.000360
11.380	91.571	825.334	13.0491	-.000438
11.400	108.239	841.551	13.1715	-.000519
11.420	125.235	858.029	13.2952	-.000600
11.440	142.562	874.773	13.4201	-.000684
11.460	160.227	891.788	13.5464	-.000769
11.480	178.236	909.078	13.6740	-.000856
11.500	196.592	926.648	13.8030	-.000945
11.520	215.304	944.504	13.9333	-.001036
11.540	234.375	962.650	14.0651	-.001128
11.560	253.812	981.092	14.1982	-.001222
11.580	273.620	999.835	14.3327	-.001318
11.600	293.807	1018.885	14.4687	-.001416
11.620	314.378	1038.248	14.6062	-.001516
11.640	335.339	1057.928	14.7451	-.001618
11.660	356.697	1077.932	14.8855	-.001722
11.680	378.459	1098.267	15.0274	-.001829
11.700	400.630	1118.938	15.1708	-.001937
11.720	423.218	1139.951	15.3158	-.002047
11.740	446.230	1161.314	15.4624	-.002160
11.760	469.673	1183.032	15.6105	-.002274
11.780	493.554	1205.113	15.7603	-.002391
11.800	517.880	1227.564	15.9117	-.002510
11.820	542.659	1250.392	16.0647	-.002632
11.840	567.899	1273.603	16.2194	-.002756
11.860	593.606	1297.207	16.3758	-.002882
11.880	619.789	1321.210	16.5339	-.003011
11.900	646.457	1345.620	16.6937	-.003142
11.920	673.617	1370.446	16.8553	-.003275
11.940	701.278	1395.695	17.0187	-.003412

Table 16. Continued

THE ISOTHERM AT 250.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.019	.392	19.923	.0016	-.000000
10.748	.392	556.404	9.7871	.000000
10.760	6.979	562.961	9.8383	-.000024
10.800	29.949	585.687	10.0148	-.000108
10.840	53.843	609.112	10.1947	-.000195
10.880	78.688	633.256	10.3783	-.000286
10.920	104.513	658.142	10.5656	-.000381
10.960	131.349	683.795	10.7567	-.000480
11.000	159.227	710.238	10.9516	-.000583
11.040	188.179	737.496	11.1505	-.000690
11.080	218.238	765.597	11.3534	-.000802
11.120	249.439	794.568	11.5605	-.000918
11.160	281.816	824.436	11.7717	-.001038
11.200	315.405	855.233	11.9873	-.001163
11.240	350.246	886.988	12.2074	-.001294
11.280	386.378	919.736	12.4320	-.001429
11.320	423.839	953.508	12.6612	-.001569
11.360	462.673	988.340	12.8951	-.001715
11.400	502.921	1024.269	13.1339	-.001867
11.440	544.629	1061.332	13.3777	-.002024
11.480	587.844	1099.571	13.6265	-.002187
11.520	632.611	1139.027	13.8806	-.002356
11.560	678.983	1179.743	14.1400	-.002532

Table 16. Continued

THE ISOTHERM AT 300.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.040	.969	23.549	.0034	-.000001
.080	1.884	22.208	.0071	-.000003
.112	2.581	21.106	.0102	-.000006
9.817	2.581	324.098	6.5623	.000000
9.840	10.059	331.810	6.6250	-.000018
9.880	23.607	345.658	6.7365	-.000052
9.920	37.717	359.920	6.8501	-.000087
9.960	52.406	374.608	6.9659	-.000123
10.000	67.692	389.733	7.0838	-.000161
10.040	83.591	405.308	7.2039	-.000201
10.080	100.122	421.345	7.3262	-.000242
10.120	117.305	437.856	7.4509	-.000285
10.160	135.157	454.855	7.5779	-.000330
10.200	153.700	472.355	7.7074	-.000377
10.240	172.953	490.371	7.8392	-.000425
10.280	192.937	508.917	7.9736	-.000476
10.320	213.673	528.007	8.1106	-.000528
10.360	235.185	547.658	8.2501	-.000583
10.400	257.494	567.885	8.3924	-.000639
10.440	280.623	588.705	8.5373	-.000698
10.480	304.598	610.134	8.6851	-.000759
10.520	329.442	632.191	8.8357	-.000823
10.560	355.182	654.893	8.9891	-.000889
10.600	381.843	678.259	9.1456	-.000957
10.640	409.452	702.309	9.3051	-.001028
10.680	438.037	727.062	9.4676	-.001102
10.720	467.626	752.541	9.6334	-.001178
10.760	498.250	778.766	9.8024	-.001257
10.800	529.938	805.761	9.9746	-.001339
10.840	562.721	833.547	10.1503	-.001424
10.880	596.633	862.150	10.3294	-.001512
10.920	631.705	891.595	10.5120	-.001603
10.960	667.972	921.907	10.6982	-.001697
11.000	705.469	953.114	10.8881	-.001795

Table 16. Continued

THE ISOTHERM AT 350.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.080	2.235	26.829	.0070	-.000002
.160	4.291	24.570	.0146	-.000007
.240	6.167	22.347	.0228	-.000017
.320	7.868	20.189	.0318	-.000033
.400	9.399	18.089	.0414	-.000060
.403	9.457	18.005	.0418	-.000061
8.696	9.457	154.000	4.1672	.000017
8.720	13.166	158.206	4.2066	.000009
8.800	26.406	172.933	4.3423	-.000018
8.880	40.860	188.573	4.4826	-.000047
8.960	56.603	205.178	4.6277	-.000077
9.040	73.715	222.802	4.7779	-.000110
9.120	92.280	241.501	4.9333	-.000145
9.200	112.386	261.332	5.0942	-.000182
9.280	134.125	282.359	5.2608	-.000222
9.360	157.597	304.646	5.4334	-.000266
9.440	182.904	328.260	5.6121	-.000312
9.520	210.156	353.273	5.7973	-.000363
9.600	239.467	379.761	5.9891	-.000417
9.680	270.959	407.801	6.1880	-.000475
9.760	304.759	437.479	6.3941	-.000538
9.840	341.001	468.881	6.6078	-.000605
9.920	379.828	502.102	6.8294	-.000678
10.000	421.389	537.239	7.0592	-.000755
10.080	465.840	574.397	7.2976	-.000839
10.160	513.349	613.687	7.5448	-.000928
10.240	564.090	655.227	7.8013	-.001024
10.320	618.249	699.142	8.0675	-.001126
10.400	676.020	745.565	8.3438	-.001236

Table 16. Continued

THE ISOTHERM AT 400.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.080	2.582	31.340	.0069	-.000001
.160	5.012	29.431	.0143	-.000005
.240	7.292	27.559	.0222	-.000010
.320	9.424	25.753	.0306	-.000019
.400	11.414	24.013	.0394	-.000029
.480	13.267	22.330	.0487	-.000043
.560	14.988	20.702	.0585	-.000060
.640	16.581	19.125	.0687	-.000080
.720	18.049	17.598	.0795	-.000104
.800	19.398	16.121	.0906	-.000133
.880	20.630	14.694	.1023	-.000167
.960	21.750	13.315	.1144	-.000209
1.040	22.762	11.986	.1269	-.000262
1.120	23.669	10.705	.1400	-.000332
1.200	24.476	9.472	.1536	-.000428
1.249	24.923	8.737	.1623	-.000510
7.030	24.923	36.241	2.1408	.000604
7.040	25.296	36.841	2.1501	.000589
7.120	28.437	41.721	2.2237	.000488
7.200	31.981	46.936	2.2991	.000404
7.280	35.956	52.503	2.3762	.000334
7.360	40.391	58.439	2.4553	.000273
7.440	45.316	64.765	2.5363	.000221
7.520	50.764	71.500	2.6193	.000174
7.600	56.768	78.669	2.7046	.000132
7.680	63.363	86.295	2.7921	.000095
7.760	70.588	94.404	2.8821	.000060
7.840	78.482	103.023	2.9746	.000028
7.920	87.086	112.182	3.0698	-.000001
8.000	96.446	121.912	3.1678	-.000029
8.080	106.608	132.246	3.2687	-.000056
8.160	117.622	143.217	3.3727	-.000082
8.240	129.541	154.863	3.4799	-.000108
8.320	142.419	167.221	3.5905	-.000133
8.400	156.316	180.331	3.7046	-.000158
8.480	171.293	194.234	3.8224	-.000184
8.560	187.416	208.976	3.9440	-.000211
8.640	204.753	224.601	4.0697	-.000239
8.720	223.377	241.157	4.1995	-.000267
8.800	243.364	258.694	4.3337	-.000298
8.880	264.796	277.265	4.4725	-.000329
8.960	287.756	296.925	4.6160	-.000363
9.040	312.334	317.731	4.7645	-.000399
9.120	338.625	339.744	4.9181	-.000437
9.200	366.727	363.027	5.0770	-.000477
9.280	396.745	387.647	5.2415	-.000521
9.360	428.788	413.674	5.4118	-.000567
9.440	462.972	441.181	5.5881	-.000616
9.520	499.419	470.245	5.7707	-.000668
9.600	538.255	500.949	5.9599	-.000724
9.680	579.617	533.378	6.1558	-.000783
9.760	623.644	567.623	6.3587	-.000847
9.840	670.487	603.780	6.5690	-.000914

Table 16. Continued

THE ISOTHERM AT 425.16 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.160	5.371	31.818	.0142	-.000004
.320	10.187	28.426	.0301	-.000015
.480	14.480	25.280	.0478	-.000034
.640	18.288	22.344	.0670	-.000061
.800	21.641	19.602	.0878	-.000095
.960	24.571	17.051	.1101	-.000139
1.120	27.107	14.692	.1338	-.000192
1.280	29.282	12.528	.1589	-.000255
1.440	31.127	10.559	.1852	-.000331
1.600	32.672	8.784	.2126	-.000423
1.760	33.948	7.201	.2410	-.000534
1.920	34.986	5.803	.2702	-.000672
2.080	35.814	4.584	.3002	-.000845
2.240	36.462	3.536	.3307	-.001071
2.400	36.954	2.649	.3616	-.001373
2.560	37.318	1.914	.3927	-.001796
2.720	37.574	1.319	.4238	-.002417
2.880	37.747	.855	.4548	-.003381
3.040	37.854	.510	.4855	-.004988
3.200	37.916	.270	.5157	-.007933
3.360	37.946	.120	.5452	-.014101
3.520	37.958	.039	.5737	-.030148
3.680	37.961	.007	.6007	-.094319
3.840	37.961	.000	.6249	-1.262098
4.000	37.961	.001	.6437	.414228
4.160	37.962	.014	.6711	.067752
4.320	37.968	.065	.7034	.027772
4.480	37.986	.182	.7404	.015293
4.640	38.032	.403	.7822	.009772
4.800	38.123	.771	.8292	.006830
4.960	38.289	1.340	.8819	.005066
5.120	38.566	2.171	.9405	.003917
5.280	39.001	3.328	1.0054	.003120
5.440	39.652	4.885	1.0769	.002536
5.600	40.590	6.917	1.1550	.002090
5.760	41.895	9.501	1.2399	.001736
5.920	43.664	12.713	1.3316	.001446
6.080	46.001	16.631	1.4301	.001203
6.240	49.027	21.332	1.5352	.000994
6.400	52.873	26.891	1.6469	.000814
6.560	57.683	33.390	1.7653	.000656
6.720	63.613	40.915	1.8902	.000518
6.880	70.835	49.562	2.0219	.000398
7.040	79.538	59.439	2.1605	.000292
7.200	89.928	70.672	2.3064	.000201
7.360	102.233	83.407	2.4600	.000120
7.520	116.707	97.810	2.6220	.000050
7.680	133.632	114.075	2.7931	-.000012
7.840	153.321	132.415	2.9741	-.000068
8.000	176.128	153.074	3.1658	-.000121
8.160	202.443	176.319	3.3694	-.000171
8.320	232.704	202.444	3.5860	-.000221
8.480	267.396	231.772	3.8166	-.000273
8.640	307.060	264.658	4.0625	-.000329
8.800	352.297	301.489	4.3250	-.000389
8.960	403.770	342.688	4.6057	-.000456
9.120	462.215	388.723	4.9058	-.000531
9.280	528.446	440.107	5.2272	-.000616
9.440	603.364	497.407	5.5714	-.000712
9.600	687.965	561.252	5.9404	-.000820

Table 16. Continued

THE ISOTHERM AT 450.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.320	10.931	31.005	.0298	-.000012
.640	19.935	25.401	.0657	-.000048
.960	27.267	20.545	.1071	-.000106
1.280	33.160	16.405	.1536	-.000182
1.600	37.842	12.977	.2043	-.000270
1.920	41.538	10.228	.2585	-.000360
2.240	44.455	8.099	.3151	-.000436
2.560	46.780	6.522	.3731	-.000479
2.880	48.682	5.444	.4321	-.000468
3.200	50.314	4.834	.4920	-.000390
3.520	51.824	4.671	.5536	-.000247
3.840	53.346	4.900	.6185	-.000051
4.160	54.994	5.464	.6892	.000179
4.480	56.900	6.561	.7693	.000413
4.800	59.281	8.488	.8629	.000615
5.120	62.456	11.584	.9745	.000749
5.440	66.862	16.248	1.1082	.000792
5.760	73.071	22.938	1.2665	.000745
6.080	81.813	32.168	1.4511	.000629
6.400	93.990	44.508	1.6622	.000475
6.720	110.700	60.622	1.9002	.000312
7.040	133.278	81.345	2.1659	.000158
7.360	163.366	107.759	2.4618	.000025
7.680	203.000	141.270	2.7918	-.000089
8.000	254.723	183.641	3.1620	-.000189
8.320	321.703	237.022	3.5796	-.000288
8.640	407.864	303.982	4.0534	-.000397
8.960	518.026	387.593	4.5934	-.000526
9.280	658.091	491.550	5.2109	-.000686

Table 16. Continued

THE ISOTHERM AT 500.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.320	12.408	36.062	.0293	-.000008
.640	23.165	31.295	.0637	-.000032
.960	32.509	27.209	.1029	-.000069
1.280	40.646	23.757	.1464	-.000113
1.600	47.779	20.920	.1940	-.000161
1.920	54.096	18.656	.2451	-.000205
2.240	59.774	16.911	.2993	-.000237
2.560	64.971	15.647	.3563	-.000250
2.880	69.839	14.866	.4159	-.000239
3.200	74.542	14.622	.4786	-.000200
3.520	79.264	14.997	.5449	-.000133
3.840	84.212	16.047	.6163	-.000042
4.160	89.610	17.832	.6946	.000064
4.480	95.737	20.670	.7824	.000172
4.800	102.991	24.934	.8828	.000268
5.120	111.882	30.952	.9993	.000336
5.440	123.020	39.030	1.1348	.000365
5.760	137.114	49.477	1.2920	.000349
6.080	154.977	62.660	1.4728	.000293
6.400	177.559	79.067	1.6784	.000207
6.720	205.998	99.400	1.9100	.000106
7.040	241.697	124.636	2.1695	.000001
7.360	286.426	156.086	2.4596	-.000099
7.680	342.430	195.408	2.7845	-.000193
8.000	412.539	244.603	3.1499	-.000284
8.320	500.280	306.030	3.5627	-.000380
8.640	609.996	382.452	4.0311	-.000488

THE ISOTHERM AT 550.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.320	13.863	40.989	.0289	-.000006
.640	26.313	36.945	.0623	-.000022
.960	37.575	33.542	.1000	-.000047
1.280	47.843	30.729	.1417	-.000077
1.600	57.302	28.483	.1874	-.000108
1.920	66.128	26.762	.2367	-.000136
2.240	74.481	25.523	.2897	-.000157
2.560	82.512	24.751	.3461	-.000166
2.880	90.376	24.489	.4062	-.000160
3.200	98.251	24.847	.4703	-.000137
3.520	106.360	25.977	.5393	-.000097
3.840	114.973	28.012	.6142	-.000043
4.160	124.398	31.094	.6966	.000020
4.480	135.030	35.638	.7886	.000085
4.800	147.407	42.067	.8927	.000141
5.120	162.190	50.720	1.0118	.000179
5.440	180.133	61.858	1.1483	.000192
5.760	202.068	75.708	1.3047	.000177
6.080	228.906	92.556	1.4831	.000134
6.400	261.671	112.855	1.6850	.000070
6.720	301.578	137.340	1.9122	-.000008
7.040	350.131	167.108	2.1671	-.000091
7.360	409.249	203.649	2.4527	-.000174
7.680	481.387	248.825	2.7732	-.000257
8.000	569.652	304.844	3.1341	-.000342
8.320	677.914	374.253	3.5422	-.000434

Table 16. Continued

THE ISOTHERM AT 600.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.320	15.303	45.824	.0287	-.000004
.640	29.405	42.428	.0614	-.000016
.960	42.523	39.655	.0980	-.000033
1.280	54.845	37.454	.1385	-.000054
1.600	66.552	35.803	.1829	-.000076
1.920	77.814	34.666	.2310	-.000096
2.240	88.789	34.010	.2831	-.000110
2.560	99.632	33.839	.3391	-.000118
2.880	110.505	34.226	.3994	-.000115
3.200	121.612	35.325	.4644	-.000102
3.520	133.211	37.339	.5349	-.000078
3.840	145.627	40.453	.6120	-.000044
4.160	159.239	44.878	.6969	-.000005
4.480	174.541	51.101	.7915	.000034
4.800	192.186	59.592	.8978	.000068
5.120	212.960	70.704	1.0183	.000088
5.440	237.742	84.678	1.1552	.000091
5.760	267.479	101.702	1.3108	.000074
6.080	303.182	122.019	1.4872	.000037
6.400	345.968	146.073	1.6862	-.000015
6.720	397.148	174.641	1.9100	-.000079
7.040	458.346	208.924	2.1610	-.000148
7.360	531.643	250.561	2.4427	-.000220
7.680	619.706	301.591	2.7593	-.000296

THE ISOTHERM AT 700.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.320	18.154	55.317	.0284	-.000002
.640	35.479	53.075	.0602	-.000008
.960	52.189	51.462	.0956	-.000017
1.280	68.477	50.437	.1346	-.000028
1.600	84.530	49.987	.1773	-.000040
1.920	100.528	50.088	.2240	-.000051
2.240	116.644	50.729	.2749	-.000060
2.560	133.055	51.946	.3302	-.000066
2.880	149.963	53.856	.3906	-.000067
3.200	167.620	56.673	.4564	-.000064
3.520	186.359	60.668	.5284	-.000056
3.840	206.601	66.103	.6075	-.000045
4.160	228.848	73.278	.6949	-.000032
4.480	253.750	82.797	.7918	-.000019
4.800	282.147	95.207	.9001	-.000010
5.120	315.033	110.902	1.0216	-.000008
5.440	353.502	130.130	1.1582	-.000016
5.760	398.711	153.059	1.3120	-.000035
6.080	451.878	179.920	1.4851	-.000065
6.400	514.328	211.185	1.6795	-.000106
6.720	587.598	247.734	1.8978	-.000154
7.040	673.586	290.947	2.1428	-.000208

Table 17. The Joule-Thomson inversion locus.

THE JOULE-THOMSON INVERSION LOCUS FOR N-BUTANE

T,K	P,BAR	MOL/L	T,K	P,BAR	MOL/L
350	26.1	8.80	610	388.8	6.56
360	53.7	8.71	620	393.0	6.48
370	79.9	8.62	630	396.9	6.40
380	104.7	8.54	640	400.7	6.32
390	128.2	8.45	650	404.3	6.25
400	150.5	8.37	660	407.8	6.18
410	171.5	8.28	670	411.2	6.10
420	191.4	8.20	680	414.6	6.03
430	210.1	8.11	690	417.9	5.97
440	227.7	8.03	700	421.1	5.90
450	244.2	7.94	710	424.2	5.84
460	259.7	7.86	720	427.3	5.77
470	274.1	7.77	730	430.3	5.71
480	287.5	7.68	740	433.2	5.65
490	300.0	7.60	750	436.0	5.60
500	311.5	7.51	760	438.8	5.54
510	322.1	7.43	770	441.4	5.48
520	331.8	7.34	780	443.9	5.43
530	340.7	7.25	790	446.3	5.37
540	348.7	7.16	800	448.6	5.32
550	356.1	7.08	810	450.8	5.27
560	362.8	6.99	820	452.9	5.21
570	368.9	6.90	830	454.8	5.16
580	374.5	6.81	840	456.5	5.11
590	379.7	6.73	850	458.1	5.06
600	384.4	6.65	860	459.6	5.01

TABLE 18. Thermophysical properties of the saturated liquid

This table was computed along paths described in section 3.0. Column headings have the following interpretations--

DPS/DT	$\equiv$	dP_σ/dT, vapor pressure,
DDL/DT	$\equiv$	$d\rho_\ell/dT$, saturated liquid,
DP/DT	$\equiv$	$(\partial P/\partial T)$, single phase,
DP/DD	$\equiv$	$(\partial P/\partial \rho)$, single phase,
Q,VAP	$\equiv$	ΔH_{vap}, heat of vaporization,
CV	$\equiv$	$C_v(\rho,T)$,
CS	$\equiv$	$C_\sigma(T)$,
CP	$\equiv$	$C_p(\rho,T)$,
W	$\equiv$	speed of sound.

Table 18. Thermophysical properties of the saturated fluid.

PROPERTIES OF SATURATED LIQUID N-BUTANE

T DEG K	P BAR	DEN MOL/L	V,LIQ L/MOL	V,GAS L/MOL	DPS/DT BAR/K	DDL/DT MOL/L/K	DP/DT BAR/K	DP/DD BAR-L/MOL	Q,VAP J/MOL
134.860	.6738E-05	12.650	.07905	.1664E+07	.1282E-05	-.01602	24.804	.1548E+04	28725
140.000	.1721E-04	12.568	.07957	.6763E+06	.3012E-05	-.01604	23.703	.1478E+04	28431
145.000	.3992E-04	12.487	.08008	.3020E+06	.6456E-05	-.01605	22.693	.1414E+04	28246
150.000	.8694E-04	12.407	.08060	.1435E+06	.1303E-04	-.01607	21.738	.1352E+04	28012
155.000	.1789E-03	12.327	.08113	.7201E+05	.2490E-04	-.01610	20.834	.1294E+04	27781
160.000	.3501E-03	12.246	.08166	.3800E+05	.4531E-04	-.01612	19.976	.1239E+04	27552
165.000	.6540E-03	12.165	.08220	.2097E+05	.7893E-04	-.01615	19.162	.1187E+04	27325
170.000	.1172E-02	12.085	.08275	.1206E+05	.1321E-03	-.01618	18.388	.1136E+04	27098
175.000	.2022E-02	12.004	.08331	.7194E+04	.2133E-03	-.01622	17.652	.1088E+04	26874
180.000	.3369E-02	11.922	.08388	.4439E+04	.3332E-03	-.01626	16.950	.1042E+04	26650
185.000	.5440E-02	11.841	.08445	.2824E+04	.5052E-03	-.01631	16.281	.9985E+03	26427
190.000	.8535E-02	11.759	.08504	.1848E+04	.7454E-03	-.01636	15.643	.9563E+03	26205
195.000	.1304E-01	11.677	.08564	.1241E+04	.1073E-02	-.01641	15.034	.9158E+03	25983
200.000	.1944E-01	11.595	.08624	.8530E+03	.1508E-02	-.01648	14.451	.8769E+03	25762
205.000	.2835E-01	11.513	.08686	.5992E+03	.2077E-02	-.01655	13.893	.8395E+03	25540
210.000	.4048E-01	11.430	.08749	.4293E+03	.2806E-02	-.01662	13.359	.8035E+03	25319
215.000	.5672E-01	11.346	.08813	.3133E+03	.3724E-02	-.01671	12.847	.7687E+03	25096
220.000	.7808E-01	11.263	.08879	.2325E+03	.4861E-02	-.01680	12.356	.7352E+03	24873
225.000	.1057E+00	11.178	.08946	.1753E+03	.6250E-02	-.01690	11.885	.7028E+03	24649
230.000	.1411E+00	11.094	.09014	.1341E+03	.7924E-02	-.01701	11.432	.6716E+03	24423
235.000	.1855E+00	11.008	.09084	.1039E+03	.9918E-02	-.01713	10.997	.6414E+03	24195
240.000	.2408E+00	10.922	.09156	.8154E+02	.1227E-01	-.01726	10.578	.6121E+03	23966
245.000	.3088E+00	10.836	.09229	.6472E+02	.1500E-01	-.01740	10.175	.5838E+03	23734
250.000	.3915E+00	10.748	.09304	.5193E+02	.1815E-01	-.01756	9.787	.5564E+03	23499
255.000	.4911E+00	10.660	.09381	.4207E+02	.2176E-01	-.01772	9.413	.5298E+03	23261
260.000	.6100E+00	10.571	.09460	.3440E+02	.2585E-01	-.01790	9.052	.5041E+03	23019
265.000	.7505E+00	10.481	.09541	.2837E+02	.3046E-01	-.01810	8.703	.4791E+03	22774
270.000	.9155E+00	10.390	.09625	.2358E+02	.3561E-01	-.01831	8.366	.4549E+03	22524
272.638	.1013E+01	10.341	.09670	.2145E+02	.3855E-01	-.01843	8.193	.4424E+03	22390
280.000	.1330E+01	10.204	.09800	.1664E+02	.4764E-01	-.01879	7.726	.4087E+03	22008
285.000	.1585E+01	10.110	.09891	.1412E+02	.5457E-01	-.01906	7.421	.3865E+03	21742
290.000	.1876E+01	10.014	.09986	.1205E+02	.6213E-01	-.01935	7.126	.3651E+03	21469
295.000	.2207E+01	9.916	.10084	.1034E+02	.7035E-01	-.01966	6.840	.3443E+03	21189
300.000	.2581E+01	9.817	.10186	.8913E+01	.7924E-01	-.02000	6.562	.3241E+03	20900
305.000	.3001E+01	9.716	.10292	.7721E+01	.8883E-01	-.02037	6.293	.3045E+03	20604
310.000	.3471E+01	9.613	.10402	.6717E+01	.9912E-01	-.02077	6.031	.2855E+03	20297
315.000	.3993E+01	9.508	.10517	.5867E+01	.1101E+00	-.02121	5.777	.2672E+03	19981
320.000	.4573E+01	9.401	.10637	.5143E+01	.1219E+00	-.02169	5.529	.2493E+03	19653
325.000	.5213E+01	9.292	.10763	.4524E+01	.1344E+00	-.02221	5.288	.2321E+03	19313
330.000	.5918E+01	9.179	.10894	.3991E+01	.1476E+00	-.02278	5.053	.2154E+03	18959
335.000	.6691E+01	9.064	.11033	.3531E+01	.1616E+00	-.02340	4.824	.1992E+03	18590
340.000	.7535E+01	8.945	.11180	.3132E+01	.1764E+00	-.02409	4.600	.1836E+03	18206
345.000	.8456E+01	8.823	.11335	.2784E+01	.1920E+00	-.02486	4.381	.1685E+03	17804
350.000	.9457E+01	8.696	.11499	.2480E+01	.2085E+00	-.02571	4.167	.1540E+03	17382
355.000	.1054E+02	8.565	.11675	.2213E+01	.2258E+00	-.02666	3.957	.1400E+03	16938
360.000	.1172E+02	8.429	.11863	.1977E+01	.2440E+00	-.02773	3.750	.1265E+03	16471
365.000	.1298E+02	8.288	.12066	.1769E+01	.2631E+00	-.02895	3.547	.1134E+03	15976
370.000	.1435E+02	8.140	.12285	.1583E+01	.2833E+00	-.03035	3.346	.1009E+03	15451
375.000	.1582E+02	7.984	.12525	.1418E+01	.3044E+00	-.03197	3.147	.8892E+02	14892
380.000	.1740E+02	7.820	.12788	.1269E+01	.3267E+00	-.03388	2.949	.7740E+02	14293
385.000	.1909E+02	7.645	.13081	.1135E+01	.3503E+00	-.03617	2.751	.6636E+02	13649
390.000	.2090E+02	7.457	.13410	.1014E+01	.3753E+00	-.03898	2.551	.5582E+02	12950
395.000	.2284E+02	7.254	.13786	.9027E+00	.4019E+00	-.04253	2.349	.4577E+02	12185
400.000	.2492E+02	7.030	.14225	.8006E+00	.4303E+00	-.04720	2.141	.3624E+02	11340
405.000	.2715E+02	6.779	.14752	.7055E+00	.4610E+00	-.05368	1.925	.2727E+02	10387
410.000	.2954E+02	6.488	.15414	.6154E+00	.4945E+00	-.06349	1.696	.1893E+02	9288
415.000	.3210E+02	6.132	.16308	.5275E+00	.5316E+00	-.08068	1.448	.1136E+02	7959
420.000	.3486E+02	5.644	.17718	.4360E+00	.5742E+00	-.12213	1.163	.4825E+01	6186
425.160	.3796E+02	3.900	.25641	.2564E+00	.6313E+00	0.00000	.631	0.	0

Table 18. Continued

PROPERTIES OF SATURATED LIQUID N-BUTANE

T DEG K	P BAR	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CS J/MOL/K	CP J/MOL/K	W M/SEC
134.860	.6738E-05	-.0	-.0	134.011	78.11	111.60	111.60	1950
140.000	.1721E-04	578.5	578.5	138.210	78.53	112.22	112.22	1906
145.000	.3992E-04	1143.8	1143.8	142.170	78.96	112.83	112.83	1864
150.000	.8694E-04	1711.4	1711.4	146.014	79.40	113.45	113.45	1823
155.000	.1789E-03	2281.5	2281.5	149.750	79.86	114.07	114.07	1783
160.000	.3501E-03	2854.0	2854.0	153.385	80.34	114.70	114.70	1744
165.000	.6540E-03	3429.2	3429.2	156.926	80.83	115.33	115.33	1706
170.000	.1172E-02	4007.0	4007.0	160.378	81.34	115.98	115.98	1669
175.000	.2022E-02	4587.6	4587.6	163.748	81.86	116.63	116.63	1633
180.000	.3369E-02	5171.3	5171.3	167.040	82.40	117.30	117.30	1597
185.000	.5440E-02	5758.0	5758.1	170.260	82.95	117.98	117.98	1563
190.000	.8535E-02	6348.1	6348.2	173.412	83.51	118.67	118.67	1529
195.000	.1304E-01	6941.7	6941.8	176.500	84.09	119.38	119.38	1495
200.000	.1944E-01	7538.8	7539.0	179.528	84.69	120.11	120.11	1462
205.000	.2835E-01	8139.8	8140.1	182.499	85.29	120.85	120.86	1430
210.000	.4048E-01	8744.7	8745.1	185.418	85.92	121.61	121.62	1398
215.000	.5672E-01	9353.7	9354.2	188.286	86.55	122.40	122.41	1367
220.000	.7808E-01	9967.0	9967.7	191.108	87.21	123.21	123.22	1336
225.000	.1057E+00	10584.6	10585.6	193.885	87.88	124.04	124.06	1306
230.000	.1411E+00	11206.8	11208.1	196.621	88.56	124.91	124.93	1276
235.000	.1855E+00	11833.7	11835.4	199.317	89.26	125.79	125.83	1247
240.000	.2408E+00	12465.4	12467.7	201.977	89.98	126.71	126.76	1218
245.000	.3088E+00	13102.2	13105.0	204.601	90.71	127.66	127.72	1189
250.000	.3915E+00	13744.1	13747.7	207.193	91.46	128.65	128.72	1160
255.000	.4911E+00	14391.2	14395.8	209.754	92.23	129.67	129.76	1132
260.000	.6100E+00	15043.9	15049.6	212.285	93.02	130.73	130.84	1104
265.000	.7505E+00	15702.1	15709.2	214.789	93.83	131.83	131.96	1076
270.000	.9155E+00	16366.0	16374.8	217.268	94.65	132.97	133.14	1049
272.638	.1013E+01	16718.6	16728.4	218.565	95.10	133.59	133.78	1034
280.000	.1330E+01	17711.5	17724.6	222.153	96.37	135.40	135.64	994
285.000	.1585E+01	18393.6	18409.2	224.564	97.26	136.69	136.99	967
290.000	.1876E+01	19081.9	19100.7	226.955	98.17	138.04	138.39	941
295.000	.2207E+01	19776.9	19799.1	229.327	99.10	139.45	139.87	914
300.000	.2581E+01	20478.5	20504.8	231.683	100.06	140.92	141.42	887
305.000	.3001E+01	21187.2	21218.1	234.024	101.04	142.46	143.05	861
310.000	.3471E+01	21903.4	21939.5	236.352	102.05	144.07	144.78	834
315.000	.3993E+01	22627.0	22669.0	238.668	103.08	145.77	146.60	808
320.000	.4573E+01	23358.9	23407.5	240.974	104.13	147.55	148.53	782
325.000	.5213E+01	24099.1	24155.2	243.272	105.22	149.43	150.58	755
330.000	.5918E+01	24848.5	24912.9	245.564	106.33	151.41	152.76	729
335.000	.6691E+01	25607.7	25681.5	247.852	107.46	153.50	155.10	703
340.000	.7535E+01	26377.1	26461.3	250.138	108.63	155.72	157.60	677
345.000	.8456E+01	27157.6	27253.5	252.424	109.82	158.09	160.30	650
350.000	.9457E+01	27950.2	28059.0	254.713	111.03	160.61	163.22	624
355.000	.1054E+02	28755.7	28878.8	257.008	112.28	163.32	166.41	597
360.000	.1172E+02	29575.3	29714.3	259.312	113.65	166.24	170.00	570
365.000	.1298E+02	30410.2	30566.9	261.627	115.07	169.40	174.01	543
370.000	.1435E+02	31261.7	31438.0	263.957	116.57	172.86	178.52	515
375.000	.1582E+02	32131.3	32329.5	266.306	118.15	176.67	183.67	487
380.000	.1740E+02	33021.2	33243.7	268.679	119.82	180.92	189.65	459
385.000	.1909E+02	33933.4	34183.1	271.081	121.60	185.73	196.72	429
390.000	.2090E+02	34870.7	35151.0	273.520	123.52	191.27	205.31	399
395.000	.2284E+02	35836.7	36151.7	276.004	125.61	197.82	216.09	368
400.000	.2492E+02	36836.6	37191.1	278.545	127.93	205.84	230.29	335
405.000	.2715E+02	37877.1	38277.6	281.164	130.57	216.14	250.32	299
410.000	.2954E+02	38970.7	39426.0	283.892	133.69	230.46	281.78	262
415.000	.3210E+02	40141.5	40665.1	286.795	137.67	253.16	341.43	220
420.000	.3486E+02	41458.0	42075.7	290.058	143.64	301.31	513.53	172
425.160	.3796E+02	44566.2	45539.6	298.092	0.00	0.00	0.00	0

TABLE 19. Thermophysical properties along isobars*.

The following pages give physical and thermodynamic properties along selected isobars, as computed by methods of section 3 of the text.

The first line of each table refers to freezing liquid on the P(T) melting line.

Each table at $P < P_c$ contains a blank line for the transition from saturated liquid to vapor, as seen by the abrupt decrease of density.

Table headings for partial derivatives have the following interprettions--

DP/DT $\equiv \partial P/\partial T$,

DP/DD $\equiv \partial P/\partial \rho$.

The specific heat interpretations are--

CV $\equiv C_v(\rho,T)$,

CP $\equiv C_p(\rho,T)$.

*These tables are extrapolated beyond the range of some of the P-ρ-T data used for adjusting the equation of state. Small discontinuities may be detected at T = 425.16 K along isobars at $P > P_c$ = 37.96 bar, due to change in the paths of computation, section 3.

Table 19. Thermophysical properties along isobars.

N-BUTANE ISOBAR AT P = .10000 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
134.862	12.650	.07905	24.8041	1548.194	.0	.8	134.011	78.11	111.60	1950
140.000	12.568	.07957	23.7041	1478.155	578.4	579.2	138.209	78.53	112.22	1906
150.000	12.407	.08060	21.7390	1352.568	1711.3	1712.1	146.013	79.40	113.45	1823
160.000	12.246	.08166	19.9768	1239.275	2853.9	2854.7	153.384	80.34	114.70	1744
170.000	12.085	.08275	18.3887	1136.432	4006.8	4007.6	160.377	81.34	115.98	1669
180.000	11.923	.08387	16.9510	1042.551	5171.0	5171.9	167.039	82.40	117.30	1597
190.000	11.759	.08504	15.6440	956.418	6347.9	6348.7	173.411	83.51	118.67	1529
200.000	11.595	.08624	14.4515	877.014	7538.7	7539.5	179.527	84.69	120.11	1462
210.000	11.430	.08749	13.3596	803.518	8744.6	8745.4	185.417	85.92	121.62	1398
220.000	11.263	.08879	12.3564	735.225	9966.9	9967.8	191.108	87.21	123.22	1336
224.059	11.194	.08933	11.9722	708.851	10468.0	10468.9	193.366	87.75	123.90	1312
224.059	.00542	184.654	.000453	18.321	33313.8	35160.4	303.567	72.96	81.53	187
230.000	.00527	189.665	.000441	18.829	33751.8	35648.4	305.716	74.22	82.77	190
240.000	.00505	198.086	.000422	19.682	34506.0	36486.9	309.285	76.41	84.94	194
250.000	.00484	206.496	.000405	20.531	35282.4	37347.4	312.797	78.67	87.17	197
260.000	.00465	214.896	.000389	21.379	36081.6	38230.6	316.261	81.00	89.48	201
270.000	.00448	223.288	.000374	22.226	36904.3	39137.2	319.682	83.38	91.85	205
280.000	.00432	231.672	.000360	23.071	37750.9	40067.7	323.065	85.81	94.26	208
290.000	.00417	240.050	.000348	23.914	38622.0	41022.5	326.416	88.28	96.72	212
300.000	.00403	248.422	.000336	24.757	39517.9	42002.1	329.737	90.78	99.21	215
310.000	.00389	256.789	.000325	25.598	40438.9	43006.8	333.031	93.31	101.73	219
320.000	.00377	265.151	.000314	26.439	41385.2	44036.7	336.300	95.85	104.26	222
330.000	.00366	273.510	.000305	27.279	42357.0	45092.1	339.548	98.41	106.81	225
340.000	.00355	281.865	.000296	28.118	43354.3	46173.0	342.774	100.97	109.37	228
350.000	.00345	290.217	.000287	28.956	44377.3	47279.5	345.982	103.54	111.93	232
360.000	.00335	298.567	.000279	29.794	45425.9	48411.5	349.171	106.10	114.49	235
370.000	.00326	306.913	.000271	30.632	46500.0	49569.1	352.342	108.66	117.04	238
380.000	.00317	315.258	.000264	31.469	47599.6	50752.2	355.497	111.20	119.58	241
390.000	.00309	323.600	.000257	32.306	48724.6	51960.6	358.636	113.73	122.10	244
400.000	.00301	331.941	.000251	33.142	49874.8	53194.2	361.759	116.24	124.61	247
410.000	.00294	340.280	.000245	33.978	51050.0	54452.8	364.866	118.74	127.10	250
420.000	.00287	348.617	.000239	34.814	52250.0	55736.2	367.959	121.21	129.57	253
430.000	.00280	356.953	.000233	35.650	53474.7	57044.2	371.037	123.66	132.02	255
440.000	.00274	365.288	.000228	36.485	54723.7	58376.6	374.100	126.09	134.45	258
450.000	.00268	373.621	.000223	37.320	55996.8	59733.0	377.148	128.49	136.84	261
460.000	.00262	381.953	.000218	38.155	57293.8	61113.3	380.182	130.86	139.21	264
470.000	.00256	390.285	.000213	38.989	58614.4	62517.2	383.201	133.21	141.56	266
480.000	.00251	398.615	.000209	39.824	59958.2	63944.4	386.205	135.52	143.87	269
490.000	.00246	406.945	.000204	40.658	61325.1	65394.5	389.195	137.81	146.15	272
500.000	.00241	415.274	.000200	41.492	62714.6	66867.4	392.171	140.07	148.41	275
520.000	.00232	431.929	.000193	43.160	65560.7	69880.0	398.078	144.49	152.83	280
540.000	.00223	448.582	.000185	44.827	68493.9	72979.7	403.927	148.79	157.13	285
560.000	.00215	465.233	.000179	46.494	71511.9	76164.2	409.717	152.96	161.30	290
580.000	.00208	481.882	.000173	48.161	74612.2	79431.0	415.448	157.02	165.36	295
600.000	.00201	498.530	.000167	49.827	77792.3	82777.6	421.121	160.96	169.29	300
620.000	.00194	515.176	.000161	51.493	81050.0	86201.8	426.734	164.77	173.10	305
640.000	.00188	531.821	.000156	53.159	84382.9	89701.1	432.289	168.47	176.81	309
660.000	.00182	548.464	.000152	54.825	87788.6	93273.3	437.785	172.06	180.39	314
680.000	.00177	565.107	.000147	56.490	91265.0	96916.1	443.222	175.54	183.87	319
700.000	.00172	581.748	.000143	58.155	94810.0	100627.5	448.601	178.92	187.25	323

Table 19. Continued

N-BUTANE ISOBAR AT P = .50000 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
134.868	12.650	.07905	24.8061	1548.548	.2	4.2	134.013	78.11	111.60	1951
140.000	12.568	.07957	23.7076	1478.597	577.8	581.8	138.205	78.53	112.22	1906
150.000	12.407	.08060	21.7424	1353.000	1710.6	1714.7	146.009	79.40	113.45	1823
160.000	12.247	.08166	19.9802	1239.698	2853.2	2857.3	153.380	80.34	114.69	1744
170.000	12.085	.08275	18.3920	1136.848	4006.0	4010.2	160.373	81.34	115.97	1669
180.000	11.923	.08387	16.9542	1042.962	5170.2	5174.4	167.035	82.40	117.29	1598
190.000	11.760	.08503	15.6472	956.824	6347.0	6351.3	173.406	83.51	118.67	1529
200.000	11.596	.08624	14.4546	877.416	7537.7	7542.0	179.522	84.69	120.10	1463
210.000	11.430	.08749	13.3627	803.918	8743.5	8747.9	185.412	85.92	121.62	1399
220.000	11.263	.08878	12.3596	735.623	9965.7	9970.2	191.102	87.21	123.22	1337
230.000	11.094	.09014	11.4351	671.942	11205.7	11210.2	196.616	88.56	124.93	1277
240.000	10.923	.09155	10.5804	612.379	12464.5	12469.1	201.973	89.98	126.75	1218
250.000	10.748	.09304	9.7879	556.513	13743.7	13748.3	207.191	91.46	128.72	1160
255.405	10.653	.09387	9.3830	527.728	14443.9	14448.6	209.960	92.30	129.84	1130
255.405	.02417	41.376	.002061	20.196	35621.9	37690.7	300.961	80.22	89.42	196
260.000	.02371	42.178	.002019	20.615	35994.9	38103.8	302.564	81.28	90.42	198
270.000	.02277	43.915	.001934	21.521	36823.5	39019.2	306.019	83.62	92.67	202
280.000	.02191	45.645	.001857	22.418	37675.3	39957.5	309.431	86.03	95.00	206
290.000	.02111	47.367	.001786	23.309	38551.0	40919.3	312.806	88.47	97.38	210
300.000	.02037	49.084	.001721	24.193	39451.0	41905.2	316.148	90.96	99.81	213
310.000	.01969	50.795	.001661	25.072	40375.8	42915.5	319.460	93.47	102.27	217
320.000	.01905	52.502	.001605	25.946	41325.5	43950.6	322.746	96.00	104.76	220
330.000	.01845	54.205	.001553	26.817	42300.5	45010.7	326.008	98.55	107.26	224
340.000	.01789	55.905	.001504	27.684	43300.7	46095.9	329.248	101.10	109.78	227
350.000	.01736	57.601	.001459	28.549	44326.3	47206.4	332.467	103.66	112.31	230
360.000	.01686	59.295	.001416	29.410	45377.3	48342.1	335.666	106.21	114.84	233
370.000	.01640	60.986	.001376	30.269	46453.7	49503.1	338.847	108.76	117.36	237
380.000	.01596	62.675	.001338	31.126	47555.5	50689.2	342.010	111.29	119.87	240
390.000	.01554	64.363	.001302	31.981	48682.4	51900.5	345.156	113.82	122.38	243
400.000	.01514	66.048	.001268	32.834	49834.4	53136.8	348.286	116.33	124.87	246
410.000	.01476	67.732	.001236	33.686	51011.2	54397.8	351.400	118.81	127.34	249
420.000	.01441	69.414	.001205	34.536	52212.8	55683.6	354.498	121.28	129.80	252
430.000	.01407	71.096	.001176	35.385	53438.9	56993.7	357.581	123.73	132.23	255
440.000	.01374	72.776	.001149	36.233	54689.3	58328.1	360.648	126.15	134.64	257
450.000	.01343	74.454	.001123	37.080	55963.7	59686.4	363.701	128.55	137.03	260
460.000	.01314	76.132	.001098	37.926	57261.9	61068.5	366.738	130.91	139.38	263
470.000	.01285	77.809	.001074	38.771	58583.5	62474.0	369.761	133.26	141.72	266
480.000	.01258	79.485	.001051	39.615	59928.4	63902.7	372.769	135.57	144.02	269
490.000	.01232	81.161	.001029	40.458	61296.3	65354.3	375.762	137.85	146.30	271
500.000	.01207	82.836	.001008	41.301	62686.8	66828.5	378.740	140.11	148.54	274
520.000	.01160	86.183	.000968	42.984	65534.5	69843.6	384.652	144.52	152.95	279
540.000	.01117	89.528	.000932	44.666	68469.2	72945.6	390.505	148.82	157.23	284
560.000	.01077	92.872	.000898	46.345	71488.5	76132.1	396.299	152.99	161.40	290
580.000	.01039	96.214	.000867	48.023	74590.0	79400.7	402.033	157.04	165.44	295
600.000	.01004	99.554	.000837	49.700	77771.3	82749.0	407.709	160.98	169.37	299
620.000	.00972	102.893	.000810	51.375	81029.9	86174.6	413.325	164.79	173.18	304
640.000	.00941	106.232	.000784	53.050	84363.6	89675.2	418.881	168.49	176.87	309
660.000	.00913	109.569	.000760	54.723	87770.2	93248.6	424.379	172.08	180.45	314
680.000	.00886	112.905	.000738	56.396	91247.3	96892.6	429.818	175.56	183.93	318
700.000	.00860	116.241	.000717	58.068	94792.9	100605.0	435.198	178.93	187.30	323

Table 19. Continued

N-BUTANE ISOBAR AT P = 1.01325 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
134.877	12.650	.07905	24.8088	1549.003	.5	8.5	134.015	78.11	111.60	1951
140.000	12.568	.07957	23.7121	1479.164	577.1	585.1	138.200	78.53	112.22	1906
150.000	12.408	.08059	21.7468	1353.554	1709.8	1718.0	146.003	79.40	113.44	1824
160.000	12.247	.08165	19.9845	1240.241	2852.3	2860.6	153.374	80.34	114.69	1745
170.000	12.086	.08274	18.3962	1137.382	4005.1	4013.4	160.367	81.34	115.97	1670
180.000	11.923	.08387	16.9583	1043.489	5169.2	5177.7	167.029	82.40	117.29	1598
190.000	11.760	.08503	15.6513	957.345	6345.8	6354.5	173.400	83.51	118.66	1529
200.000	11.596	.08623	14.4587	877.933	7536.4	7545.2	179.515	84.69	120.10	1463
210.000	11.431	.08748	13.3667	804.431	8742.1	8751.0	185.405	85.92	121.61	1399
220.000	11.264	.08878	12.3635	736.135	9964.3	9973.2	191.096	87.21	123.21	1337
230.000	11.095	.09013	11.4391	672.453	11204.0	11213.2	196.609	88.56	124.92	1277
240.000	10.924	.09155	10.5844	612.889	12462.8	12472.0	201.966	89.98	126.74	1218
250.000	10.749	.09303	9.7919	557.024	13741.7	13751.1	207.184	91.46	128.71	1161
260.000	10.572	.09459	9.0549	504.502	15042.2	15051.8	212.279	93.02	130.83	1104
270.000	10.390	.09624	8.3672	455.023	16365.5	16375.3	217.266	94.65	133.13	1049
272.638	10.341	.09670	8.1933	442.444	16718.6	16728.4	218.565	95.10	133.78	1034
272.638	.04662	21.452	.004048	20.868	36945.3	39118.9	300.691	84.62	94.47	200
280.000	.04524	22.106	.003915	21.584	37580.3	39820.2	303.229	86.35	96.06	203
290.000	.04350	22.989	.003749	22.542	38462.7	40792.0	306.639	88.76	98.31	207
300.000	.04190	23.865	.003599	23.486	39368.6	41786.7	310.011	91.21	100.63	211
310.000	.04043	24.735	.003463	24.418	40298.6	42804.8	313.349	93.69	103.01	214
320.000	.03906	25.600	.003337	25.340	41253.0	43846.9	316.658	96.21	105.42	218
330.000	.03779	26.461	.003221	26.253	42232.1	44913.3	319.939	98.73	107.87	222
340.000	.03660	27.319	.003114	27.159	43236.2	46004.3	323.196	101.27	110.33	225
350.000	.03550	28.173	.003014	28.058	44265.3	47119.9	326.430	103.81	112.81	229
360.000	.03445	29.024	.002921	28.951	45319.5	48260.4	329.642	106.35	115.29	232
370.000	.03348	29.873	.002834	29.839	46398.9	49425.7	332.835	108.89	117.78	235
380.000	.03255	30.719	.002752	30.722	47503.3	50615.9	336.009	111.42	120.26	238
390.000	.03168	31.564	.002676	31.601	48632.7	51830.9	339.165	113.93	122.74	242
400.000	.03086	32.407	.002603	32.477	49787.0	53070.6	342.303	116.43	125.20	245
410.000	.03008	33.248	.002535	33.349	50966.0	54334.8	345.425	118.91	127.65	248
420.000	.02934	34.087	.002471	34.219	52169.5	55623.4	348.530	121.37	130.08	251
430.000	.02863	34.926	.002409	35.085	53397.5	56936.3	351.619	123.81	132.49	254
440.000	.02796	35.763	.002351	35.950	54649.6	58273.2	354.693	126.23	134.88	257
450.000	.02732	36.599	.002296	36.812	55925.5	59633.9	357.750	128.62	137.25	259
460.000	.02671	37.434	.002244	37.672	57225.2	61018.2	360.793	130.98	139.60	262
470.000	.02613	38.268	.002193	38.530	58548.2	62425.7	363.820	133.32	141.91	265
480.000	.02557	39.101	.002146	39.387	59894.4	63856.4	366.832	135.63	144.21	268
490.000	.02504	39.934	.002100	40.242	61263.5	65309.8	369.828	137.91	146.47	271
500.000	.02453	40.765	.002056	41.095	62655.1	66785.7	372.810	140.16	148.71	273
520.000	.02357	42.427	.001974	42.799	65504.9	69803.8	378.728	144.57	153.09	279
540.000	.02268	44.087	.001899	44.498	68441.4	72908.5	384.587	148.86	157.36	284
560.000	.02186	45.745	.001829	46.193	71462.4	76097.5	390.385	153.03	161.51	289
580.000	.02110	47.401	.001764	47.886	74565.3	79368.2	396.123	157.07	165.54	294
600.000	.02039	49.056	.001704	49.575	77747.8	82718.4	401.802	161.00	169.46	299
620.000	.01972	50.709	.001648	51.262	81007.6	86145.8	407.420	164.81	173.26	304
640.000	.01910	52.362	.001595	52.947	84342.4	89648.0	412.980	168.51	176.94	309
660.000	.01851	54.014	.001546	54.631	87749.9	93222.8	418.479	172.10	180.52	313
680.000	.01796	55.664	.001500	56.312	91227.9	96868.1	423.920	175.57	183.99	318
700.000	.01745	57.315	.001456	57.993	94774.3	100581.7	429.302	178.94	187.35	323

Table 19. Continued

N-BUTANE ISOBAR AT P = 1.50000 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
134.885	12.651	.07905	24.8113	1549.434	.8	12.6	134.017	78.11	111.60	1951
140.000	12.569	.07956	23.7163	1479.702	576.4	588.3	138.195	78.53	112.22	1907
150.000	12.408	.08059	21.7509	1354.080	1709.1	1721.2	145.998	79.40	113.44	1824
160.000	12.247	.08165	19.9886	1240.756	2851.5	2863.7	153.369	80.34	114.69	1745
170.000	12.086	.08274	18.4002	1137.889	4004.1	4016.6	160.362	81.34	115.97	1670
180.000	11.924	.08387	16.9623	1043.989	5168.2	5180.7	167.023	82.40	117.29	1598
190.000	11.761	.08503	15.6552	957.840	6344.8	6357.5	173.394	83.51	118.66	1530
200.000	11.597	.08623	14.4625	878.423	7535.2	7548.2	179.509	84.69	120.10	1463
210.000	11.432	.08748	13.3705	804.918	8740.8	8754.0	185.399	85.92	121.61	1400
220.000	11.265	.08877	12.3673	736.620	9962.8	9976.2	191.089	87.21	123.21	1338
230.000	11.096	.09013	11.4428	672.937	11202.5	11216.0	196.602	88.56	124.91	1277
240.000	10.924	.09154	10.5882	613.373	12461.1	12474.8	201.959	89.98	126.73	1219
250.000	10.750	.09302	9.7957	557.509	13739.9	13753.8	207.176	91.46	128.70	1161
260.000	10.573	.09458	9.0587	504.989	15040.1	15054.3	212.271	93.02	130.82	1105
270.000	10.391	.09624	8.3710	455.513	16363.3	16377.7	217.258	94.65	133.12	1049
280.000	10.205	.09799	7.7274	408.826	17710.7	17725.4	222.150	96.37	135.64	994
283.409	10.140	.09862	7.5171	393.503	18175.9	18190.7	223.799	96.97	136.55	976
283.409	.06726	14.868	.005930	21.100	37788.4	40018.7	300.818	87.51	97.95	201
290.000	.06546	15.276	.005747	21.777	38377.3	40668.7	303.086	89.06	99.32	204
300.000	.06294	15.888	.005496	22.785	39289.5	41672.7	306.489	91.47	101.51	208
310.000	.06063	16.494	.005270	23.773	40224.9	42699.0	309.855	93.92	103.78	212
320.000	.05850	17.094	.005065	24.744	41184.2	43748.3	313.186	96.41	106.10	216
330.000	.05653	17.690	.004877	25.701	42167.7	44821.2	316.487	98.92	108.48	220
340.000	.05470	18.282	.004705	26.646	43175.6	45917.9	319.761	101.44	110.88	223
350.000	.05299	18.871	.004546	27.580	44208.2	47038.8	323.010	103.97	113.31	227
360.000	.05140	19.456	.004399	28.505	45265.6	48184.1	326.236	106.50	115.75	230
370.000	.04990	20.039	.004262	29.423	46347.9	49353.8	329.441	109.02	118.19	234
380.000	.04850	20.620	.004134	30.333	47455.0	50548.0	332.626	111.54	120.64	237
390.000	.04717	21.198	.004014	31.236	48586.8	51766.6	335.791	114.04	123.08	240
400.000	.04592	21.775	.003902	32.134	49743.3	53009.6	338.938	116.53	125.52	244
410.000	.04474	22.350	.003796	33.027	50924.4	54276.9	342.067	119.01	127.94	247
420.000	.04362	22.923	.003696	33.916	52129.9	55568.4	345.179	121.46	130.35	250
430.000	.04256	23.495	.003602	34.800	53359.6	56883.9	348.274	123.90	132.75	253
440.000	.04155	24.066	.003513	35.681	54613.3	58223.2	351.353	126.31	135.12	256
450.000	.04059	24.636	.003428	36.558	55890.8	59586.1	354.416	128.69	137.47	259
460.000	.03968	25.204	.003348	37.432	57191.9	60972.5	357.463	131.05	139.80	262
470.000	.03880	25.772	.003272	38.303	58516.2	62382.0	360.495	133.38	142.10	264
480.000	.03797	26.339	.003199	39.172	59863.7	63814.5	363.510	135.69	144.38	267
490.000	.03717	26.905	.003129	40.039	61233.9	65269.6	366.511	137.96	146.64	270
500.000	.03640	27.470	.003063	40.903	62626.6	66747.1	369.496	140.21	148.86	273
520.000	.03497	28.599	.002939	42.626	65478.3	69768.2	375.419	144.61	153.23	278
540.000	.03364	29.726	.002825	44.343	68416.6	72875.5	381.283	148.90	157.48	284
560.000	.03241	30.851	.002720	46.054	71439.0	76066.7	387.085	153.06	161.62	289
580.000	.03127	31.975	.002622	47.760	74543.3	79339.5	392.827	157.10	165.64	294
600.000	.03021	33.097	.002532	49.462	77727.0	82691.5	398.508	161.03	169.55	299
620.000	.02922	34.217	.002448	51.161	80987.9	86120.5	404.130	164.84	173.34	304
640.000	.02830	35.337	.002369	52.857	84323.6	89624.2	409.692	168.53	177.02	309
660.000	.02743	36.456	.002295	54.549	87732.0	93200.4	415.193	172.11	180.58	313
680.000	.02661	37.574	.002226	56.240	91210.8	96846.9	420.636	175.59	184.05	318
700.000	.02585	38.691	.002161	57.928	94757.9	100561.6	426.020	178.96	187.41	323

Table 19. Continued

N-BUTANE ISOBAR AT P = 2 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
134.894	12.651	.07905	24.8139	1549.877	1.0	16.8	134.019	78.11	111.60	1951
140.000	12.569	.07956	23.7207	1480.255	575.7	591.6	138.190	78.53	112.22	1907
150.000	12.409	.08059	21.7552	1354.620	1708.3	1724.4	145.993	79.40	113.44	1824
160.000	12.248	.08165	19.9927	1241.286	2850.6	2866.9	153.364	80.34	114.69	1746
170.000	12.086	.08274	18.4043	1138.409	4003.2	4019.8	160.356	81.34	115.96	1671
180.000	11.924	.08386	16.9663	1044.502	5167.1	5183.9	167.017	82.40	117.28	1599
190.000	11.761	.08502	15.6592	958.347	6343.6	6360.6	173.388	83.51	118.66	1530
200.000	11.597	.08623	14.4665	878.926	7534.0	7551.2	179.503	84.69	120.09	1464
210.000	11.432	.08747	13.3744	805.419	8739.5	8757.0	185.393	85.92	121.60	1400
220.000	11.265	.08877	12.3712	737.118	9961.4	9979.1	191.082	87.21	123.20	1338
230.000	11.096	.09012	11.4467	673.434	11200.9	11218.9	196.595	88.56	124.90	1278
240.000	10.925	.09153	10.5921	613.871	12459.3	12477.6	201.951	89.98	126.73	1219
250.000	10.751	.09301	9.7996	558.007	13738.0	13756.6	207.169	91.46	128.69	1162
260.000	10.574	.09457	9.0626	505.489	15038.1	15057.0	212.263	93.02	130.80	1105
270.000	10.392	.09622	8.3750	456.016	16361.0	16380.2	217.249	94.65	133.11	1050
280.000	10.206	.09798	7.7315	409.333	17708.1	17727.7	222.141	96.37	135.62	995
290.000	10.014	.09986	7.1271	365.219	19081.2	19101.2	226.952	98.17	138.39	941
291.940	9.976	.10024	7.0140	356.942	19350.8	19370.8	227.877	98.53	138.96	930
291.940	.08814	11.346	.007880	21.160	38463.3	40732.4	301.048	89.87	100.90	202
300.000	.08525	11.730	.007575	22.029	39206.1	41552.0	303.818	91.76	102.51	205
310.000	.08197	12.199	.007236	23.080	40147.8	42587.7	307.214	94.18	104.65	210
320.000	.07897	12.663	.006933	24.106	41112.5	43645.2	310.571	96.63	106.87	214
330.000	.07621	13.122	.006659	25.112	42100.8	44725.2	313.894	99.12	109.15	218
340.000	.07366	13.577	.006410	26.100	43113.0	45828.3	317.187	101.62	111.48	221
350.000	.07129	14.028	.006181	27.073	44149.4	46954.9	320.453	104.13	113.85	225
360.000	.06908	14.475	.005970	28.033	45210.2	48105.3	323.694	106.65	116.24	229
370.000	.06702	14.920	.005776	28.982	46295.6	49279.6	326.911	109.16	118.64	232
380.000	.06509	15.363	.005595	29.921	47405.5	50478.0	330.107	111.66	121.05	236
390.000	.06328	15.803	.005426	30.851	48539.9	51700.5	333.282	114.16	123.45	239
400.000	.06157	16.241	.005269	31.773	49698.8	52947.1	336.438	116.64	125.86	242
410.000	.05996	16.678	.005121	32.688	50882.1	54217.6	339.575	119.11	128.26	246
420.000	.05844	17.113	.004982	33.596	52089.6	55512.1	342.695	121.56	130.64	249
430.000	.05699	17.546	.004852	34.499	53321.1	56830.4	345.797	123.98	133.01	252
440.000	.05562	17.979	.004728	35.397	54576.6	58172.3	348.882	126.38	135.37	255
450.000	.05432	18.410	.004612	36.291	55855.7	59537.6	351.950	128.76	137.70	258
460.000	.05308	18.840	.004501	37.180	57158.2	60926.2	355.002	131.12	140.01	261
470.000	.05190	19.269	.004396	38.065	58484.0	62337.8	358.038	133.44	142.30	264
480.000	.05077	19.698	.004296	38.947	59832.7	63772.2	361.057	135.74	144.57	267
490.000	.04969	20.125	.004201	39.826	61204.1	65229.2	364.061	138.02	146.81	269
500.000	.04866	20.552	.004110	40.702	62597.9	66708.4	367.050	140.26	149.02	272
520.000	.04672	21.404	.003941	42.446	65451.7	69732.5	372.980	144.66	153.37	278
540.000	.04494	22.254	.003786	44.181	68391.7	72842.5	378.848	148.93	157.61	283
560.000	.04329	23.101	.003643	45.909	71415.8	76036.0	384.654	153.09	161.73	288
580.000	.04176	23.947	.003511	47.630	74521.4	79310.9	390.400	157.13	165.74	293
600.000	.04034	24.792	.003388	49.345	77706.4	82664.8	396.085	161.05	169.63	299
620.000	.03901	25.636	.003275	51.056	80968.4	86095.5	401.709	164.86	173.42	303
640.000	.03777	26.478	.003168	52.763	84305.1	89600.7	407.273	168.55	177.09	308
660.000	.03660	27.320	.003069	54.465	87714.3	93178.3	412.777	172.13	180.65	313
680.000	.03551	28.161	.002976	56.165	91193.9	96826.0	418.222	175.60	184.11	318
700.000	.03448	29.001	.002889	57.862	94741.7	100541.9	423.607	178.97	187.46	322

Table 19. Continued

N-BUTANE ISOBAR AT P = 3 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
134.910	12.651	.07904	24.8191	1550.763	1.6	25.3	134.023	78.11	111.59	1952
140.000	12.570	.07956	23.7295	1481.362	574.2	598.1	138.180	78.53	112.21	1908
150.000	12.409	.08058	21.7638	1355.699	1706.7	1730.9	145.983	79.40	113.44	1825
160.000	12.249	.08164	20.0011	1242.344	2848.9	2873.4	153.353	80.34	114.68	1746
170.000	12.087	.08273	18.4125	1139.450	4001.3	4026.1	160.345	81.34	115.96	1671
180.000	11.925	.08386	16.9744	1045.528	5165.1	5190.2	167.006	82.40	117.28	1600
190.000	11.762	.08502	15.6671	959.362	6341.4	6366.9	173.376	83.51	118.65	1531
200.000	11.599	.08622	14.4743	879.933	7531.6	7557.4	179.491	84.69	120.08	1465
210.000	11.433	.08746	13.3822	806.419	8736.8	8763.1	185.380	85.92	121.59	1401
220.000	11.267	.08876	12.3790	738.114	9958.5	9985.1	191.069	87.21	123.19	1339
230.000	11.098	.09011	11.4545	674.428	11197.7	11224.8	196.582	88.56	124.89	1279
240.000	10.927	.09152	10.5998	614.865	12455.9	12483.3	201.937	89.98	126.71	1220
250.000	10.753	.09300	9.8074	559.003	13734.2	13762.1	207.153	91.46	128.67	1163
260.000	10.576	.09456	9.0704	506.489	15033.9	15062.3	212.247	93.02	130.78	1106
270.000	10.395	.09620	8.3829	457.021	16356.4	16385.3	217.232	94.65	133.08	1051
280.000	10.209	.09796	7.7395	410.346	17703.1	17732.4	222.123	96.37	135.59	996
290.000	10.017	.09983	7.1353	366.242	19075.6	19105.6	226.933	98.17	138.34	942
300.000	9.818	.10185	6.5659	324.531	20475.9	20506.4	231.674	100.06	141.40	888
304.989	9.716	.10292	6.2935	304.565	21185.7	21216.6	234.019	101.04	143.05	861
304.989	.12948	7.723	.011871	21.015	39504.3	41821.3	301.578	93.60	105.80	202
310.000	.12672	7.891	.011557	21.609	39986.2	42353.6	303.309	94.76	106.69	204
320.000	.12164	8.221	.010993	22.760	40963.6	43429.9	306.727	97.13	108.61	209
330.000	.11703	8.544	.010496	23.873	41962.8	44526.1	310.100	99.55	110.67	213
340.000	.11283	8.863	.010052	24.956	42984.5	45643.4	313.435	102.00	112.82	217
350.000	.10896	9.178	.009652	26.013	44029.3	46782.6	316.737	104.48	115.03	221
360.000	.10539	9.488	.009289	27.048	45097.7	47944.2	320.010	106.96	117.30	225
370.000	.10208	9.796	.008957	28.064	46189.8	49128.6	323.255	109.44	119.59	229
380.000	.09900	10.101	.008652	29.063	47305.8	50336.2	326.475	111.92	121.91	233
390.000	.09612	10.404	.008371	30.048	48445.8	51566.9	329.672	114.40	124.24	236
400.000	.09342	10.704	.008110	31.021	49609.7	52821.0	332.847	116.86	126.58	240
410.000	.09089	11.003	.007867	31.982	50797.6	54098.4	336.001	119.31	128.92	243
420.000	.08850	11.300	.007640	32.933	52009.3	55399.2	339.136	121.74	131.25	247
430.000	.08624	11.595	.007428	33.875	53244.7	56723.3	342.251	124.15	133.57	250
440.000	.08411	11.890	.007229	34.810	54503.7	58070.5	345.348	126.55	135.88	253
450.000	.08208	12.182	.007041	35.737	55786.1	59440.8	348.428	128.91	138.18	256
460.000	.08016	12.474	.006864	36.657	57091.7	60834.0	351.490	131.26	140.46	259
470.000	.07834	12.765	.006697	37.571	58420.2	62249.8	354.535	133.57	142.71	262
480.000	.07660	13.055	.006538	38.480	59771.6	63688.2	357.563	135.86	144.95	265
490.000	.07494	13.344	.006388	39.384	61145.4	65148.7	360.574	138.13	147.17	268
500.000	.07335	13.633	.006245	40.284	62541.5	66631.4	363.570	140.36	149.36	271
520.000	.07038	14.208	.005979	42.071	65399.4	69661.7	369.512	144.75	153.66	277
540.000	.06766	14.781	.005736	43.845	68343.0	72777.2	375.390	149.01	157.87	282
560.000	.06514	15.351	.005514	45.606	71370.2	75975.6	381.206	153.16	161.96	288
580.000	.06281	15.920	.005309	47.358	74478.7	79254.8	386.959	157.19	165.94	293
600.000	.06065	16.488	.005120	49.101	77666.1	82612.5	392.650	161.11	169.82	298
620.000	.05864	17.054	.004945	50.837	80930.3	86046.6	398.280	164.91	173.58	303
640.000	.05675	17.620	.004782	52.566	84269.0	89554.9	403.849	168.59	177.24	308
660.000	.05499	18.184	.004630	54.290	87680.1	93135.3	409.357	172.17	180.78	313
680.000	.05334	18.748	.004488	56.009	91161.2	96785.6	414.806	175.63	184.23	317
700.000	.05179	19.311	.004354	57.723	94710.5	100503.7	420.195	179.00	187.57	322

Table 19. Continued

N-BUTANE ISOBAR AT P = 4 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
134.927	12.652	.07904	24.8243	1551.649	2.1	33.7	134.027	78.11	111.59	1952
140.000	12.570	.07955	23.7382	1482.466	572.8	604.7	138.170	78.53	112.21	1909
150.000	12.410	.08058	21.7723	1356.779	1705.2	1737.4	145.972	79.40	113.43	1826
160.000	12.249	.08164	20.0094	1243.402	2847.2	2879.8	153.342	80.34	114.68	1747
170.000	12.088	.08273	18.4207	1140.491	3999.5	4032.5	160.334	81.34	115.95	1672
180.000	11.926	.08385	16.9824	1046.555	5163.0	5196.6	166.995	82.40	117.27	1600
190.000	11.764	.08501	15.6751	960.377	6339.2	6373.2	173.365	83.51	118.64	1532
200.000	11.600	.08621	14.4822	880.939	7529.1	7563.6	179.479	84.69	120.07	1465
210.000	11.435	.08745	13.3900	807.418	8734.2	8769.2	185.367	85.92	121.58	1402
220.000	11.268	.08875	12.3868	739.109	9955.6	9991.1	191.056	87.21	123.18	1340
230.000	11.099	.09010	11.4622	675.422	11194.6	11230.6	196.568	88.56	124.88	1280
240.000	10.928	.09150	10.6076	615.858	12452.4	12489.0	201.923	89.98	126.69	1221
250.000	10.755	.09298	9.8152	559.999	13730.4	13767.6	207.138	91.46	128.65	1164
260.000	10.578	.09454	9.0783	507.488	15029.7	15067.6	212.231	93.02	130.76	1107
270.000	10.397	.09618	8.3909	458.026	16351.8	16390.3	217.215	94.65	133.05	1052
280.000	10.211	.09793	7.7475	411.358	17698.0	17737.2	222.105	96.37	135.55	997
290.000	10.020	.09980	7.1435	367.264	19070.0	19109.9	226.913	98.17	138.30	943
300.000	9.822	.10182	6.5743	325.565	20469.6	20510.3	231.654	100.06	141.35	889
310.000	9.615	.10400	6.0358	286.099	21899.6	21941.2	236.340	102.05	144.74	835
315.060	9.507	.10518	5.7738	266.933	22635.8	22677.8	238.696	103.09	146.62	808
315.060	.17072	5.857	.016011	20.690	40312.1	42655.0	302.103	96.58	109.97	201
320.000	.16701	5.988	.015562	21.324	40805.0	43200.1	303.820	97.70	110.73	203
330.000	.16011	6.246	.014752	22.563	41817.3	44315.7	307.253	100.03	112.45	208
340.000	.15389	6.498	.014047	23.752	42850.2	45449.5	310.638	102.42	114.35	213
350.000	.14824	6.746	.013424	24.902	43904.8	46603.1	313.982	104.85	116.37	218
360.000	.14308	6.989	.012866	26.018	44981.6	47777.2	317.289	107.29	118.48	222
370.000	.13833	7.229	.012363	27.107	46081.2	48972.8	320.565	109.74	120.64	226
380.000	.13394	7.466	.011906	28.171	47203.8	50190.2	323.811	112.20	122.85	230
390.000	.12987	7.700	.011488	29.215	48349.8	51429.8	327.032	114.65	125.09	234
400.000	.12607	7.932	.011103	30.241	49519.1	52692.0	330.227	117.09	127.35	237
410.000	.12251	8.162	.010748	31.250	50711.9	53976.8	333.399	119.52	129.62	241
420.000	.11918	8.391	.010419	32.246	51928.0	55284.3	336.550	121.93	131.89	244
430.000	.11605	8.617	.010113	33.229	53167.6	56614.5	339.680	124.33	134.16	248
440.000	.11309	8.843	.009826	34.200	54430.3	57967.4	342.790	126.71	136.42	251
450.000	.11029	9.067	.009559	35.162	55716.2	59342.8	345.881	129.06	138.68	254
460.000	.10765	9.290	.009307	36.114	57024.9	60740.8	348.954	131.40	140.92	258
470.000	.10514	9.512	.009070	37.059	58356.5	62161.1	352.008	133.70	143.14	261
480.000	.10275	9.732	.008846	37.996	59710.5	63603.5	355.045	135.98	145.35	264
490.000	.10048	9.953	.008635	38.926	61086.9	65067.9	358.065	138.24	147.54	267
500.000	.09831	10.172	.008434	39.850	62485.4	66554.2	361.067	140.47	149.70	270
520.000	.09426	10.609	.008063	41.681	65347.6	69591.0	367.022	144.84	153.97	276
540.000	.09056	11.043	.007727	43.494	68294.9	72712.1	372.911	149.09	158.13	281
560.000	.08714	11.475	.007419	45.290	71325.3	75915.4	378.736	153.23	162.19	287
580.000	.08399	11.906	.007138	47.074	74436.7	79199.0	384.497	157.25	166.15	292
600.000	.08107	12.335	.006878	48.845	77626.6	82560.7	390.195	161.16	170.00	297
620.000	.07835	12.763	.006638	50.606	80893.1	85998.3	395.830	164.95	173.75	302
640.000	.07582	13.190	.006416	52.359	84233.8	89509.8	401.404	168.63	177.38	307
660.000	.07344	13.616	.006208	54.104	87646.6	93093.0	406.917	172.20	180.92	312
680.000	.07122	14.041	.006015	55.842	91129.4	96745.8	412.369	175.67	184.35	317
700.000	.06913	14.465	.005833	57.574	94680.2	100466.3	417.761	179.03	187.68	322

Table 19. Continued

N-BUTANE ISOBAR AT P = 5 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
134.944	12.652	.07904	24.8295	1552.536	2.6	42.1	134.031	78.11	111.59	1953
140.000	12.571	.07955	23.7470	1483.571	571.4	611.2	138.160	78.53	112.20	1909
150.000	12.411	.08058	21.7808	1357.858	1703.6	1743.9	145.962	79.40	113.43	1826
160.000	12.250	.08163	20.0178	1244.460	2845.5	2886.3	153.331	80.34	114.67	1748
170.000	12.089	.08272	18.4289	1141.531	3997.6	4038.9	160.323	81.34	115.95	1673
180.000	11.927	.08384	16.9905	1047.581	5161.0	5202.9	166.983	82.40	117.26	1601
190.000	11.765	.08500	15.6831	961.392	6336.9	6379.4	173.353	83.51	118.63	1532
200.000	11.601	.08620	14.4901	881.945	7526.7	7569.8	179.467	84.69	120.06	1466
210.000	11.436	.08744	13.3979	808.418	8731.5	8775.2	185.355	85.92	121.57	1402
220.000	11.269	.08874	12.3945	740.105	9952.7	9997.0	191.043	87.21	123.17	1341
230.000	11.101	.09008	11.4700	676.415	11191.4	11236.5	196.554	88.56	124.86	1280
240.000	10.930	.09149	10.6153	616.851	12449.0	12494.7	201.908	89.98	126.68	1222
250.000	10.756	.09297	9.8230	560.994	13726.6	13773.1	207.123	91.46	128.63	1165
260.000	10.580	.09452	9.0861	508.487	15025.6	15072.9	212.215	93.02	130.73	1108
270.000	10.399	.09616	8.3988	459.030	16347.3	16395.4	217.198	94.65	133.02	1053
280.000	10.213	.09791	7.7556	412.370	17693.0	17741.9	222.087	96.37	135.52	998
290.000	10.022	.09978	7.1517	368.285	19064.4	19114.3	226.894	98.17	138.26	944
300.000	9.825	.10178	6.5827	326.598	20463.3	20514.2	231.633	100.06	141.29	890
310.000	9.619	.10396	6.0445	287.146	21892.6	21944.5	236.317	102.05	144.68	836
320.000	9.403	.10635	5.5331	249.787	23355.4	23408.6	240.963	104.13	148.49	782
323.388	9.327	.10721	5.3653	237.581	23859.4	23913.0	242.532	104.86	149.90	764
323.388	.21218	4.713	.020317	20.276	40980.6	43337.1	302.596	99.11	113.74	200
330.000	.20583	4.858	.019513	21.183	41662.6	44091.8	304.907	100.58	114.58	203
340.000	.19714	5.073	.018454	22.495	42708.9	45245.2	308.350	102.88	116.13	209
350.000	.18936	5.281	.017539	23.748	43774.6	46415.1	311.741	105.25	117.89	213
360.000	.18232	5.485	.016734	24.953	44860.9	47603.4	315.088	107.64	119.80	218
370.000	.17591	5.685	.016017	26.120	45968.8	48811.2	318.398	110.06	121.80	223
380.000	.17003	5.881	.015374	27.254	47098.8	50039.5	321.673	112.48	123.88	227
390.000	.16460	6.075	.014792	28.360	48251.3	51288.9	324.919	114.91	126.01	231
400.000	.15958	6.266	.014261	29.441	49426.5	52559.7	328.136	117.32	128.18	235
410.000	.15490	6.456	.013774	30.501	50624.5	53852.4	331.328	119.73	130.36	239
420.000	.15053	6.643	.013327	31.543	51845.5	55167.0	334.496	122.13	132.57	242
430.000	.14644	6.829	.012912	32.567	53089.5	56503.8	337.641	124.51	134.78	246
440.000	.14260	7.013	.012527	33.578	54356.2	57862.6	340.765	126.88	136.99	249
450.000	.13897	7.196	.012169	34.575	55645.7	59243.5	343.868	129.22	139.20	253
460.000	.13555	7.377	.011833	35.560	56957.8	60646.4	346.952	131.54	141.40	256
470.000	.13231	7.558	.011519	36.535	58292.4	62071.3	350.016	133.84	143.59	259
480.000	.12924	7.738	.011223	37.500	59649.3	63518.0	353.062	136.11	145.76	262
490.000	.12632	7.916	.010945	38.456	61028.3	64986.4	356.090	138.35	147.92	265
500.000	.12354	8.094	.010682	39.405	62429.1	66476.3	359.100	140.57	150.06	269
520.000	.11837	8.448	.010196	41.281	65295.6	69519.7	365.067	144.93	154.27	274
540.000	.11364	8.800	.009758	43.133	68246.8	72646.5	370.968	149.17	158.40	280
560.000	.10930	9.149	.009360	44.965	71280.5	75855.0	376.801	153.30	162.43	286
580.000	.10530	9.497	.008997	46.780	74394.8	79143.0	382.570	157.31	166.36	291
600.000	.10160	9.843	.008663	48.580	77587.3	82508.7	388.275	161.21	170.19	297
620.000	.09816	10.188	.008355	50.367	80856.2	85950.0	393.916	165.00	173.92	302
640.000	.09495	10.531	.008070	52.143	84198.9	89464.6	399.495	168.67	177.54	307
660.000	.09196	10.874	.007805	53.910	87613.6	93050.7	405.013	172.24	181.06	312
680.000	.08916	11.216	.007558	55.668	91098.0	96706.2	410.469	175.70	184.48	317
700.000	.08652	11.558	.007327	57.418	94650.3	100429.0	415.864	179.05	187.80	321

Table 19. Continued

N-BUTANE ISOBAR AT P = 6 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
134.961	12.652	.07904	24.8347	1553.424	3.2	50.6	134.035	78.12	111.59	1953
140.000	12.572	.07954	23.7557	1484.676	570.0	617.7	138.150	78.53	112.20	1910
150.000	12.411	.08057	21.7894	1358.937	1702.1	1750.4	145.951	79.40	113.42	1827
160.000	12.251	.08163	20.0261	1245.518	2843.7	2892.7	153.321	80.34	114.67	1748
170.000	12.090	.08271	18.4371	1142.571	3995.7	4045.3	160.312	81.34	115.94	1673
180.000	11.928	.08384	16.9986	1048.607	5158.9	5209.2	166.972	82.40	117.26	1602
190.000	11.766	.08499	15.6910	962.406	6334.7	6385.7	173.341	83.51	118.63	1533
200.000	11.602	.08619	14.4979	882.951	7524.2	7576.0	179.454	84.69	120.06	1467
210.000	11.437	.08743	13.4057	809.417	8728.9	8781.3	185.342	85.92	121.56	1403
220.000	11.271	.08873	12.4023	741.100	9949.8	10003.0	191.030	87.21	123.15	1341
230.000	11.102	.09007	11.4777	677.408	11188.3	11242.3	196.540	88.56	124.85	1281
240.000	10.932	.09148	10.6231	617.844	12445.5	12500.4	201.894	89.98	126.66	1223
250.000	10.758	.09295	9.8307	561.989	13722.8	13778.6	207.108	91.46	128.61	1165
260.000	10.582	.09450	9.0939	509.485	15021.5	15078.2	212.199	93.02	130.71	1109
270.000	10.401	.09614	8.4067	460.034	16342.7	16400.4	217.181	94.65	132.99	1054
280.000	10.216	.09789	7.7636	413.381	17687.9	17746.7	222.069	96.37	135.49	999
290.000	10.025	.09975	7.1599	369.306	19058.8	19118.7	226.875	98.17	138.22	945
300.000	9.828	.10175	6.5911	327.630	20457.1	20518.1	231.612	100.06	141.24	892
310.000	9.622	.10393	6.0532	288.193	21885.5	21947.9	236.294	102.05	144.61	838
320.000	9.407	.10630	5.5421	250.851	23347.5	23411.2	240.938	104.13	148.41	784
330.000	9.179	.10894	5.0541	215.471	24847.7	24913.1	245.562	106.33	152.75	729
330.554	9.166	.10909	5.0277	213.567	24932.0	24997.5	245.817	106.45	153.01	726
330.554	.25402	3.937	.024803	19.809	41554.8	43916.8	303.053	101.34	117.25	198
340.000	.24293	4.116	.023349	21.181	42558.9	45028.7	306.369	103.40	118.23	204
350.000	.23256	4.300	.022049	22.552	43637.7	46217.7	309.816	105.68	119.63	209
360.000	.22330	4.478	.020929	23.856	44735.0	47422.0	313.208	108.02	121.28	214
370.000	.21495	4.652	.019948	25.108	45852.3	48643.6	316.556	110.39	123.08	219
380.000	.20736	4.822	.019078	26.316	46990.5	49883.9	319.863	112.78	125.00	224
390.000	.20042	4.990	.018299	27.487	48150.1	51143.8	323.136	115.17	127.00	228
400.000	.19402	5.154	.017596	28.627	49331.7	52424.2	326.377	117.57	129.06	232
410.000	.18810	5.316	.016956	29.740	50535.4	53725.2	329.590	119.96	131.16	236
420.000	.18260	5.476	.016371	30.829	51761.5	55047.3	332.776	122.33	133.29	240
430.000	.17747	5.635	.015833	31.897	53009.9	56390.8	335.937	124.70	135.43	244
440.000	.17266	5.792	.015336	32.946	54280.8	57755.8	339.075	127.05	137.58	247
450.000	.16815	5.947	.014876	33.980	55574.1	59142.4	342.191	129.38	139.74	251
460.000	.16390	6.101	.014447	34.999	56889.7	60550.6	345.286	131.68	141.90	254
470.000	.15988	6.255	.014047	36.004	58227.5	61980.2	348.361	133.97	144.05	258
480.000	.15609	6.407	.013672	36.998	59587.3	63431.4	351.416	136.23	146.19	261
490.000	.15249	6.558	.013320	37.981	60969.1	64903.8	354.452	138.47	148.31	264
500.000	.14907	6.708	.012988	38.955	62372.6	66397.6	357.470	140.68	150.42	267
520.000	.14271	7.007	.012379	40.876	65243.6	69447.8	363.451	145.02	154.59	273
540.000	.13693	7.303	.011832	42.768	68198.6	72580.6	369.362	149.25	158.68	279
560.000	.13162	7.597	.011337	44.635	71235.8	75794.2	375.206	153.37	162.68	285
580.000	.12675	7.890	.010886	46.481	74353.0	79086.8	380.982	157.37	166.58	290
600.000	.12224	8.181	.010474	48.310	77548.2	82456.6	386.694	161.26	170.38	296
620.000	.11806	8.470	.010095	50.123	80819.2	85901.4	392.342	165.04	174.09	301
640.000	.11417	8.759	.009745	51.922	84164.1	89419.3	397.926	168.71	177.69	306
660.000	.11054	9.046	.009420	53.710	87580.6	93008.3	403.448	172.27	181.20	311
680.000	.10715	9.333	.009118	55.488	91066.7	96666.4	408.908	175.73	184.60	316
700.000	.10396	9.619	.008836	57.256	94620.4	100391.7	414.307	179.08	187.91	321

Table 19. Continued

N-BUTANE ISOBAR AT P = 7 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
134.977	12.653	.07903	24.8399	1554.312	3.7	59.0	134.038	78.12	111.59	1954
140.000	12.572	.07954	23.7645	1485.781	568.6	624.3	138.139	78.53	112.20	1911
150.000	12.412	.08057	21.7979	1360.017	1700.5	1756.9	145.941	79.40	113.42	1828
160.000	12.252	.08162	20.0345	1246.576	2842.0	2899.2	153.310	80.34	114.66	1749
170.000	12.091	.08271	18.4453	1143.612	3993.8	4051.7	160.301	81.34	115.94	1674
180.000	11.929	.08383	17.0066	1049.633	5156.9	5215.6	166.960	82.40	117.25	1603
190.000	11.767	.08499	15.6989	963.420	6332.4	6391.9	173.329	83.51	118.62	1534
200.000	11.603	.08618	14.5058	883.956	7521.8	7582.1	179.442	84.69	120.05	1468
210.000	11.438	.08743	13.4135	810.417	8726.2	8787.4	185.329	85.92	121.55	1404
220.000	11.272	.08872	12.4101	742.095	9946.9	10009.0	191.016	87.21	123.14	1342
230.000	11.104	.09006	11.4854	678.401	11185.1	11248.1	196.527	88.56	124.83	1282
240.000	10.933	.09146	10.6308	618.837	12442.1	12506.1	201.879	89.98	126.64	1224
250.000	10.760	.09294	9.8385	562.983	13719.1	13784.1	207.093	91.46	128.59	1166
260.000	10.584	.09449	9.1017	510.483	15017.3	15083.5	212.183	93.02	130.69	1110
270.000	10.403	.09612	8.4146	461.037	16338.2	16405.5	217.165	94.65	132.97	1055
280.000	10.218	.09786	7.7716	414.391	17682.9	17751.4	222.051	96.37	135.45	1001
290.000	10.028	.09972	7.1680	370.325	19053.2	19123.0	226.855	98.17	138.18	947
300.000	9.831	.10172	6.5995	328.662	20450.9	20522.1	231.591	100.06	141.19	893
310.000	9.626	.10389	6.0618	289.238	21878.5	21951.3	236.272	102.05	144.55	839
320.000	9.411	.10626	5.5511	251.913	23339.5	23413.9	240.913	104.13	148.33	785
330.000	9.184	.10888	5.0636	216.554	24838.6	24914.8	245.534	106.33	152.65	731
336.883	9.019	.11087	4.7393	193.293	25896.2	25973.8	248.712	107.90	156.02	693
336.883	.29638	3.374	.029478	19.311	42060.1	44422.0	303.474	103.35	120.61	196
340.000	.29173	3.428	.028834	19.804	42398.7	44798.1	304.586	103.99	120.76	198
350.000	.27816	3.595	.027021	21.310	43493.2	46009.7	308.098	106.16	121.66	204
360.000	.26624	3.756	.025498	22.726	44603.2	47232.4	311.543	108.43	122.96	210
370.000	.25562	3.912	.024188	24.071	45731.1	48469.5	314.932	110.75	124.51	215
380.000	.24607	4.064	.023042	25.359	46878.5	49723.2	318.275	113.09	126.23	220
390.000	.23740	4.212	.022028	26.600	48045.9	50994.6	321.578	115.45	128.08	225
400.000	.22947	4.358	.021121	27.802	49234.3	52284.9	324.845	117.82	130.01	229
410.000	.22217	4.501	.020303	28.969	50444.1	53594.8	328.079	120.19	132.00	233
420.000	.21542	4.642	.019561	30.107	51675.6	54925.0	331.285	122.54	134.04	238
430.000	.20916	4.781	.018882	31.220	52928.9	56275.7	334.463	124.89	136.11	241
440.000	.20331	4.919	.018259	32.310	54204.2	57647.2	337.616	127.22	138.21	245
450.000	.19784	5.055	.017684	33.381	55501.7	59039.9	340.746	129.54	140.31	249
460.000	.19270	5.189	.017152	34.433	56820.9	60453.4	343.852	131.83	142.42	252
470.000	.18787	5.323	.016657	35.470	58162.0	61888.1	346.938	134.11	144.52	256
480.000	.18330	5.455	.016194	36.493	59524.9	63343.8	350.003	136.36	146.62	259
490.000	.17898	5.587	.015762	37.503	60909.4	64820.4	353.047	138.58	148.72	263
500.000	.17489	5.718	.015355	38.502	62315.4	66318.0	356.073	140.79	150.80	266
520.000	.16730	5.977	.014613	40.468	65191.0	69375.1	362.068	145.11	154.92	272
540.000	.16041	6.234	.013949	42.400	68150.1	72513.9	367.990	149.33	158.96	278
560.000	.15411	6.489	.013350	44.303	71190.7	75732.9	373.843	153.44	162.92	284
580.000	.14833	6.742	.012808	46.180	74311.1	79030.3	379.628	157.43	166.80	290
600.000	.14300	6.993	.012313	48.037	77509.0	82404.2	385.347	161.32	170.58	295
620.000	.13806	7.243	.011859	49.876	80782.4	85852.6	391.000	165.09	174.26	300
640.000	.13347	7.492	.011441	51.699	84129.4	89373.8	396.590	168.75	177.85	306
660.000	.12920	7.740	.011053	53.508	87547.7	92965.8	402.116	172.31	181.34	311
680.000	.12520	7.987	.010694	55.305	91035.6	96626.6	407.580	175.76	184.73	316
700.000	.12145	8.234	.010359	57.092	94590.8	100354.3	412.983	179.11	188.03	321

Table 19. Continued

N-BUTANE ISOBAR AT P = 8 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
134.994	12.653	.07903	24.8451	1555.200	4.2	67.5	134.042	78.12	111.59	1954
140.000	12.573	.07954	23.7732	1486.886	567.2	630.8	138.129	78.53	112.19	1911
150.000	12.413	.08056	21.8064	1361.096	1698.9	1763.4	145.931	79.40	113.41	1828
160.000	12.253	.08162	20.0428	1247.633	2840.3	2905.6	153.299	80.34	114.66	1750
170.000	12.092	.08270	18.4535	1144.652	3992.0	4058.1	160.290	81.34	115.93	1675
180.000	11.930	.08382	17.0147	1050.658	5154.8	5221.9	166.949	82.40	117.24	1603
190.000	11.768	.08498	15.7069	964.435	6330.2	6398.2	173.317	83.51	118.61	1535
200.000	11.604	.08618	14.5137	884.962	7519.4	7588.3	179.430	84.69	120.04	1469
210.000	11.440	.08742	13.4212	811.415	8723.6	8793.5	185.317	85.92	121.54	1405
220.000	11.273	.08870	12.4178	743.089	9944.0	10015.0	191.003	87.21	123.13	1343
230.000	11.105	.09005	11.4932	679.393	11182.0	11254.0	196.513	88.56	124.82	1283
240.000	10.935	.09145	10.6385	619.829	12438.6	12511.8	201.865	89.98	126.63	1225
250.000	10.762	.09292	9.8463	563.977	13715.3	13789.6	207.078	91.46	128.57	1167
260.000	10.586	.09447	9.1096	511.480	15013.2	15088.8	212.167	93.02	130.67	1111
270.000	10.405	.09610	8.4225	462.040	16333.6	16410.5	217.148	94.65	132.94	1056
280.000	10.221	.09784	7.7796	415.401	17677.9	17756.2	222.033	96.37	135.42	1002
290.000	10.030	.09970	7.1762	371.344	19047.7	19127.4	226.836	98.17	138.14	948
300.000	9.834	.10169	6.6078	329.692	20444.7	20526.0	231.570	100.06	141.14	894
310.000	9.629	.10385	6.0704	290.282	21871.6	21954.7	236.249	102.05	144.49	840
320.000	9.415	.10621	5.5601	252.974	23331.6	23416.6	240.889	104.13	148.25	787
330.000	9.189	.10883	5.0730	217.637	24829.5	24916.6	245.506	106.33	152.54	732
340.000	8.947	.11176	4.6050	184.139	26372.2	26461.6	250.123	108.63	157.54	677
342.576	8.882	.11258	4.4870	175.792	26777.8	26867.9	251.315	109.24	158.97	663
342.576	.33935	2.947	.034351	18.791	42512.0	44869.5	303.863	105.19	123.87	195
350.000	.32656	3.062	.032541	20.015	43339.6	45789.4	306.520	106.70	124.06	200
360.000	.31140	3.211	.030497	21.557	44464.6	47033.6	310.025	108.87	124.89	206
370.000	.29811	3.354	.028776	23.006	45604.8	48288.4	313.463	111.12	126.11	211
380.000	.28628	3.493	.027294	24.382	46762.2	49556.6	316.845	113.42	127.59	217
390.000	.27564	3.628	.025999	25.698	47938.3	50840.6	320.181	115.75	129.25	222
400.000	.26599	3.760	.024853	26.965	49134.2	52141.8	323.475	118.08	131.03	226
410.000	.25716	3.889	.023828	28.190	50350.5	53461.4	326.734	120.42	132.91	231
420.000	.24905	4.015	.022905	29.380	51588.0	54800.2	329.960	122.76	134.85	235
430.000	.24154	4.140	.022067	30.538	52846.5	56158.5	333.156	125.08	136.84	239
440.000	.23457	4.263	.021302	31.670	54126.4	57536.9	336.325	127.40	138.86	243
450.000	.22807	4.385	.020599	32.779	55427.9	58935.6	339.468	129.70	140.90	247
460.000	.22199	4.505	.019951	33.866	56751.0	60354.8	342.587	131.98	142.95	251
470.000	.21627	4.624	.019351	34.935	58095.6	61794.6	345.684	134.24	145.01	254
480.000	.21090	4.742	.018793	35.987	59461.6	63255.0	348.758	136.48	147.08	258
490.000	.20582	4.859	.018273	37.024	60849.1	64736.0	351.812	138.70	149.13	261
500.000	.20102	4.975	.017786	38.048	62257.8	66237.5	354.846	140.90	151.18	265
520.000	.19214	5.205	.016898	40.060	65138.3	69302.0	360.855	145.21	155.25	271
540.000	.18410	5.432	.016109	42.032	68101.4	72447.0	366.789	149.41	159.25	277
560.000	.17677	5.657	.015401	43.970	71145.6	75671.3	372.652	153.51	163.18	283
580.000	.17006	5.880	.014762	45.879	74269.0	78973.3	378.445	157.49	167.02	289
600.000	.16387	6.102	.014180	47.764	77469.6	82351.3	384.171	161.37	170.77	294
620.000	.15816	6.323	.013647	49.628	80745.4	85803.5	389.830	165.14	174.44	300
640.000	.15286	6.542	.013158	51.474	84094.5	89328.1	395.425	168.79	178.01	305
660.000	.14792	6.760	.012706	53.304	87514.9	92923.2	400.956	172.34	181.48	310
680.000	.14331	6.978	.012287	55.121	91004.4	96586.6	406.424	175.79	184.86	315
700.000	.13900	7.194	.011897	56.926	94561.2	100316.8	411.830	179.14	188.14	320

Table 19. Continued

N-BUTANE ISOBAR AT P = 10 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
135.028	12.654	.07903	24.8553	1556.953	5.3	84.4	134.050	78.12	111.58	1956
140.000	12.574	.07953	23.7907	1489.096	564.3	643.9	138.109	78.53	112.19	1913
150.000	12.414	.08055	21.8235	1363.254	1695.8	1776.4	145.910	79.40	113.41	1830
160.000	12.254	.08161	20.0595	1249.749	2836.9	2918.5	153.278	80.34	114.65	1751
170.000	12.093	.08269	18.4698	1146.731	3988.2	4070.9	160.268	81.34	115.92	1676
180.000	11.932	.08381	17.0308	1052.709	5150.8	5234.6	166.926	82.40	117.23	1605
190.000	11.770	.08496	15.7228	966.462	6325.8	6410.7	173.294	83.51	118.60	1536
200.000	11.607	.08616	14.5294	886.972	7514.5	7600.7	179.406	84.69	120.02	1470
210.000	11.442	.08740	13.4368	813.413	8718.3	8805.7	185.291	85.92	121.52	1406
220.000	11.276	.08868	12.4333	745.078	9938.2	10026.9	190.977	87.21	123.11	1345
230.000	11.108	.09002	11.5086	681.377	11175.7	11265.7	196.485	88.56	124.79	1285
240.000	10.938	.09142	10.6540	621.812	12431.8	12523.2	201.836	89.98	126.60	1226
250.000	10.765	.09289	9.8617	565.963	13707.8	13800.7	207.048	91.46	128.53	1169
260.000	10.589	.09443	9.1251	513.473	15005.0	15099.4	212.135	93.02	130.62	1113
270.000	10.410	.09606	8.4382	464.043	16324.6	16420.7	217.114	94.65	132.89	1058
280.000	10.225	.09779	7.7956	417.419	17667.9	17765.7	221.997	96.37	135.35	1004
290.000	10.036	.09964	7.1925	373.380	19036.6	19136.3	226.798	98.17	138.06	950
300.000	9.840	.10163	6.6245	331.750	20432.3	20533.9	231.529	100.06	141.05	896
310.000	9.636	.10378	6.0876	292.367	21857.7	21961.5	236.204	102.05	144.36	843
320.000	9.423	.10613	5.5780	255.092	23315.9	23422.0	240.839	104.13	148.09	790
330.000	9.198	.10872	5.0917	219.796	24811.5	24920.2	245.451	106.33	152.34	736
340.000	8.958	.11163	4.6249	186.351	26351.1	26462.8	250.061	108.63	157.26	681
350.000	8.700	.11495	4.1730	154.618	27943.5	28058.4	254.694	111.03	163.12	625
352.550	8.630	.11587	4.0595	146.781	28359.4	28475.3	255.883	111.66	164.81	610
352.550	.42745	2.339	.044733	17.706	43294.8	45634.3	304.554	108.49	130.30	191
360.000	.40987	2.440	.042097	19.079	44162.8	46602.6	307.272	109.90	129.80	196
370.000	.38949	2.567	.039196	20.779	45333.5	47901.0	310.830	111.97	130.00	203
380.000	.37188	2.689	.036799	22.358	46515.4	49204.4	314.306	114.14	130.78	209
390.000	.35640	2.806	.034765	23.844	47711.8	50517.6	317.717	116.37	131.94	215
400.000	.34260	2.919	.033006	25.255	48925.0	51843.9	321.075	118.64	133.34	220
410.000	.33017	3.029	.031465	26.606	50156.2	53184.9	324.386	120.92	134.91	225
420.000	.31888	3.136	.030097	27.906	51406.4	54542.3	327.658	123.20	136.61	230
430.000	.30855	3.241	.028874	29.163	52676.3	55917.2	330.893	125.49	138.40	235
440.000	.29904	3.344	.027769	30.383	53966.5	57310.5	334.096	127.77	140.25	239
450.000	.29024	3.445	.026766	31.570	55277.0	58722.5	337.269	130.03	142.16	243
460.000	.28206	3.545	.025850	32.729	56608.2	60153.6	340.415	132.29	144.09	247
470.000	.27442	3.644	.025008	33.864	57960.2	61604.3	343.534	134.53	146.05	251
480.000	.26727	3.742	.024231	34.976	59333.0	63074.6	346.630	136.74	148.02	255
490.000	.26055	3.838	.023511	36.069	60726.6	64564.6	349.702	138.94	150.00	258
500.000	.25422	3.934	.022842	37.144	62140.9	66074.5	352.753	141.12	151.98	262
520.000	.24258	4.122	.021632	39.248	65031.4	69153.8	358.791	145.40	155.93	269
540.000	.23210	4.308	.020566	41.299	68003.0	72311.5	364.749	149.57	159.84	275
560.000	.22260	4.492	.019618	43.308	71054.5	75546.8	370.632	153.65	163.69	281
580.000	.21394	4.674	.018767	45.279	74184.2	78858.5	376.442	157.62	167.47	287
600.000	.20599	4.855	.017998	47.220	77390.4	82245.1	382.182	161.48	171.18	293
620.000	.19866	5.034	.017297	49.135	80671.3	85705.0	387.855	165.23	174.79	299
640.000	.19188	5.212	.016657	51.027	84024.8	89236.3	393.460	168.87	178.33	304
660.000	.18559	5.388	.016067	52.899	87448.9	92837.3	399.000	172.42	181.77	309
680.000	.17972	5.564	.015523	54.754	90941.9	96506.2	404.477	175.85	185.12	314
700.000	.17423	5.739	.015018	56.594	94501.8	100241.3	409.890	179.19	188.38	319

Table 19. Continued

N-BUTANE ISOBAR AT P = 12 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
135.061	12.655	.07902	24.8656	1558.721	6.4	101.2	134.058	78.12	111.58	1957
140.000	12.576	.07952	23.8082	1491.305	561.5	657.0	138.089	78.53	112.18	1914
150.000	12.416	.08054	21.8405	1365.412	1692.7	1789.4	145.889	79.40	113.40	1831
160.000	12.256	.08159	20.0762	1251.863	2833.5	2931.4	153.257	80.34	114.64	1753
170.000	12.095	.08268	18.4862	1148.811	3984.5	4083.7	160.246	81.34	115.91	1678
180.000	11.934	.08380	17.0468	1054.760	5146.7	5247.2	166.904	82.40	117.22	1606
190.000	11.772	.08495	15.7386	968.490	6321.3	6423.3	173.271	83.51	118.58	1538
200.000	11.609	.08614	14.5451	888.981	7509.7	7613.1	179.381	84.69	120.00	1472
210.000	11.445	.08738	13.4524	815.409	8713.0	8817.8	185.266	85.92	121.50	1408
220.000	11.279	.08866	12.4488	747.065	9932.5	10038.9	190.951	87.21	123.08	1346
230.000	11.111	.09000	11.5240	683.360	11169.4	11277.4	196.458	88.56	124.77	1286
240.000	10.941	.09140	10.6694	623.794	12424.9	12534.6	201.808	89.98	126.56	1228
250.000	10.769	.09286	9.8772	567.948	13700.3	13811.8	207.018	91.46	128.49	1171
260.000	10.593	.09440	9.1407	515.465	14996.8	15110.1	212.104	93.02	130.58	1115
270.000	10.414	.09602	8.4539	466.044	16315.6	16430.8	217.081	94.65	132.83	1060
280.000	10.230	.09775	7.8115	419.434	17658.0	17775.3	221.962	96.37	135.29	1006
290.000	10.041	.09959	7.2087	375.413	19025.6	19145.1	226.760	98.17	137.98	952
300.000	9.846	.10157	6.6411	333.804	20420.0	20541.9	231.488	100.06	140.95	899
310.000	9.643	.10370	6.1048	294.448	21843.9	21968.4	236.159	102.05	144.24	846
320.000	9.431	.10604	5.5958	257.205	23300.3	23427.5	240.790	104.13	147.94	792
330.000	9.207	.10861	5.1103	221.949	24793.6	24923.9	245.397	106.33	152.13	739
340.000	8.969	.11150	4.6447	188.554	26330.4	26464.2	249.999	108.63	156.98	684
350.000	8.713	.11478	4.1943	156.888	27918.8	28056.6	254.623	111.03	162.74	628
360.000	8.432	.11860	3.7538	126.789	29571.1	29713.4	259.300	113.65	169.92	571
361.150	8.397	.11908	3.7034	123.418	29766.1	29909.0	259.843	113.97	170.88	564
361.150	.51894	1.927	.056038	16.581	43956.4	46268.8	305.143	111.43	136.83	187
370.000	.49168	2.034	.051761	18.379	45031.2	47471.8	308.433	112.98	135.29	194
380.000	.46587	2.147	.047945	20.216	46245.7	48821.6	312.033	114.96	134.87	202
390.000	.44385	2.253	.044836	21.907	47468.0	50171.6	315.540	117.07	135.23	208
400.000	.42468	2.355	.042225	23.488	48702.1	51527.7	318.974	119.24	136.07	214
410.000	.40773	2.453	.039988	24.981	49950.8	52893.9	322.348	121.45	137.23	220
420.000	.39254	2.547	.038040	26.404	51216.1	54273.0	325.671	123.67	138.61	225
430.000	.37882	2.640	.036322	27.768	52498.9	55666.6	328.950	125.91	140.15	230
440.000	.36631	2.730	.034793	29.082	53800.3	57076.2	332.191	128.15	141.80	235
450.000	.35484	2.818	.033419	30.354	55120.9	58502.7	335.397	130.38	143.53	239
460.000	.34425	2.905	.032175	31.589	56461.2	59947.0	338.571	132.61	145.33	244
470.000	.33443	2.990	.031043	32.792	57821.2	61409.3	341.716	134.82	147.16	248
480.000	.32529	3.074	.030006	33.967	59201.2	62890.2	344.834	137.01	149.03	252
490.000	.31674	3.157	.029052	35.117	60601.4	64389.9	347.926	139.19	150.92	255
500.000	.30872	3.239	.028170	36.245	62021.7	65908.6	350.994	141.34	152.83	259
520.000	.29406	3.401	.026589	38.443	64922.7	69003.4	357.063	145.59	156.65	266
540.000	.28096	3.559	.025210	40.575	67903.2	72174.3	363.046	149.74	160.45	273
560.000	.26914	3.716	.023992	42.654	70962.4	75421.1	368.950	153.79	164.22	279
580.000	.25840	3.870	.022907	44.688	74098.7	78742.7	374.777	157.74	167.94	286
600.000	.24859	4.023	.021931	46.685	77310.8	82138.2	380.532	161.58	171.59	292
620.000	.23957	4.174	.021048	48.650	80596.7	85605.6	386.217	165.32	175.16	297
640.000	.23125	4.324	.020243	50.587	83954.6	89143.8	391.834	168.96	178.65	303
660.000	.22354	4.474	.019506	52.500	87382.7	92750.9	397.383	172.49	182.06	308
680.000	.21637	4.622	.018827	54.393	90879.2	96425.4	402.868	175.92	185.38	314
700.000	.20967	4.769	.018200	56.267	94442.3	100165.5	408.289	179.25	188.62	319

Table 19. Continued

N-BUTANE ISOBAR AT P = 14 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
135.095	12.655	.07902	24.8760	1560.490	7.5	118.1	134.066	78.13	111.58	1958
140.000	12.577	.07951	23.8256	1493.515	558.7	670.0	138.069	78.53	112.17	1915
150.000	12.417	.08053	21.8575	1367.569	1689.6	1802.4	145.868	79.40	113.39	1832
160.000	12.257	.08158	20.0928	1253.978	2830.1	2944.3	153.235	80.34	114.63	1754
170.000	12.097	.08267	18.5025	1150.890	3980.8	4096.5	160.224	81.34	115.90	1679
180.000	11.936	.08378	17.0629	1056.809	5142.6	5259.9	166.881	82.40	117.21	1608
190.000	11.774	.08493	15.7545	970.516	6316.9	6435.8	173.247	83.51	118.56	1539
200.000	11.611	.08613	14.5607	890.990	7504.9	7625.4	179.357	84.69	119.99	1473
210.000	11.447	.08736	13.4679	817.404	8707.7	8830.0	185.241	85.92	121.48	1410
220.000	11.281	.08864	12.4642	749.052	9926.8	10050.9	190.925	87.21	123.06	1348
230.000	11.114	.08998	11.5394	685.341	11163.2	11289.1	196.431	88.56	124.74	1288
240.000	10.945	.09137	10.6848	625.775	12418.1	12546.0	201.779	89.98	126.53	1230
250.000	10.772	.09283	9.8926	569.931	13692.9	13822.8	206.988	91.46	128.46	1173
260.000	10.597	.09436	9.1562	517.454	14988.6	15120.7	212.072	93.02	130.53	1117
270.000	10.418	.09599	8.4696	468.044	16306.6	16441.0	217.047	94.65	132.78	1062
280.000	10.235	.09770	7.8274	421.446	17648.1	17784.9	221.926	96.37	135.23	1008
290.000	10.047	.09954	7.2249	377.442	19014.6	19154.0	226.722	98.17	137.90	955
300.000	9.852	.10150	6.6577	335.855	20407.8	20549.9	231.447	100.06	140.85	901
310.000	9.650	.10363	6.1218	296.525	21830.2	21975.3	236.115	102.05	144.12	848
320.000	9.438	.10595	5.6135	259.313	23284.8	23433.1	240.741	104.13	147.78	795
330.000	9.216	.10851	5.1289	224.095	24775.9	24927.8	245.342	106.33	151.94	742
340.000	8.979	.11137	4.6643	190.749	26309.8	26465.7	249.938	108.63	156.72	688
350.000	8.725	.11461	4.2154	159.146	27894.6	28055.0	254.553	111.03	162.37	632
360.000	8.447	.11838	3.7770	129.136	29541.6	29707.4	259.217	113.64	169.38	575
368.754	8.177	.12229	3.3961	104.008	31047.8	31219.0	263.374	116.19	177.34	522
368.754	.61447	1.627	.068373	15.427	44526.2	46804.6	305.640	114.11	143.71	182
370.000	.60903	1.642	.067453	15.723	44684.6	46983.3	306.124	114.28	143.15	184
380.000	.57081	1.752	.061283	17.913	45946.2	48398.8	309.899	115.93	140.38	193
390.000	.53965	1.853	.056555	19.862	47202.5	49796.8	313.530	117.85	139.42	201
400.000	.51333	1.948	.052738	21.645	48462.8	51190.1	317.059	119.90	139.41	208
410.000	.49058	2.038	.049557	23.304	49732.9	52586.6	320.507	122.02	139.97	214
420.000	.47058	2.125	.046846	24.865	51015.6	53990.7	323.890	124.18	140.92	220
430.000	.45275	2.209	.044497	26.348	52313.3	55405.6	327.220	126.36	142.12	225
440.000	.43669	2.290	.042435	27.766	53627.7	56833.7	330.503	128.55	143.51	230
450.000	.42209	2.369	.040604	29.128	54959.4	58276.2	333.745	130.74	145.04	235
460.000	.40874	2.447	.038965	30.444	56309.4	59734.6	336.950	132.93	146.66	240
470.000	.39644	2.522	.037486	31.720	57678.3	61209.7	340.123	135.11	148.36	244
480.000	.38506	2.597	.036141	32.960	59066.2	62702.0	343.264	137.28	150.11	249
490.000	.37448	2.670	.034913	34.170	60473.4	64211.9	346.378	139.44	151.90	253
500.000	.36460	2.743	.033785	35.352	61900.1	65739.9	349.465	141.57	153.72	256
520.000	.34664	2.885	.031780	37.645	64812.2	68851.0	355.565	145.78	157.39	264
540.000	.33069	3.024	.030046	39.860	67802.1	72035.7	361.575	149.91	161.09	271
560.000	.31638	3.161	.028528	42.010	70869.2	75294.2	367.500	153.93	164.77	278
580.000	.30345	3.295	.027183	44.108	74012.4	78626.0	373.345	157.86	168.42	284
600.000	.29167	3.429	.025982	46.160	77230.4	82030.4	379.116	161.69	172.00	290
620.000	.28088	3.560	.024900	48.175	80521.5	85505.7	384.813	165.41	175.53	296
640.000	.27095	3.691	.023918	50.157	83883.9	89050.9	390.441	169.04	178.98	302
660.000	.26178	3.820	.023022	52.111	87316.2	92664.2	396.000	172.56	182.35	307
680.000	.25326	3.949	.022200	54.040	90816.3	96344.3	401.493	175.98	185.65	313
700.000	.24532	4.076	.021442	55.949	94382.8	100089.6	406.921	179.30	188.86	318

Table 19. Continued

N-BUTANE ISOBAR AT P = 16 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
135.128	12.656	.07901	24.8863	1562.258	8.6	135.0	134.074	78.13	111.57	1959
140.000	12.578	.07950	23.8431	1495.724	555.9	683.1	138.049	78.53	112.16	1917
150.000	12.419	.08052	21.8745	1369.726	1686.5	1815.4	145.848	79.40	113.38	1834
160.000	12.259	.08157	20.1094	1256.092	2826.7	2957.2	153.214	80.34	114.62	1755
170.000	12.099	.08265	18.5188	1152.968	3977.1	4109.3	160.202	81.34	115.88	1681
180.000	11.938	.08377	17.0790	1058.859	5138.6	5272.6	166.858	82.40	117.19	1609
190.000	11.776	.08492	15.7703	972.542	6312.5	6448.3	173.224	83.51	118.55	1541
200.000	11.613	.08611	14.5764	892.998	7500.0	7637.8	179.333	84.69	119.97	1475
210.000	11.449	.08734	13.4834	819.398	8702.5	8842.2	185.216	85.92	121.46	1411
220.000	11.284	.08862	12.4796	751.037	9921.1	10062.8	190.899	87.21	123.04	1350
230.000	11.117	.08995	11.5548	687.321	11156.9	11300.9	196.404	88.56	124.71	1290
240.000	10.948	.09134	10.7002	627.753	12411.3	12557.5	201.751	89.98	126.50	1232
250.000	10.776	.09280	9.9080	571.912	13685.5	13833.9	206.958	91.46	128.42	1175
260.000	10.601	.09433	9.1717	519.441	14980.5	15131.4	212.041	93.02	130.49	1119
270.000	10.423	.09595	8.4852	470.041	16297.7	16451.2	217.014	94.65	132.73	1064
280.000	10.240	.09766	7.8433	423.456	17638.3	17794.5	221.891	96.37	135.16	1010
290.000	10.052	.09948	7.2410	379.469	19003.7	19162.9	226.684	98.17	137.83	957
300.000	9.858	.10144	6.6742	337.902	20395.7	20558.0	231.406	100.06	140.76	904
310.000	9.656	.10356	6.1388	298.597	21816.6	21982.3	236.071	102.05	144.00	851
320.000	9.446	.10587	5.6311	261.416	23269.4	23438.8	240.693	104.13	147.63	798
330.000	9.225	.10840	5.1473	226.235	24758.3	24931.7	245.289	106.33	151.74	745
340.000	8.990	.11124	4.6838	192.936	26289.5	26467.5	249.878	108.63	156.46	691
350.000	8.738	.11445	4.2363	161.394	27870.6	28053.7	254.484	111.03	162.01	636
360.000	8.463	.11817	3.8000	131.468	29512.7	29701.7	259.136	113.64	168.86	579
370.000	8.156	.12261	3.3676	102.961	31231.8	31428.0	263.875	116.57	177.84	519
375.593	7.965	.12555	3.1236	87.529	32235.9	32436.8	266.586	118.34	184.34	484
375.593	.71476	1.399	.081874	14.247	45021.8	47260.3	306.053	116.61	151.20	178
380.000	.69102	1.447	.077762	15.380	45604.7	47920.1	307.800	117.15	148.43	183
390.000	.64625	1.547	.070445	17.675	46908.9	49384.7	311.604	118.76	144.98	192
400.000	.61009	1.639	.064864	19.709	48203.6	50826.1	315.254	120.64	143.58	200
410.000	.57976	1.725	.060381	21.563	49499.9	52259.7	318.794	122.64	143.27	208
420.000	.55367	1.806	.056660	23.283	50803.7	53693.5	322.250	124.72	143.61	214
430.000	.53081	1.884	.053501	24.898	52118.9	55133.1	325.637	126.83	144.38	220
440.000	.51050	1.959	.050771	26.428	53447.7	56581.8	328.968	128.97	145.44	226
450.000	.49225	2.031	.048380	27.889	54792.1	58042.4	332.250	131.12	146.70	231
460.000	.47571	2.102	.046262	29.291	56152.9	59516.4	335.490	133.27	148.12	236
470.000	.46059	2.171	.044369	30.643	57531.2	61005.1	338.692	135.42	149.65	241
480.000	.44669	2.239	.042663	31.952	58927.7	62509.7	341.859	137.56	151.27	245
490.000	.43383	2.305	.041116	33.224	60342.5	64030.6	344.995	139.69	152.94	250
500.000	.42190	2.370	.039704	34.462	61776.0	65568.4	348.102	141.80	154.65	254
520.000	.40033	2.498	.037214	36.855	64699.7	68696.4	354.236	145.98	158.17	262
540.000	.38132	2.623	.035082	39.153	67699.5	71895.5	360.272	150.07	161.75	269
560.000	.36435	2.745	.033230	41.376	70774.9	75166.3	366.220	154.08	165.34	276
580.000	.34909	2.865	.031600	43.537	73925.4	78508.8	372.084	157.99	168.90	282
600.000	.33524	2.983	.030153	45.645	77149.4	81922.1	377.870	161.80	172.43	289
620.000	.32260	3.100	.028855	47.710	80445.8	85405.5	383.580	165.51	175.90	295
640.000	.31100	3.215	.027683	49.736	83812.9	88957.7	389.219	169.12	179.31	301
660.000	.30030	3.330	.026617	51.731	87249.3	92577.4	394.788	172.63	182.65	306
680.000	.29038	3.444	.025642	53.697	90753.3	96263.2	400.290	176.04	185.92	312
700.000	.28117	3.557	.024747	55.640	94322.9	100013.5	405.725	179.36	189.10	317

Table 19. Continued

N-BUTANE ISOBAR AT P = 18 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
135.162	12.657	.07901	24.8966	1564.026	9.6	151.9	134.082	78.13	111.57	1960
140.000	12.580	.07949	23.8605	1497.933	553.1	696.2	138.028	78.53	112.15	1918
150.000	12.420	.08051	21.8915	1371.883	1683.4	1828.4	145.827	79.40	113.37	1835
160.000	12.261	.08156	20.1261	1258.206	2823.3	2970.1	153.193	80.34	114.61	1757
170.000	12.100	.08264	18.5351	1155.046	3973.3	4122.1	160.180	81.34	115.87	1682
180.000	11.940	.08376	17.0950	1060.907	5134.5	5285.3	166.836	82.40	117.18	1611
190.000	11.778	.08490	15.7861	974.567	6308.1	6460.9	173.200	83.51	118.54	1542
200.000	11.616	.08609	14.5920	895.005	7495.2	7650.2	179.309	84.69	119.95	1476
210.000	11.452	.08732	13.4989	821.392	8697.2	8854.4	185.191	85.92	121.44	1413
220.000	11.287	.08860	12.4950	753.021	9915.4	10074.8	190.872	87.21	123.01	1351
230.000	11.120	.08993	11.5701	689.300	11150.7	11312.6	196.376	88.56	124.68	1292
240.000	10.951	.09132	10.7155	629.731	12404.6	12568.9	201.722	89.98	126.47	1234
250.000	10.779	.09277	9.9234	573.892	13678.1	13845.0	206.928	91.46	128.38	1177
260.000	10.605	.09430	9.1872	521.427	14972.4	15142.1	212.009	93.02	130.44	1121
270.000	10.427	.09591	8.5008	472.035	16288.8	16461.4	216.981	94.65	132.67	1066
280.000	10.244	.09761	7.8591	425.463	17628.5	17804.2	221.855	96.37	135.10	1013
290.000	10.057	.09943	7.2571	381.493	18992.9	19171.9	226.646	98.17	137.75	959
300.000	9.864	.10138	6.6907	339.946	20383.6	20566.1	231.365	100.06	140.66	906
310.000	9.663	.10349	6.1558	300.665	21803.1	21989.4	236.027	102.05	143.89	854
320.000	9.454	.10578	5.6486	263.514	23254.1	23444.5	240.645	104.13	147.49	801
330.000	9.234	.10830	5.1656	228.369	24740.9	24935.8	245.236	106.33	151.55	748
340.000	9.000	.11111	4.7031	195.115	26269.4	26469.4	249.818	108.63	156.21	694
350.000	8.750	.11429	4.2570	163.632	27846.9	28052.7	254.416	111.03	161.66	640
360.000	8.478	.11796	3.8226	133.785	29484.2	29696.5	259.056	113.64	168.35	583
370.000	8.175	.12232	3.3932	105.395	31196.3	31416.5	263.778	116.57	177.05	524
380.000	7.827	.12776	2.9581	78.187	33007.2	33237.2	268.641	119.82	189.24	460
381.825	7.757	.12892	2.8767	73.314	33351.4	33583.5	269.552	120.46	192.09	448
381.825	.82067	1.219	.096717	13.046	45454.3	47647.6	306.386	118.96	159.61	173
390.000	.76765	1.303	.087367	15.291	46576.8	48921.6	309.688	119.87	152.91	183
400.000	.71719	1.394	.079075	17.651	47918.8	50428.6	313.504	121.48	149.03	193
410.000	.67663	1.478	.072747	19.742	49248.8	51909.1	317.160	123.33	147.33	201
420.000	.64272	1.556	.067669	21.646	50578.4	53379.0	320.702	125.30	146.80	208
430.000	.61363	1.630	.063460	23.411	51913.9	54847.3	324.157	127.33	146.98	215
440.000	.58819	1.700	.059891	25.066	53259.7	56319.9	327.543	129.41	147.61	221
450.000	.56563	1.768	.056811	26.634	54618.1	57800.4	330.870	131.51	148.55	227
460.000	.54538	1.834	.054115	28.128	55991.2	59291.7	334.147	133.62	149.72	232
470.000	.52703	1.897	.051730	29.562	57380.0	60795.3	337.381	135.74	151.05	237
480.000	.51029	1.960	.049600	30.943	58785.5	62312.9	340.577	137.85	152.50	242
490.000	.49490	2.021	.047682	32.279	60208.6	63845.7	343.737	139.95	154.04	247
500.000	.48069	2.080	.045943	33.576	61649.4	65394.0	346.865	142.04	155.65	251
520.000	.45519	2.197	.042904	36.070	64585.5	68539.9	353.034	146.18	158.99	259
540.000	.43286	2.310	.040326	38.455	67595.6	71754.0	359.099	150.24	162.43	267
560.000	.41306	2.421	.038103	40.751	70679.6	75037.4	365.069	154.22	165.92	274
580.000	.39532	2.530	.036161	42.976	73837.4	78390.7	370.952	158.11	169.40	281
600.000	.37930	2.636	.034445	45.141	77067.7	81813.3	376.754	161.91	172.87	287
620.000	.36472	2.742	.032915	47.255	80369.6	85304.8	382.478	165.60	176.29	294
640.000	.35138	2.846	.031538	49.326	83741.5	88864.2	388.128	169.20	179.65	300
660.000	.33910	2.949	.030291	51.361	87182.3	92490.5	393.707	172.70	182.95	305
680.000	.32775	3.051	.029155	53.364	90689.9	96181.9	399.217	176.10	186.19	311
700.000	.31721	3.152	.028113	55.340	94262.8	99937.3	404.660	179.41	189.35	316

Table 19. Continued

N-BUTANE ISOBAR AT P = 20 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
135.195	12.657	.07900	24.9069	1565.793	10.7	168.7	134.090	78.14	111.57	1961
140.000	12.581	.07948	23.8780	1500.142	550.3	709.3	138.008	78.53	112.15	1919
150.000	12.422	.08050	21.9085	1374.040	1680.4	1841.4	145.806	79.40	113.36	1837
160.000	12.262	.08155	20.1427	1260.319	2819.9	2983.0	153.171	80.34	114.60	1758
170.000	12.102	.08263	18.5514	1157.123	3969.6	4134.9	160.158	81.34	115.86	1683
180.000	11.941	.08374	17.1110	1062.956	5130.5	5298.0	166.813	82.40	117.17	1612
190.000	11.780	.08489	15.8019	976.591	6303.6	6473.4	173.177	83.51	118.52	1544
200.000	11.618	.08608	14.6076	897.011	7490.4	7662.6	179.285	84.69	119.93	1478
210.000	11.454	.08730	13.5144	823.384	8692.0	8866.6	185.166	85.92	121.42	1414
220.000	11.289	.08858	12.5104	755.004	9909.7	10086.8	190.846	87.21	122.99	1353
230.000	11.123	.08991	11.5855	691.278	11144.5	11324.3	196.349	88.56	124.66	1293
240.000	10.954	.09129	10.7308	631.707	12397.8	12580.4	201.694	89.98	126.44	1235
250.000	10.783	.09274	9.9388	575.870	13670.7	13856.2	206.898	91.46	128.35	1179
260.000	10.609	.09426	9.2026	523.411	14964.3	15152.9	211.978	93.02	130.40	1123
270.000	10.431	.09587	8.5164	474.028	16280.0	16471.7	216.948	94.65	132.62	1068
280.000	10.249	.09757	7.8749	427.468	17618.7	17813.8	221.820	96.37	135.04	1015
290.000	10.062	.09938	7.2732	383.514	18982.1	19180.9	226.609	98.17	137.67	961
300.000	9.870	.10132	6.7071	341.987	20371.6	20574.3	231.325	100.06	140.57	909
310.000	9.670	.10342	6.1726	302.730	21789.7	21996.5	235.983	102.05	143.77	856
320.000	9.461	.10570	5.6661	265.607	23239.0	23450.4	240.597	104.13	147.34	804
330.000	9.242	.10820	5.1838	230.498	24723.6	24940.0	245.183	106.33	151.37	751
340.000	9.010	.11098	4.7223	197.287	26249.5	26471.4	249.759	108.63	155.96	698
350.000	8.762	.11413	4.2776	165.860	27823.6	28051.8	254.348	111.03	161.33	643
360.000	8.493	.11775	3.8450	136.089	29456.2	29691.7	258.977	113.64	167.87	588
370.000	8.194	.12204	3.4184	107.808	31161.5	31405.6	263.682	116.57	176.30	529
380.000	7.852	.12735	2.9878	80.774	32961.8	33216.5	268.520	119.82	187.93	466
387.557	7.550	.13244	2.6490	60.908	34409.5	34674.4	272.323	122.57	200.89	414
387.557	.93330	1.071	.113125	11.824	45830.5	47973.4	306.638	121.22	169.38	168
390.000	.91111	1.098	.108963	12.617	46187.1	48382.2	307.690	121.33	165.55	172
400.000	.83816	1.193	.096117	15.434	47600.0	49986.2	311.752	122.47	156.56	184
410.000	.78315	1.277	.087064	17.824	48975.2	51529.0	315.562	124.10	152.53	194
420.000	.73892	1.353	.080121	19.946	50337.0	53043.7	319.212	125.93	150.68	202
430.000	.70196	1.425	.074538	21.882	51697.2	54546.3	322.748	127.87	150.03	210
440.000	.67027	1.492	.069905	23.676	53062.5	56046.4	326.197	129.87	150.09	216
450.000	.64257	1.556	.065974	25.359	54437.2	57549.6	329.575	131.92	150.63	223
460.000	.61801	1.618	.062581	26.953	55823.6	59059.8	332.894	133.99	151.49	228
470.000	.59596	1.678	.059611	28.473	57224.1	60580.0	336.164	136.06	152.58	234
480.000	.57600	1.736	.056983	29.930	58639.7	62111.9	339.389	138.14	153.84	239
490.000	.55779	1.793	.054636	31.334	60071.4	63657.0	342.575	140.22	155.22	244
500.000	.54105	1.848	.052523	32.692	61520.1	65216.6	345.726	142.29	156.70	248
520.000	.51124	1.956	.048861	35.290	64469.4	68381.5	351.932	146.38	159.84	257
540.000	.48534	2.060	.045785	37.763	67490.3	71611.1	358.026	150.42	163.14	265
560.000	.46251	2.162	.043153	40.134	70583.3	74907.5	364.020	154.37	166.52	272
580.000	.44216	2.262	.040870	42.424	73748.7	78271.9	369.923	158.24	169.92	279
600.000	.42385	2.359	.038863	44.645	76985.5	81704.1	375.740	162.01	173.31	286
620.000	.40725	2.456	.037081	46.809	80292.9	85203.9	381.478	165.70	176.68	293
640.000	.39209	2.550	.035486	48.926	83670.0	88770.8	387.140	169.28	180.00	299
660.000	.37818	2.644	.034046	51.001	87114.8	92403.4	392.729	172.77	183.26	305
680.000	.36534	2.737	.032737	53.040	90626.2	96100.6	398.248	176.17	186.46	310
700.000	.35345	2.829	.031541	55.049	94202.6	99861.2	403.698	179.47	189.59	316

Table 19. Continued

N-BUTANE ISOBAR AT P = 22 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
135.229	12.658	.07900	24.9172	1567.561	11.8	185.6	134.098	78.14	111.56	1962
140.000	12.582	.07948	23.8954	1502.350	547.5	722.4	137.988	78.53	112.14	1921
150.000	12.423	.08049	21.9255	1376.196	1677.3	1854.4	145.786	79.40	113.35	1838
160.000	12.264	.08154	20.1593	1262.432	2816.6	2996.0	153.150	80.34	114.59	1760
170.000	12.104	.08262	18.5677	1159.201	3966.0	4147.7	160.136	81.34	115.85	1685
180.000	11.943	.08373	17.1270	1065.003	5126.4	5310.7	166.791	82.40	117.15	1614
190.000	11.782	.08487	15.8177	978.615	6299.3	6486.0	173.154	83.51	118.51	1545
200.000	11.620	.08606	14.6232	899.016	7485.6	7675.0	179.260	84.69	119.92	1479
210.000	11.457	.08729	13.5299	825.376	8686.8	8878.8	185.141	85.92	121.40	1416
220.000	11.292	.08856	12.5258	756.986	9904.0	10098.8	190.820	87.21	122.97	1355
230.000	11.126	.08988	11.6008	693.255	11138.4	11336.1	196.322	88.56	124.63	1295
240.000	10.957	.09126	10.7461	633.682	12391.1	12591.9	201.666	89.98	126.41	1237
250.000	10.786	.09271	9.9541	577.847	13663.3	13867.3	206.869	91.46	128.31	1180
260.000	10.613	.09423	9.2180	525.392	14956.3	15163.6	211.947	93.02	130.36	1125
270.000	10.435	.09583	8.5320	476.018	16271.1	16482.0	216.915	94.65	132.57	1070
280.000	10.254	.09752	7.8906	429.471	17609.0	17823.6	221.785	96.37	134.98	1017
290.000	10.067	.09933	7.2892	385.532	18971.4	19189.9	226.571	98.17	137.60	964
300.000	9.875	.10126	6.7234	344.024	20359.7	20582.5	231.285	100.06	140.48	911
310.000	9.676	.10335	6.1894	304.790	21776.4	22003.7	235.940	102.05	143.66	859
320.000	9.469	.10561	5.6834	267.695	23224.0	23456.3	240.549	104.13	147.20	806
330.000	9.251	.10810	5.2020	232.620	24706.5	24944.4	245.130	106.33	151.18	754
340.000	9.020	.11086	4.7414	199.451	26229.8	26473.7	249.700	108.63	155.72	701
350.000	8.774	.11397	4.2980	168.078	27800.5	28051.3	254.281	111.03	161.00	647
360.000	8.507	.11755	3.8672	138.379	29428.6	29687.2	258.899	113.64	167.40	592
370.000	8.212	.12177	3.4432	110.201	31127.5	31395.4	263.589	116.57	175.59	534
380.000	7.877	.12695	3.0169	83.328	32917.6	33196.9	268.401	119.82	186.71	472
390.000	7.476	.13375	2.5714	57.371	34836.7	35131.0	273.431	123.52	203.93	403
392.870	7.342	.13620	2.4354	49.988	35421.4	35721.0	274.939	124.70	211.17	381
392.870	1.05404	.949	.131394	10.584	46154.3	48241.5	306.808	123.42	181.11	163
400.000	.979	1.02146	.1173	12.996	47232.3	49479.5	309.932	123.71	167.90	174
410.000	.902	1.10835	.1039	15.782	48672.1	51110.5	313.960	124.98	159.46	186
420.000	.844	1.18498	.0944	18.171	50076.1	52683.0	317.750	126.62	155.52	195
430.000	.797	1.25501	.0869	20.304	51466.6	54227.6	321.384	128.44	153.66	204
440.000	.757	1.32034	.0809	22.254	52855.0	55759.7	324.907	130.37	152.95	211
450.000	.724	1.38214	.0760	24.065	54248.1	57288.8	328.343	132.35	152.96	218
460.000	.694	1.44115	.0717	25.765	55649.9	58820.5	331.710	134.36	153.44	224
470.000	.668	1.49792	.0681	27.377	57063.1	60358.5	335.018	136.40	154.24	230
480.000	.644	1.55283	.0648	28.914	58489.8	61906.0	338.276	138.44	155.28	236
490.000	.623	1.60617	.0620	30.388	59931.0	63464.6	341.489	140.49	156.48	241
500.000	.603	1.65817	.0595	31.809	61387.9	65035.9	344.664	142.53	157.82	246
520.000	.569	1.75887	.0551	34.516	64351.4	68220.9	350.910	146.59	160.74	255
540.000	.539	1.85601	.0515	37.078	67383.6	71466.8	357.034	150.59	163.88	263
560.000	.513	1.95034	.0484	39.525	70485.9	74776.7	363.053	154.52	167.14	271
580.000	.490	2.04243	.0457	41.880	73659.1	78152.4	368.976	158.36	170.45	278
600.000	.469	2.13266	.0434	44.158	76902.6	81594.4	374.810	162.12	173.77	285
620.000	.450	2.22135	.0414	46.373	80215.8	85102.8	380.562	165.79	177.07	291
640.000	.433	2.30876	.0395	48.534	83597.8	88677.1	386.235	169.36	180.35	298
660.000	.418	2.39506	.0379	50.649	87047.1	92316.2	391.834	172.84	183.57	304
680.000	.403	2.48041	.0364	52.725	90562.4	96019.3	397.362	176.23	186.74	310
700.000	.390	2.56495	.0350	54.767	94142.3	99785.2	402.820	179.52	189.84	315

Table 19. Continued

N-BUTANE ISOBAR AT P = 24 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
135.262	12.659	.07900	24.9274	1569.328	12.9	202.5	134.105	78.14	111.56	1963
140.000	12.584	.07947	23.9128	1504.559	544.7	735.4	137.968	78.53	112.13	1922
150.000	12.425	.08049	21.9425	1378.353	1674.2	1867.4	145.765	79.40	113.34	1839
160.000	12.265	.08153	20.1759	1264.544	2813.2	3008.9	153.129	80.34	114.58	1761
170.000	12.106	.08261	18.5840	1161.277	3962.3	4160.5	160.114	81.34	115.84	1686
180.000	11.945	.08372	17.1430	1067.050	5122.4	5323.3	166.768	82.40	117.14	1615
190.000	11.784	.08486	15.8335	980.639	6294.9	6498.5	173.130	83.51	118.49	1547
200.000	11.622	.08604	14.6388	901.021	7480.9	7687.4	179.236	84.69	119.90	1481
210.000	11.459	.08727	13.5453	827.367	8681.6	8891.1	185.116	85.92	121.38	1418
220.000	11.295	.08854	12.5411	758.967	9898.3	10110.8	190.795	87.21	122.95	1356
230.000	11.129	.08986	11.6161	695.230	11132.2	11347.9	196.295	88.56	124.61	1297
240.000	10.960	.09124	10.7614	635.655	12384.4	12603.3	201.637	89.98	126.38	1239
250.000	10.790	.09268	9.9694	579.822	13656.0	13878.4	206.839	91.46	128.27	1182
260.000	10.616	.09419	9.2334	527.373	14948.3	15174.3	211.916	93.02	130.31	1127
270.000	10.439	.09579	8.5475	478.007	16262.3	16492.2	216.882	94.65	132.52	1073
280.000	10.258	.09748	7.9063	431.471	17599.3	17833.3	221.750	96.37	134.91	1019
290.000	10.073	.09928	7.3052	387.551	18960.7	19199.0	226.534	98.17	137.53	966
300.000	9.881	.10120	6.7397	346.058	20347.9	20590.7	231.245	100.06	140.39	913
310.000	9.683	.10328	6.2062	306.846	21763.1	22011.0	235.896	102.05	143.55	861
320.000	9.476	.10553	5.7008	269.779	23209.1	23462.3	240.502	104.13	147.06	809
330.000	9.259	.10800	5.2200	234.736	24689.6	24948.8	245.078	106.33	151.01	757
340.000	9.030	.11074	4.7604	201.609	26210.3	26476.0	249.642	108.63	155.49	704
350.000	8.786	.11382	4.3182	170.287	27777.8	28050.9	254.215	111.03	160.68	651
360.000	8.521	.11735	3.8891	140.657	29401.5	29683.1	258.822	113.64	166.95	596
370.000	8.230	.12150	3.4676	112.576	31094.1	31385.7	263.497	116.57	174.91	539
380.000	7.900	.12657	3.0453	85.852	32874.7	33178.5	268.286	119.82	185.58	478
390.000	7.510	.13315	2.6071	60.155	34776.9	35096.4	273.274	123.51	201.64	411
397.822	7.130	.14025	2.2321	40.325	36396.6	36733.2	277.430	126.89	223.57	349
397.822	1.18475	.844	.151924	9.324	46427.2	48453.0	306.890	125.60	195.75	158
400.000	1.152	.86834	.1453	10.212	46786.0	48870.0	307.936	125.44	187.81	162
410.000	1.039	.96285	.1244	13.579	48329.1	50639.9	312.307	126.03	169.34	177
420.000	.960	1.04169	.1109	16.305	49790.4	52290.5	316.285	127.40	161.75	188
430.000	.899	1.11176	.1009	18.671	51219.3	53887.5	320.043	129.07	158.08	198
440.000	.850	1.17603	.0932	20.797	52635.5	55458.0	323.655	130.89	156.30	206
450.000	.809	1.23612	.0869	22.747	54050.2	57016.9	327.158	132.80	155.62	214
460.000	.773	1.29303	.0816	24.564	55469.3	58572.6	330.577	134.76	155.62	220
470.000	.742	1.34742	.0771	26.273	56896.8	60130.7	333.928	136.75	156.07	227
480.000	.714	1.39976	.0732	27.894	58335.4	61694.8	337.221	138.75	156.84	232
490.000	.689	1.45041	.0698	29.442	59787.1	63268.1	340.465	140.77	157.84	238
500.000	.667	1.49962	.0668	30.928	61252.9	64852.0	343.665	142.79	159.00	243
520.000	.627	1.59452	.0616	33.745	64231.3	68058.2	349.952	146.80	161.68	252
540.000	.593	1.68568	.0574	36.399	67275.4	71321.0	356.109	150.77	164.65	261
560.000	.564	1.77393	.0538	38.923	70387.4	74644.9	362.153	154.67	167.77	269
580.000	.538	1.85985	.0507	41.344	73568.8	78032.4	368.097	158.49	170.99	277
600.000	.514	1.94387	.0481	43.680	76819.1	81484.4	373.948	162.23	174.23	284
620.000	.494	2.02632	.0457	45.945	80138.4	85001.6	379.714	165.88	177.48	290
640.000	.475	2.10745	.0437	48.151	83525.4	88583.3	385.399	169.45	180.70	297
660.000	.457	2.18747	.0418	50.307	86979.1	92229.0	391.009	172.91	183.88	303
680.000	.441	2.26653	.0401	52.419	90498.5	95938.2	396.545	176.29	187.02	309
700.000	.426	2.34477	.0386	54.494	94081.8	99709.2	402.010	179.58	190.09	315

Table 19. Continued

N-BUTANE ISOBAR AT P = 26 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
135.296	12.660	.07899	24.9377	1571.095	14.0	219.4	134.113	78.14	111.56	1964
140.000	12.585	.07946	23.9302	1506.767	541.9	748.5	137.948	78.53	112.12	1923
150.000	12.426	.08048	21.9594	1380.508	1671.1	1880.4	145.744	79.40	113.34	1841
160.000	12.267	.08152	20.1924	1266.657	2809.8	3021.8	153.108	80.34	114.57	1762
170.000	12.107	.08260	18.6002	1163.353	3958.6	4173.3	160.092	81.34	115.83	1688
180.000	11.947	.08370	17.1590	1069.097	5118.4	5336.0	166.745	82.40	117.13	1616
190.000	11.786	.08485	15.8492	982.661	6290.5	6511.1	173.107	83.51	118.48	1548
200.000	11.624	.08603	14.6544	903.025	7476.1	7699.8	179.212	84.69	119.88	1483
210.000	11.462	.08725	13.5608	829.357	8676.4	8903.3	185.091	85.92	121.36	1419
220.000	11.297	.08852	12.5565	760.947	9892.7	10122.8	190.769	87.21	122.92	1358
230.000	11.131	.08984	11.6314	697.204	11126.1	11359.6	196.268	88.56	124.58	1298
240.000	10.964	.09121	10.7766	637.627	12377.7	12614.8	201.609	89.98	126.35	1241
250.000	10.793	.09265	9.9847	581.795	13648.7	13889.6	206.810	91.46	128.24	1184
260.000	10.620	.09416	9.2488	529.351	14940.3	15185.1	211.885	93.02	130.27	1129
270.000	10.444	.09575	8.5629	479.993	16253.6	16502.6	216.849	94.65	132.47	1075
280.000	10.263	.09744	7.9219	433.468	17589.7	17843.0	221.716	96.37	134.85	1021
290.000	10.078	.09923	7.3211	389.563	18950.1	19208.0	226.497	98.17	137.45	968
300.000	9.887	.10114	6.7560	348.088	20336.1	20599.0	231.205	100.06	140.30	916
310.000	9.689	.10321	6.2228	308.899	21749.9	22018.3	235.853	102.05	143.44	864
320.000	9.483	.10545	5.7180	271.858	23194.2	23468.4	240.455	104.13	146.93	812
330.000	9.268	.10790	5.2379	236.847	24672.8	24953.3	245.026	106.33	150.83	760
340.000	9.040	.11062	4.7792	203.759	26191.0	26478.6	249.584	108.63	155.26	707
350.000	8.798	.11367	4.3382	172.487	27755.3	28050.8	254.150	111.03	160.37	654
360.000	8.536	.11716	3.9108	142.922	29374.7	29679.3	258.747	113.64	166.52	600
370.000	8.248	.12125	3.4917	114.933	31061.4	31376.7	263.407	116.57	174.27	543
380.000	7.923	.12621	3.0731	88.346	32833.0	33161.1	268.174	119.81	184.52	483
390.000	7.543	.13257	2.6416	62.883	34719.6	35064.3	273.123	123.51	199.57	418
400.000	7.059	.14167	2.1673	37.959	36787.6	37156.0	278.419	127.92	227.25	340
402.460	6.910	.14471	2.0358	31.754	37342.8	37719.1	279.823	129.18	239.19	318
402.460	1.32801	.753	.175266	8.047	46648.1	48605.9	306.873	127.79	214.90	152
410.000	1.201	.83294	.1502	11.150	47926.6	50092.2	310.534	127.36	184.90	166
420.000	1.091	.91688	.1304	14.327	49472.8	51856.6	314.786	128.30	170.18	180
430.000	1.012	.98840	.1169	16.974	50951.6	53521.4	318.704	129.76	163.59	191
440.000	.950	1.05252	.1068	19.301	52402.2	55138.8	322.423	131.45	160.28	201
450.000	.900	1.11161	.0989	21.407	53842.3	56732.5	326.004	133.27	158.67	209
460.000	.857	1.16703	.0924	23.348	55281.1	58315.3	329.484	135.16	158.06	216
470.000	.820	1.21960	.0869	25.161	56724.6	59895.6	332.882	137.10	158.08	223
480.000	.787	1.26992	.0822	26.871	58176.5	61478.3	336.214	139.07	158.53	229
490.000	.759	1.31838	.0781	28.495	59639.3	63067.1	339.491	141.05	159.29	235
500.000	.732	1.36530	.0745	30.048	61115.0	64664.7	342.718	143.04	160.27	240
520.000	.687	1.45539	.0685	32.980	64109.2	67893.2	349.049	147.01	162.67	250
540.000	.649	1.54156	.0635	35.726	67165.7	71173.8	355.239	150.94	165.44	259
560.000	.616	1.62469	.0594	38.329	70287.9	74512.1	361.310	154.82	168.43	267
580.000	.586	1.70542	.0559	40.816	73477.6	77911.7	367.274	158.62	171.54	275
600.000	.560	1.78420	.0529	43.209	76735.1	81374.0	373.143	162.34	174.71	282
620.000	.537	1.86138	.0502	45.525	80060.4	84900.0	378.923	165.98	177.89	289
640.000	.516	1.93721	.0479	47.776	83452.6	88489.3	384.621	169.53	181.06	296
660.000	.497	2.01192	.0458	49.972	86911.0	92142.0	390.241	172.99	184.20	302
680.000	.479	2.08565	.0439	52.121	90434.2	95856.9	395.786	176.35	187.30	308
700.000	.463	2.15855	.0422	54.228	94021.1	99633.3	401.259	179.63	190.34	314

Table 19. Continued

N-BUTANE ISOBAR AT P = 28 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
135.329	12.660	.07899	24.9480	1572.861	15.1	236.2	134.121	78.15	111.56	1965
140.000	12.586	.07945	23.9476	1508.975	539.1	761.6	137.928	78.53	112.12	1925
150.000	12.428	.08047	21.9763	1382.664	1668.1	1893.4	145.724	79.40	113.33	1842
160.000	12.268	.08151	20.2090	1268.769	2806.5	3034.7	153.087	80.34	114.56	1764
170.000	12.109	.08258	18.6164	1165.429	3954.9	4186.1	160.071	81.34	115.82	1689
180.000	11.949	.08369	17.1750	1071.143	5114.4	5348.7	166.723	82.40	117.12	1618
190.000	11.788	.08483	15.8650	984.683	6286.1	6523.6	173.084	83.51	118.46	1550
200.000	11.627	.08601	14.6700	905.028	7471.3	7712.2	179.188	84.69	119.87	1484
210.000	11.464	.08723	13.5762	831.346	8671.3	8915.5	185.066	85.92	121.34	1421
220.000	11.300	.08850	12.5718	762.926	9887.1	10134.9	190.743	87.21	122.90	1360
230.000	11.134	.08981	11.6466	699.177	11119.9	11371.4	196.241	88.56	124.55	1300
240.000	10.967	.09119	10.7919	639.598	12371.0	12626.3	201.581	89.98	126.32	1242
250.000	10.797	.09262	9.9999	583.767	13641.4	13900.8	206.780	91.46	128.20	1186
260.000	10.624	.09413	9.2641	531.327	14932.3	15195.9	211.854	93.02	130.23	1131
270.000	10.448	.09571	8.5784	481.977	16244.9	16512.9	216.816	94.65	132.42	1077
280.000	10.268	.09739	7.9376	435.464	17580.1	17852.8	221.681	96.37	134.79	1023
290.000	10.083	.09918	7.3369	391.572	18939.5	19217.2	226.460	98.17	137.38	970
300.000	9.893	.10109	6.7722	350.115	20324.3	20607.4	231.166	100.06	140.21	918
310.000	9.696	.10314	6.2394	310.948	21736.9	22025.6	235.811	102.05	143.33	866
320.000	9.491	.10536	5.7351	273.932	23179.5	23474.6	240.409	104.13	146.79	815
330.000	9.276	.10780	5.2558	238.953	24656.1	24958.0	244.975	106.33	150.66	763
340.000	9.050	.11050	4.7980	205.902	26171.9	26481.3	249.527	108.63	155.04	711
350.000	8.809	.11352	4.3581	174.679	27733.0	28050.9	254.085	111.03	160.08	658
360.000	8.549	.11697	3.9323	145.176	29348.4	29675.9	258.672	113.64	166.10	604
370.000	8.265	.12099	3.5155	117.273	31029.3	31368.1	263.318	116.57	173.65	548
380.000	7.946	.12585	3.1003	90.815	32792.4	33144.8	268.065	119.81	183.52	489
390.000	7.574	.13203	2.6749	65.563	34664.5	35034.2	272.978	123.50	197.70	424
400.000	7.109	.14066	2.2139	41.059	36702.0	37095.8	278.198	127.90	222.37	350
406.819	6.678	.14974	1.8435	24.157	38268.0	38687.3	282.142	131.64	259.96	286
406.819	1.48761	.672	.202229	6.753	46813.0	48695.2	306.742	130.05	241.37	146
410.000	1.406	.71117	.1853	8.363	47423.7	49414.9	308.505	129.26	214.44	154
420.000	1.242	.80542	.1541	12.205	49110.8	51366.0	313.208	129.35	182.34	172
430.000	1.136	.88019	.1354	15.204	50658.7	53123.2	317.344	130.52	170.68	184
440.000	1.058	.94513	.1222	17.764	52152.5	54798.8	321.196	132.05	165.09	195
450.000	.996	1.00389	.1121	20.042	53622.9	56433.8	324.871	133.77	162.22	204
460.000	.945	1.05834	.1041	22.118	55084.6	58048.0	328.419	135.59	160.82	212
470.000	.901	1.10957	.0974	24.042	56546.0	59652.8	331.870	137.47	160.31	219
480.000	.863	1.15829	.0918	25.844	58012.6	61255.8	335.245	139.40	160.38	226
490.000	.830	1.20498	.0869	27.549	59487.8	62861.7	338.557	141.34	160.86	232
500.000	.800	1.25001	.0827	29.172	60973.8	64473.9	341.814	143.30	161.62	237
520.000	.748	1.33609	.0756	32.220	63984.9	67725.9	348.191	147.22	163.71	248
540.000	.705	1.41803	.0699	35.060	67054.4	71024.9	354.416	151.12	166.27	257
560.000	.668	1.49681	.0652	37.742	70187.3	74378.4	360.514	154.97	169.11	266
580.000	.636	1.57311	.0613	40.296	73385.7	77790.4	366.500	158.75	172.11	274
600.000	.607	1.64742	.0578	42.747	76650.4	81263.2	372.387	162.45	175.19	281
620.000	.581	1.72008	.0548	45.114	79981.9	84798.1	378.182	166.07	178.31	288
640.000	.558	1.79138	.0522	47.410	83379.4	88395.3	383.892	169.61	181.42	295
660.000	.537	1.86153	.0499	49.646	86842.5	92054.8	389.522	173.06	184.52	301
680.000	.518	1.93070	.0478	51.830	90369.8	95775.8	395.076	176.42	187.58	307
700.000	.500	1.99903	.0459	53.971	93960.2	99557.5	400.557	179.69	190.60	313

Table 19. Continued

N-BUTANE ISOBAR AT P = 30 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
135.363	12.661	.07898	24.9582	1574.628	16.2	253.1	134.129	78.15	111.55	1966
140.000	12.588	.07944	23.9649	1511.183	536.4	774.7	137.908	78.53	112.11	1926
150.000	12.429	.08046	21.9933	1384.819	1665.0	1906.4	145.703	79.40	113.32	1843
160.000	12.270	.08150	20.2255	1270.880	2803.1	3047.6	153.065	80.34	114.55	1765
170.000	12.111	.08257	18.6327	1167.504	3951.2	4199.0	160.049	81.34	115.81	1691
180.000	11.951	.08368	17.1909	1073.188	5110.4	5361.4	166.701	82.40	117.10	1619
190.000	11.790	.08482	15.8807	986.704	6281.8	6536.2	173.061	83.51	118.45	1551
200.000	11.629	.08599	14.6855	907.031	7466.6	7724.6	179.164	84.69	119.85	1486
210.000	11.466	.08721	13.5916	833.334	8666.1	8927.7	185.041	85.92	121.32	1422
220.000	11.303	.08848	12.5871	764.904	9881.5	10146.9	190.717	87.21	122.88	1361
230.000	11.137	.08979	11.6618	701.149	11113.8	11383.2	196.214	88.56	124.53	1302
240.000	10.970	.09116	10.8071	641.567	12364.3	12637.8	201.553	89.98	126.29	1244
250.000	10.800	.09259	10.0152	585.737	13634.2	13911.9	206.751	91.46	128.17	1188
260.000	10.628	.09409	9.2794	533.302	14924.4	15206.7	211.823	93.02	130.19	1133
270.000	10.452	.09568	8.5938	483.960	16236.2	16523.2	216.784	94.65	132.37	1079
280.000	10.272	.09735	7.9531	437.457	17570.6	17862.6	221.646	96.37	134.74	1025
290.000	10.088	.09913	7.3528	393.579	18929.0	19226.3	226.423	98.17	137.31	973
300.000	9.898	.10103	6.7883	352.139	20312.7	20615.7	231.126	100.06	140.13	921
310.000	9.702	.10307	6.2560	312.992	21723.8	22033.1	235.768	102.05	143.23	869
320.000	9.498	.10528	5.7522	276.002	23164.9	23480.8	240.362	104.13	146.66	817
330.000	9.285	.10770	5.2735	241.053	24639.6	24962.7	244.924	106.33	150.49	766
340.000	9.060	.11038	4.8166	208.039	26152.9	26484.1	249.471	108.63	154.82	714
350.000	8.821	.11337	4.3779	176.861	27711.1	28051.2	254.021	111.03	159.78	661
360.000	8.563	.11678	3.9536	147.418	29322.4	29672.7	258.599	113.64	165.70	608
370.000	8.282	.12075	3.5389	119.598	30997.8	31360.1	263.231	116.57	173.06	552
380.000	7.968	.12551	3.1271	93.258	32752.7	33129.3	267.958	119.81	182.58	494
390.000	7.604	.13151	2.7073	68.198	34611.5	35006.1	272.838	123.50	195.99	431
400.000	7.156	.13973	2.2579	44.055	36622.0	37041.2	277.992	127.88	218.26	359
410.000	6.511	.15358	1.7147	19.829	38932.9	39393.6	283.796	133.66	277.05	265
410.928	6.428	.15558	1.6521	17.462	39181.1	39647.8	284.415	134.35	289.83	254
410.928	1.66946	.599	.234058	5.443	46913.4	48710.4	306.469	132.45	280.86	140
420.000	1.423	.70276	.1841	9.889	48683.0	50791.3	311.481	130.68	201.77	162
430.000	1.276	.78348	.1571	13.347	50333.0	52683.4	315.934	131.38	180.22	177
440.000	1.176	.85037	.1396	16.181	51883.0	54434.1	319.959	132.71	171.04	189
450.000	1.100	.90948	.1268	18.652	53390.3	56118.7	323.745	134.30	166.39	199
460.000	1.038	.96345	.1168	20.875	54878.6	57769.0	327.373	136.04	163.95	208
470.000	.986	1.01374	.1087	22.916	56360.6	59401.8	330.885	137.86	162.78	215
480.000	.942	1.06122	.1020	24.816	57843.5	61027.1	334.307	139.73	162.40	222
490.000	.904	1.10649	.0963	26.603	59331.9	62651.3	337.656	141.64	162.54	229
500.000	.870	1.14995	.0913	28.298	60829.2	64279.1	340.944	143.57	163.05	235
520.000	.811	1.23264	.0831	31.465	63858.2	67556.2	347.371	147.44	164.80	245
540.000	.763	1.31097	.0766	34.402	66941.7	70874.6	353.633	151.30	167.13	255
560.000	.721	1.38602	.0713	37.163	70085.6	74243.7	359.759	155.12	169.82	264
580.000	.686	1.45851	.0668	39.784	73293.0	77668.5	365.768	158.88	172.70	272
600.000	.654	1.52894	.0629	42.294	76565.2	81152.0	371.672	162.56	175.69	280
620.000	.626	1.59770	.0596	44.711	79903.0	84696.1	377.483	166.17	178.73	287
640.000	.601	1.66507	.0566	47.052	83306.0	88301.2	383.205	169.69	181.79	294
660.000	.578	1.73128	.0540	49.328	86773.8	91967.6	388.846	173.13	184.84	301
680.000	.557	1.79649	.0517	51.548	90305.2	95694.7	394.409	176.48	187.87	307
700.000	.537	1.86086	.0496	53.721	93899.4	99482.0	399.898	179.74	190.85	313

Table 19. Continued

N-BUTANE ISOBAR AT P = 32 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
135.396	12.662	.07898	24.9684	1576.394	17.3	270.0	134.137	78.15	111.55	1967
140.000	12.589	.07943	23.9823	1513.391	533.6	787.8	137.888	78.53	112.10	1927
150.000	12.430	.08045	22.0102	1386.974	1662.0	1919.4	145.683	79.40	113.31	1845
160.000	12.272	.08149	20.2421	1272.991	2799.8	3060.5	153.044	80.34	114.54	1767
170.000	12.112	.08256	18.6489	1169.579	3947.6	4211.8	160.027	81.34	115.80	1692
180.000	11.953	.08366	17.2069	1075.233	5106.4	5374.1	166.678	82.40	117.09	1621
190.000	11.792	.08480	15.8964	988.725	6277.4	6548.8	173.038	83.51	118.43	1553
200.000	11.631	.08598	14.7011	909.043	7461.8	7737.0	179.140	84.69	119.83	1487
210.000	11.469	.08719	13.6070	835.321	8660.9	8940.0	185.016	85.92	121.31	1424
220.000	11.305	.08846	12.6023	766.881	9875.9	10158.9	190.691	87.21	122.86	1363
230.000	11.140	.08977	11.6770	703.120	11107.7	11395.0	196.188	88.56	124.50	1304
240.000	10.973	.09113	10.8223	643.535	12357.7	12649.3	201.525	89.98	126.26	1246
250.000	10.803	.09256	10.0304	587.706	13626.9	13923.1	206.722	91.46	128.13	1190
260.000	10.631	.09406	9.2946	535.275	14916.5	15217.5	211.792	93.02	130.15	1135
270.000	10.456	.09564	8.6092	485.940	16227.6	16533.6	216.751	94.65	132.32	1081
280.000	10.277	.09731	7.9687	439.447	17561.1	17872.5	221.612	96.37	134.68	1027
290.000	10.093	.09908	7.3685	395.583	18918.5	19235.5	226.386	98.17	137.24	975
300.000	9.904	.10097	6.8044	354.160	20301.1	20624.2	231.087	100.06	140.04	923
310.000	9.708	.10300	6.2725	315.034	21710.9	22040.5	235.726	102.05	143.12	871
320.000	9.505	.10520	5.7692	278.068	23150.5	23487.1	240.316	104.13	146.53	820
330.000	9.293	.10761	5.2912	243.148	24623.2	24967.5	244.874	106.33	150.33	769
340.000	9.069	.11026	4.8351	210.169	26134.2	26487.0	249.415	108.63	154.61	717
350.000	8.832	.11323	4.3975	179.036	27689.4	28051.7	253.958	111.03	159.50	665
360.000	8.577	.11660	3.9747	149.650	29296.8	29669.9	258.526	113.64	165.31	611
370.000	8.298	.12050	3.5620	121.906	30966.9	31352.5	263.146	116.57	172.49	557
380.000	7.989	.12518	3.1533	95.677	32714.1	33114.7	267.853	119.81	181.69	499
390.000	7.633	.13101	2.7387	70.792	34560.4	34979.7	272.703	123.49	194.42	437
400.000	7.200	.13888	2.2995	46.964	36546.9	36991.3	277.797	127.87	214.73	368
410.000	6.604	.15143	1.7870	23.519	38785.3	39269.9	283.420	133.56	261.21	281
414.809	6.147	.16268	1.4581	11.632	40094.8	40615.3	286.679	137.49	338.13	221
414.809	1.884	.53086	.2729	4.116	46933.2	48632.0	306.005	135.16	346.63	134
420.000	1.657	.60352	.2252	7.277	48143.1	50074.4	309.462	132.53	239.12	150
430.000	1.438	.69527	.1834	11.385	49963.0	52187.9	314.438	132.39	193.78	169
440.000	1.306	.76558	.1596	14.550	51589.1	54039.0	318.694	133.43	178.57	183
450.000	1.211	.82574	.1432	17.237	53142.2	55784.6	322.618	134.86	171.36	194
460.000	1.137	.87971	.1308	19.619	54662.1	57477.2	326.338	136.50	167.56	203
470.000	1.076	.92941	.1210	21.785	56167.4	59141.5	329.918	138.26	165.55	211
480.000	1.025	.97597	.1130	23.787	57668.5	60791.6	333.392	140.08	164.62	219
490.000	.980	1.02009	.1062	25.660	59171.7	62436.0	336.783	141.95	164.37	226
500.000	.941	1.06226	.1004	27.429	60681.2	64080.5	340.105	143.84	164.59	232
520.000	.876	1.14208	.0910	30.717	63729.5	67384.1	346.583	147.66	165.94	243
540.000	.821	1.21730	.0835	33.751	66827.5	70722.8	352.884	151.48	168.03	253
560.000	.776	1.28911	.0775	36.592	69982.8	74108.0	359.039	155.27	170.54	262
580.000	.736	1.35828	.0724	39.281	73199.5	77545.9	365.071	159.00	173.29	271
600.000	.702	1.42534	.0681	41.848	76479.4	81040.5	370.994	162.67	176.19	279
620.000	.671	1.49069	.0644	44.317	79823.7	84593.9	376.820	166.26	179.16	286
640.000	.643	1.55463	.0612	46.702	83232.4	88207.2	382.555	169.77	182.17	293
660.000	.618	1.61739	.0583	49.017	86704.8	91880.4	388.207	173.20	185.17	300
680.000	.596	1.67914	.0557	51.273	90240.6	95613.8	393.779	176.54	188.16	306
700.000	.575	1.74004	.0534	53.479	93838.3	99406.4	399.276	179.79	191.11	312

Table 19. Continued

N-BUTANE ISOBAR AT P = 34 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
135.429	12.663	.07897	24.9787	1578.160	18.3	286.8	134.145	78.15	111.55	1968
140.000	12.590	.07943	23.9996	1515.598	530.8	800.9	137.868	78.53	112.09	1929
150.000	12.432	.08044	22.0271	1389.129	1658.9	1932.4	145.662	79.40	113.30	1846
160.000	12.273	.08148	20.2586	1275.102	2796.4	3073.4	153.023	80.34	114.53	1768
170.000	12.114	.08255	18.6651	1171.653	3943.9	4224.6	160.005	81.34	115.79	1693
180.000	11.955	.08365	17.2228	1077.277	5102.4	5386.8	166.656	82.40	117.08	1622
190.000	11.794	.08479	15.9121	990.745	6273.1	6561.3	173.015	83.51	118.42	1554
200.000	11.633	.08596	14.7166	911.043	7457.1	7749.4	179.116	84.69	119.82	1489
210.000	11.471	.08718	13.6223	837.307	8655.8	8952.2	184.992	85.92	121.29	1426
220.000	11.308	.08843	12.6176	768.857	9870.3	10170.9	190.666	87.21	122.84	1364
230.000	11.143	.08974	11.6922	705.089	11101.7	11406.8	196.161	88.56	124.48	1305
240.000	10.976	.09111	10.8374	645.502	12351.1	12660.9	201.497	89.98	126.23	1248
250.000	10.807	.09253	10.0455	589.674	13619.7	13934.3	206.692	91.46	128.10	1191
260.000	10.635	.09403	9.3099	537.246	14908.6	15228.3	211.762	93.02	130.11	1137
270.000	10.460	.09560	8.6245	487.918	16218.9	16544.0	216.719	94.65	132.27	1083
280.000	10.281	.09726	7.9842	441.435	17551.6	17882.3	221.578	96.37	134.62	1030
290.000	10.098	.09903	7.3843	397.584	18908.1	19244.8	226.350	98.17	137.17	977
300.000	9.910	.10091	6.8204	356.178	20289.5	20632.6	231.048	100.06	139.96	925
310.000	9.715	.10294	6.2889	317.071	21698.1	22048.1	235.683	102.05	143.02	874
320.000	9.512	.10513	5.7861	280.129	23136.1	23493.5	240.270	104.13	146.40	823
330.000	9.301	.10751	5.3087	245.237	24606.9	24972.5	244.823	106.33	150.16	771
340.000	9.079	.11015	4.8534	212.293	26115.6	26490.1	249.359	108.63	154.40	720
350.000	8.843	.11309	4.4169	181.202	27667.9	28052.4	253.895	111.03	159.22	668
360.000	8.590	.11642	3.9955	151.870	29271.6	29667.4	258.454	113.64	164.93	615
370.000	8.315	.12027	3.5849	124.200	30936.6	31345.5	263.061	116.57	171.95	561
380.000	8.009	.12485	3.1791	98.075	32676.3	33100.8	267.751	119.81	180.86	504
390.000	7.661	.13054	2.7693	73.349	34511.0	34954.8	272.573	123.49	192.98	444
400.000	7.242	.13809	2.3391	49.797	36476.0	36945.5	277.614	127.85	211.66	376
410.000	6.683	.14963	1.8505	26.959	38657.3	39166.0	283.093	133.49	250.09	294
418.478	5.815	.17197	1.2558	6.677	41032.8	41617.5	289.002	141.46	433.77	187
418.478	2.151	.46493	.3227	2.771	46837.8	48418.6	305.254	138.50	478.52	128
420.000	2.014	.49651	.2925	4.078	47345.3	49033.5	306.721	135.99	353.23	134
430.000	1.632	.61269	.2162	9.294	49529.0	51612.2	312.794	133.61	214.79	160
440.000	1.452	.68859	.1829	12.866	51264.8	53606.0	317.380	134.22	188.45	176
450.000	1.332	.75065	.1616	15.798	52876.3	55428.5	321.476	135.47	177.38	188
460.000	1.242	.80508	.1462	18.353	54433.8	57171.0	325.306	136.99	171.72	198
470.000	1.170	.85453	.1343	20.651	55965.9	58871.3	328.963	138.67	168.66	207
480.000	1.111	.90044	.1248	22.760	57487.3	60548.8	332.495	140.43	167.05	215
490.000	1.060	.94366	.1168	24.721	59006.7	62215.2	335.931	142.26	166.35	223
500.000	1.015	.98476	.1101	26.565	60529.5	63877.7	339.290	144.11	166.24	229
520.000	.942	1.06213	.0992	29.977	63598.3	67209.5	345.824	147.88	167.15	241
540.000	.881	1.13467	.0908	33.109	66711.6	70569.5	352.164	151.66	168.96	251
560.000	.831	1.20365	.0839	36.029	69878.9	73971.3	358.350	155.42	171.29	261
580.000	.787	1.26990	.0783	38.786	73105.2	77422.8	364.406	159.13	173.91	270
600.000	.750	1.33399	.0735	41.412	76393.1	80928.7	370.348	162.78	176.71	278
620.000	.716	1.39634	.0694	43.930	79744.0	84491.5	376.189	166.36	179.60	285
640.000	.686	1.45725	.0658	46.360	83158.3	88112.9	381.938	169.85	182.55	292
660.000	.659	1.51697	.0626	48.715	86635.6	91793.3	387.600	173.27	185.50	299
680.000	.635	1.57567	.0598	51.007	90175.6	95532.9	393.182	176.60	188.45	306
700.000	.612	1.63350	.0573	53.244	93777.1	99331.0	398.687	179.85	191.37	312

Table 19. Continued

N-BUTANE ISOBAR AT P = 36 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
135.463	12.663	.07897	24.9889	1579.925	19.4	303.7	134.153	78.16	111.54	1969
140.000	12.592	.07942	24.0170	1517.806	528.0	814.0	137.848	78.53	112.09	1930
150.000	12.433	.08043	22.0441	1391.301	1655.8	1945.4	145.641	79.40	113.29	1848
160.000	12.275	.08147	20.2751	1277.212	2793.1	3086.4	153.002	80.34	114.52	1769
170.000	12.116	.08254	18.6813	1173.727	3940.3	4237.4	159.984	81.34	115.77	1695
180.000	11.956	.08364	17.2387	1079.321	5098.4	5399.5	166.633	82.40	117.07	1624
190.000	11.796	.08477	15.9278	992.764	6268.7	6573.9	172.991	83.51	118.41	1556
200.000	11.635	.08594	14.7321	913.043	7452.4	7761.8	179.093	84.69	119.80	1490
210.000	11.474	.08716	13.6377	839.293	8650.7	8964.4	184.967	85.92	121.27	1427
220.000	11.310	.08841	12.6328	770.832	9864.7	10183.0	190.640	87.21	122.81	1366
230.000	11.146	.08972	11.7074	707.057	11095.6	11418.6	196.134	88.56	124.45	1307
240.000	10.979	.09108	10.8526	647.468	12344.5	12672.4	201.469	89.98	126.20	1249
250.000	10.810	.09250	10.0607	591.639	13612.6	13945.6	206.663	91.46	128.06	1193
260.000	10.639	.09400	9.3251	539.215	14900.8	15239.2	211.731	93.02	130.07	1138
270.000	10.464	.09556	8.6398	489.894	16210.4	16554.4	216.687	94.65	132.23	1085
280.000	10.286	.09722	7.9997	443.421	17542.2	17892.2	221.544	96.37	134.56	1032
290.000	10.103	.09898	7.4000	399.583	18897.7	19254.0	226.314	98.17	137.10	979
300.000	9.915	.10086	6.8364	358.193	20278.1	20641.1	231.009	100.06	139.88	928
310.000	9.721	.10287	6.3053	319.105	21685.3	22055.7	235.642	102.05	142.92	876
320.000	9.520	.10505	5.8030	282.186	23121.8	23499.9	240.225	104.13	146.27	825
330.000	9.309	.10742	5.3262	247.321	24590.8	24977.5	244.774	106.33	150.01	774
340.000	9.088	.11003	4.8717	214.411	26097.3	26493.4	249.304	108.63	154.19	723
350.000	8.854	.11295	4.4362	183.360	27646.7	28053.3	253.833	111.03	158.96	672
360.000	8.603	.11624	4.0162	154.081	29246.7	29665.1	258.383	113.64	164.57	619
370.000	8.331	.12004	3.6075	126.479	30906.7	31338.9	262.979	116.57	171.43	565
380.000	8.029	.12454	3.2045	100.451	32639.4	33087.8	267.651	119.81	180.06	509
390.000	7.687	.13008	2.7991	75.872	34463.2	34931.5	272.446	123.49	191.64	450
400.000	7.281	.13735	2.3771	52.563	36408.6	36903.1	277.439	127.84	208.96	384
410.000	6.753	.14808	1.9077	30.216	38543.2	39076.3	282.801	133.44	241.73	306
420.000	5.826	.17164	1.2668	7.777	41194.9	41812.8	289.385	142.89	398.22	193
421.949	5.370	.18621	1.0321	2.676	42061.9	42732.3	291.568	147.45	729.88	150
421.949	2.527	.39576	.3945	1.400	46532.0	47956.7	303.950	143.61	878.11	121
430.000	1.878	.53241	.2597	7.031	48992.7	50909.4	310.894	135.19	252.13	150
440.000	1.619	.61760	.2105	11.128	50900.9	53124.2	315.988	135.13	201.93	169
450.000	1.465	.68259	.1825	14.338	52588.8	55046.1	320.308	136.12	184.81	183
460.000	1.355	.73798	.1632	17.079	54191.8	56848.6	324.270	137.51	176.59	194
470.000	1.270	.78750	.1488	19.517	55755.2	58590.2	328.016	139.10	172.17	203
480.000	1.200	.83300	.1374	21.735	57299.6	60298.4	331.612	140.80	169.74	212
490.000	1.142	.87552	.1281	23.788	58836.9	61988.8	335.098	142.57	168.49	219
500.000	1.092	.91575	.1203	25.709	60374.0	63670.7	338.496	144.39	168.00	226
520.000	1.009	.99103	.1079	29.245	63464.6	67032.3	345.088	148.10	168.42	239
540.000	.942	1.06122	.0983	32.475	66594.2	70414.6	351.471	151.85	169.93	250
560.000	.887	1.12771	.0906	35.476	69773.8	73833.6	357.688	155.57	172.06	259
580.000	.839	1.19139	.0843	38.301	73010.1	77299.0	363.768	159.26	174.54	268
600.000	.798	1.25285	.0790	40.984	76306.2	80816.4	369.730	162.89	177.23	276
620.000	.762	1.31254	.0745	43.553	79663.8	84388.9	375.587	166.45	180.05	284
640.000	.730	1.37076	.0705	46.027	83083.9	88018.7	381.349	169.94	182.93	291
660.000	.700	1.42777	.0671	48.421	86566.2	91706.2	387.022	173.34	185.84	298
680.000	.674	1.48376	.0640	50.748	90110.5	95452.0	392.613	176.66	188.74	305
700.000	.650	1.53888	.0613	53.017	93715.9	99255.9	398.126	179.90	191.63	311

Table 19. Continued

N-BUTANE ISOBAR AT P =37.96120 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
135.496	12.664	.07896	24.9989	1581.656	20.5	320.3	134.160	78.16	111.54	1970
140.000	12.593	.07941	24.0340	1519.970	525.3	826.8	137.828	78.53	112.08	1931
150.000	12.435	.08042	22.0607	1393.413	1652.9	1958.2	145.621	79.40	113.29	1849
160.000	12.276	.08146	20.2913	1279.282	2789.8	3099.0	152.981	80.34	114.51	1771
170.000	12.117	.08253	18.6971	1175.760	3936.7	4250.0	159.962	81.34	115.76	1696
180.000	11.958	.08362	17.2543	1081.325	5094.5	5412.0	166.611	82.40	117.05	1625
190.000	11.798	.08476	15.9432	994.744	6264.5	6586.2	172.969	83.51	118.39	1557
200.000	11.638	.08593	14.7473	915.004	7447.8	7774.0	179.069	84.69	119.79	1492
210.000	11.476	.08714	13.6527	841.239	8645.7	8976.5	184.943	85.92	121.25	1429
220.000	11.313	.08839	12.6478	772.768	9859.2	10194.8	190.615	87.21	122.79	1368
230.000	11.148	.08970	11.7222	708.986	11089.7	11430.2	196.108	88.56	124.43	1309
240.000	10.982	.09106	10.8674	649.393	12338.1	12683.7	201.442	89.98	126.17	1251
250.000	10.814	.09248	10.0755	593.565	13605.5	13956.6	206.635	91.46	128.03	1195
260.000	10.642	.09396	9.3400	541.145	14893.1	15249.8	211.701	93.02	130.03	1140
270.000	10.468	.09553	8.6548	491.830	16202.0	16564.6	216.655	94.65	132.18	1087
280.000	10.290	.09718	8.0148	445.366	17533.0	17901.9	221.510	96.37	134.51	1034
290.000	10.108	.09893	7.4153	401.540	18887.6	19263.1	226.278	98.17	137.04	982
300.000	9.921	.10080	6.8521	360.166	20266.9	20649.5	230.971	100.06	139.80	930
310.000	9.727	.10280	6.3213	321.096	21672.9	22063.1	235.601	102.05	142.82	879
320.000	9.527	.10497	5.8195	284.199	23107.9	23506.3	240.181	104.13	146.15	828
330.000	9.317	.10733	5.3433	249.360	24575.1	24982.5	244.725	106.33	149.85	777
340.000	9.097	.10992	4.8895	216.481	26079.4	26496.7	249.250	108.63	154.00	726
350.000	8.865	.11281	4.4550	185.469	27626.1	28054.3	253.773	111.03	158.70	675
360.000	8.616	.11607	4.0363	156.238	29222.6	29663.2	258.315	113.64	164.22	623
370.000	8.346	.11982	3.6294	128.701	30877.9	31332.8	262.899	116.57	170.93	569
380.000	8.049	.12424	3.2290	102.762	32604.0	33075.7	267.555	119.81	179.32	514
390.000	7.713	.12966	2.8276	78.314	34417.7	34909.9	272.325	123.49	190.42	455
400.000	7.317	.13666	2.4128	55.219	36345.7	36864.5	277.275	127.83	206.60	391
410.000	6.815	.14674	1.9593	33.269	38441.7	38998.7	282.542	133.40	235.26	317
420.000	6.026	.16594	1.3887	12.001	40898.4	41528.3	288.629	142.39	328.24	218
430.000	2.220	.45044	.3226	4.572	48276.6	49986.6	308.523	137.44	336.06	138
440.000	1.811	.55221	.2433	9.369	50492.0	52588.2	314.509	136.14	220.90	161
450.000	1.609	.62143	.2059	12.889	52281.8	54640.8	319.123	136.81	193.95	177
460.000	1.474	.67829	.1817	15.827	53939.8	56514.7	323.242	138.04	182.21	189
470.000	1.373	.72817	.1643	18.407	55538.7	58302.9	327.088	139.53	176.07	199
480.000	1.293	.77348	.1508	20.737	57108.6	60044.9	330.756	141.17	172.65	208
490.000	1.226	.81550	.1399	22.880	58665.2	61760.9	334.295	142.89	170.77	216
500.000	1.170	.85503	.1309	24.878	60217.5	63463.3	337.734	144.67	169.85	224
520.000	1.077	.92856	.1167	28.537	63331.2	66856.2	344.388	148.33	169.73	237
540.000	1.003	.99673	.1059	31.864	66477.3	70261.0	350.813	152.03	170.92	248
560.000	.942	1.06106	.0974	34.944	69669.8	73697.7	357.062	155.72	172.84	258
580.000	.891	1.12249	.0904	37.834	72916.0	77177.1	363.167	159.39	175.17	267
600.000	.846	1.18165	.0845	40.573	76220.4	80706.0	369.148	163.00	177.76	275
620.000	.807	1.23900	.0796	43.191	79584.8	84288.2	375.021	166.54	180.49	283
640.000	.772	1.29487	.0753	45.708	83010.7	87926.2	380.796	170.01	183.31	291
660.000	.741	1.34951	.0715	48.140	86498.1	91620.9	386.480	173.41	186.17	298
680.000	.713	1.40311	.0682	50.501	90046.5	95372.9	392.081	176.72	189.04	304
700.000	.687	1.45583	.0652	52.801	93655.7	99182.2	397.602	179.95	191.89	311

Table 19. Continued

N-BUTANE ISOBAR AT P = 40 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
135.530	12.665	.07896	25.0093	1583.456	21.6	337.5	134.168	78.16	111.54	1971
140.000	12.594	.07940	24.0516	1522.220	522.5	840.1	137.808	78.53	112.07	1933
150.000	12.436	.08041	22.0779	1395.607	1649.8	1971.4	145.601	79.40	113.28	1850
160.000	12.278	.08145	20.3081	1281.432	2786.4	3112.2	152.960	80.34	114.50	1772
170.000	12.119	.08251	18.7136	1177.874	3933.0	4263.1	159.940	81.34	115.75	1698
180.000	11.960	.08361	17.2705	1083.407	5090.5	5424.9	166.589	82.40	117.04	1627
190.000	11.800	.08474	15.9591	996.801	6260.1	6599.1	172.945	83.51	118.38	1559
200.000	11.640	.08591	14.7631	917.041	7443.0	7786.6	179.045	84.69	119.77	1493
210.000	11.478	.08712	13.6683	843.261	8640.5	8989.0	184.918	85.92	121.23	1430
220.000	11.316	.08837	12.6633	774.779	9853.6	10207.1	190.589	87.21	122.77	1369
230.000	11.151	.08968	11.7377	710.991	11083.5	11442.2	196.081	88.56	124.40	1310
240.000	10.985	.09103	10.8828	651.394	12331.4	12695.5	201.414	89.98	126.14	1253
250.000	10.817	.09245	10.0909	595.566	13598.3	13968.0	206.605	91.46	127.99	1197
260.000	10.646	.09393	9.3554	543.149	14885.2	15260.9	211.670	93.02	129.99	1142
270.000	10.472	.09549	8.6703	493.840	16193.3	16575.3	216.623	94.65	132.13	1089
280.000	10.295	.09714	8.0305	447.386	17523.5	17912.1	221.476	96.37	134.45	1036
290.000	10.113	.09888	7.4312	403.572	18877.1	19272.6	226.241	98.17	136.97	984
300.000	9.926	.10074	6.8683	362.213	20255.3	20658.3	230.931	100.06	139.71	932
310.000	9.734	.10274	6.3379	323.163	21660.0	22071.0	235.558	102.05	142.72	881
320.000	9.534	.10489	5.8365	286.287	23093.5	23513.1	240.135	104.13	146.03	831
330.000	9.325	.10724	5.3609	251.475	24558.9	24987.9	244.675	106.33	149.70	780
340.000	9.107	.10981	4.9080	218.627	26061.0	26500.2	249.194	108.63	153.80	729
350.000	8.875	.11267	4.4744	187.654	27604.9	28055.6	253.711	111.03	158.44	678
360.000	8.629	.11589	4.0570	158.472	29197.9	29661.5	258.244	113.64	163.87	626
370.000	8.362	.11959	3.6519	130.997	30848.5	31326.9	262.817	116.57	170.44	574
380.000	8.068	.12394	3.2540	105.145	32568.0	33063.8	267.457	119.81	178.59	519
390.000	7.738	.12923	2.8566	80.824	34371.8	34888.7	272.203	123.48	189.24	461
400.000	7.353	.13599	2.4485	57.926	36283.2	36827.2	277.112	127.83	204.39	399
410.000	6.874	.14549	2.0090	36.323	38344.8	38926.7	282.293	133.37	229.80	328
420.000	6.173	.16198	1.4844	15.848	40675.5	41323.4	288.062	142.13	295.37	238
430.000	2.926	.34181	.4542	1.643	46914.2	48281.4	304.367	142.08	772.92	124
440.000	2.054	.48693	.2862	7.489	49989.0	51936.7	312.787	137.39	251.51	153
450.000	1.777	.56260	.2340	11.372	51930.3	54180.7	317.832	137.60	206.19	171
460.000	1.609	.62161	.2032	14.527	53659.9	56146.3	322.153	138.63	189.16	184
470.000	1.488	.67219	.1818	17.260	55302.4	57991.1	326.121	140.00	180.68	195
480.000	1.394	.71751	.1657	19.709	56902.2	59772.3	329.871	141.56	176.00	205
490.000	1.317	.75918	.1530	21.948	58481.0	61517.7	333.471	143.23	173.35	213
500.000	1.253	.79812	.1426	24.025	60050.7	63243.1	336.957	144.97	171.92	221
520.000	1.149	.87009	.1264	27.313	63190.0	66670.4	343.678	148.56	171.16	234
540.000	1.068	.93642	.1142	31.239	66354.2	70099.9	350.149	152.22	171.99	246
560.000	1.001	.99874	.1047	34.400	69560.3	73555.2	356.433	155.88	173.67	256
580.000	.945	1.05808	.0969	37.359	72817.5	77049.8	362.564	159.52	175.84	266
600.000	.897	1.11509	.0905	40.156	76130.6	80590.9	368.566	163.11	178.31	274
620.000	.855	1.17026	.0850	42.824	79502.3	84183.3	374.456	166.64	180.96	282
640.000	.817	1.22393	.0803	45.385	82934.3	87830.0	380.245	170.10	183.72	290
660.000	.783	1.27634	.0762	47.857	86426.9	91532.2	385.941	173.48	186.52	297
680.000	.753	1.32771	.0726	50.254	89979.8	95290.7	391.551	176.78	189.34	304
700.000	.726	1.37820	.0693	52.585	93593.0	99105.8	397.080	180.01	192.16	310

Table 19. Continued

N-BUTANE ISOBAR AT P = 42 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
135.563	12.666	.07895	25.0195	1585.220	22.7	354.3	134.176	78.17	111.54	1972
140.000	12.596	.07939	24.0690	1524.426	519.8	853.2	137.788	78.53	112.07	1934
150.000	12.438	.08040	22.0947	1397.760	1646.7	1984.4	145.580	79.40	113.27	1852
160.000	12.279	.08144	20.3246	1283.542	2783.1	3125.1	152.939	80.34	114.49	1773
170.000	12.121	.08250	18.7298	1179.946	3929.4	4275.9	159.919	81.34	115.74	1699
180.000	11.962	.08360	17.2864	1085.450	5086.5	5437.7	166.566	82.40	117.03	1628
190.000	11.802	.08473	15.9748	998.819	6255.8	6611.6	172.922	83.51	118.36	1560
200.000	11.642	.08590	14.7785	919.038	7438.3	7799.1	179.021	84.69	119.75	1495
210.000	11.481	.08710	13.6836	845.244	8635.4	9001.2	184.893	85.92	121.21	1432
220.000	11.318	.08835	12.6784	776.751	9848.1	10219.2	190.563	87.21	122.75	1371
230.000	11.154	.08965	11.7528	712.956	11077.5	11454.1	196.054	88.56	124.38	1312
240.000	10.988	.09101	10.8978	653.356	12324.9	12707.1	201.386	89.98	126.11	1255
250.000	10.820	.09242	10.1060	597.528	13591.1	13979.3	206.576	91.46	127.96	1199
260.000	10.650	.09390	9.3705	545.113	14877.4	15271.8	211.640	93.02	129.95	1144
270.000	10.476	.09545	8.6856	495.811	16184.8	16585.7	216.591	94.65	132.08	1091
280.000	10.299	.09709	8.0459	449.365	17514.2	17922.0	221.442	96.37	134.40	1038
290.000	10.118	.09883	7.4468	405.563	18866.9	19282.0	226.205	98.17	136.90	986
300.000	9.932	.10069	6.8841	364.219	20244.0	20666.9	230.893	100.06	139.63	935
310.000	9.740	.10267	6.3541	325.186	21647.5	22078.7	235.517	102.05	142.62	884
320.000	9.541	.10481	5.8532	288.332	23079.5	23519.7	240.090	104.13	145.91	833
330.000	9.333	.10714	5.3782	253.545	24543.2	24993.2	244.626	106.33	149.55	783
340.000	9.116	.10970	4.9259	220.727	26043.1	26503.9	249.140	108.63	153.61	732
350.000	8.886	.11254	4.4934	189.790	27584.4	28057.1	253.651	111.04	158.19	682
360.000	8.641	.11573	4.0772	160.653	29173.9	29660.0	258.176	113.65	163.53	630
370.000	8.377	.11938	3.6737	133.237	30820.1	31321.5	262.738	116.57	169.98	578
380.000	8.087	.12365	3.2782	107.465	32533.4	33052.7	267.363	119.81	177.91	523
390.000	7.763	.12882	2.8844	83.257	34328.0	34869.0	272.087	123.48	188.16	467
400.000	7.387	.13537	2.4824	60.533	36224.4	36793.0	276.959	127.82	202.44	406
410.000	6.927	.14437	2.0547	39.220	38256.7	38863.0	282.067	133.34	225.33	337
420.000	6.287	.15905	1.5623	19.309	40499.6	41167.6	287.614	141.98	276.28	254
430.000	4.713	.21216	.8185	1.936	44127.4	45018.4	296.655	143.65	813.34	137
440.000	2.361	.42356	.3420	5.621	49377.0	51156.0	310.806	138.87	303.12	145
450.000	1.966	.50866	.2665	9.886	51545.6	53681.9	316.486	138.44	222.08	165
460.000	1.753	.57052	.2269	13.261	53364.9	55761.1	321.057	139.23	197.36	179
470.000	1.607	.62210	.2007	16.148	55058.0	57670.8	325.164	140.48	185.87	191
480.000	1.498	.66763	.1816	18.713	56691.5	59495.5	329.006	141.95	179.66	201
490.000	1.410	.70908	.1667	21.046	58294.4	61272.5	332.671	143.56	176.10	210
500.000	1.338	.74757	.1547	23.201	59882.7	63022.5	336.206	145.26	174.09	218
520.000	1.222	.81824	.1363	27.115	63048.7	66485.3	342.997	148.79	172.64	232
540.000	1.133	.88296	.1227	30.639	66231.8	69940.2	349.517	152.40	173.08	244
560.000	1.060	.94353	.1121	33.879	69451.9	73414.7	355.835	156.03	174.51	255
580.000	.999	1.00103	.1035	36.903	72720.0	76924.3	361.993	159.65	176.52	264
600.000	.947	1.05614	.0964	39.757	76041.9	80477.7	368.016	163.22	178.87	273
620.000	.901	1.10938	.0905	42.474	79420.9	84080.3	373.922	166.73	181.43	281
640.000	.861	1.16109	.0853	45.078	82859.0	87735.6	379.724	170.18	184.11	289
660.000	.825	1.21154	.0809	47.588	86356.8	91445.3	385.432	173.55	186.86	296
680.000	.793	1.26093	.0770	50.018	89914.5	95210.4	391.052	176.85	189.64	303
700.000	.764	1.30943	.0735	52.381	93531.4	99031.0	396.589	180.06	192.43	310

Table 19. Continued

N-BUTANE ISOBAR AT P = 44 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
135.596	12.666	.07895	25.0297	1586.985	23.8	371.2	134.184	78.17	111.53	1973
140.000	12.597	.07938	24.0863	1526.633	517.0	866.3	137.768	78.53	112.06	1935
150.000	12.439	.08039	22.1116	1399.913	1643.7	1997.4	145.560	79.40	113.26	1853
160.000	12.281	.08143	20.3411	1285.651	2779.8	3138.1	152.918	80.34	114.48	1775
170.000	12.123	.08249	18.7459	1182.019	3925.7	4288.7	159.897	81.34	115.73	1701
180.000	11.964	.08359	17.3022	1087.491	5082.6	5450.4	166.544	82.40	117.02	1630
190.000	11.804	.08471	15.9904	1000.836	6251.5	6624.2	172.900	83.51	118.35	1562
200.000	11.644	.08588	14.7939	921.036	7433.6	7811.5	178.998	84.69	119.74	1496
210.000	11.483	.08709	13.6989	847.226	8630.3	9013.5	184.869	85.92	121.19	1433
220.000	11.321	.08833	12.6936	778.722	9842.6	10231.2	190.538	87.21	122.73	1373
230.000	11.157	.08963	11.7679	714.920	11071.5	11465.9	196.028	88.56	124.35	1314
240.000	10.991	.09098	10.9129	655.316	12318.3	12718.7	201.359	89.98	126.08	1256
250.000	10.824	.09239	10.1210	599.487	13584.0	13990.6	206.547	91.46	127.93	1201
260.000	10.654	.09387	9.3856	547.076	14869.7	15282.7	211.609	93.02	129.91	1146
270.000	10.480	.09542	8.7008	497.779	16176.4	16596.2	216.559	94.65	132.04	1092
280.000	10.304	.09705	8.0612	451.342	17505.0	17932.0	221.408	96.37	134.34	1040
290.000	10.123	.09879	7.4623	407.552	18856.7	19291.4	226.170	98.17	136.84	988
300.000	9.937	.10063	6.8999	366.222	20232.8	20675.5	230.855	100.06	139.55	937
310.000	9.746	.10261	6.3703	327.206	21635.0	22086.5	235.476	102.05	142.52	886
320.000	9.548	.10474	5.8698	290.372	23065.6	23526.4	240.045	104.14	145.79	836
330.000	9.341	.10705	5.3953	255.609	24527.5	24998.6	244.577	106.33	149.40	786
340.000	9.125	.10959	4.9438	222.820	26025.4	26507.6	249.087	108.63	153.42	735
350.000	8.897	.11240	4.5121	191.919	27564.1	28058.7	253.591	111.04	157.95	685
360.000	8.653	.11556	4.0971	162.825	29150.3	29658.8	258.108	113.65	163.21	634
370.000	8.392	.11917	3.6952	135.465	30792.1	31316.5	262.659	116.57	169.53	582
380.000	8.106	.12337	3.3021	109.768	32499.5	33042.3	267.270	119.81	177.26	528
390.000	7.786	.12843	2.9117	85.665	34285.4	34850.5	271.973	123.48	187.14	472
400.000	7.419	.13478	2.5152	63.098	36168.0	36761.0	276.812	127.81	200.67	412
410.000	6.976	.14335	2.0978	42.035	38174.3	38805.1	281.856	133.32	221.54	346
420.000	6.383	.15666	1.6302	22.558	40350.1	41039.4	287.234	141.87	263.31	268
430.000	5.299	.18872	1.0244	5.549	43309.7	44140.1	294.520	141.87	431.43	170
440.000	2.790	.35842	.4209	3.854	48570.4	50147.4	308.335	140.63	400.51	137
450.000	2.185	.45767	.3052	8.424	51110.8	53124.5	315.032	139.35	243.58	159
460.000	1.911	.52324	.2536	12.016	53046.6	55348.8	319.923	139.87	207.29	175
470.000	1.736	.57613	.2215	15.054	54800.2	57335.2	324.195	140.97	191.82	187
480.000	1.608	.62204	.1987	17.735	56471.8	59208.8	328.140	142.36	183.71	198
490.000	1.507	.66341	.1814	20.161	58101.7	61020.7	331.877	143.91	179.10	207
500.000	1.425	.70156	.1676	22.394	59710.1	62797.0	335.465	145.55	176.41	216
520.000	1.297	.77110	.1467	26.431	62904.9	66297.8	342.331	149.02	174.19	230
540.000	1.198	.83440	.1314	30.051	66107.7	69779.1	348.900	152.59	174.20	242
560.000	1.119	.89339	.1197	33.369	69342.4	73273.3	355.254	156.19	175.38	253
580.000	1.054	.94922	.1103	36.458	72621.7	76798.2	361.439	159.78	177.21	263
600.000	.997	1.00261	.1025	39.368	75952.8	80364.3	367.483	163.33	179.44	272
620.000	.949	1.05409	.0960	42.133	79339.3	83977.3	373.407	166.83	181.91	281
640.000	.906	1.10403	.0905	44.780	82783.5	87641.2	379.223	170.26	184.52	288
660.000	.868	1.15268	.0857	47.327	86286.6	91358.4	384.942	173.62	187.21	296
680.000	.833	1.20027	.0814	49.791	89848.8	95130.0	390.572	176.91	189.95	303
700.000	.802	1.24696	.0777	52.184	93469.7	98956.3	396.117	180.11	192.70	309

Table 19. Continued

N-BUTANE ISOBAR AT P = 46 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
135.630	12.667	.07894	25.0399	1588.749	24.9	388.1	134.192	78.17	111.53	1974
140.000	12.598	.07938	24.1035	1528.839	514.3	879.4	137.748	78.53	112.05	1937
150.000	12.440	.08038	22.1284	1402.065	1640.7	2010.5	145.539	79.40	113.25	1854
160.000	12.283	.08142	20.3575	1287.760	2776.5	3151.0	152.897	80.34	114.47	1776
170.000	12.124	.08248	18.7620	1184.090	3922.1	4301.5	159.876	81.34	115.72	1702
180.000	11.966	.08357	17.3181	1089.533	5078.6	5463.1	166.522	82.40	117.00	1631
190.000	11.806	.08470	16.0060	1002.852	6247.2	6636.8	172.877	83.51	118.34	1563
200.000	11.646	.08586	14.8094	923.032	7429.0	7824.0	178.974	84.69	119.72	1498
210.000	11.485	.08707	13.7142	849.208	8625.2	9025.7	184.844	85.92	121.18	1435
220.000	11.323	.08831	12.7088	780.692	9837.1	10243.3	190.512	87.21	122.71	1374
230.000	11.160	.08961	11.7829	716.882	11065.6	11477.8	196.002	88.56	124.33	1315
240.000	10.994	.09096	10.9279	657.275	12311.8	12730.2	201.331	89.98	126.05	1258
250.000	10.827	.09236	10.1361	601.446	13577.0	14001.8	206.519	91.46	127.89	1202
260.000	10.657	.09383	9.4007	549.037	14862.0	15293.6	211.579	93.02	129.87	1148
270.000	10.484	.09538	8.7159	499.746	16168.0	16606.7	216.527	94.65	131.99	1094
280.000	10.308	.09701	8.0765	453.317	17495.7	17942.0	221.374	96.37	134.29	1042
290.000	10.128	.09874	7.4778	409.537	18846.6	19300.8	226.134	98.17	136.77	990
300.000	9.943	.10058	6.9157	368.222	20221.6	20684.2	230.817	100.06	139.48	939
310.000	9.752	.10254	6.3863	329.223	21622.6	22094.3	235.435	102.05	142.43	889
320.000	9.554	.10466	5.8863	292.409	23051.8	23533.2	240.001	104.14	145.67	838
330.000	9.349	.10696	5.4124	257.669	24512.0	25004.1	244.529	106.33	149.25	788
340.000	9.134	.10948	4.9616	224.908	26007.8	26511.5	249.034	108.63	153.24	738
350.000	8.907	.11227	4.5308	194.040	27544.0	28060.4	253.532	111.04	157.71	688
360.000	8.666	.11540	4.1169	164.988	29127.0	29657.8	258.041	113.65	162.89	637
370.000	8.406	.11896	3.7166	137.682	30764.6	31311.8	262.583	116.57	169.10	586
380.000	8.124	.12310	3.3256	112.055	32466.2	33032.5	267.180	119.81	176.64	533
390.000	7.809	.12805	2.9384	88.049	34243.9	34832.9	271.862	123.48	186.19	477
400.000	7.450	.13422	2.5470	65.624	36113.6	36731.0	276.669	127.81	199.04	419
410.000	7.022	.14241	2.1388	44.777	38096.8	38751.9	281.657	133.30	218.25	355
420.000	6.466	.15465	1.6909	25.647	40218.8	40930.2	286.900	141.79	253.78	281
430.000	5.578	.17927	1.1525	9.025	42911.4	43736.0	293.495	141.21	344.60	194
440.000	3.420	.29238	.5376	2.767	47486.9	48831.9	305.197	142.27	535.09	133
450.000	2.445	.40903	.3521	7.030	50612.5	52494.0	313.438	140.33	273.11	153
460.000	2.087	.47923	.2840	10.805	52701.6	54906.0	318.742	140.53	219.38	170
470.000	1.874	.53375	.2444	13.987	54527.6	56982.9	323.210	141.48	198.65	183
480.000	1.724	.58020	.2173	16.780	56242.9	58911.8	327.271	142.77	188.22	195
490.000	1.609	.62159	.1970	19.296	57902.6	60761.9	331.086	144.25	182.35	204
500.000	1.516	.65949	.1812	21.605	59533.0	62566.6	334.732	145.85	178.90	213
520.000	1.373	.72807	.1576	25.763	62758.3	66107.5	341.677	149.25	175.82	228
540.000	1.266	.79010	.1406	29.477	65981.8	69616.3	348.298	152.77	175.37	241
560.000	1.180	.84766	.1276	32.872	69231.8	73131.0	354.689	156.34	176.27	252
580.000	1.109	.90197	.1173	36.025	72522.7	76671.8	360.902	159.91	177.92	262
600.000	1.048	.95379	.1088	38.990	75863.1	80250.5	366.968	163.44	180.01	271
620.000	.996	1.00367	.1018	41.803	79257.2	83874.1	372.909	166.92	182.39	280
640.000	.951	1.05198	.0957	44.491	82707.7	87546.8	378.739	170.34	184.93	288
660.000	.910	1.09900	.0905	47.075	86216.2	91271.6	384.470	173.69	187.57	295
680.000	.873	1.14495	.0860	49.573	89783.0	95049.8	390.109	176.97	190.26	302
700.000	.840	1.18999	.0819	51.995	93408.0	98882.0	395.663	180.17	192.97	309

Table 19. Continued

N-BUTANE ISOBAR AT P = 48 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
135.663	12.668	.07894	25.0501	1590.514	26.0	404.9	134.200	78.17	111.53	1975
140.000	12.600	.07937	24.1208	1531.046	511.5	892.5	137.729	78.53	112.04	1938
150.000	12.442	.08037	22.1452	1404.217	1637.7	2023.5	145.519	79.40	113.24	1856
160.000	12.284	.08141	20.3740	1289.868	2773.2	3163.9	152.876	80.34	114.46	1778
170.000	12.126	.08247	18.7782	1186.162	3918.5	4314.4	159.854	81.34	115.71	1703
180.000	11.967	.08356	17.3339	1091.573	5074.7	5475.8	166.500	82.40	116.99	1632
190.000	11.808	.08469	16.0216	1004.868	6242.9	6649.4	172.854	83.51	118.32	1565
200.000	11.648	.08585	14.8248	925.027	7424.3	7836.4	178.950	84.69	119.71	1499
210.000	11.488	.08705	13.7294	851.188	8620.2	9038.0	184.820	85.92	121.16	1437
220.000	11.326	.08829	12.7239	782.662	9831.6	10255.4	190.487	87.21	122.69	1376
230.000	11.162	.08959	11.7980	718.844	11059.6	11489.6	195.975	88.56	124.30	1317
240.000	10.997	.09093	10.9429	659.232	12305.4	12741.8	201.304	89.98	126.02	1260
250.000	10.830	.09233	10.1511	603.403	13569.9	14013.1	206.490	91.46	127.86	1204
260.000	10.661	.09380	9.4157	550.996	14854.3	15304.6	211.549	93.02	129.83	1150
270.000	10.488	.09534	8.7310	501.710	16159.6	16617.2	216.495	94.65	131.95	1096
280.000	10.313	.09697	8.0918	455.290	17486.6	17952.0	221.341	96.37	134.23	1044
290.000	10.133	.09869	7.4933	411.521	18836.5	19310.2	226.098	98.17	136.71	992
300.000	9.948	.10052	6.9314	370.219	20210.5	20693.0	230.779	100.06	139.40	941
310.000	9.758	.10248	6.4024	331.236	21610.3	22102.2	235.394	102.05	142.34	891
320.000	9.561	.10459	5.9028	294.441	23038.0	23540.1	239.957	104.14	145.56	841
330.000	9.357	.10688	5.4294	259.725	24496.6	25009.6	244.481	106.33	149.11	791
340.000	9.143	.10938	4.9792	226.991	25990.4	26515.4	248.981	108.63	153.06	741
350.000	8.917	.11214	4.5493	196.155	27524.1	28062.4	253.473	111.04	157.48	691
360.000	8.678	.11524	4.1366	167.143	29104.0	29657.1	257.975	113.65	162.59	641
370.000	8.421	.11875	3.7377	139.887	30737.5	31307.5	262.507	116.57	168.68	590
380.000	8.141	.12283	3.3488	114.326	32433.6	33023.2	267.091	119.81	176.04	537
390.000	7.832	.12768	2.9646	90.410	34203.4	34816.3	271.754	123.48	185.29	483
400.000	7.480	.13368	2.5779	68.113	36061.1	36702.8	276.532	127.80	197.55	425
410.000	7.065	.14154	2.1779	47.457	38023.6	38702.9	281.468	133.29	215.38	363
420.000	6.540	.15291	1.7463	28.611	40101.1	40835.1	286.600	141.73	246.40	292
430.000	5.767	.17340	1.2510	12.289	42635.9	43468.2	292.790	140.85	305.51	214
440.000	4.124	.24245	.6791	3.117	46398.8	47562.6	302.192	142.57	525.24	140
450.000	2.759	.36251	.4097	5.797	50036.2	51776.3	311.672	141.33	312.53	148
460.000	2.283	.43811	.3186	9.652	52326.0	54428.9	317.505	141.21	234.08	165
470.000	2.022	.49454	.2696	12.957	54238.9	56612.7	322.203	141.99	206.48	180
480.000	1.846	.54166	.2373	15.853	56004.2	58604.1	326.396	143.19	193.21	191
490.000	1.715	.58317	.2138	18.455	57696.9	60496.1	330.298	144.60	185.87	202
500.000	1.611	.62089	.1956	20.836	59351.1	62331.3	334.006	146.15	181.56	211
520.000	1.452	.68864	.1690	25.112	62609.1	65914.6	341.034	149.48	177.52	226
540.000	1.334	.74953	.1501	28.918	65854.4	69452.2	347.709	152.96	176.58	239
560.000	1.241	.80579	.1357	32.388	69120.1	72987.9	354.138	156.49	177.18	251
580.000	1.165	.85871	.1244	35.604	72423.0	76544.8	360.379	160.03	178.64	261
600.000	1.100	.90910	.1153	38.623	75772.9	80136.6	366.467	163.54	180.60	270
620.000	1.044	.95752	.1076	41.482	79174.7	83770.8	372.426	167.01	182.87	279
640.000	.996	1.00434	.1011	44.211	82631.8	87452.7	378.270	170.42	185.34	287
660.000	.953	1.04986	.0955	46.832	86145.6	91184.9	384.013	173.76	187.92	295
680.000	.914	1.09429	.0906	49.362	89717.1	94969.7	389.662	177.03	190.56	302
700.000	.879	1.13782	.0863	51.815	93346.2	98807.7	395.224	180.22	193.24	309

Table 19. Continued

N-BUTANE ISOBAR AT P = 50 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
135.696	12.669	.07894	25.0602	1592.277	27.1	421.8	134.208	78.18	111.52	1976
140.000	12.601	.07936	24.1381	1533.252	508.8	905.6	137.709	78.53	112.04	1939
150.000	12.443	.08036	22.1621	1406.369	1634.7	2036.5	145.499	79.40	113.24	1857
160.000	12.286	.08140	20.3904	1291.976	2769.9	3176.9	152.855	80.34	114.45	1779
170.000	12.128	.08246	18.7943	1188.233	3914.9	4327.2	159.833	81.34	115.70	1705
180.000	11.969	.08355	17.3497	1093.614	5070.8	5488.5	166.478	82.40	116.98	1634
190.000	11.810	.08467	16.0372	1006.883	6238.6	6662.0	172.831	83.51	118.31	1566
200.000	11.651	.08583	14.8401	927.022	7419.7	7848.8	178.927	84.69	119.69	1501
210.000	11.490	.08703	13.7446	853.168	8615.1	9050.3	184.795	85.92	121.14	1438
220.000	11.328	.08827	12.7390	784.630	9826.1	10267.5	190.462	87.21	122.67	1377
230.000	11.165	.08956	11.8130	720.804	11053.7	11501.5	195.949	88.56	124.28	1319
240.000	11.000	.09091	10.9579	661.189	12298.9	12753.4	201.276	89.98	126.00	1262
250.000	10.834	.09230	10.1660	605.358	13562.9	14024.4	206.461	91.46	127.83	1206
260.000	10.664	.09377	9.4307	552.954	14846.7	15315.5	211.519	93.02	129.79	1152
270.000	10.492	.09531	8.7461	503.673	16151.2	16627.8	216.464	94.66	131.90	1098
280.000	10.317	.09693	8.1070	457.260	17477.4	17962.1	221.308	96.37	134.18	1046
290.000	10.138	.09864	7.5087	413.502	18826.5	19319.7	226.063	98.17	136.64	995
300.000	9.954	.10047	6.9471	372.213	20199.4	20701.7	230.741	100.06	139.32	944
310.000	9.764	.10242	6.4184	333.246	21598.1	22110.2	235.354	102.05	142.24	893
320.000	9.568	.10452	5.9192	296.470	23024.4	23547.0	239.914	104.14	145.45	844
330.000	9.364	.10679	5.4463	261.776	24481.4	25015.3	244.434	106.33	148.97	794
340.000	9.151	.10927	4.9968	229.068	25973.1	26519.5	248.929	108.63	152.88	744
350.000	8.927	.11202	4.5677	198.263	27504.4	28064.5	253.415	111.04	157.25	695
360.000	8.690	.11508	4.1561	169.289	29081.2	29656.6	257.910	113.65	162.29	644
370.000	8.435	.11855	3.7587	142.081	30710.8	31303.6	262.432	116.57	168.28	594
380.000	8.159	.12257	3.3717	116.582	32401.6	33014.4	267.003	119.81	175.47	542
390.000	7.854	.12733	2.9903	92.750	34164.0	34800.6	271.648	123.48	184.44	488
400.000	7.509	.13317	2.6080	70.570	36010.4	36676.2	276.399	127.80	196.17	431
410.000	7.106	.14072	2.2153	50.081	37954.0	38657.6	281.288	133.28	212.83	370
420.000	6.607	.15137	1.7975	31.472	39993.9	40750.8	286.327	141.69	240.48	303
430.000	5.912	.16915	1.3332	15.386	42420.5	43266.3	292.241	140.63	282.75	230
440.000	4.662	.21452	.8142	4.612	45624.7	46697.3	300.122	141.98	432.98	155
450.000	3.136	.31892	.4799	4.920	49380.7	50975.3	309.740	142.23	356.43	145
460.000	2.502	.39964	.3583	8.591	51916.7	53914.9	316.206	141.90	251.66	161
470.000	2.183	.45815	.2975	11.976	53933.1	56223.8	321.173	142.52	215.42	176
480.000	1.976	.50606	.2590	14.961	55755.0	58285.3	325.514	143.61	198.73	188
490.000	1.826	.54777	.2317	17.642	57484.3	60223.1	329.510	144.95	189.69	199
500.000	1.708	.58536	.2109	20.092	59164.4	62091.2	333.284	146.45	184.39	208
520.000	1.533	.65240	.1809	24.480	62457.3	65719.3	340.400	149.71	179.30	224
540.000	1.404	.71226	.1599	28.375	65725.2	69286.5	347.132	153.14	177.83	238
560.000	1.303	.76733	.1442	31.918	69007.2	72843.8	353.600	156.65	178.12	249
580.000	1.221	.81898	.1318	35.196	72322.6	76417.5	359.871	160.16	179.37	260
600.000	1.152	.86805	.1219	38.267	75682.0	80022.3	365.981	163.65	181.19	269
620.000	1.093	.91511	.1136	41.172	79091.9	83667.5	371.957	167.10	183.37	278
640.000	1.041	.96056	.1066	43.941	82555.6	87358.4	377.816	170.50	185.76	286
660.000	.995	1.00470	.1005	46.598	86075.0	91098.5	383.570	173.83	188.28	294
680.000	.954	1.04774	.0953	49.160	89651.1	94889.8	389.229	177.09	190.88	301
700.000	.918	1.08987	.0907	51.642	93284.2	98733.6	394.800	180.27	193.51	308

Table 19. Continued

N-BUTANE ISOBAR AT P = 52 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
135.730	12.669	.07893	25.0704	1594.041	28.2	438.7	134.216	78.18	111.52	1977
140.000	12.602	.07935	24.1554	1535.458	506.1	918.7	137.689	78.53	112.03	1941
150.000	12.445	.08036	22.1789	1408.521	1631.7	2049.5	145.478	79.40	113.23	1858
160.000	12.287	.08139	20.4068	1294.084	2766.6	3189.8	152.834	80.34	114.45	1780
170.000	12.129	.08244	18.8104	1190.303	3911.3	4340.0	159.811	81.34	115.69	1706
180.000	11.971	.08353	17.3655	1095.653	5066.9	5501.2	166.456	82.40	116.97	1635
190.000	11.812	.08466	16.0527	1008.897	6234.4	6674.6	172.808	83.51	118.29	1568
200.000	11.653	.08582	14.8555	929.017	7415.1	7861.3	178.903	84.69	119.67	1502
210.000	11.492	.08701	13.7598	855.146	8610.1	9062.6	184.771	85.92	121.12	1440
220.000	11.331	.08825	12.7541	786.597	9820.6	10279.6	190.436	87.21	122.64	1379
230.000	11.168	.08954	11.8280	722.764	11047.7	11513.3	195.923	88.56	124.26	1320
240.000	11.003	.09088	10.9729	663.144	12292.5	12765.0	201.249	89.98	125.97	1263
250.000	10.837	.09228	10.1810	607.312	13555.9	14035.7	206.433	91.46	127.80	1208
260.000	10.668	.09374	9.4457	554.910	14839.1	15326.5	211.489	93.02	129.75	1153
270.000	10.496	.09527	8.7612	505.634	16142.9	16638.3	216.432	94.66	131.86	1100
280.000	10.321	.09689	8.1222	459.229	17468.3	17972.1	221.274	96.37	134.13	1048
290.000	10.142	.09860	7.5241	415.480	18816.5	19329.2	226.028	98.17	136.58	997
300.000	9.959	.10041	6.9627	374.204	20188.4	20710.6	230.703	100.06	139.25	946
310.000	9.770	.10235	6.4343	335.252	21585.9	22118.1	235.313	102.05	142.15	896
320.000	9.575	.10444	5.9355	298.495	23010.9	23554.0	239.870	104.14	145.33	846
330.000	9.372	.10670	5.4632	263.822	24466.2	25021.0	244.386	106.33	148.83	797
340.000	9.160	.10917	5.0143	231.139	25956.0	26523.7	248.877	108.63	152.71	747
350.000	8.937	.11189	4.5860	200.365	27484.9	28066.7	253.358	111.04	157.03	698
360.000	8.701	.11492	4.1754	171.427	29058.7	29656.3	257.845	113.65	162.00	648
370.000	8.449	.11836	3.7794	144.264	30684.4	31299.9	262.358	116.57	167.89	597
380.000	8.176	.12231	3.3943	118.824	32370.1	33006.2	266.917	119.81	174.93	546
390.000	7.875	.12698	3.0156	95.070	34125.4	34785.7	271.545	123.48	183.63	493
400.000	7.537	.13268	2.6374	72.996	35961.2	36651.1	276.269	127.80	194.89	437
410.000	7.145	.13995	2.2512	52.656	37887.7	38615.5	281.117	133.26	210.56	378
420.000	6.667	.14998	1.8453	34.246	39895.3	40675.2	286.075	141.65	235.59	313
430.000	6.031	.16582	1.4047	18.348	42241.4	43103.7	291.785	140.47	267.60	245
440.000	5.017	.19932	.9282	6.859	45121.7	46158.2	298.803	141.40	360.94	173
450.000	3.558	.28108	.5610	4.679	48690.8	50152.4	307.778	142.79	381.92	146
460.000	2.749	.36378	.4035	7.677	51472.8	53364.4	314.843	142.56	271.69	158
470.000	2.356	.42436	.3283	11.062	53609.1	55815.8	320.117	143.04	225.50	173
480.000	2.114	.47310	.2825	14.113	55495.2	57955.3	324.622	144.03	204.80	185
490.000	1.942	.51505	.2508	16.863	57264.8	59943.1	328.721	145.30	193.80	196
500.000	1.810	.55257	.2271	19.375	58972.8	61846.2	332.567	146.75	187.40	206
520.000	1.616	.61899	.1934	23.869	62302.7	65521.5	339.775	149.94	181.16	222
540.000	1.475	.67790	.1701	27.850	65594.6	69119.7	346.565	153.33	179.12	236
560.000	1.366	.73189	.1529	31.463	68893.3	72699.2	353.074	156.80	179.08	248
580.000	1.278	.78236	.1394	34.801	72221.4	76289.7	359.374	160.29	180.12	259
600.000	1.205	.83021	.1286	37.923	75590.8	79907.9	365.507	163.76	181.80	269
620.000	1.142	.87602	.1197	40.872	79008.8	83564.1	371.501	167.19	183.87	278
640.000	1.087	.92021	.1121	43.681	82479.1	87264.1	377.375	170.57	186.18	286
660.000	1.038	.96307	.1057	46.374	86004.1	91012.1	383.141	173.89	188.64	294
680.000	.995	1.00483	.1001	48.967	89585.1	94810.2	388.810	177.14	191.19	301
700.000	.956	1.04566	.0952	51.477	93222.2	98659.7	394.390	180.32	193.78	308

Table 19. Continued

N-BUTANE ISOBAR AT P = 55 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
135.780	12.670	.07892	25.0856	1596.686	29.9	464.0	134.227	78.18	111.52	1979
140.000	12.604	.07934	24.1814	1538.787	502.0	938.3	137.659	78.53	112.02	1943
150.000	12.447	.08034	22.2040	1411.748	1627.2	2069.1	145.448	79.40	113.22	1860
160.000	12.289	.08137	20.4314	1297.245	2761.7	3209.2	152.803	80.34	114.43	1782
170.000	12.132	.08243	18.8345	1193.408	3905.9	4359.3	159.779	81.34	115.67	1708
180.000	11.974	.08352	17.3892	1098.712	5061.0	5520.3	166.422	82.40	116.95	1637
190.000	11.815	.08464	16.0761	1011.918	6228.0	6693.5	172.774	83.51	118.27	1570
200.000	11.656	.08579	14.8785	932.007	7408.1	7880.0	178.868	84.69	119.65	1505
210.000	11.496	.08699	13.7826	858.113	8602.6	9081.0	184.734	85.92	121.09	1442
220.000	11.335	.08822	12.7767	789.546	9812.5	10297.7	190.399	87.21	122.61	1381
230.000	11.172	.08951	11.8505	725.701	11038.9	11531.2	195.883	88.56	124.22	1323
240.000	11.008	.09084	10.9953	666.074	12282.8	12782.5	201.208	89.98	125.93	1266
250.000	10.842	.09223	10.2034	610.241	13545.4	14052.7	206.390	91.46	127.75	1210
260.000	10.673	.09369	9.4682	557.841	14827.7	15343.0	211.444	93.02	129.70	1156
270.000	10.502	.09522	8.7837	508.571	16130.5	16654.2	216.385	94.66	131.79	1103
280.000	10.328	.09683	8.1449	462.177	17454.7	17987.3	221.225	96.37	134.05	1051
290.000	10.150	.09853	7.5471	418.443	18801.6	19343.5	225.975	98.17	136.49	1000
300.000	9.967	.10033	6.9861	377.189	20172.0	20723.8	230.647	100.06	139.14	949
310.000	9.779	.10226	6.4581	338.257	21567.8	22130.2	235.253	102.05	142.02	899
320.000	9.585	.10433	5.9599	301.526	22990.7	23564.5	239.805	104.14	145.17	850
330.000	9.383	.10657	5.4883	266.884	24443.6	25029.8	244.316	106.33	148.63	801
340.000	9.173	.10902	5.0404	234.237	25930.6	26530.2	248.800	108.63	152.46	752
350.000	8.952	.11170	4.6133	203.506	27456.0	28070.3	253.272	111.04	156.71	702
360.000	8.719	.11470	4.2042	174.620	29025.5	29656.3	257.749	113.65	161.58	653
370.000	8.469	.11807	3.8101	147.521	30645.6	31295.0	262.249	116.57	167.33	603
380.000	8.201	.12194	3.4276	122.162	32324.0	32994.7	266.790	119.81	174.15	552
390.000	7.906	.12649	3.0527	98.514	34069.1	34764.8	271.394	123.48	182.50	500
400.000	7.577	.13197	2.6801	76.583	35890.3	36616.1	276.083	127.79	193.14	446
410.000	7.200	.13889	2.3028	56.435	37793.6	38557.5	280.874	133.25	207.56	388
420.000	6.750	.14814	1.9118	38.270	39760.0	40574.7	285.730	141.60	229.63	326
430.000	6.178	.16187	1.4983	22.593	42016.5	42906.8	291.212	140.30	252.25	264
440.000	5.366	.18635	1.0663	10.638	44624.3	45649.2	297.515	140.81	304.11	198
450.000	4.161	.24032	.6895	5.467	47771.1	49092.8	305.251	142.87	368.84	155
460.000	3.168	.31566	.4824	6.776	50754.1	52490.2	312.721	143.38	300.76	156
470.000	2.644	.37821	.3805	9.869	53089.8	55169.9	318.487	143.78	242.39	169
480.000	2.336	.42812	.3214	12.943	55085.4	57440.1	323.267	144.65	214.88	181
490.000	2.126	.47045	.2820	15.767	56922.4	59509.9	327.536	145.82	200.51	193
500.000	1.969	.50792	.2532	18.358	58676.5	61470.0	331.496	147.20	192.24	203
520.000	1.744	.57352	.2132	22.995	62066.1	65220.4	338.852	150.29	184.09	220
540.000	1.584	.63117	.1862	27.096	65395.5	68867.0	345.734	153.60	181.12	234
560.000	1.463	.68367	.1664	30.810	68720.7	72480.8	352.305	157.02	180.56	246
580.000	1.365	.73255	.1512	34.233	72068.4	76097.4	358.651	160.48	181.26	257
600.000	1.284	.77873	.1391	37.429	75453.2	79736.3	364.819	163.92	182.72	267
620.000	1.215	.82284	.1291	40.444	78883.4	83409.0	370.840	167.33	184.62	277
640.000	1.156	.86529	.1207	43.311	82363.8	87122.9	376.736	170.69	186.81	285
660.000	1.103	.90640	.1136	46.054	85897.4	90882.6	382.520	173.99	189.18	293
680.000	1.057	.94640	.1074	48.694	89485.6	94690.8	388.205	177.23	191.66	300
700.000	1.015	.98547	.1020	51.245	93129.2	98549.3	393.797	180.40	194.20	308

Table 19. Continued

N-BUTANE ISOBAR AT P = 60 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
135.863	12.672	.07891	25.1109	1601.093	32.6	506.1	134.247	78.19	111.51	1982
140.000	12.607	.07932	24.2243	1544.281	495.2	971.1	137.610	78.53	112.00	1946
150.000	12.450	.08032	22.2460	1417.125	1619.7	2101.6	145.397	79.40	113.20	1864
160.000	12.293	.08134	20.4724	1302.511	2753.5	3241.5	152.751	80.34	114.41	1786
170.000	12.136	.08240	18.8746	1198.581	3897.0	4391.4	159.725	81.34	115.65	1712
180.000	11.978	.08348	17.4287	1103.807	5051.3	5552.2	166.367	82.40	116.92	1641
190.000	11.820	.08460	16.1149	1016.950	6217.4	6725.0	172.717	83.51	118.24	1573
200.000	11.661	.08575	14.9168	936.986	7396.6	7911.1	178.809	84.69	119.61	1508
210.000	11.502	.08694	13.8205	863.054	8590.1	9111.8	184.674	85.92	121.05	1446
220.000	11.341	.08818	12.8143	794.457	9798.9	10328.0	190.336	87.21	122.56	1385
230.000	11.179	.08945	11.8878	730.591	11024.2	11560.9	195.818	88.56	124.16	1327
240.000	11.015	.09078	11.0325	670.952	12266.9	12811.6	201.140	89.98	125.86	1270
250.000	10.850	.09217	10.2406	615.114	13528.1	14081.1	206.319	91.47	127.67	1215
260.000	10.682	.09361	9.5054	562.718	14808.8	15370.5	211.370	93.02	129.61	1161
270.000	10.512	.09513	8.8212	513.459	16109.9	16680.7	216.307	94.66	131.68	1108
280.000	10.339	.09672	8.1826	467.081	17432.3	18012.6	221.142	96.37	133.92	1056
290.000	10.162	.09841	7.5852	423.370	18777.0	19367.4	225.888	98.17	136.34	1005
300.000	9.980	.10020	7.0248	382.145	20144.9	20746.1	230.555	100.06	138.96	955
310.000	9.794	.10211	6.4976	343.248	21537.9	22150.5	235.154	102.05	141.80	905
320.000	9.601	.10415	6.0003	306.558	22957.5	23582.5	239.698	104.14	144.91	856
330.000	9.402	.10636	5.5299	271.964	24406.6	25044.8	244.200	106.33	148.31	807
340.000	9.194	.10877	5.0834	239.375	25889.0	26541.6	248.673	108.63	152.05	759
350.000	8.976	.11140	4.6581	208.710	27408.7	28077.1	253.132	111.04	156.20	710
360.000	8.747	.11433	4.2514	179.903	28971.3	29657.2	257.593	113.65	160.92	662
370.000	8.503	.11761	3.8603	152.900	30582.7	31288.4	262.072	116.57	166.45	612
380.000	8.241	.12135	3.4820	127.662	32249.6	32977.7	266.585	119.81	172.95	563
390.000	7.955	.12570	3.1127	104.168	33979.3	34733.5	271.152	123.47	180.79	512
400.000	7.640	.13089	2.7482	82.436	35778.6	36563.9	275.788	127.79	190.57	459
410.000	7.284	.13728	2.3833	62.544	37648.8	38472.5	280.498	133.23	203.41	405
420.000	6.871	.14554	2.0120	44.685	39560.5	40433.8	285.219	141.54	222.14	347
430.000	6.371	.15695	1.6303	29.262	41714.1	42655.8	290.444	140.12	236.34	291
440.000	5.734	.17439	1.2444	17.011	44087.4	45133.8	296.139	140.29	262.11	233
450.000	4.882	.20485	.8895	9.151	46731.9	47961.0	302.491	142.20	305.45	183
460.000	3.907	.25598	.6325	7.163	49585.1	51121.0	309.436	143.92	312.27	163
470.000	3.190	.31347	.4836	8.686	52158.2	54039.1	315.714	144.77	269.13	166
480.000	2.749	.36377	.3966	11.390	54353.2	56535.8	320.972	145.59	233.32	177
490.000	2.460	.40644	.3409	14.192	56318.5	58757.1	325.553	146.65	212.92	188
500.000	2.253	.44378	.3016	16.849	58159.4	60822.0	329.725	147.92	201.09	198
520.000	1.968	.50820	.2491	21.666	61659.0	64708.1	337.348	150.85	189.32	216
540.000	1.773	.56401	.2149	25.938	65056.3	68440.4	344.391	154.05	184.64	231
560.000	1.628	.61435	.1905	29.804	68428.2	72114.3	351.072	157.39	183.12	244
580.000	1.513	.66090	.1719	33.359	71810.3	75775.7	357.496	160.78	183.23	255
600.000	1.419	.70466	.1573	36.671	75221.7	79449.6	363.724	164.18	184.29	266
620.000	1.340	.74628	.1454	39.787	78673.2	83150.9	369.792	167.55	185.91	275
640.000	1.272	.78622	.1356	42.745	82171.0	86888.3	375.725	170.88	187.89	284
660.000	1.212	.82480	.1272	45.569	85719.1	90667.9	381.540	174.16	190.10	292
680.000	1.160	.86225	.1200	48.282	89319.7	94493.2	387.250	177.38	192.45	300
700.000	1.113	.89875	.1137	50.900	92973.9	98366.5	392.864	180.53	194.89	307

Table 19. Continued

N-BUTANE ISOBAR AT P = 65 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
135.946	12.674	.07890	25.1362	1605.499	35.4	548.3	134.267	78.20	111.50	1984
140.000	12.611	.07930	24.2673	1549.795	488.4	1003.8	137.561	78.53	111.98	1949
150.000	12.454	.08030	22.2878	1422.502	1612.3	2134.2	145.346	79.40	113.18	1867
160.000	12.297	.08132	20.5133	1307.776	2745.3	3273.9	152.699	80.34	114.39	1789
170.000	12.140	.08237	18.9146	1203.752	3888.1	4423.5	159.672	81.34	115.62	1715
180.000	11.983	.08345	17.4680	1108.899	5041.6	5584.0	166.312	82.40	116.89	1645
190.000	11.825	.08457	16.1536	1021.977	6206.9	6756.6	172.660	83.51	118.21	1577
200.000	11.667	.08571	14.9551	941.962	7385.2	7942.3	178.751	84.69	119.58	1512
210.000	11.507	.08690	13.8583	867.989	8577.7	9142.5	184.613	85.92	121.01	1450
220.000	11.347	.08813	12.8518	799.362	9785.5	10358.3	190.273	87.21	122.51	1389
230.000	11.186	.08940	11.9251	735.474	11009.6	11590.7	195.753	88.56	124.10	1331
240.000	11.023	.09072	11.0696	675.823	12251.1	12840.7	201.072	89.98	125.79	1274
250.000	10.858	.09210	10.2776	619.980	13510.9	14109.5	206.248	91.47	127.59	1219
260.000	10.691	.09353	9.5425	567.585	14790.1	15398.1	211.296	93.02	129.52	1166
270.000	10.522	.09504	8.8584	518.335	16089.6	16707.3	216.230	94.66	131.58	1113
280.000	10.349	.09663	8.2202	471.972	17410.0	18038.1	221.061	96.37	133.80	1061
290.000	10.173	.09830	7.6231	428.282	18752.6	19391.6	225.801	98.17	136.19	1011
300.000	9.993	.10007	7.0632	387.084	20118.2	20768.6	230.463	100.06	138.78	961
310.000	9.808	.10196	6.5367	348.220	21508.4	22171.1	235.056	102.05	141.59	911
320.000	9.617	.10398	6.0403	311.569	22924.9	23600.7	239.593	104.14	144.65	862
330.000	9.420	.10616	5.5710	277.020	24370.2	25060.2	244.086	106.33	148.00	814
340.000	9.215	.10852	5.1258	244.482	25848.2	26553.5	248.549	108.63	151.66	766
350.000	9.000	.11111	4.7023	213.877	27362.6	28084.8	252.995	111.04	155.71	718
360.000	8.774	.11397	4.2977	185.141	28918.6	29659.4	257.440	113.65	160.30	670
370.000	8.535	.11717	3.9095	158.224	30521.8	31283.4	261.900	116.57	165.64	621
380.000	8.279	.12079	3.5348	133.089	32178.2	32963.3	266.388	119.81	171.86	573
390.000	8.002	.12497	3.1705	109.724	33893.9	34706.2	270.921	123.47	179.27	523
400.000	7.699	.12989	2.8130	88.153	35673.9	36518.2	275.511	127.78	188.36	472
410.000	7.361	.13586	2.4583	68.457	37516.3	38399.4	280.153	133.22	200.02	420
420.000	6.976	.14335	2.1021	50.815	39385.3	40317.1	284.769	141.51	216.56	365
430.000	6.526	.15323	1.7427	35.553	41467.8	42463.8	289.817	140.02	226.26	314
440.000	5.985	.16709	1.3860	23.169	43711.1	44797.2	295.180	140.00	241.85	262
450.000	5.318	.18805	1.0543	14.253	46106.0	47328.3	300.868	141.64	265.75	214
460.000	4.521	.22117	.7844	9.534	48678.4	50116.0	306.994	143.67	288.89	181
470.000	3.763	.26576	.6006	9.052	51249.7	52977.1	313.148	145.20	277.50	172
480.000	3.207	.31184	.4843	10.636	53586.1	55613.1	318.699	146.29	249.22	176
490.000	2.829	.35352	.4087	13.067	55681.9	57979.8	323.580	147.36	225.66	185
500.000	2.562	.39034	.3566	15.641	57617.4	60154.6	327.974	148.58	210.52	195
520.000	2.205	.45351	.2889	20.521	61237.9	64185.7	335.881	151.38	194.89	213
540.000	1.970	.50767	.2462	24.919	64708.7	68008.6	343.096	154.49	188.34	228
560.000	1.798	.55614	.2163	28.910	68130.4	71745.3	349.891	157.75	185.78	242
580.000	1.665	.60068	.1940	32.580	71548.7	75453.1	356.397	161.08	185.35	253
600.000	1.557	.64236	.1766	35.996	74987.8	79163.2	362.686	164.43	185.09	264
620.000	1.467	.68186	.1627	39.205	78461.3	82893.4	368.802	167.77	187.22	274
640.000	1.390	.71964	.1511	42.246	81977.2	86654.9	374.772	171.07	188.99	283
660.000	1.323	.75605	.1414	45.146	85540.2	90454.5	380.619	174.32	191.03	291
680.000	1.264	.79132	.1331	47.928	89153.5	94297.0	386.354	177.52	193.25	299
700.000	1.211	.82565	.1259	50.609	92818.5	98185.2	391.989	180.65	195.59	307

Table 19. Continued

N-BUTANE ISOBAR AT P = 70 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
136.029	12.676	.07889	25.1614	1609.903	38.2	590.4	134.287	78.20	111.50	1987
140.000	12.614	.07928	24.3102	1555.303	481.7	1036.6	137.511	78.53	111.97	1953
150.000	12.457	.08027	22.3296	1427.876	1604.9	2166.8	145.296	79.40	113.16	1871
160.000	12.301	.08129	20.5541	1313.039	2737.2	3306.3	152.647	80.34	114.36	1793
170.000	12.144	.08234	18.9546	1208.920	3879.2	4455.7	159.619	81.34	115.60	1719
180.000	11.987	.08342	17.5072	1113.989	5031.9	5615.9	166.258	82.40	116.86	1648
190.000	11.830	.08453	16.1922	1027.002	6196.4	6788.1	172.604	83.51	118.17	1581
200.000	11.672	.08568	14.9932	946.934	7373.8	7973.5	178.693	84.69	119.54	1516
210.000	11.513	.08686	13.8960	872.920	8565.3	9173.3	184.553	85.92	120.96	1454
220.000	11.354	.08808	12.8891	804.261	9772.1	10388.6	190.211	87.21	122.46	1393
230.000	11.193	.08934	11.9622	740.351	10995.1	11620.5	195.688	88.56	124.05	1335
240.000	11.030	.09066	11.1066	680.686	12235.3	12869.9	201.005	89.98	125.73	1279
250.000	10.866	.09203	10.3145	624.836	13493.9	14138.1	206.178	91.47	127.52	1224
260.000	10.700	.09346	9.5795	572.443	14771.6	15425.8	211.223	93.02	129.43	1170
270.000	10.531	.09495	8.8955	523.200	16069.4	16734.1	216.153	94.66	131.48	1118
280.000	10.360	.09653	8.2575	476.851	17388.0	18063.7	220.980	96.37	133.68	1066
290.000	10.185	.09818	7.6608	433.180	18728.6	19415.8	225.716	98.17	136.05	1016
300.000	10.006	.09994	7.1014	392.007	20091.8	20791.4	230.372	100.06	138.61	966
310.000	9.822	.10181	6.5755	353.173	21479.3	22192.0	234.959	102.05	141.39	917
320.000	9.633	.10381	6.0799	316.558	22892.7	23619.4	239.489	104.14	144.41	869
330.000	9.438	.10596	5.6116	282.050	24334.5	25076.1	243.973	106.33	147.70	820
340.000	9.235	.10828	5.1678	249.559	25808.1	26566.1	248.426	108.63	151.30	773
350.000	9.023	.11083	4.7459	219.010	27317.5	28093.2	252.861	111.04	155.25	725
360.000	8.801	.11362	4.3433	190.338	28867.3	29662.6	257.291	113.65	159.71	678
370.000	8.566	.11674	3.9577	163.496	30462.8	31280.0	261.732	116.57	164.88	630
380.000	8.316	.12025	3.5863	138.450	32109.4	32951.2	266.198	119.81	170.86	582
390.000	8.047	.12428	3.2264	115.194	33812.4	34682.4	270.700	123.47	177.91	534
400.000	7.754	.12897	2.8750	93.753	35575.3	36478.1	275.249	127.78	186.44	485
410.000	7.431	.13458	2.5287	74.207	37393.9	38335.9	279.834	133.21	197.20	434
420.000	7.069	.14147	2.1847	56.720	39228.2	40218.4	284.365	141.48	212.21	382
430.000	6.656	.15024	1.8419	41.560	41257.6	42309.3	289.281	139.94	219.18	334
440.000	6.177	.16189	1.5058	29.089	43416.0	44549.2	294.430	139.82	229.71	286
450.000	5.615	.17808	1.1918	19.634	45670.6	46917.2	299.751	141.29	244.53	241
460.000	4.965	.20143	.9240	13.423	48039.8	49449.8	305.317	143.25	261.96	205
470.000	4.273	.23401	.7205	10.797	50484.2	52122.2	311.064	145.15	268.88	185
480.000	3.673	.27228	.5802	11.027	52847.5	54753.4	316.604	146.63	255.27	181
490.000	3.220	.31055	.4847	12.618	55035.2	57209.1	321.669	147.88	235.85	186
500.000	2.891	.34592	.4180	14.848	57060.2	59481.6	326.260	149.12	219.53	193
520.000	2.455	.40740	.3327	19.595	60805.9	63657.7	334.453	151.87	200.61	211
540.000	2.174	.45996	.2801	24.051	64354.3	67574.0	341.844	154.90	192.15	226
560.000	1.973	.50671	.2440	28.135	67828.2	71375.2	348.756	158.09	188.52	240
580.000	1.820	.54947	.2175	31.901	71284.4	75130.7	355.346	161.37	187.33	252
600.000	1.697	.58933	.1970	35.407	74752.3	78877.6	361.697	164.68	187.53	263
620.000	1.595	.62697	.1807	38.700	78248.4	82637.2	367.861	167.98	188.55	273
640.000	1.509	.66288	.1674	41.817	81782.5	86422.7	373.870	171.25	190.09	282
660.000	1.434	.69741	.1562	44.786	85360.9	90242.8	379.748	174.48	191.96	291
680.000	1.368	.73080	.1466	47.632	88987.0	94102.6	385.509	177.66	194.05	299
700.000	1.310	.76323	.1384	50.371	92663.0	98005.6	391.166	180.77	196.28	306

Table 19. Continued

N-BUTANE ISOBAR AT P = 75 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
136.112	12.678	.07888	25.1865	1614.306	41.0	632.6	134.306	78.21	111.49	1989
140.000	12.617	.07926	24.3531	1560.813	474.9	1069.4	137.462	78.53	111.95	1956
150.000	12.461	.08025	22.3713	1433.250	1597.5	2199.4	145.246	79.41	113.14	1874
160.000	12.305	.08127	20.5949	1318.300	2729.1	3338.6	152.595	80.34	114.34	1796
170.000	12.148	.08232	18.9945	1214.085	3870.4	4487.8	159.566	81.34	115.57	1722
180.000	11.992	.08339	17.5464	1119.075	5022.3	5647.8	166.203	82.40	116.84	1652
190.000	11.835	.08450	16.2308	1032.022	6186.0	6819.7	172.548	83.51	118.14	1584
200.000	11.677	.08564	15.0312	951.901	7362.5	8004.8	178.635	84.69	119.50	1520
210.000	11.519	.08681	13.9337	877.845	8553.1	9204.2	184.493	85.92	120.92	1457
220.000	11.360	.08803	12.9264	809.154	9758.8	10419.0	190.149	87.21	122.42	1397
230.000	11.199	.08929	11.9992	745.222	10980.7	11650.3	195.624	88.56	123.99	1339
240.000	11.038	.09060	11.1434	685.541	12219.7	12899.2	200.938	89.98	125.66	1283
250.000	10.874	.09196	10.3513	629.685	13476.9	14166.6	206.109	91.47	127.44	1228
260.000	10.709	.09338	9.6162	577.291	14753.2	15453.5	211.150	93.02	129.34	1175
270.000	10.541	.09487	8.9324	528.054	16049.4	16760.9	216.076	94.66	131.37	1122
280.000	10.370	.09643	8.2946	481.718	17366.2	18089.5	220.899	96.37	133.56	1071
290.000	10.196	.09807	7.6982	438.065	18704.7	19440.3	225.631	98.17	135.91	1021
300.000	10.019	.09981	7.1393	396.914	20065.7	20814.3	230.282	100.06	138.44	972
310.000	9.836	.10166	6.6140	358.109	21450.6	22213.1	234.863	102.05	141.19	923
320.000	9.649	.10364	6.1193	321.526	22861.0	23638.3	239.386	104.14	144.17	875
330.000	9.455	.10576	5.6519	287.056	24299.3	25092.5	243.863	106.33	147.41	827
340.000	9.255	.10805	5.2093	254.609	25768.9	26579.3	248.306	108.63	150.94	780
350.000	9.046	.11055	4.7889	224.109	27273.3	28102.4	252.729	111.04	154.81	733
360.000	8.827	.11329	4.3882	195.495	28817.3	29666.9	257.146	113.65	159.16	686
370.000	8.596	.11633	4.0049	168.719	30405.5	31278.0	261.570	116.57	164.17	639
380.000	8.351	.11974	3.6365	143.751	32043.1	32941.2	266.013	119.81	169.93	592
390.000	8.089	.12362	3.2806	120.586	33734.5	34661.7	270.488	123.47	176.67	544
400.000	7.806	.12811	2.9345	99.250	35482.1	36442.9	275.000	127.78	184.74	496
410.000	7.496	.13341	2.5955	79.820	37279.9	38280.5	279.535	133.20	194.79	448
420.000	7.153	.13981	2.2612	62.444	39085.2	40133.7	283.996	141.46	208.68	398
430.000	6.768	.14774	1.9316	47.345	41073.0	42181.1	288.810	139.89	213.86	352
440.000	6.334	.15788	1.6107	34.798	43170.3	44354.4	293.806	139.71	221.48	308
450.000	5.841	.17122	1.3105	25.001	45334.5	46618.7	298.894	141.06	231.68	265
460.000	5.286	.18918	1.0480	17.972	47574.7	48993.5	304.113	142.91	243.51	229
470.000	4.685	.21343	.8364	13.772	49883.6	51484.3	309.469	144.89	253.63	203
480.000	4.102	.24380	.6786	12.457	52197.0	54025.5	314.820	146.67	252.13	191
490.000	3.612	.27685	.5660	13.053	54415.4	56491.8	319.906	148.16	240.33	190
500.000	3.231	.30947	.4849	14.630	56504.2	58825.3	324.620	149.53	226.48	195
520.000	2.714	.36840	.3802	18.939	60367.6	63130.6	333.066	152.29	206.15	210
540.000	2.385	.41925	.3165	23.354	63995.1	67139.5	340.632	155.27	195.99	225
560.000	2.153	.46439	.2735	27.488	67522.8	71005.7	347.663	158.42	191.28	238
580.000	1.978	.50553	.2423	31.326	71017.9	74809.4	354.337	161.65	189.43	251
600.000	1.839	.54374	.2185	34.907	74515.3	78593.3	360.752	164.92	189.18	262
620.000	1.725	.57974	.1996	38.273	78034.6	82382.6	366.964	168.18	189.88	272
640.000	1.629	.61400	.1843	41.457	81587.5	86192.5	373.012	171.43	191.20	282
660.000	1.546	.64687	.1715	44.490	85181.4	90032.9	378.921	174.63	192.90	290
680.000	1.474	.67860	.1607	47.394	88820.5	93910.0	384.708	177.79	194.85	298
700.000	1.410	.70939	.1514	50.187	92507.6	97828.0	390.386	180.89	196.98	306

Table 19. Continued

N-BUTANE ISOBAR AT P = 80 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
136.195	12.679	.07887	25.2116	1618.708	43.8	674.7	134.326	78.22	111.48	1992
140.000	12.620	.07924	24.3959	1566.323	468.2	1102.1	137.413	78.53	111.93	1959
150.000	12.464	.08023	22.4130	1438.622	1590.1	2231.9	145.196	79.41	113.12	1877
160.000	12.309	.08124	20.6355	1323.558	2721.1	3371.0	152.544	80.34	114.32	1800
170.000	12.153	.08229	19.0344	1219.248	3861.6	4519.9	159.513	81.34	115.55	1726
180.000	11.996	.08336	17.5855	1124.158	5012.8	5679.6	166.149	82.40	116.81	1655
190.000	11.840	.08446	16.2693	1037.040	6175.6	6851.3	172.492	83.52	118.11	1588
200.000	11.682	.08560	15.0692	956.864	7351.2	8036.0	178.577	84.69	119.46	1523
210.000	11.525	.08677	13.9712	882.766	8540.9	9235.0	184.433	85.92	120.88	1461
220.000	11.366	.08798	12.9635	814.042	9745.6	10449.4	190.087	87.21	122.37	1401
230.000	11.206	.08924	12.0361	750.086	10966.3	11680.2	195.560	88.56	123.94	1343
240.000	11.045	.09054	11.1801	690.390	12204.2	12928.5	200.872	89.98	125.60	1287
250.000	10.882	.09189	10.3879	634.525	13460.1	14195.3	206.039	91.47	127.37	1232
260.000	10.717	.09331	9.6529	582.130	14734.9	15481.4	211.078	93.02	129.26	1179
270.000	10.550	.09478	8.9691	532.898	16029.5	16787.8	216.000	94.66	131.28	1127
280.000	10.381	.09633	8.3315	486.572	17344.6	18115.3	220.820	96.37	133.44	1076
290.000	10.208	.09797	7.7355	442.936	18681.2	19464.9	225.547	98.17	135.77	1026
300.000	10.031	.09969	7.1770	401.806	20039.9	20837.4	230.193	100.06	138.28	977
310.000	9.850	.10152	6.6523	363.030	21422.3	22234.4	234.768	102.05	141.00	928
320.000	9.664	.10347	6.1582	326.474	22829.8	23657.6	239.284	104.14	143.94	881
330.000	9.473	.10557	5.6918	292.040	24264.7	25109.2	243.753	106.33	147.13	833
340.000	9.274	.10783	5.2503	259.632	25730.3	26592.9	248.187	108.63	150.60	786
350.000	9.068	.11028	4.8313	229.177	27230.1	28112.4	252.600	111.04	154.40	740
360.000	8.852	.11297	4.4324	200.614	28768.5	29672.2	257.003	113.65	158.64	694
370.000	8.625	.11594	4.0512	173.897	30349.9	31277.4	261.411	116.57	163.51	647
380.000	8.385	.11926	3.6856	148.996	31979.0	32933.0	265.835	119.81	169.08	601
390.000	8.130	.12301	3.3333	125.907	33659.7	34643.7	270.284	123.47	175.55	554
400.000	7.855	.12731	2.9918	104.656	35393.4	36412.0	274.763	127.78	183.23	508
410.000	7.556	.13234	2.6590	85.316	37173.0	38231.7	279.254	133.20	192.71	460
420.000	7.229	.13832	2.3330	68.017	38953.6	40060.2	283.655	141.45	205.75	412
430.000	6.868	.14560	2.0138	52.950	40907.6	42072.4	288.386	139.86	209.67	369
440.000	6.467	.15463	1.7050	40.329	42958.2	44195.2	293.266	139.62	215.46	327
450.000	6.022	.16606	1.4156	30.280	45058.4	46386.9	298.191	140.90	223.02	287
460.000	5.533	.18074	1.1586	22.735	47212.4	48658.3	303.183	142.66	231.38	251
470.000	5.007	.19972	.9444	17.560	49417.5	51015.2	308.252	144.61	239.84	223
480.000	4.471	.22364	.7760	14.820	51652.0	53441.1	313.359	146.53	244.06	206
490.000	3.979	.25130	.6493	14.310	53854.9	55865.3	318.358	148.24	239.41	199
500.000	3.569	.28020	.5554	15.113	55971.8	58213.4	323.102	149.76	229.89	199
520.000	2.981	.33544	.4312	18.622	59929.4	62612.9	331.733	152.64	211.05	210
540.000	2.602	.38435	.3554	22.852	63633.5	66708.2	339.462	155.61	199.71	224
560.000	2.337	.42789	.3048	26.979	67215.6	70638.7	346.610	158.71	194.03	238
580.000	2.139	.46751	.2685	30.860	70750.2	74490.3	353.368	161.91	191.52	250
600.000	1.983	.50423	.2410	34.499	74277.5	78311.3	359.845	165.14	190.82	261
620.000	1.856	.53874	.2194	37.925	77820.3	82130.2	366.106	168.38	191.22	272
640.000	1.750	.57152	.2019	41.169	81392.4	85964.5	372.193	171.60	192.30	281
660.000	1.659	.60292	.1874	44.258	85001.8	89825.1	378.133	174.78	193.83	290
680.000	1.579	.63318	.1753	47.215	88654.1	93719.6	383.946	177.92	195.65	298
700.000	1.509	.66250	.1648	50.057	92352.5	97652.5	389.646	181.00	197.67	306

Table 19. Continued

N-BUTANE ISOBAR AT P = 85 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
136.278	12.681	.07886	25.2367	1623.108	46.6	716.9	134.346	78.23	111.48	1994
140.000	12.623	.07922	24.4387	1571.831	461.6	1134.9	137.365	78.53	111.92	1963
150.000	12.468	.08021	22.4546	1443.993	1582.8	2264.5	145.145	79.41	113.10	1881
160.000	12.312	.08122	20.6762	1328.815	2713.1	3403.4	152.493	80.34	114.30	1803
170.000	12.157	.08226	19.0741	1224.409	3852.9	4552.1	159.460	81.34	115.52	1729
180.000	12.001	.08333	17.6245	1129.238	5003.3	5711.5	166.094	82.40	116.78	1659
190.000	11.844	.08443	16.3077	1042.053	6165.2	6882.9	172.436	83.52	118.08	1592
200.000	11.688	.08556	15.1070	961.824	7340.0	8067.3	178.519	84.69	119.43	1527
210.000	11.530	.08673	14.0086	887.683	8528.7	9265.9	184.374	85.92	120.84	1465
220.000	11.372	.08794	13.0006	818.925	9732.4	10479.9	190.026	87.21	122.32	1405
230.000	11.213	.08918	12.0729	754.944	10952.1	11710.2	195.496	88.56	123.88	1347
240.000	11.052	.09048	11.2167	695.231	12188.8	12957.9	200.806	89.98	125.54	1291
250.000	10.890	.09183	10.4244	639.357	13443.4	14224.0	205.970	91.47	127.30	1237
260.000	10.726	.09323	9.6894	586.960	14716.8	15509.3	211.006	93.02	129.17	1184
270.000	10.560	.09470	9.0057	537.732	16009.9	16814.8	215.925	94.66	131.18	1132
280.000	10.391	.09624	8.3683	491.415	17323.3	18141.3	220.741	96.37	133.33	1081
290.000	10.219	.09786	7.7725	447.793	18657.9	19489.7	225.463	98.17	135.64	1031
300.000	10.043	.09957	7.2144	406.683	20014.4	20860.7	230.104	100.06	138.13	982
310.000	9.864	.10138	6.6903	367.930	21394.3	22256.1	234.674	102.05	140.81	934
320.000	9.680	.10331	6.1969	331.403	22799.0	23677.2	239.184	104.14	143.72	887
330.000	9.490	.10538	5.7313	297.001	24230.7	25126.4	243.645	106.33	146.86	840
340.000	9.293	.10760	5.2909	264.630	25692.5	26607.1	248.071	108.64	150.28	793
350.000	9.089	.11002	4.8732	234.216	27187.8	28123.0	252.473	111.04	154.00	747
360.000	8.877	.11265	4.4759	205.698	28720.8	29678.4	256.864	113.65	158.15	701
370.000	8.654	.11556	4.0967	179.032	30295.8	31278.1	261.256	116.58	162.89	656
380.000	8.418	.11879	3.7337	154.189	31917.0	32926.7	265.662	119.81	168.29	610
390.000	8.168	.12242	3.3845	131.164	33587.8	34628.4	270.088	123.47	174.52	564
400.000	7.901	.12656	3.0472	109.982	35309.0	36384.7	274.536	127.78	181.87	518
410.000	7.613	.13135	2.7198	90.709	37072.2	38188.7	278.988	133.19	190.88	472
420.000	7.300	.13698	2.4008	73.463	38831.5	39995.8	283.338	141.43	203.27	426
430.000	6.958	.14372	2.0902	58.406	40757.2	41978.8	288.000	139.83	206.27	385
440.000	6.583	.15190	1.7911	45.708	42770.6	44061.7	292.789	139.57	210.82	344
450.000	6.174	.16196	1.5106	35.455	44822.5	46199.2	297.592	140.78	216.75	306
460.000	5.732	.17445	1.2587	27.540	46914.9	48397.7	302.424	142.47	223.00	272
470.000	5.263	.19001	1.0441	21.740	49044.9	50660.0	307.289	144.38	229.47	243
480.000	4.778	.20928	.8695	17.975	51204.6	52983.5	312.181	146.33	234.76	222
490.000	4.308	.23213	.7326	16.281	53365.5	55338.6	317.037	148.17	235.21	210
500.000	3.889	.25715	.6277	16.267	55482.0	57667.7	321.743	149.85	229.93	207
520.000	3.249	.30774	.4850	18.727	59499.4	62115.3	330.467	152.90	214.76	212
540.000	2.822	.35434	.3967	22.580	63272.7	66284.6	338.336	155.90	203.15	224
560.000	2.524	.39624	.3379	26.620	66907.9	70275.9	345.594	158.98	196.70	238
580.000	2.302	.43441	.2960	30.508	70482.0	74174.4	352.435	162.15	193.58	250
600.000	2.129	.46974	.2645	34.184	74039.5	78032.3	358.975	165.35	192.46	261
620.000	1.989	.50289	.2400	37.658	77606.1	81880.7	365.284	168.57	192.54	272
640.000	1.871	.53433	.2202	40.952	81197.2	85739.0	371.409	171.76	193.40	281
660.000	1.772	.56440	.2039	44.091	84822.5	89619.9	377.380	174.93	194.76	290
680.000	1.685	.59334	.1903	47.095	88488.1	93531.5	383.218	178.05	196.45	298
700.000	1.609	.62135	.1786	49.982	92197.8	97479.2	388.940	181.11	198.36	306

Table 19. Continued

N-BUTANE ISOBAR AT P = 90 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
136.361	12.683	.07885	25.2617	1627.506	49.4	759.0	134.365	78.23	111.47	1997
140.000	12.627	.07920	24.4814	1577.339	454.9	1167.7	137.316	78.53	111.90	1966
150.000	12.471	.08018	22.4961	1449.363	1575.5	2297.1	145.096	79.41	113.08	1884
160.000	12.316	.08119	20.7167	1334.070	2705.1	3435.8	152.441	80.34	114.28	1806
170.000	12.161	.08223	19.1138	1229.567	3844.2	4584.3	159.407	81.34	115.50	1733
180.000	12.005	.08330	17.6635	1134.316	4993.8	5743.5	166.040	82.40	116.75	1662
190.000	11.849	.08439	16.3460	1047.064	6155.0	6914.5	172.380	83.52	118.05	1595
200.000	11.693	.08552	15.1448	966.779	7328.9	8098.6	178.462	84.69	119.39	1531
210.000	11.536	.08669	14.0459	892.594	8516.7	9296.8	184.315	85.92	120.80	1469
220.000	11.378	.08789	13.0376	823.803	9719.4	10510.4	189.964	87.21	122.28	1409
230.000	11.219	.08913	12.1096	759.796	10938.0	11740.2	195.433	88.56	123.83	1351
240.000	11.059	.09042	11.2532	700.066	12173.5	12987.3	200.740	89.98	125.48	1295
250.000	10.898	.09176	10.4608	644.182	13426.9	14252.7	205.902	91.47	127.23	1241
260.000	10.734	.09316	9.7257	591.781	14698.9	15537.3	210.934	93.03	129.09	1188
270.000	10.569	.09462	9.0421	542.555	15990.4	16842.0	215.850	94.66	131.08	1136
280.000	10.401	.09615	8.4048	496.247	17302.1	18167.4	220.662	96.37	133.22	1086
290.000	10.230	.09775	7.8094	452.638	18634.8	19514.6	225.381	98.17	135.51	1036
300.000	10.056	.09945	7.2516	411.545	19989.2	20884.2	230.017	100.07	137.98	988
310.000	9.877	.10124	6.7280	372.814	21366.7	22277.9	234.581	102.05	140.63	940
320.000	9.695	.10315	6.2353	336.313	22768.7	23697.0	239.085	104.14	143.50	892
330.000	9.506	.10519	5.7705	301.940	24197.1	25143.9	243.539	106.34	146.61	846
340.000	9.312	.10739	5.3311	269.602	25655.3	26621.8	247.956	108.64	149.97	800
350.000	9.111	.10976	4.9146	239.225	27146.4	28134.2	252.348	111.04	153.62	754
360.000	8.901	.11235	4.5188	210.749	28674.3	29685.4	256.727	113.65	157.68	709
370.000	8.681	.11519	4.1415	184.128	30243.2	31279.9	261.105	116.58	162.31	664
380.000	8.450	.11834	3.7807	159.334	31856.9	32921.9	265.493	119.81	167.55	619
390.000	8.206	.12186	3.4345	136.363	33518.5	34615.3	269.898	123.48	173.58	574
400.000	7.946	.12586	3.1009	115.235	35228.2	36360.9	274.319	127.78	180.65	529
410.000	7.667	.13043	2.7782	96.013	36976.8	38150.7	278.736	133.19	189.27	484
420.000	7.366	.13576	2.4651	78.799	38717.3	39939.2	283.041	141.43	201.12	439
430.000	7.040	.14204	2.1618	63.735	40619.0	41897.4	287.645	139.81	203.43	399
440.000	6.687	.14955	1.8707	50.960	42601.8	43947.7	292.358	139.52	207.10	360
450.000	6.306	.15858	1.5975	40.528	44615.5	46042.7	297.066	140.70	211.95	324
460.000	5.900	.16950	1.3503	32.323	46661.4	48186.9	301.779	142.33	216.88	291
470.000	5.472	.18273	1.1362	26.085	48735.9	50380.5	306.496	144.19	221.87	262
480.000	5.032	.19873	.9581	21.623	50834.9	52623.5	311.219	146.13	226.61	240
490.000	4.593	.21771	.8141	18.944	52946.5	54905.8	315.924	148.04	229.29	224
500.000	4.182	.23913	.7002	17.987	55042.6	57194.8	320.549	149.83	227.77	216
520.000	3.513	.28466	.5409	19.308	59086.7	61648.7	329.285	153.07	216.91	216
540.000	3.044	.32854	.4400	22.584	62916.4	65873.3	337.258	156.13	206.10	226
560.000	2.712	.36869	.3726	26.433	66601.5	69919.7	344.617	159.22	199.21	238
580.000	2.467	.40542	.3248	30.278	70214.4	73863.2	351.537	162.37	195.59	250
600.000	2.276	.43944	.2891	33.966	73801.9	77756.9	358.137	165.55	194.06	261
620.000	2.122	.47134	.2614	37.472	77392.2	81634.2	364.494	168.74	193.85	272
640.000	1.994	.50155	.2392	40.807	81002.6	85516.5	370.657	171.92	194.49	281
660.000	1.885	.53041	.2210	43.987	84643.7	89417.3	376.658	175.06	195.68	290
680.000	1.792	.55815	.2058	47.033	88322.6	93345.9	382.522	178.17	197.24	299
700.000	1.709	.58498	.1928	49.961	92043.5	97308.3	388.265	181.22	199.05	307

Table 19. Continued

N-BUTANE ISOBAR AT P = 100 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
136.527	12.687	.07882	25.3116	1636.299	55.0	843.3	134.405	78.25	111.46	2002
140.000	12.633	.07916	24.5665	1588.351	441.7	1233.3	137.219	78.53	111.87	1972
150.000	12.478	.08014	22.5790	1460.098	1561.0	2362.4	144.996	79.41	113.04	1891
160.000	12.324	.08115	20.7976	1344.575	2689.2	3500.7	152.339	80.34	114.24	1813
170.000	12.169	.08218	19.1930	1239.877	3826.9	4648.7	159.302	81.34	115.45	1739
180.000	12.014	.08324	17.7411	1144.462	4975.0	5807.3	165.932	82.40	116.70	1669
190.000	11.859	.08433	16.4223	1057.075	6134.5	6977.8	172.269	83.52	117.99	1602
200.000	11.703	.08545	15.2200	976.678	7306.8	8161.2	178.348	84.69	119.32	1538
210.000	11.547	.08660	14.1203	902.413	8492.7	9358.7	184.197	85.92	120.72	1476
220.000	11.390	.08780	13.1112	833.542	9693.5	10571.4	189.843	87.21	122.18	1417
230.000	11.232	.08903	12.1826	769.482	10910.0	11800.3	195.307	88.57	123.73	1359
240.000	11.073	.09031	11.3258	709.714	12143.2	13046.3	200.609	89.98	125.36	1304
250.000	10.913	.09163	10.5331	653.808	13394.1	14310.4	205.766	91.47	127.09	1250
260.000	10.751	.09301	9.7980	601.397	14663.4	15593.5	210.792	93.03	128.93	1197
270.000	10.587	.09445	9.1144	552.173	15951.9	16896.5	215.702	94.66	130.90	1146
280.000	10.421	.09596	8.4774	505.877	17260.3	18219.9	220.507	96.38	133.00	1095
290.000	10.252	.09754	7.8824	462.290	18589.3	19564.8	225.217	98.18	135.26	1046
300.000	10.080	.09921	7.3253	421.227	19939.7	20931.8	229.844	100.07	137.68	998
310.000	9.904	.10097	6.8026	382.535	21312.5	22322.2	234.398	102.06	140.29	951
320.000	9.724	.10284	6.3111	346.079	22709.2	23737.6	238.890	104.14	143.09	904
330.000	9.539	.10483	5.8478	311.758	24131.7	25180.0	243.330	106.34	146.12	858
340.000	9.348	.10697	5.4102	279.477	25582.9	26652.6	247.731	108.64	149.38	813
350.000	9.151	.10927	4.9959	249.163	27065.8	28158.6	252.104	111.05	152.91	768
360.000	8.947	.11177	4.6028	220.755	28584.2	29701.9	256.462	113.66	156.82	723
370.000	8.734	.11449	4.2289	194.208	30141.8	31286.8	260.814	116.58	161.24	679
380.000	8.511	.11749	3.8722	169.493	31741.9	32916.9	265.169	119.82	166.22	636
390.000	8.277	.12082	3.5310	146.602	33387.0	34595.2	269.535	123.48	171.90	592
400.000	8.029	.12455	3.2037	125.551	35076.3	36321.8	273.908	127.78	178.51	549
410.000	7.766	.12877	2.8888	106.390	36799.7	38087.4	278.266	133.19	186.52	506
420.000	7.485	.13360	2.5855	89.199	38508.6	39844.7	282.495	141.42	197.60	463
430.000	7.185	.13917	2.2936	74.084	40371.2	41762.9	287.005	139.78	198.92	425
440.000	6.866	.14565	2.0150	61.143	42305.8	43762.3	291.602	139.46	201.45	389
450.000	6.527	.15321	1.7533	50.399	44262.6	45794.7	296.169	140.58	205.02	355
460.000	6.171	.16204	1.5139	41.736	46241.9	47862.3	300.713	142.15	208.48	324
470.000	5.803	.17233	1.3020	34.892	48240.2	49963.5	305.232	143.93	211.74	297
480.000	5.426	.18428	1.1203	29.579	50254.3	52097.1	309.724	145.82	214.98	273
490.000	5.048	.19811	.9679	25.641	52281.4	54262.5	314.189	147.75	218.01	255
500.000	4.675	.21389	.8420	23.081	54314.6	56453.5	318.615	149.64	219.90	241
520.000	4.003	.24980	.6553	21.805	58339.5	60837.5	327.213	153.18	217.08	230
540.000	3.479	.28741	.5313	23.576	62233.8	65107.9	335.272	156.44	209.84	233
560.000	3.090	.32363	.4463	26.673	66000.7	69236.9	342.781	159.60	203.40	241
580.000	2.798	.35745	.3859	30.234	69685.1	73259.6	349.840	162.74	199.25	252
600.000	2.571	.38897	.3411	33.842	73330.4	77220.1	356.554	165.90	197.10	263
620.000	2.389	.41856	.3065	37.355	76967.4	81153.0	363.002	169.06	196.38	273
640.000	2.239	.44658	.2790	40.732	80615.6	85081.4	369.238	172.20	196.60	282
660.000	2.113	.47330	.2567	43.972	84288.2	89021.2	375.299	175.32	197.47	291
680.000	2.004	.49895	.2381	47.082	87993.5	92983.0	381.213	178.39	198.78	300
700.000	1.909	.52371	.2224	50.076	91737.1	96974.2	386.998	181.42	200.38	308

Table 19. Continued

N-BUTANE ISOBAR AT P = 110 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
136.692	12.690	.07880	25.3612	1645.087	60.7	927.5	134.444	78.26	111.45	2007
140.000	12.639	.07912	24.6515	1599.360	428.6	1298.9	137.122	78.53	111.83	1979
150.000	12.485	.08010	22.6616	1470.829	1546.6	2427.6	144.897	79.41	113.01	1897
160.000	12.331	.08110	20.8782	1355.072	2673.5	3565.5	152.238	80.35	114.19	1820
170.000	12.177	.08212	19.2718	1250.178	3809.7	4713.1	159.198	81.34	115.40	1746
180.000	12.023	.08318	17.8185	1154.598	4956.3	5871.3	165.825	82.40	116.65	1676
190.000	11.868	.08426	16.4984	1067.072	6114.3	7041.2	172.159	83.52	117.93	1610
200.000	11.713	.08537	15.2950	986.562	7284.9	8224.0	178.234	84.69	119.26	1545
210.000	11.558	.08652	14.1943	912.204	8469.0	9420.7	184.080	85.92	120.64	1484
220.000	11.402	.08770	13.1844	843.260	9667.9	10632.6	189.722	87.21	122.10	1425
230.000	11.245	.08893	12.2552	779.145	10882.3	11860.5	195.182	88.57	123.63	1367
240.000	11.087	.09019	11.3979	719.337	12113.3	13105.4	200.479	89.98	125.24	1312
250.000	10.928	.09151	10.6050	663.404	13361.8	14368.3	205.631	91.47	126.96	1258
260.000	10.768	.09287	9.8696	610.979	14628.5	15650.0	210.652	93.03	128.78	1206
270.000	10.605	.09429	9.1861	561.753	15914.1	16951.3	215.556	94.66	130.72	1155
280.000	10.440	.09578	8.5493	515.465	17219.3	18272.9	220.353	96.38	132.80	1105
290.000	10.273	.09734	7.9547	471.894	18544.8	19615.5	225.056	98.18	135.02	1056
300.000	10.103	.09898	7.3982	430.856	19891.2	20979.9	229.674	100.07	137.40	1008
310.000	9.930	.10071	6.8763	392.194	21259.6	22367.4	234.219	102.06	139.96	961
320.000	9.752	.10254	6.3858	355.779	22651.3	23779.2	238.699	104.15	142.71	915
330.000	9.571	.10449	5.9238	321.497	24068.1	25217.5	243.126	106.34	145.66	870
340.000	9.384	.10657	5.4878	289.263	25512.8	26685.1	247.513	108.64	148.84	825
350.000	9.191	.10880	5.0755	259.000	26988.3	28185.1	251.869	111.05	152.26	781
360.000	8.991	.11122	4.6847	230.645	28497.9	29721.3	256.206	113.66	156.03	738
370.000	8.784	.11384	4.3136	204.154	30045.2	31297.5	260.534	116.58	160.29	694
380.000	8.568	.11671	3.9604	179.495	31633.2	32917.0	264.862	119.82	165.05	652
390.000	8.343	.11987	3.6234	156.656	33263.7	34582.3	269.193	123.48	170.45	609
400.000	8.105	.12338	3.3013	135.648	34935.5	36292.7	273.525	127.78	176.70	568
410.000	7.855	.12730	2.9927	116.508	36637.7	38038.0	277.833	133.19	184.27	526
420.000	7.591	.13173	2.6968	99.300	38321.0	39770.1	282.002	141.41	194.79	485
430.000	7.312	.13676	2.4136	84.103	40152.7	41657.1	286.438	139.77	195.48	449
440.000	7.017	.14250	2.1442	70.988	42051.2	43618.8	290.948	139.43	197.30	415
450.000	6.708	.14907	1.8911	59.963	43966.2	45605.9	295.414	140.52	200.15	383
460.000	6.388	.15655	1.6580	50.923	45899.3	47621.4	299.843	142.03	202.89	353
470.000	6.058	.16506	1.4487	43.634	47847.1	49662.7	304.234	143.76	205.34	327
480.000	5.725	.17468	1.2655	37.796	49806.3	51727.7	308.581	145.60	207.66	304
490.000	5.390	.18553	1.1084	33.164	51775.1	53815.9	312.887	147.50	209.98	284
500.000	5.058	.19771	.9753	29.631	53752.0	55926.8	317.151	149.41	212.15	269
520.000	4.426	.22594	.7695	25.882	57709.7	60195.0	325.521	153.11	213.83	249
540.000	3.885	.25737	.6257	25.907	61614.3	64445.3	333.542	156.56	210.61	244
560.000	3.458	.28921	.5244	27.902	65429.8	68611.1	341.118	159.83	205.99	248
580.000	3.126	.31993	.4511	30.858	69171.2	72690.4	348.276	163.02	202.17	256
600.000	2.865	.34901	.3965	34.194	72868.3	76707.5	355.085	166.18	199.78	265
620.000	2.656	.37648	.3545	37.603	76549.0	80690.3	361.615	169.33	198.70	275
640.000	2.484	.40254	.3213	40.958	80233.9	84661.9	367.920	172.45	198.59	284
660.000	2.340	.42740	.2944	44.215	83937.2	88638.6	374.038	175.55	199.18	293
680.000	2.216	.45125	.2722	47.361	87668.5	92632.2	380.000	178.60	200.26	302
700.000	2.109	.47425	.2534	50.400	91434.3	96651.0	385.824	181.61	201.68	310

Table 19. Continued

N-BUTANE ISOBAR AT P = 120 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
136.857	12.694	.07878	25.4107	1653.870	66.4	1011.7	134.484	78.27	111.44	2012
140.000	12.645	.07908	24.7362	1610.366	415.5	1364.5	137.026	78.54	111.80	1985
150.000	12.492	.08005	22.7440	1481.555	1532.3	2492.9	144.798	79.41	112.97	1904
160.000	12.338	.08105	20.9585	1365.563	2657.8	3630.4	152.137	80.35	114.15	1827
170.000	12.185	.08207	19.3504	1260.470	3792.7	4777.6	159.095	81.34	115.36	1753
180.000	12.031	.08312	17.8955	1164.723	4937.9	5935.3	165.719	82.40	116.59	1683
190.000	11.877	.08419	16.5741	1077.057	6094.3	7104.6	172.050	83.52	117.87	1617
200.000	11.723	.08530	15.3696	996.431	7263.2	8286.8	178.122	84.69	119.19	1553
210.000	11.569	.08644	14.2679	921.977	8445.6	9482.8	183.964	85.92	120.57	1491
220.000	11.414	.08761	13.2572	852.959	9642.6	10693.9	189.602	87.21	122.01	1432
230.000	11.258	.08883	12.3274	788.785	10855.0	11920.9	195.058	88.57	123.53	1375
240.000	11.101	.09008	11.4696	728.934	12083.8	13164.8	200.351	89.99	125.13	1320
250.000	10.943	.09138	10.6763	672.971	13329.9	14426.5	205.498	91.47	126.83	1267
260.000	10.784	.09273	9.9408	620.528	14594.0	15706.8	210.514	93.03	128.63	1214
270.000	10.623	.09414	9.2572	571.296	15876.9	17006.5	215.411	94.66	130.55	1164
280.000	10.460	.09561	8.6206	525.011	17179.0	18326.3	220.202	96.38	132.60	1114
290.000	10.294	.09714	8.0262	481.452	18501.1	19666.8	224.898	98.18	134.80	1066
300.000	10.126	.09875	7.4702	440.433	19843.7	21028.8	229.508	100.07	137.14	1019
310.000	9.955	.10045	6.9490	401.796	21208.0	22413.4	234.042	102.06	139.65	972
320.000	9.780	.10225	6.4594	365.411	22594.9	23821.9	238.512	104.15	142.35	926
330.000	9.601	.10415	5.9986	331.164	24006.3	25256.2	242.928	106.34	145.24	882
340.000	9.418	.10618	5.5640	298.967	25445.0	26719.2	247.300	108.64	148.34	838
350.000	9.229	.10836	5.1534	268.743	26913.4	28213.7	251.640	111.05	151.66	794
360.000	9.034	.11070	4.7647	240.429	28415.0	29743.4	255.959	113.66	155.32	751
370.000	8.832	.11322	4.3961	213.978	29953.0	31311.7	260.265	116.59	159.43	709
380.000	8.623	.11597	4.0458	189.356	31530.0	32921.7	264.568	119.82	164.00	667
390.000	8.404	.11898	3.7124	166.548	33147.6	34575.4	268.870	123.49	169.18	626
400.000	8.176	.12230	3.3945	145.558	34804.1	36271.8	273.166	127.78	175.15	585
410.000	7.938	.12598	3.0909	126.412	36488.2	37999.9	277.431	133.19	182.37	545
420.000	7.687	.13009	2.8010	109.160	38150.0	39711.1	281.550	141.41	192.49	505
430.000	7.424	.13469	2.5246	93.862	39956.6	41572.9	285.927	139.76	192.73	471
440.000	7.149	.13987	2.2622	80.567	41826.3	43504.8	290.368	139.40	194.08	439
450.000	6.863	.14570	2.0157	69.278	43709.1	45457.5	294.757	140.47	196.50	408
460.000	6.568	.15224	1.7877	59.903	45607.5	47434.4	299.102	141.96	198.84	379
470.000	6.268	.15955	1.5808	52.238	47518.7	49433.3	303.400	143.65	200.88	354
480.000	5.964	.16767	1.3972	46.002	49439.4	51451.4	307.649	145.45	202.72	332
490.000	5.661	.17665	1.2371	40.921	51367.7	53487.4	311.847	147.32	204.50	312
500.000	5.360	.18656	1.0991	36.809	53302.9	55541.6	315.997	149.22	206.33	295
520.000	4.778	.20930	.8800	31.310	57189.4	59701.0	324.153	152.97	209.32	271
540.000	4.249	.23536	.7206	29.401	61069.6	63893.9	332.066	156.55	209.39	260
560.000	3.803	.26293	.6047	30.160	64903.4	68058.6	339.639	159.94	206.88	259
580.000	3.443	.29043	.5192	32.276	68682.4	72167.5	346.849	163.20	204.07	263
600.000	3.154	.31703	.4548	35.117	72421.3	76225.7	353.728	166.40	201.92	270
620.000	2.920	.34246	.4051	38.274	76140.9	80250.5	360.327	169.55	200.72	279
640.000	2.727	.36672	.3658	41.514	79859.8	84260.4	366.692	172.66	200.40	287
660.000	2.565	.38991	.3340	44.730	83592.2	88271.1	372.863	175.74	200.77	296
680.000	2.426	.41217	.3079	47.874	87348.6	92294.6	378.869	178.78	201.65	304
700.000	2.306	.43365	.2859	50.930	91135.9	96339.7	384.732	181.78	202.91	312

Table 19. Continued

N-BUTANE ISOBAR AT P = 130 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
137.022	12.697	.07876	25.4599	1662.647	72.1	1095.9	134.523	78.29	111.42	2017
140.000	12.652	.07904	24.8207	1621.369	402.6	1430.1	136.930	78.54	111.77	1992
150.000	12.499	.08001	22.8261	1492.276	1518.1	2558.2	144.700	79.41	112.94	1910
160.000	12.346	.08100	21.0386	1376.047	2642.4	3695.4	152.036	80.35	114.11	1833
170.000	12.193	.08202	19.4287	1270.753	3775.9	4842.1	158.991	81.35	115.31	1760
180.000	12.040	.08306	17.9723	1174.837	4919.5	5999.3	165.613	82.40	116.54	1690
190.000	11.887	.08413	16.6495	1087.030	6074.5	7168.1	171.941	83.52	117.81	1624
200.000	11.733	.08523	15.4438	1006.285	7241.7	8349.7	178.010	84.69	119.13	1560
210.000	11.580	.08636	14.3412	931.734	8422.4	9545.1	183.849	85.92	120.49	1499
220.000	11.426	.08752	13.3296	862.639	9617.5	10755.3	189.483	87.22	121.93	1440
230.000	11.271	.08873	12.3991	798.404	10828.0	11981.4	194.935	88.57	123.43	1383
240.000	11.115	.08997	11.5409	738.506	12054.7	13224.3	200.224	89.99	125.02	1328
250.000	10.958	.09126	10.7472	682.510	13298.5	14484.9	205.366	91.47	126.71	1275
260.000	10.800	.09259	10.0114	630.046	14560.1	15763.9	210.377	93.03	128.49	1223
270.000	10.640	.09398	9.3278	580.804	15840.3	17062.1	215.268	94.66	130.39	1173
280.000	10.479	.09543	8.6912	534.518	17139.4	18380.0	220.053	96.38	132.42	1124
290.000	10.315	.09695	8.0971	490.966	18458.3	19718.6	224.741	98.18	134.58	1076
300.000	10.149	.09854	7.5415	449.960	19797.2	21078.2	229.344	100.07	136.89	1029
310.000	9.979	.10021	7.0209	411.343	21157.4	22460.1	233.869	102.06	139.36	983
320.000	9.807	.10197	6.5320	374.981	22539.9	23865.4	238.329	104.15	142.01	937
330.000	9.631	.10383	6.0722	340.764	23946.2	25296.0	242.733	106.34	144.84	893
340.000	9.451	.10581	5.6388	308.594	25379.2	26754.7	247.093	108.65	147.87	850
350.000	9.265	.10793	5.2297	278.399	26841.1	28244.2	251.418	111.06	151.11	807
360.000	9.075	.11020	4.8428	250.115	28335.2	29767.8	255.720	113.67	154.66	765
370.000	8.878	.11264	4.4764	223.691	29864.6	31328.9	260.007	116.59	158.64	723
380.000	8.674	.11529	4.1287	199.092	31431.7	32930.4	264.286	119.83	163.07	682
390.000	8.463	.11816	3.7983	176.298	33037.7	34573.9	268.561	123.49	168.05	642
400.000	8.243	.12132	3.4839	155.307	34680.7	36257.8	272.827	127.79	173.80	602
410.000	8.014	.12478	3.1846	136.136	36349.0	37971.2	277.055	133.20	180.75	563
420.000	7.775	.12862	2.8994	118.822	37992.6	39664.6	281.131	141.41	190.57	524
430.000	7.526	.13288	2.6283	103.409	39778.2	41505.6	285.459	139.75	190.47	492
440.000	7.267	.13761	2.3715	89.934	41624.2	43413.2	289.845	139.39	191.50	461
450.000	6.999	.14288	2.1302	78.394	43481.2	45338.6	294.172	140.45	193.62	431
460.000	6.724	.14872	1.9063	68.708	45352.2	47285.5	298.451	141.91	195.72	403
470.000	6.445	.15516	1.7017	60.701	47235.0	49252.1	302.680	143.57	197.55	379
480.000	6.164	.16222	1.5182	54.121	49126.8	51235.7	306.856	145.35	199.14	357
490.000	5.885	.16993	1.3560	48.694	51025.4	53234.5	310.978	147.19	200.62	337
500.000	5.608	.17832	1.2145	44.197	52930.0	55248.2	315.046	149.07	202.13	321
520.000	5.069	.19726	.9855	37.561	56757.0	59321.4	323.033	152.83	205.15	294
540.000	4.566	.21903	.8141	34.012	60598.5	63445.8	330.816	156.48	206.96	278
560.000	4.119	.24276	.6857	33.317	64428.3	67584.1	338.341	159.97	206.54	272
580.000	3.743	.26714	.5891	34.510	68226.6	71699.4	345.562	163.31	204.93	272
600.000	3.433	.29127	.5152	36.691	71995.1	75781.7	352.482	166.54	203.37	277
620.000	3.178	.31469	.4578	39.436	75746.6	79837.6	359.132	169.71	202.34	284
640.000	2.965	.33723	.4122	42.446	79495.6	83879.6	365.548	172.84	201.97	292
660.000	2.786	.35889	.3754	45.543	83255.0	87920.5	371.765	175.91	202.21	300
680.000	2.633	.37972	.3450	48.633	87034.9	91971.3	377.812	178.94	202.95	308
700.000	2.501	.39984	.3197	51.674	90842.9	96040.8	383.710	181.93	204.06	315

Table 19. Continued

N-BUTANE ISOBAR AT P = 140 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
137.187	12.701	.07874	25.5090	1671.420	77.8	1180.1	134.562	78.30	111.41	2022
140.000	12.658	.07900	24.9049	1632.370	389.8	1495.8	136.834	78.54	111.74	1998
150.000	12.505	.07997	22.9080	1502.992	1504.0	2623.6	144.602	79.41	112.90	1917
160.000	12.353	.08095	21.1186	1386.540	2627.0	3760.3	151.936	80.35	114.08	1840
170.000	12.201	.08196	19.5068	1281.028	3759.1	4906.6	158.889	81.35	115.27	1767
180.000	12.048	.08300	18.0488	1184.942	4901.4	6063.4	165.508	82.40	116.49	1697
190.000	11.896	.08406	16.7247	1096.991	6054.8	7231.7	171.833	83.52	117.76	1631
200.000	11.743	.08515	15.5178	1016.126	7220.5	8412.6	177.899	84.69	119.06	1567
210.000	11.590	.08628	14.4141	941.475	8399.5	9607.4	183.734	85.93	120.42	1506
220.000	11.437	.08744	13.4017	872.300	9592.8	10816.9	189.365	87.22	121.85	1447
230.000	11.283	.08863	12.4705	808.001	10801.3	12042.1	194.814	88.57	123.34	1391
240.000	11.128	.08986	11.6117	748.053	12026.0	13284.0	200.098	89.99	124.92	1336
250.000	10.973	.09114	10.8175	692.022	13267.5	14543.4	205.236	91.47	126.59	1283
260.000	10.816	.09246	10.0815	639.534	14526.7	15821.2	210.241	93.03	128.36	1232
270.000	10.657	.09383	9.3978	590.278	15804.2	17117.9	215.127	94.67	130.24	1181
280.000	10.497	.09526	8.7612	543.987	17100.5	18434.2	219.906	96.38	132.24	1133
290.000	10.335	.09676	8.1672	500.437	18416.2	19770.8	224.588	98.18	134.37	1085
300.000	10.171	.09832	7.6120	459.440	19751.7	21128.2	229.182	100.07	136.65	1038
310.000	10.004	.09996	7.0918	420.837	21108.0	22507.5	233.700	102.06	139.09	993
320.000	9.833	.10169	6.6037	384.493	22486.2	23909.9	238.150	104.15	141.69	948
330.000	9.660	.10352	6.1447	350.296	23887.7	25337.0	242.543	106.35	144.47	904
340.000	9.482	.10546	5.7125	318.148	25315.2	26791.7	246.891	108.65	147.43	861
350.000	9.301	.10752	5.3047	287.975	26771.1	28276.3	251.202	111.06	150.60	819
360.000	9.114	.10972	4.9194	259.711	28258.3	29794.4	255.488	113.67	154.06	778
370.000	8.922	.11209	4.5547	233.304	29779.7	31349.0	259.757	116.59	157.93	737
380.000	8.723	.11464	4.2092	208.715	31337.7	32942.6	264.016	119.83	162.22	697
390.000	8.518	.11740	3.8814	185.922	32933.3	34576.9	268.267	123.49	167.05	657
400.000	8.305	.12040	3.5701	164.915	34564.3	36250.0	272.505	127.79	172.61	619
410.000	8.085	.12369	3.2742	145.705	36218.8	37950.4	276.702	133.20	179.35	580
420.000	7.856	.12729	2.9930	128.316	37846.5	39628.6	280.741	141.41	188.92	543
430.000	7.618	.13126	2.7261	112.781	39614.2	41451.8	285.027	139.75	188.57	511
440.000	7.373	.13564	2.4738	99.127	41440.3	43339.2	289.366	139.39	189.36	481
450.000	7.120	.14045	2.2367	87.344	43275.8	45242.2	293.643	140.43	191.28	452
460.000	6.861	.14575	2.0161	77.365	45124.3	47164.8	297.868	141.88	193.22	425
470.000	6.599	.15153	1.8136	69.039	46984.4	49105.8	302.043	143.52	194.93	401
480.000	6.337	.15781	1.6303	62.142	48853.3	51062.6	306.162	145.28	196.40	380
490.000	6.075	.16460	1.4668	56.414	50728.9	53033.3	310.226	147.10	197.73	361
500.000	5.817	.17191	1.3225	51.617	52610.3	55017.0	314.233	148.95	199.02	344
520.000	5.315	.18816	1.0856	44.220	56390.4	59024.6	322.092	152.70	201.77	317
540.000	4.839	.20666	.9047	39.469	60192.6	63085.9	329.756	156.39	204.22	297
560.000	4.403	.22711	.7661	37.363	64004.5	67184.0	337.207	159.94	205.32	287
580.000	4.022	.24864	.6596	37.466	67807.6	71288.6	344.409	163.35	204.98	284
600.000	3.698	.27040	.5769	38.927	71594.3	75379.9	351.345	166.64	204.15	286
620.000	3.426	.29187	.5120	41.141	75369.6	79455.7	358.027	169.84	203.49	291
640.000	3.197	.31275	.4602	43.803	79143.7	83522.2	364.482	172.97	203.24	297
660.000	3.003	.33296	.4182	46.691	82926.9	87588.3	370.738	176.05	203.46	304
680.000	2.837	.35248	.3836	49.664	86728.6	91663.3	376.821	179.08	204.11	312
700.000	2.693	.37136	.3547	52.644	90556.1	95755.1	382.751	182.06	205.12	319

Table 19. Continued

N-BUTANE ISOBAR AT P = 160 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
137.515	12.708	.07869	25.6066	1688.951	89.4	1348.5	134.641	78.33	111.39	2032
140.000	12.670	.07893	25.0727	1654.364	364.3	1627.2	136.645	78.54	111.68	2011
150.000	12.518	.07988	23.0710	1524.412	1476.2	2754.3	144.408	79.41	112.83	1930
160.000	12.367	.08086	21.2774	1407.470	2596.6	3890.3	151.737	80.35	114.00	1853
170.000	12.216	.08186	19.6620	1301.555	3726.1	5035.9	158.685	81.35	115.19	1780
180.000	12.065	.08288	18.2009	1205.122	4865.6	6191.7	165.299	82.41	116.40	1711
190.000	11.914	.08394	16.8740	1116.878	6016.0	7359.0	171.619	83.52	117.65	1645
200.000	11.763	.08501	15.6647	1035.766	7178.6	8538.8	177.679	84.70	118.94	1581
210.000	11.611	.08612	14.5590	960.910	8354.3	9732.2	183.508	85.93	120.29	1521
220.000	11.460	.08726	13.5449	891.577	9544.1	10940.3	189.132	87.22	121.69	1462
230.000	11.308	.08844	12.6121	827.134	10748.9	12163.9	194.573	88.57	123.17	1406
240.000	11.155	.08965	11.7520	767.080	11969.5	13403.9	199.850	89.99	124.72	1352
250.000	11.001	.09090	10.9570	710.968	13206.8	14661.2	204.979	91.48	126.36	1299
260.000	10.846	.09220	10.2203	658.422	14461.3	15936.5	209.975	93.04	128.10	1248
270.000	10.691	.09354	9.5361	609.128	15733.8	17230.5	214.850	94.67	129.94	1199
280.000	10.533	.09494	8.8994	562.816	17024.6	18543.6	219.617	96.39	131.90	1151
290.000	10.374	.09639	8.3056	519.260	18334.3	19876.6	224.286	98.19	133.98	1104
300.000	10.213	.09791	7.7508	478.268	19663.2	21229.8	228.867	100.08	136.20	1058
310.000	10.050	.09950	7.2314	439.678	21012.3	22604.3	233.368	102.07	138.57	1013
320.000	9.884	.10117	6.7443	403.353	22382.4	24001.2	237.801	104.16	141.09	969
330.000	9.715	.10293	6.2868	369.179	23775.1	25421.9	242.175	106.35	143.78	926
340.000	9.544	.10478	5.8563	337.058	25192.7	26869.2	246.500	108.66	146.64	884
350.000	9.368	.10675	5.4507	306.908	26637.3	28345.3	250.787	111.07	149.67	843
360.000	9.188	.10884	5.0679	278.658	28112.0	29853.4	255.045	113.68	152.98	803
370.000	9.004	.11106	4.7063	252.258	29619.4	31396.4	259.282	116.60	156.68	763
380.000	8.815	.11344	4.3644	227.662	31161.3	32976.5	263.505	119.84	160.76	724
390.000	8.620	.11600	4.0407	204.839	32738.8	34594.9	267.715	123.50	165.33	686
400.000	8.420	.11876	3.7340	183.771	34349.2	36249.4	271.906	127.80	170.61	649
410.000	8.214	.12174	3.4434	164.453	35980.3	37928.2	276.049	133.21	177.02	613
420.000	8.001	.12498	3.1682	146.892	37581.7	39581.4	280.028	141.42	186.25	576
430.000	7.783	.12849	2.9077	131.103	39320.2	41376.1	284.247	139.76	185.54	547
440.000	7.558	.13231	2.6620	117.094	41114.5	43231.5	288.513	139.38	186.00	518
450.000	7.328	.13646	2.4310	104.854	42916.1	45099.4	292.710	140.42	187.65	490
460.000	7.095	.14095	2.2155	94.330	44729.5	46984.7	296.854	141.85	189.40	465
470.000	6.859	.14579	2.0162	85.409	46554.3	48886.9	300.945	143.47	191.01	442
480.000	6.623	.15098	1.8338	77.916	48388.5	50804.2	304.982	145.19	192.41	421
490.000	6.389	.15652	1.6686	71.634	50230.3	52734.6	308.962	146.98	193.63	402
500.000	6.158	.16239	1.5205	66.334	52078.3	54676.6	312.885	148.81	194.76	386
520.000	5.709	.17517	1.2716	57.925	55791.6	58594.3	320.568	152.51	197.05	358
540.000	5.281	.18936	1.0761	51.735	59530.3	62560.0	328.051	156.21	199.54	337
560.000	4.879	.20498	.9219	47.572	63295.2	66574.8	335.351	159.82	201.86	321
580.000	4.508	.22181	.7994	45.459	67080.2	70629.2	342.465	163.32	203.44	312
600.000	4.177	.23941	.7016	45.157	70876.0	74706.6	349.376	166.70	204.19	308
620.000	3.887	.25728	.6231	46.149	74677.2	78793.7	356.077	169.97	204.49	309
640.000	3.635	.27507	.5594	47.898	78485.0	82886.2	362.573	173.15	204.78	312
660.000	3.418	.29258	.5072	50.125	82304.8	86986.1	368.882	176.25	205.25	316
680.000	3.229	.30970	.4639	52.652	86142.5	91097.7	375.019	179.29	205.95	322
700.000	3.064	.32638	.4277	55.347	90003.8	95225.9	381.002	182.27	206.91	328

Table 19. Continued

N-BUTANE ISOBAR AT P = 180 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
137.843	12.714	.07865	25.7034	1706.464	101.0	1516.8	134.720	78.36	111.37	2042
140.000	12.682	.07885	25.2397	1676.350	339.3	1758.6	136.457	78.54	111.62	2024
150.000	12.531	.07980	23.2332	1545.823	1448.7	2885.1	144.216	79.41	112.77	1943
160.000	12.381	.08077	21.4353	1428.378	2566.7	4020.5	151.540	80.35	113.93	1866
170.000	12.231	.08176	19.8163	1322.052	3693.6	5165.2	158.484	81.35	115.10	1793
180.000	12.081	.08277	18.3519	1225.264	4830.3	6320.2	165.093	82.41	116.31	1724
190.000	11.932	.08381	17.0222	1136.720	5977.9	7486.5	171.407	83.53	117.54	1658
200.000	11.782	.08488	15.8104	1055.355	7137.5	8665.2	177.461	84.70	118.83	1596
210.000	11.632	.08597	14.7025	980.286	8310.0	9857.4	183.285	85.93	120.16	1535
220.000	11.482	.08709	13.6865	910.775	9496.4	11064.1	188.902	87.22	121.54	1477
230.000	11.331	.08825	12.7522	846.189	10697.6	12286.1	194.337	88.58	123.00	1421
240.000	11.180	.08944	11.8908	786.019	11914.4	13524.4	199.606	89.99	124.53	1367
250.000	11.029	.09067	11.0946	729.815	13147.6	14779.7	204.726	91.48	126.15	1315
260.000	10.876	.09194	10.3571	677.201	14397.7	16052.7	209.713	93.04	127.85	1265
270.000	10.723	.09326	9.6724	627.856	15665.4	17344.1	214.579	94.67	129.66	1216
280.000	10.568	.09462	9.0354	581.509	16951.1	18654.3	219.336	96.39	131.59	1168
290.000	10.412	.09604	8.4415	537.932	18255.2	19983.9	223.993	98.19	133.63	1122
300.000	10.254	.09752	7.8869	496.929	19578.0	21333.3	228.560	100.08	135.80	1077
310.000	10.095	.09906	7.3680	458.335	20920.4	22703.5	233.048	102.07	138.11	1032
320.000	9.933	.10068	6.8817	422.012	22283.2	24095.4	237.465	104.16	140.56	989
330.000	9.768	.10237	6.4251	387.841	23667.7	25510.4	241.821	106.36	143.17	947
340.000	9.601	.10415	5.9959	355.723	25076.4	26951.1	246.127	108.66	145.94	906
350.000	9.431	.10603	5.5919	325.572	26511.2	28419.7	250.392	111.07	148.87	866
360.000	9.258	.10802	5.2112	297.316	27974.8	29919.2	254.625	113.69	152.05	827
370.000	9.080	.11013	4.8519	270.897	29469.8	31452.1	258.835	116.61	155.61	788
380.000	8.899	.11237	4.5126	246.263	30998.1	33020.7	263.027	119.85	159.52	750
390.000	8.714	.11476	4.1919	223.381	32560.2	34625.9	267.203	123.51	163.92	714
400.000	8.524	.11732	3.8887	202.224	34153.5	36265.2	271.355	127.81	168.98	678
410.000	8.329	.12006	3.6019	182.772	35765.6	37926.6	275.455	133.22	175.17	643
420.000	8.130	.12300	3.3308	165.023	37346.0	39560.1	279.387	141.43	184.15	608
430.000	7.926	.12617	3.0748	148.976	39061.6	41332.7	283.554	139.77	183.21	579
440.000	7.717	.12958	2.8335	134.629	40831.2	43163.6	287.764	139.39	183.45	552
450.000	7.505	.13324	2.6067	121.965	42606.8	45005.2	291.902	140.42	184.93	525
460.000	7.290	.13717	2.3947	110.940	44393.6	46862.7	295.985	141.84	186.58	501
470.000	7.074	.14137	2.1977	101.468	46191.9	48736.5	300.014	143.44	188.16	478
480.000	6.857	.14583	2.0161	93.414	48000.4	50625.3	303.991	145.15	189.57	458
490.000	6.643	.15054	1.8500	86.600	49817.5	52527.3	307.912	146.92	190.81	439
500.000	6.431	.15551	1.6993	80.825	51641.8	54441.0	311.779	148.72	191.92	423
520.000	6.019	.16615	1.4416	71.626	55309.9	58300.6	319.347	152.39	194.04	396
540.000	5.626	.17774	1.2348	64.630	59004.4	62203.7	326.712	156.07	196.31	373
560.000	5.255	.19030	1.0688	59.319	62728.8	66154.2	333.896	159.70	198.75	356
580.000	4.906	.20381	.9344	55.634	66484.0	70152.7	340.911	163.24	201.05	343
600.000	4.584	.21813	.8247	53.600	70266.6	74193.0	347.759	166.67	202.90	335
620.000	4.292	.23300	.7347	53.066	74071.1	78265.1	354.436	170.00	204.24	331
640.000	4.031	.24811	.6605	53.698	77894.2	82360.1	360.936	173.23	205.23	330
660.000	3.799	.26322	.5988	55.107	81735.6	86473.6	367.265	176.37	206.12	332
680.000	3.595	.27819	.5473	56.989	85598.1	90605.5	373.432	179.43	207.09	336
700.000	3.414	.29292	.5037	59.195	89485.1	94757.7	379.451	182.42	208.17	340

Table 19. Continued

N-BUTANE ISOBAR AT P = 200 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
138.169	12.721	.07861	25.7993	1723.929	112.8	1685.0	134.799	78.39	111.36	2052
140.000	12.694	.07878	25.4057	1698.331	314.6	1890.2	136.270	78.54	111.56	2037
150.000	12.544	.07972	23.3943	1567.204	1421.7	3016.1	144.026	79.42	112.70	1956
160.000	12.395	.08068	21.5922	1449.267	2537.2	4150.8	151.346	80.35	113.86	1879
170.000	12.246	.08166	19.9695	1342.520	3661.6	5294.8	158.285	81.35	115.02	1807
180.000	12.098	.08266	18.5019	1245.372	4795.7	6448.9	164.889	82.41	116.22	1738
190.000	11.949	.08369	17.1693	1156.521	5940.5	7614.3	171.198	83.53	117.45	1672
200.000	11.801	.08474	15.9549	1074.894	7097.1	8792.0	177.247	84.70	118.71	1609
210.000	11.652	.08582	14.8448	999.605	8266.6	9983.0	183.065	85.93	120.03	1549
220.000	11.504	.08693	13.8269	929.908	9449.7	11188.3	188.676	87.23	121.41	1492
230.000	11.355	.08807	12.8908	865.171	10647.5	12408.9	194.104	88.58	122.84	1436
240.000	11.206	.08924	12.0280	804.876	11860.6	13645.5	199.366	90.00	124.35	1383
250.000	11.056	.09045	11.2307	748.570	13089.9	14898.9	204.479	91.49	125.95	1331
260.000	10.906	.09170	10.4922	695.876	14335.8	16169.8	209.457	93.04	127.63	1281
270.000	10.754	.09299	9.8068	646.469	15599.0	17458.8	214.314	94.68	129.41	1232
280.000	10.602	.09432	9.1693	600.076	16879.8	18766.2	219.061	96.39	131.30	1185
290.000	10.449	.09571	8.5752	556.464	18178.6	20092.8	223.707	98.20	133.30	1139
300.000	10.294	.09715	8.0206	515.437	19495.8	21438.7	228.263	100.09	135.42	1095
310.000	10.137	.09865	7.5019	476.825	20832.0	22804.9	232.737	102.08	137.68	1051
320.000	9.979	.10021	7.0160	440.488	22188.0	24192.2	237.140	104.17	140.08	1009
330.000	9.819	.10185	6.5601	406.304	23565.2	25602.1	241.480	106.37	142.62	968
340.000	9.656	.10356	6.1319	374.170	24965.7	27037.0	245.768	108.67	145.31	927
350.000	9.491	.10536	5.7291	343.999	26391.6	28498.9	250.014	111.08	148.15	888
360.000	9.323	.10726	5.3497	315.715	27845.4	29990.7	254.226	113.69	151.24	850
370.000	9.152	.10927	4.9922	289.256	29329.7	31515.0	258.412	116.62	154.68	812
380.000	8.978	.11139	4.6548	264.567	30846.0	33073.7	262.578	119.86	158.47	775
390.000	8.800	.11364	4.3364	241.606	32394.9	34667.7	266.724	123.52	162.72	739
400.000	8.619	.11603	4.0357	220.339	33973.7	36294.2	270.845	127.82	167.63	705
410.000	8.434	.11857	3.7517	200.742	35569.9	37941.3	274.909	133.23	173.65	670
420.000	8.245	.12129	3.4836	182.799	37133.0	39558.7	278.802	141.44	182.46	636
430.000	8.053	.12418	3.2306	166.498	38829.8	41313.5	282.928	139.78	181.35	609
440.000	7.857	.12728	2.9924	151.829	40579.6	43125.1	287.092	139.40	181.44	583
450.000	7.659	.13057	2.7685	138.771	42334.4	44945.9	291.184	140.42	182.80	557
460.000	7.458	.13408	2.5589	127.286	44100.1	46781.7	295.219	141.84	184.38	533
470.000	7.257	.13780	2.3636	117.303	45877.4	48633.4	299.201	143.44	185.94	511
480.000	7.056	.14173	2.1825	108.718	47665.5	50500.1	303.131	145.13	187.38	491
490.000	6.856	.14586	2.0158	101.385	49463.3	52380.5	307.008	146.89	188.67	473
500.000	6.658	.15019	1.8633	95.134	51269.4	54273.1	310.832	148.68	189.84	457
520.000	6.274	.15938	1.5988	85.168	54903.8	58091.4	318.320	152.32	191.96	429
540.000	5.908	.16925	1.3828	77.570	58566.8	61951.9	325.604	155.98	194.11	407
560.000	5.561	.17981	1.2070	71.586	62260.9	65857.1	332.705	159.60	196.44	389
580.000	5.234	.19106	1.0629	66.953	65989.1	69810.2	339.641	163.15	198.87	374
600.000	4.927	.20297	.9437	63.668	69751.9	73811.2	346.423	166.61	201.19	363
620.000	4.642	.21544	.8444	61.748	73547.1	77855.8	353.054	169.98	203.21	356
640.000	4.380	.22829	.7612	61.089	77371.4	81937.3	359.533	173.25	204.89	352
660.000	4.143	.24135	.6912	61.464	81222.4	86049.5	365.859	176.42	206.31	351
680.000	3.930	.25445	.6320	62.593	85099.6	90188.7	372.038	179.51	207.60	352
700.000	3.739	.26747	.5816	64.212	89004.1	94353.6	378.074	182.52	208.90	355

Table 19. Continued

N-BUTANE ISOBAR AT P = 220 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
138.495	12.728	.07857	25.8946	1741.397	124.6	1853.1	134.877	78.42	111.34	2062
140.000	12.705	.07871	25.5707	1720.278	290.2	2021.8	136.085	78.55	111.51	2049
150.000	12.557	.07964	23.5546	1588.578	1395.1	3147.1	143.837	79.42	112.64	1968
160.000	12.409	.08059	21.7482	1470.137	2508.2	4281.1	151.153	80.36	113.79	1892
170.000	12.261	.08156	20.1218	1362.962	3630.1	5424.4	158.087	81.36	114.95	1820
180.000	12.114	.08255	18.6508	1265.447	4761.6	6577.8	164.687	82.42	116.13	1751
190.000	11.966	.08357	17.3153	1176.282	5903.7	7742.2	170.991	83.53	117.35	1686
200.000	11.819	.08461	16.0983	1094.388	7057.5	8918.9	177.035	84.71	118.61	1623
210.000	11.672	.08567	14.9859	1018.870	8224.0	10108.8	182.847	85.94	119.91	1563
220.000	11.525	.08677	13.9659	948.980	9404.0	11312.9	188.453	87.23	121.27	1506
230.000	11.378	.08789	13.0282	884.090	10598.5	12532.1	193.874	88.58	122.69	1451
240.000	11.230	.08905	12.1638	823.654	11808.1	13767.1	199.129	90.00	124.19	1398
250.000	11.082	.09023	11.3652	767.238	13033.6	15018.7	204.235	91.49	125.76	1347
260.000	10.934	.09146	10.6257	714.454	14275.5	16287.6	209.206	93.05	127.42	1297
270.000	10.785	.09272	9.9394	664.975	15534.5	17574.4	214.055	94.68	129.17	1249
280.000	10.635	.09403	9.3012	618.525	16810.6	18879.3	218.792	96.40	131.03	1202
290.000	10.484	.09538	8.7067	574.867	18104.5	20203.0	223.428	98.20	132.99	1157
300.000	10.332	.09679	8.1519	533.803	19416.3	21545.7	227.973	100.10	135.08	1113
310.000	10.178	.09825	7.6332	495.161	20746.8	22908.2	232.435	102.09	137.29	1070
320.000	10.024	.09977	7.1475	458.796	22096.6	24291.4	236.825	104.18	139.64	1028
330.000	9.867	.10135	6.6921	424.584	23467.0	25696.7	241.151	106.37	142.13	987
340.000	9.708	.10301	6.2645	392.421	24860.1	27126.2	245.423	108.68	144.75	948
350.000	9.548	.10474	5.8625	362.215	26277.9	28582.2	249.652	111.09	147.52	909
360.000	9.384	.10656	5.4842	333.887	27723.0	30067.2	253.845	113.70	150.52	872
370.000	9.219	.10847	5.1279	307.372	29197.5	31583.9	258.010	116.63	153.87	835
380.000	9.051	.11049	4.7920	282.611	30703.3	33134.1	262.153	119.87	157.56	799
390.000	8.880	.11262	4.4752	259.558	32240.8	34718.4	266.274	123.53	161.70	764
400.000	8.706	.11486	4.1763	238.171	33807.1	36334.1	270.367	127.84	166.48	730
410.000	8.529	.11725	3.8943	218.421	35389.7	37969.1	274.402	133.24	172.38	697
420.000	8.349	.11977	3.6283	200.281	36938.2	39573.1	278.263	141.46	181.06	664
430.000	8.167	.12245	3.3775	183.734	38619.4	41313.3	282.353	139.79	179.82	637
440.000	7.982	.12528	3.1414	168.760	40352.8	43109.0	286.482	139.41	179.80	611
450.000	7.795	.12829	2.9195	155.336	42090.6	44913.0	290.536	140.43	181.08	587
460.000	7.606	.13147	2.7115	143.425	43838.9	46731.3	294.532	141.85	182.61	563
470.000	7.417	.13483	2.5173	132.970	45598.9	48565.2	298.476	143.44	184.16	541
480.000	7.228	.13835	2.3366	123.883	47370.3	50414.1	302.369	145.13	185.62	522
490.000	7.040	.14205	2.1694	116.049	49152.2	52277.2	306.210	146.88	186.97	504
500.000	6.854	.14589	2.0154	109.324	50943.5	54153.1	310.000	148.66	188.20	487
520.000	6.492	.15403	1.7455	98.565	54551.1	57939.7	317.425	152.28	190.41	460
540.000	6.147	.16268	1.5219	90.396	58190.0	61769.1	324.651	155.92	192.54	438
560.000	5.819	.17185	1.3376	83.930	61861.3	65642.0	331.693	159.53	194.78	419
580.000	5.509	.18151	1.1851	78.714	65568.0	69561.3	338.570	163.08	197.17	404
600.000	5.217	.19168	1.0579	74.625	69312.2	73529.2	345.296	166.56	199.62	392
620.000	4.942	.20233	.9509	71.680	73094.0	77545.2	351.880	169.94	201.96	382
640.000	4.687	.21337	.8602	69.889	76911.8	81606.0	358.326	173.24	204.08	376
660.000	4.450	.22470	.7829	69.173	80763.4	85706.8	364.635	176.44	205.97	372
680.000	4.234	.23619	.7169	69.368	84647.1	89843.3	370.809	179.55	207.65	371
700.000	4.037	.24773	.6601	70.270	88562.1	94012.1	376.851	182.58	209.22	372

Table 19. Continued

N-BUTANE ISOBAR AT P = 250 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
138.982	12.738	.07851	26.0361	1767.563	142.6	2105.3	134.995	78.46	111.32	2077
140.000	12.723	.07860	25.8169	1753.215	254.3	2219.3	135.811	78.55	111.43	2068
150.000	12.576	.07952	23.7933	1620.617	1355.8	3343.8	143.556	79.42	112.56	1987
160.000	12.429	.08046	21.9805	1501.409	2465.5	4476.9	150.866	80.36	113.69	1911
170.000	12.283	.08141	20.3484	1393.587	3583.8	5619.1	157.795	81.36	114.84	1839
180.000	12.137	.08239	18.8724	1295.501	4711.5	6771.4	164.388	82.42	116.01	1771
190.000	11.991	.08339	17.5323	1205.853	5849.8	7934.6	170.685	83.54	117.22	1706
200.000	11.846	.08442	16.3113	1123.545	6999.5	9109.8	176.722	84.71	118.46	1644
210.000	11.701	.08546	15.1953	1047.674	8161.6	10298.2	182.526	85.94	119.75	1584
220.000	11.556	.08653	14.1722	977.481	9337.1	11500.5	188.124	87.24	121.09	1527
230.000	11.411	.08763	13.2317	912.333	10526.8	12717.7	193.536	88.59	122.49	1473
240.000	11.266	.08876	12.3649	851.693	11731.4	13950.4	198.782	90.01	123.95	1420
250.000	11.121	.08992	11.5642	795.087	12951.6	15199.6	203.878	91.50	125.50	1369
260.000	10.975	.09112	10.8228	742.152	14187.9	16465.8	208.838	93.06	127.12	1320
270.000	10.829	.09234	10.1351	692.547	15440.8	17749.4	213.675	94.69	128.84	1273
280.000	10.682	.09361	9.4957	645.992	16710.5	19050.8	218.399	96.41	130.66	1227
290.000	10.535	.09492	8.9003	602.247	17997.5	20370.6	223.022	98.21	132.58	1182
300.000	10.387	.09628	8.3449	561.108	19302.0	21708.9	227.552	100.10	134.62	1139
310.000	10.237	.09768	7.8258	522.399	20624.5	23066.5	231.998	102.09	136.77	1097
320.000	10.087	.09914	7.3401	485.971	21965.7	24444.1	236.370	104.19	139.05	1056
330.000	9.935	.10065	6.8849	451.697	23326.9	25843.1	240.677	106.38	141.47	1016
340.000	9.782	.10223	6.4577	419.466	24710.1	27265.7	244.928	108.69	144.01	977
350.000	9.627	.10387	6.0564	389.185	26117.1	28713.8	249.134	111.10	146.69	940
360.000	9.471	.10559	5.6791	360.769	27550.5	30190.1	253.302	113.72	149.60	903
370.000	9.313	.10738	5.3240	334.148	29012.4	31697.0	257.441	116.64	152.83	867
380.000	9.152	.10926	4.9895	309.259	30504.6	33236.2	261.554	119.88	156.40	833
390.000	8.990	.11124	4.6743	286.048	32027.3	34808.2	265.644	123.55	160.41	799
400.000	8.825	.11331	4.3772	264.469	33577.7	36410.4	269.702	127.85	165.06	766
410.000	8.659	.11549	4.0972	244.481	35143.2	38030.5	273.700	133.26	170.81	734
420.000	8.490	.11778	3.8332	226.050	36673.5	39618.1	277.522	141.48	179.35	702
430.000	8.320	.12020	3.5845	209.149	38335.4	41340.3	281.571	139.81	177.97	676
440.000	8.148	.12274	3.3504	193.749	40048.8	43117.2	285.655	139.43	177.83	652
450.000	7.974	.12541	3.1302	179.821	41765.8	44901.0	289.664	140.45	179.02	627
460.000	7.800	.12821	2.9237	167.330	43493.1	46698.4	293.614	141.87	180.49	605
470.000	7.625	.13115	2.7302	156.228	45232.2	48511.0	297.512	143.46	182.03	583
480.000	7.450	.13422	2.5497	146.449	46983.2	50338.8	301.361	145.14	183.53	564
490.000	7.277	.13742	2.3817	137.903	48745.7	52181.3	305.159	146.88	184.94	546
500.000	7.105	.14074	2.2259	130.482	50518.8	54037.4	308.909	148.65	186.26	530
520.000	6.770	.14772	1.9497	118.496	54094.1	57787.0	316.262	152.25	188.65	502
540.000	6.448	.15509	1.7167	109.413	57705.1	61582.2	323.424	155.87	190.85	480
560.000	6.142	.16280	1.5216	102.290	61351.1	65421.2	330.404	159.46	193.06	461
580.000	5.853	.17086	1.3581	96.490	65033.9	69305.3	337.219	163.01	195.37	446
600.000	5.579	.17924	1.2204	91.691	68755.9	73236.9	343.883	166.49	197.80	432
620.000	5.320	.18796	1.1035	87.797	72518.6	77217.6	350.409	169.89	200.27	421
640.000	5.076	.19699	1.0034	84.814	76322.4	81247.2	356.806	173.20	202.68	413
660.000	4.847	.20631	.9171	82.759	80166.4	85324.0	363.078	176.43	204.98	406
680.000	4.633	.21584	.8423	81.606	84049.2	89445.2	369.229	179.57	207.11	402
700.000	4.434	.22552	.7773	81.272	87969.5	93607.4	375.262	182.62	209.09	400

Table 19. Continued

N-BUTANE ISOBAR AT P = 300 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
139.788	12.754	.07841	26.2686	1811.088	172.9	2525.1	135.192	78.54	111.28	2101
140.000	12.751	.07843	26.2230	1808.085	196.0	2548.8	135.360	78.56	111.31	2099
150.000	12.606	.07933	24.1871	1673.969	1292.2	3672.0	143.097	79.43	112.42	2018
160.000	12.462	.08025	22.3633	1553.446	2396.3	4803.7	150.398	80.37	113.54	1943
170.000	12.318	.08118	20.7215	1444.495	3508.9	5944.3	157.316	81.37	114.67	1871
180.000	12.175	.08214	19.2368	1345.451	4630.7	7094.8	163.899	82.43	115.83	1803
190.000	12.032	.08311	17.8890	1254.969	5762.7	8256.0	170.187	83.55	117.01	1738
200.000	11.890	.08411	16.6612	1171.942	6906.0	9429.1	176.212	84.72	118.23	1677
210.000	11.748	.08512	15.5389	1095.449	8061.4	10615.1	182.005	85.95	119.49	1618
220.000	11.606	.08616	14.5102	1024.720	9229.9	11814.7	187.590	87.25	120.80	1562
230.000	11.465	.08723	13.5647	959.110	10412.2	13028.9	192.989	88.60	122.17	1508
240.000	11.323	.08831	12.6935	898.071	11609.0	14258.4	198.221	90.02	123.60	1456
250.000	11.182	.08943	11.8890	841.139	12821.0	15503.9	203.302	91.51	125.11	1406
260.000	11.040	.09058	11.1442	787.905	14048.6	16765.9	208.246	93.07	126.69	1358
270.000	10.899	.09175	10.4534	738.051	15292.4	18045.0	213.065	94.70	128.36	1311
280.000	10.757	.09296	9.8116	691.280	16552.5	19341.3	217.771	96.42	130.12	1266
290.000	10.615	.09421	9.2141	647.345	17829.2	20655.4	222.374	98.23	131.98	1223
300.000	10.472	.09549	8.6569	606.036	19122.7	21987.3	226.882	100.12	133.95	1181
310.000	10.329	.09681	8.1366	567.169	20433.5	23337.9	231.305	102.11	136.03	1140
320.000	10.185	.09818	7.6499	530.591	21762.3	24707.7	235.652	104.20	138.22	1100
330.000	10.041	.09959	7.1941	496.166	23110.2	26097.9	239.932	106.40	140.55	1061
340.000	9.895	.10106	6.7667	463.777	24479.1	27510.8	244.155	108.71	142.99	1024
350.000	9.749	.10257	6.3655	433.324	25870.9	28948.2	248.329	111.12	145.56	988
360.000	9.602	.10415	5.9886	404.718	27288.0	30412.5	252.464	113.74	148.34	952
370.000	9.453	.10579	5.6341	377.880	28732.6	31906.2	256.566	116.67	151.45	918
380.000	9.303	.10749	5.3005	352.741	30206.2	33430.8	260.641	119.91	154.88	885
390.000	9.153	.10926	4.9864	329.239	31709.1	34986.9	264.689	123.58	158.74	852
400.000	9.001	.11110	4.6906	307.319	33238.5	36571.6	268.703	127.88	163.23	821
410.000	8.847	.11303	4.4119	286.932	34781.8	38172.6	272.654	133.29	168.83	790
420.000	8.693	.11503	4.1494	268.032	36288.6	39739.6	276.426	141.51	177.21	759
430.000	8.538	.11713	3.9020	250.580	37926.1	41439.9	280.423	139.85	175.69	735
440.000	8.382	.11931	3.6692	234.540	39613.9	43193.1	284.453	139.47	175.42	712
450.000	8.225	.12158	3.4501	219.875	41304.8	44952.2	288.406	140.49	176.50	689
460.000	8.068	.12395	3.2442	206.546	43005.7	46724.2	292.301	141.90	177.91	667
470.000	7.911	.12641	3.0508	194.512	44718.6	48510.8	296.143	143.49	179.43	646
480.000	7.754	.12896	2.8696	183.723	46444.0	50312.7	299.937	145.17	180.95	627
490.000	7.599	.13160	2.7000	174.117	48181.8	52129.8	303.683	146.91	182.44	609
500.000	7.444	.13433	2.5417	165.618	49931.5	53961.4	307.384	148.68	183.87	593
520.000	7.142	.14002	2.2572	151.585	53465.2	57665.8	314.648	152.26	186.53	565
540.000	6.850	.14599	2.0124	140.809	57041.2	61421.0	321.734	155.86	188.96	541
560.000	6.571	.15219	1.8031	132.442	60657.5	65223.3	328.647	159.43	191.27	522
580.000	6.305	.15860	1.6245	125.753	64313.7	69071.6	335.399	162.96	193.57	506
600.000	6.054	.16519	1.4719	120.219	68010.9	72966.5	342.001	166.43	195.93	493
620.000	5.815	.17196	1.3408	115.529	71750.4	76909.2	348.465	169.83	198.36	481
640.000	5.589	.17892	1.2276	111.543	75533.9	80901.3	354.802	173.16	200.84	471
660.000	5.375	.18605	1.1290	108.221	79361.3	84942.8	361.020	176.40	203.31	463
680.000	5.172	.19336	1.0427	105.570	83232.9	89033.5	367.126	179.57	205.75	456
700.000	4.980	.20081	.9666	103.601	87147.8	93172.2	373.124	182.64	208.10	450

Table 19. Continued

N-BUTANE ISOBAR AT P = 350 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
140.590	12.770	.07831	26.4970	1854.513	203.7	2944.6	135.387	78.62	111.26	2124
150.000	12.635	.07914	24.5758	1727.250	1230.7	4000.7	142.647	79.44	112.29	2049
160.000	12.493	.08004	22.7410	1605.397	2329.6	5131.0	149.939	80.38	113.40	1973
170.000	12.352	.08096	21.0892	1495.289	3436.7	6270.2	156.849	81.38	114.52	1902
180.000	12.211	.08189	19.5957	1395.251	4552.9	7419.1	163.423	82.44	115.66	1835
190.000	12.071	.08284	18.2399	1303.897	5679.1	8578.6	169.701	83.56	116.83	1771
200.000	11.932	.08381	17.0049	1220.115	6816.3	9749.7	175.716	84.73	118.03	1709
210.000	11.792	.08480	15.8761	1142.965	7965.5	10933.5	181.498	85.97	119.27	1651
220.000	11.654	.08581	14.8416	1071.665	9127.5	12130.8	187.072	87.26	120.55	1596
230.000	11.515	.08684	13.8908	1005.556	10302.9	13342.3	192.460	88.61	121.90	1542
240.000	11.377	.08789	13.0148	944.081	11492.7	14568.9	197.679	90.03	123.30	1491
250.000	11.240	.08897	12.2059	886.768	12697.2	15811.2	202.747	91.52	124.77	1442
260.000	11.102	.09007	11.4573	833.211	13917.1	17069.6	207.677	93.08	126.32	1394
270.000	10.965	.09120	10.7631	783.059	15152.7	18344.8	212.481	94.72	127.94	1348
280.000	10.827	.09236	10.1181	736.028	16404.1	19636.7	217.172	96.44	129.66	1304
290.000	10.690	.09355	9.5179	691.859	17671.8	20946.0	221.757	98.24	131.47	1262
300.000	10.552	.09477	8.9584	650.334	18955.7	22272.6	226.247	100.14	133.39	1220
310.000	10.414	.09602	8.4361	611.265	20256.5	23617.3	230.651	102.13	135.41	1180
320.000	10.276	.09731	7.9477	574.491	21574.6	24980.6	234.978	104.22	137.54	1142
330.000	10.137	.09864	7.4905	539.870	22911.1	26363.7	239.236	106.42	139.80	1104
340.000	9.999	.10001	7.0619	507.281	24268.2	27768.7	243.435	108.73	142.17	1068
350.000	9.859	.10143	6.6598	476.617	25647.4	29197.4	247.584	111.15	144.65	1033
360.000	9.719	.10289	6.2822	447.783	27051.1	30652.3	251.692	113.76	147.35	998
370.000	9.578	.10440	5.9272	420.695	28481.6	32135.7	255.766	116.69	150.37	965
380.000	9.437	.10596	5.5933	395.279	29940.3	33649.0	259.811	119.94	153.71	933
390.000	9.295	.10758	5.2790	371.467	31427.6	35192.9	263.828	123.61	157.47	902
400.000	9.153	.10925	4.9830	349.198	32940.6	36764.4	267.808	127.91	161.86	871
410.000	9.010	.11099	4.7043	328.418	34466.7	38351.2	271.724	133.33	167.36	842
420.000	8.867	.11278	4.4416	309.070	35955.7	39903.1	275.459	141.54	175.65	812
430.000	8.723	.11464	4.1942	291.114	37574.7	41587.2	279.418	139.88	174.03	789
440.000	8.578	.11657	3.9611	274.502	39243.5	43323.5	283.410	139.51	173.68	766
450.000	8.434	.11857	3.7416	259.196	40915.1	45064.9	287.323	140.53	174.70	744
460.000	8.290	.12063	3.5351	245.153	42596.5	46818.6	291.178	141.94	176.07	723
470.000	8.146	.12276	3.3407	232.331	44289.9	48586.6	294.980	143.53	177.56	703
480.000	8.002	.12496	3.1581	220.686	45996.1	50369.8	298.734	145.21	179.09	684
490.000	7.860	.12723	2.9867	210.168	47715.3	52168.4	302.443	146.95	180.62	666
500.000	7.718	.12956	2.8259	200.721	49447.3	53982.1	306.107	148.72	182.11	650
520.000	7.440	.13441	2.5346	184.774	52948.8	57653.1	313.305	152.29	184.95	621
540.000	7.170	.13946	2.2806	172.234	56497.6	61378.9	320.336	155.88	187.60	597
560.000	6.911	.14470	2.0602	162.414	60091.4	65155.9	327.203	159.44	190.08	577
580.000	6.663	.15008	1.8694	154.639	63728.8	68981.5	333.916	162.96	192.48	560
600.000	6.427	.15558	1.7043	148.327	67409.6	72855.0	340.481	166.42	194.87	546
620.000	6.203	.16120	1.5612	143.052	71134.2	76776.3	346.910	169.82	197.27	534
640.000	5.991	.16693	1.4366	138.532	74903.6	80746.1	353.211	173.15	199.71	524
660.000	5.788	.17276	1.3274	134.614	78718.4	84765.0	359.395	176.39	202.18	515
680.000	5.596	.17870	1.2313	131.229	82578.8	88833.3	365.467	179.56	204.65	507
700.000	5.413	.18474	1.1460	128.361	86484.8	92950.8	371.435	182.66	207.10	500

Table 19. Continued

N-BUTANE ISOBAR AT P = 400 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
141.385	12.785	.07822	26.7213	1897.846	234.9	3363.6	135.583	78.70	111.24	2148
150.000	12.664	.07896	24.9598	1780.506	1171.1	4329.7	142.206	79.45	112.18	2079
160.000	12.524	.07985	23.1137	1657.287	2265.0	5458.9	149.490	80.39	113.27	2004
170.000	12.385	.08074	21.4519	1545.984	3367.0	6596.7	156.392	81.39	114.38	1933
180.000	12.247	.08166	19.9493	1444.910	4477.9	7744.1	162.957	82.45	115.51	1866
190.000	12.109	.08258	18.5855	1352.673	5598.6	8902.0	169.226	83.57	116.66	1802
200.000	11.972	.08353	17.3429	1268.094	6730.2	10071.4	175.233	84.74	117.84	1741
210.000	11.835	.08449	16.2075	1190.256	7873.6	11253.3	181.006	85.98	119.06	1683
220.000	11.699	.08547	15.1668	1118.351	9029.4	12448.4	186.570	87.27	120.33	1628
230.000	11.564	.08647	14.2104	1051.710	10198.7	13657.6	191.947	88.63	121.65	1575
240.000	11.429	.08750	13.3293	989.766	11381.8	14881.7	197.155	90.05	123.03	1525
250.000	11.295	.08854	12.5157	932.038	12579.6	16121.1	202.211	91.54	124.47	1476
260.000	11.161	.08960	11.7629	878.113	13792.4	17376.4	207.129	93.10	125.99	1429
270.000	11.027	.09069	11.0649	827.639	15020.6	18648.1	211.921	94.74	127.58	1384
280.000	10.893	.09180	10.4165	780.314	16264.3	19936.3	216.597	96.45	129.27	1341
290.000	10.760	.09294	9.8131	735.868	17523.9	21241.5	221.169	98.26	131.04	1299
300.000	10.626	.09410	9.2508	694.091	18799.4	22563.5	225.643	100.16	132.91	1258
310.000	10.493	.09530	8.7258	654.785	20091.3	23903.2	230.031	102.15	134.89	1219
320.000	10.360	.09653	8.2352	617.780	21400.1	25261.1	234.340	104.24	136.97	1181
330.000	10.227	.09778	7.7759	582.932	22726.9	26638.3	238.580	106.44	139.17	1145
340.000	10.093	.09908	7.3456	550.111	24073.7	28036.8	242.760	108.75	141.49	1109
350.000	9.960	.10041	6.9419	519.207	25442.2	29458.4	246.889	111.17	143.92	1075
360.000	9.826	.10177	6.5628	490.120	26834.7	30905.7	250.975	113.79	146.56	1042
370.000	9.692	.10318	6.2065	462.761	28253.5	32380.7	255.026	116.72	149.51	1009
380.000	9.557	.10463	5.8714	437.053	29700.0	33885.2	259.047	119.97	152.78	978
390.000	9.423	.10612	5.5560	412.921	31174.5	35419.4	263.039	123.64	156.47	948
400.000	9.288	.10766	5.2591	390.305	32674.2	36980.6	266.993	127.95	160.80	918
410.000	9.154	.10925	4.9793	369.136	34186.6	38556.5	270.882	133.36	166.23	889
420.000	9.019	.11088	4.7157	349.365	35661.4	40096.7	274.589	141.58	174.45	860
430.000	8.884	.11257	4.4673	330.940	37265.9	41768.6	278.519	139.92	172.78	838
440.000	8.749	.11430	4.2331	313.813	38919.8	43491.9	282.481	139.54	172.37	816
450.000	8.614	.11609	4.0124	297.936	40576.3	45220.0	286.365	140.57	173.34	795
460.000	8.479	.11793	3.8045	283.267	42242.6	46959.9	290.189	141.99	174.68	774
470.000	8.345	.11983	3.6086	269.765	43920.9	48714.0	293.961	143.58	176.15	754
480.000	8.212	.12177	3.4241	257.385	45612.1	50483.1	297.686	145.26	177.68	735
490.000	8.079	.12377	3.2505	246.082	47316.7	52267.6	301.365	146.99	179.22	718
500.000	7.948	.12582	3.0873	235.810	49034.7	54067.6	305.001	148.76	180.75	702
520.000	7.689	.13006	2.7898	218.141	52510.2	57712.5	312.149	152.34	183.72	672
540.000	7.437	.13447	2.5281	203.904	56036.6	61415.2	319.136	155.92	186.52	647
560.000	7.193	.13902	2.2985	192.553	59611.7	65172.4	325.967	159.47	189.17	626
580.000	6.960	.14369	2.0976	183.512	63233.7	68981.2	332.650	162.99	191.70	609
600.000	6.736	.14845	1.9220	176.233	66901.8	72839.9	339.190	166.44	194.16	594
620.000	6.523	.15330	1.7684	170.251	70615.6	76747.4	345.597	169.84	196.60	582
640.000	6.321	.15821	1.6336	165.209	74375.3	80703.7	351.877	173.16	199.03	571
660.000	6.128	.16319	1.5148	160.862	78181.1	84708.9	358.039	176.41	201.48	562
680.000	5.944	.16824	1.4098	157.057	82033.4	88763.1	364.090	179.58	203.94	553
700.000	5.768	.17336	1.3163	153.713	85932.0	92866.3	370.037	182.67	206.39	546

Table 19. Continued

N-BUTANE ISOBAR AT P = 500 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
142.960	12.815	.07804	27.1588	1984.266	298.7	4200.5	135.971	78.85	111.21	2194
150.000	12.718	.07863	25.7145	1886.966	1057.7	4988.9	141.348	79.48	111.97	2138
160.000	12.583	.07947	23.8454	1760.897	2142.2	6115.9	148.618	80.42	113.05	2063
170.000	12.448	.08034	22.1632	1647.148	3234.6	7251.4	155.506	81.42	114.14	1993
180.000	12.314	.08121	20.6420	1543.915	4335.7	8396.3	162.057	82.48	115.24	1926
190.000	12.180	.08210	19.2613	1449.785	5446.4	9551.4	168.311	83.60	116.37	1863
200.000	12.048	.08300	18.0035	1363.567	6567.6	10717.7	174.301	84.77	117.53	1803
210.000	11.916	.08392	16.8540	1284.264	7700.3	11896.3	180.058	86.01	118.72	1746
220.000	11.785	.08485	15.8005	1211.066	8845.3	13087.8	185.605	87.30	119.95	1692
230.000	11.655	.08580	14.8323	1143.277	10003.2	14293.1	190.965	88.66	121.24	1640
240.000	11.526	.08676	13.9403	1080.311	11174.7	15512.8	196.155	90.08	122.58	1590
250.000	11.397	.08774	13.1167	1021.667	12360.5	16747.5	201.192	91.57	123.98	1542
260.000	11.269	.08874	12.3546	966.918	13560.8	17997.7	206.090	93.13	125.45	1496
270.000	11.142	.08975	11.6480	915.698	14776.1	19263.8	210.860	94.77	127.00	1452
280.000	11.015	.09079	10.9917	867.691	16006.5	20545.9	215.514	96.49	128.63	1410
290.000	10.888	.09184	10.3810	822.625	17252.2	21844.3	220.062	98.30	130.34	1369
300.000	10.762	.09292	9.8120	780.263	18513.3	23159.2	224.512	100.20	132.16	1330
310.000	10.637	.09401	9.2808	740.400	19790.3	24491.0	228.874	102.19	134.07	1292
320.000	10.512	.09513	8.7844	702.859	21083.6	25840.3	233.156	104.29	136.08	1256
330.000	10.387	.09628	8.3198	667.482	22394.3	27208.2	237.367	106.49	138.21	1220
340.000	10.262	.09744	7.8844	634.133	23724.4	28596.7	241.517	108.80	140.45	1186
350.000	10.138	.09864	7.4761	602.692	25075.6	30007.5	245.615	111.22	142.80	1153
360.000	10.014	.09986	7.0926	573.050	26450.2	31443.2	249.669	113.84	145.35	1121
370.000	9.891	.10111	6.7323	545.113	27850.4	32905.8	253.686	116.78	148.22	1091
380.000	9.767	.10238	6.3933	518.794	29277.7	34397.0	257.671	120.02	151.41	1061
390.000	9.644	.10369	6.0742	494.016	30732.5	35917.1	261.626	123.70	155.01	1032
400.000	9.521	.10503	5.7736	470.707	32211.8	37463.3	265.543	128.01	159.26	1003
410.000	9.399	.10640	5.4903	448.800	33703.4	39023.2	269.392	133.42	164.60	975
420.000	9.277	.10780	5.2232	428.235	35156.8	40546.7	273.059	141.65	172.74	947
430.000	9.155	.10923	4.9712	408.955	36739.5	42201.2	276.948	139.99	170.99	927
440.000	9.033	.11070	4.7334	390.906	38371.4	43906.4	280.868	139.62	170.52	906
450.000	8.913	.11220	4.5089	374.039	40005.7	45615.7	284.709	140.65	171.44	885
460.000	8.792	.11373	4.2971	358.306	41649.6	47336.4	288.491	142.07	172.73	865
470.000	8.673	.11530	4.0970	343.662	43305.7	49070.8	292.221	143.66	174.18	846
480.000	8.554	.11690	3.9081	330.064	44974.9	50820.2	295.904	145.34	175.70	828
490.000	8.436	.11854	3.7298	317.468	46658.0	52584.9	299.543	147.08	177.25	811
500.000	8.319	.12021	3.5614	305.834	48355.0	54365.3	303.140	148.85	178.81	795
520.000	8.089	.12363	3.2526	285.282	51791.0	57972.6	310.213	152.43	181.90	765
540.000	7.863	.12717	2.9777	268.059	55282.1	61640.7	317.135	156.01	184.90	739
560.000	7.645	.13081	2.7332	253.790	58827.0	65367.6	323.912	159.57	187.77	716
580.000	7.433	.13454	2.5161	242.073	62424.0	69150.9	330.549	163.07	190.53	697
600.000	7.229	.13833	2.3234	232.494	66071.5	72988.2	337.054	166.53	193.18	681
620.000	7.033	.14218	2.1523	224.648	69768.5	76877.7	343.430	169.91	195.76	667
640.000	6.846	.14608	2.0002	218.162	73514.2	80818.1	349.685	173.23	198.27	655
660.000	6.666	.15001	1.8648	212.722	77308.1	84808.4	355.824	176.48	200.75	645
680.000	6.495	.15397	1.7439	208.074	81149.7	88848.1	361.854	179.65	203.21	636
700.000	6.331	.15795	1.6356	204.033	85038.9	92936.5	367.779	182.74	205.64	628

Table 19. Continued

N-BUTANE ISOBAR AT P = 600 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
144.515	12.843	.07786	27.5822	2070.402	363.8	5035.7	136.357	79.02	111.21	2239
150.000	12.770	.07831	26.4528	1993.438	950.9	5649.4	140.520	79.50	111.79	2196
160.000	12.638	.07913	24.5605	1864.413	2026.9	6774.6	147.778	80.44	112.86	2121
170.000	12.507	.07996	22.8572	1748.081	3110.6	7908.1	154.654	81.45	113.93	2051
180.000	12.376	.08080	21.3172	1642.619	4202.8	9050.7	161.192	82.51	115.02	1984
190.000	12.247	.08165	19.9191	1546.492	5304.4	10203.5	167.434	83.63	116.13	1922
200.000	12.119	.08252	18.6456	1458.525	6416.4	11367.4	173.412	84.80	117.26	1862
210.000	11.991	.08339	17.4815	1377.659	7539.6	12543.2	179.155	86.04	118.44	1806
220.000	11.865	.08428	16.4145	1303.079	8674.9	13731.8	184.689	87.34	119.65	1752
230.000	11.739	.08518	15.4338	1234.039	9822.9	14933.9	190.034	88.69	120.91	1701
240.000	11.615	.08610	14.5303	1169.954	10984.3	16150.2	195.210	90.12	122.22	1652
250.000	11.491	.08702	13.6959	1110.301	12159.7	17381.1	200.231	91.61	123.59	1605
260.000	11.368	.08797	12.9238	1054.635	13349.4	18627.3	205.113	93.17	125.03	1560
270.000	11.246	.08892	12.2078	1002.578	14553.8	19889.0	209.867	94.81	126.55	1517
280.000	11.125	.08989	11.5427	953.800	15772.9	21166.4	214.504	96.53	128.14	1475
290.000	11.004	.09088	10.9238	908.017	17007.1	22459.8	219.034	98.34	129.82	1436
300.000	10.884	.09188	10.3470	864.983	18256.4	23769.1	223.466	100.24	131.59	1397
310.000	10.765	.09290	9.8086	824.483	19521.2	25095.0	227.808	102.24	133.45	1360
320.000	10.646	.09393	9.3053	786.329	20802.0	26437.9	232.070	104.33	135.43	1325
330.000	10.528	.09499	8.8342	750.356	22099.9	27799.0	236.260	106.54	137.51	1290
340.000	10.410	.09606	8.3928	716.419	23416.8	29180.2	240.388	108.85	139.70	1257
350.000	10.294	.09715	7.9786	684.391	24754.5	30583.3	244.464	111.27	142.00	1225
360.000	10.177	.09826	7.5897	654.156	26115.2	32010.7	248.494	113.89	144.50	1194
370.000	10.062	.09939	7.2240	625.614	27501.2	33464.5	252.487	116.83	147.32	1164
380.000	9.946	.10054	6.8799	598.672	28914.0	34946.3	256.448	120.08	150.45	1135
390.000	9.832	.10171	6.5558	573.248	30353.9	36456.6	260.377	123.76	154.01	1107
400.000	9.718	.10291	6.2504	549.266	31818.2	37992.5	264.267	128.07	158.20	1080
410.000	9.604	.10412	5.9624	526.655	33294.3	39541.6	268.090	133.49	163.49	1053
420.000	9.491	.10536	5.6906	505.352	34732.3	41053.9	271.730	141.72	171.59	1026
430.000	9.379	.10662	5.4339	485.295	36299.3	42696.6	275.591	140.06	169.80	1006
440.000	9.267	.10791	5.1915	466.431	37915.3	44389.7	279.484	139.69	169.29	986
450.000	9.156	.10921	4.9624	448.705	39533.8	46086.6	283.297	140.72	170.18	966
460.000	9.046	.11054	4.7457	432.068	41161.9	47794.5	287.051	142.14	171.45	946
470.000	8.937	.11190	4.5409	416.474	42802.2	49516.1	290.753	143.74	172.88	928
480.000	8.828	.11327	4.3471	401.878	44455.8	51252.3	294.409	145.43	174.39	910
490.000	8.720	.11467	4.1637	388.237	46123.5	53003.9	298.020	147.17	175.94	893
500.000	8.614	.11610	3.9902	375.510	47805.5	54771.2	301.591	148.94	177.51	877
520.000	8.403	.11900	3.6704	352.644	51212.8	58352.9	308.614	152.52	180.65	847
540.000	8.197	.12199	3.3839	332.973	54677.7	61997.0	315.490	156.11	183.74	821
560.000	7.997	.12505	3.1270	316.195	58199.1	65702.0	322.227	159.66	186.74	797
580.000	7.802	.12817	2.8967	302.002	61775.7	69466.0	328.831	163.17	189.65	777
600.000	7.613	.13135	2.6903	290.080	65406.3	73287.1	335.308	166.62	192.45	759
620.000	7.431	.13457	2.5051	280.114	69089.3	77163.4	341.662	170.01	195.16	743
640.000	7.256	.13782	2.3389	271.792	72823.7	81093.1	347.900	173.33	197.79	730
660.000	7.087	.14110	2.1895	264.824	76608.5	85074.7	354.026	176.57	200.36	719
680.000	6.925	.14441	2.0551	258.947	80442.6	89107.0	360.045	179.74	202.87	709
700.000	6.769	.14772	1.9338	253.934	84325.6	93189.0	365.961	182.83	205.33	700

Table 19. Continued

N-BUTANE ISOBAR AT P = 700 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
146.050	12.870	.07770	27.9928	2156.303	430.3	5869.2	136.739	79.18	111.22	2282
150.000	12.819	.07801	27.1763	2100.012	850.2	6310.9	139.719	79.54	111.64	2251
160.000	12.690	.07880	25.2604	1967.921	1918.3	7434.5	146.968	80.48	112.69	2177
170.000	12.562	.07960	23.5358	1848.915	2994.0	8566.3	153.833	81.48	113.75	2107
180.000	12.435	.08042	21.9765	1741.091	4078.1	9707.1	160.361	82.54	114.83	2041
190.000	12.310	.08124	20.5608	1642.904	5171.4	10858.0	166.592	83.66	115.93	1979
200.000	12.185	.08207	19.2710	1553.089	6275.0	12019.7	172.559	84.84	117.05	1920
210.000	12.062	.08291	18.0920	1470.588	7389.8	13193.3	178.292	86.07	118.20	1863
220.000	11.939	.08376	17.0112	1394.530	8516.4	14379.5	183.814	87.37	119.40	1810
230.000	11.818	.08462	16.0176	1324.174	9655.6	15579.0	189.148	88.73	120.64	1759
240.000	11.697	.08549	15.1021	1258.897	10808.1	16792.5	194.312	90.15	121.93	1711
250.000	11.578	.08637	14.2564	1198.151	11974.4	18020.5	199.321	91.65	123.28	1665
260.000	11.459	.08727	13.4737	1141.494	13154.8	19263.5	204.190	93.21	124.70	1620
270.000	11.342	.08817	12.7478	1088.525	14349.8	20521.7	208.931	94.85	126.19	1578
280.000	11.225	.08909	12.0734	1038.906	15559.3	21795.4	213.555	96.58	127.75	1537
290.000	11.109	.09002	11.4457	992.340	16783.7	23084.8	218.071	98.38	129.41	1498
300.000	10.994	.09096	10.8606	948.571	18023.0	24389.9	222.488	100.29	131.15	1460
310.000	10.880	.09191	10.3142	907.374	19277.6	25711.3	226.816	102.28	132.99	1424
320.000	10.767	.09288	9.8034	868.553	20548.0	27049.4	231.062	104.38	134.93	1389
330.000	10.654	.09386	9.3252	831.936	21835.3	28405.4	235.237	106.59	136.98	1356
340.000	10.543	.09485	8.8770	797.370	23141.4	29781.1	239.349	108.90	139.13	1323
350.000	10.432	.09586	8.4563	764.720	24468.1	31178.4	243.407	111.32	141.40	1292
360.000	10.322	.09688	8.0611	733.867	25817.7	32599.6	247.420	113.95	143.87	1262
370.000	10.212	.09792	7.6894	704.703	27192.3	34047.0	251.396	116.89	146.66	1233
380.000	10.103	.09898	7.3394	677.132	28593.6	35522.0	255.338	120.14	149.75	1205
390.000	9.995	.10005	7.0097	651.066	30021.9	37025.2	259.249	123.82	153.28	1177
400.000	9.888	.10113	6.6988	626.426	31474.3	38553.6	263.120	128.13	157.44	1150
410.000	9.781	.10223	6.4054	603.140	32938.6	40095.1	266.924	133.55	162.71	1124
420.000	9.676	.10335	6.1283	581.139	34364.6	41599.3	270.545	141.78	170.78	1097
430.000	9.571	.10449	5.8665	560.362	35919.6	43233.7	274.387	140.13	168.96	1078
440.000	9.466	.10564	5.6189	540.752	37523.6	44918.3	278.259	139.76	168.43	1058
450.000	9.363	.10681	5.3847	522.253	39130.0	46606.5	282.053	140.80	169.30	1039
460.000	9.260	.10799	5.1630	504.816	40746.1	48305.5	285.787	142.22	170.55	1020
470.000	9.158	.10919	4.9530	488.391	42374.5	50017.9	289.470	143.82	171.97	1002
480.000	9.057	.11041	4.7541	472.935	44016.4	51745.1	293.106	145.51	173.47	984
490.000	8.957	.11164	4.5656	458.403	45672.5	53487.5	296.699	147.25	175.02	968
500.000	8.858	.11289	4.3869	444.756	47343.1	55245.6	300.251	149.02	176.60	952
520.000	8.663	.11544	4.0566	419.959	50728.6	58809.2	307.239	152.61	179.76	922
540.000	8.472	.11804	3.7592	398.251	54173.1	62435.8	314.082	156.20	182.90	895
560.000	8.285	.12070	3.4912	379.358	57675.9	66124.6	320.789	159.76	185.97	871
580.000	8.104	.12340	3.2494	363.015	61236.0	69874.0	327.367	163.27	188.96	850
600.000	7.927	.12615	3.0312	348.965	64852.2	73682.4	333.822	166.72	191.86	831
620.000	7.756	.12893	2.8342	336.952	68523.0	77547.9	340.160	170.11	194.68	814
640.000	7.591	.13174	2.6560	326.723	72247.3	81468.9	346.384	173.43	197.41	799
660.000	7.431	.13457	2.4947	318.033	76023.9	85443.6	352.499	176.67	200.06	787
680.000	7.277	.13742	2.3486	310.649	79851.5	89470.7	358.510	179.84	202.64	776
700.000	7.129	.14028	2.2159	304.356	83729.3	93548.7	364.420	182.93	205.16	766

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      PROGRAM NBUTHRM(INPUT,OUTPUT)
C     N-BUTANE THERMOFUNCTIONS ALONG ISOBARS, AUGUST, 1978.
C     NEW XEF, DGASF, EDELF, FOR LOW DENSITIES.
C     THERMO ROUTINES FROM NBUTHRM, 7/31/78 AT 9.09.
C     FREEZING LIQUID DEN., (D/DT) = (T/TT)**(0.235), GRAPH., PROPANE.
      COMMON GK,GKK, B1,B2,B3,B4, E1,ER, IX
      COMMON/B1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/B3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      COMMON/B4/XB1,XB2, XC1,XC2, XE1,XE2, DXBDR,DXCDR,DXEDR
      COMMON/B5/ DDSDT
      COMMON/B6/ TSAT, THETA, PSAT
      COMMON/B8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
      COMMON/B9/ DNG,EG,HG,SG, CVG,CPG,WG, DPGDT,DPGDD
      COMMON/B12/ DELS, DELCV
      COMMON/B13/ ZCRT,ZSAT,DZSDT,ZFX, FRT,DFRTDT
      COMMON/B15/ FLSM
      COMMON/B99/ TI,EZZ, EZ,SZ,CVZ, HZ,CPZ
      DIMENSION PP(99)
    1 FORMAT(I5, 2F10.0)
    2 FORMAT(I5, 3F10.0)
    3 FORMAT(8I10)
    5 FORMAT(1X)
    9 FORMAT(8F10.0)
   14 FORMAT(1H1,18X,22HN-BUTANE ISOBAR AT P =, F8.5, 4H BAR /)
   15 FORMAT(1H1,18X,22HN-BUTANE ISOBAR AT P =, I4,  4H BAR /)
   16 FORMAT(19X,1HT,6X,3HDEN,5X,3HVOL,5X,5HDP/DT,5X,5HDP/DD
     2,8X,1HE,8X,1HH,8X,1HS,6X,2HCV,6X,2HCP,5X,1HW /
     315X,5HDEG K,4X,5HMOL/L,4X,5HL/MOL,5X,15HBAR/K BAR-L/MOL,4X,5HJ/MOL
     4 ,4X,36HJ/MOL   J/MOL/K J/MOL/K J/MOL/K M/SEC )
   17 FORMAT(10X,F10.3, F9.3, F9.5, F10.4, F10.3, 2F9.1,F9.3,2F8.2,I6)
   18 FORMAT(10X,F10.3, F9.5, F9.3, F10.6, F10.3, 2F9.1,F9.3,2F8.2,I6)
   30 CALL PVTDAT
   31 CALL PRINT
      CALL JTLOCS
      CALL TABLIQ
C
C     COMPUTE THERMOFUNCTIONS ON ISOBARS. START ON THE MELTING LINE.
C     ISOBARS AT P UNDER PCRT TRAVERSE THE DOME.
C     NOTE USE OF QVAP ,DATA, TO CROSS THE ,DOME,.
C     NOTE USE OF CSAT ,DATA, FOR SPECIFIC HEATS IN COMPRESSED LIQUID.
   90 IN = 1
      NI = 57
      READ 9, (PP(I),I=1,NI)
   91 DO 300 I=IN,NI
      P = PP(I)
      IP = P
      IK = I
      LS = 0
   92 IF(P-IP) 93,94,93
   93 PRINT 14, P
      GO TO 95
   94 PRINT 15, IP
   95 PRINT 16
   96 IF(I.EQ.26)  P = PCRT
  100 T = FINDTM(P)
      CALL COMPLQ
      V=1/DEN
      IW=W
  101 PRINT 17, T,DEN,V,DPDT,DPDD, E,H,S,CV,CP,IW
  102 IT = T/10
      IF(P.GE.PCRT) GO TO 180
C
C     CASES FOR P LESS THAN PCRT.
  110 TS = FINDTS(P)
      L = 0
      K = 0
  111 DO 150 J=1,99
      JT = 10*(IT+J)
      T = JT
  112 IF(T.GE.TS) GO TO 117
  115 CALL COMPLQ
      V=1/DEN
      IW=W
  116 PRINT 17, T,DEN,V,DPDT,DPDD, E,H,S,CV,CP,IW
      GO TO 150
  117 LS = LS + 1
      IF(LS.NE.1) GO TO 130
C     CASE FOR SATURATED LIQUID AND VAPOR.
  120 T = TS
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      CALL COEXST
  123 V=1/DEN
      VG=1/DNG
      IW=W
      IWG=WG
  124 PRINT 17, T,DEN,V,DPDT,DPDD, E,H,S,CV,CP,IW
      PRINT 5
  125 IF(P.GE.32) GO TO 127
  126 PRINT 18, T,DNG,VG,DPGDT,DPGDD, EG,HG,SG,CVG,CPG,IWG
      GOTO 128
  127 PRINT 17, T,DNG,VG,DPGDT,DPGDD, EG,HG,SG,CVG,CPG,IWG
  128 T = JT
C     CASES FOR THE HOMOGENOUS DOMAIN.
  130 IF(JT.LE.500) GO TO 132
  131 K = K+1
      JT = JT + 10*K
      T = JT
      IF(JT.GT.700) GO TO 300
  132 CALL GENOUS
      V = 1/DEN
      IW = W
  133 IF(P.GE.22) GO TO 135
  134 PRINT 18, T,DEN,V,DPDT,DPDD, E,H,S, CV,CP,IW
      GO TO 150
  135 PRINT 17, T,DEN,V,DPDT,DPDD, E,H,S, CV,CP,IW
  150 CONTINUE
C
C     FOR P ABOVE PCRT, CASES FOR T.LT.OR.T.GT.TCRT.
  180 L=0
      K = 0
      DO 250 J=1,99
      JT = 10*(IT+J)
      T = JT
  181 IF(T.GE.TCRT) GO TO 210
C     CASE A FOR T LESS THAN TCRT.
  192 CALL COMPLQ
      V=1/DEN
      IW=W
  193 PRINT 17, T,DEN,V,DPDT,DPDD, E,H,S,CV,CP,IW
      GO TO 250
C     CASE FOR T ABOVE TCRT, HOMOGENOUS DOMAIN.
  210 IF(JT.LE.500) GO TO 220
  211 K = K+1
      JT = JT + 10*K
      T = JT
      IF(JT.GT.700) GO TO 300
  220 CALL GENOUS
      V = 1/DEN
      IW = W
  221 PRINT 17, T,DEN,V,DPDT,DPDD, E,H,S,CV,CP,IW
  250 CONTINUE
  300 CONTINUE
  999 STOP
      END
```

```
      SUBROUTINE COEXST
C     GIVEN T AT COEXSTENCE, GET BOTH VAPOR AND LIQUID FUNCTIONS.
C     FOR VAPOR, GET  DNG,EG,HG,SG, CVG,CPG,WG, DPGOT,DPGDD,  -
C     FOR LIQUID, GET  DEN,E,H,S, CV,CP,CSAT,W.
C     COEXST CALLED BY COMPLQ. P NOT USED, MUST NOT CHANGE.
      COMMON/B1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/B3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      COMMON/B5/ DDSDT
      COMMON/B8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
      COMMON/B9/DNG,EG,HG,SG, CVG,CPG,WG, DPGDT,DPGDD
      COMMON/B12/ DELS, DELCV
      COMMON/B99/ TI,EZZ, EZ,SZ,CVZ, HZ,CPZ
      DATA Q,G/1.01325,0.083145/
    1 FORMAT(1H0,9X,25HT EXCEEDS TCRT IN COEXST.  / )
    2 IF(T.LE.TCRT) GO TO 4
    3 PRINT 1
      STOP
    4 PS = PSATF(T)
      DB = DGASF(T)
      DNG = DB
    5 TI = T
      CALL IDEAL
      N = DB*20 + 10
    6 EG = EZZ + EZ + EDELF(1,N,T,0,DB)
      HG = EG + 100*PS/DB
    7 SG = SZ + DELS - 100*G*ALOG(G*T*DB/Q)
    8 IF(T.NE.TCRT) GO TO 11
    9 PX = PVTF(T,DB,1)
      DPGDT = DPDT
      DPGDD = DPDD
   10 CPG = 0
      CVG = 0
      WG = 0
      GO TO 15
   11 CVG = CVZ + DELCV
      PX = PVTF(T,DE,1)
   12 CPG = CVG + 100*T/DPDD*(DPDT/DB)**2
      WG = SQRT(WK*CPG*DPDD/CVG)
   13 DPGDT = DPDT
      DPGDD = DPDD
C     NOW TRAVERSE THE ,DOME, USING QVAP ,DATA,.
   15 DL = DLIQF(T)
      DEN = DL
      DDLDT = DDSDT
      QV = QVAPXF(T)
   16 H = HG - QV
      S = SG - QV/T
      E = H - 100*PS/DL
   17 IF(T.NE.TCRT) GO TO 19
   18 PX = PVTF(T,DL,1)
      CP=0
      CV=0
      CSAT=0
      W=0
      RETURN
   19 CSAT = CSATXF(T)
      PX = PVTF(T,DL,1)
   20 IF(T.LE.355) GO TO 22
   21 CV = CVSATF(T)
      GO TO 23
   22 CV = CSAT + 100*T*DPDT*DDLDT/DL/DL
   23 CP = CV + 100*T/DPDD*(DPDT/DL)**2
   30 W = SQRT(WK*CP*DPDD/CV)
      RETURN
      END
```

```
      SUBROUTINE COMPLQ
C     GIVEN P,T FOR COMPRESSED LIQUID AT T.LT.TC, GET DEN, FUNCTIONS.
C     IF T = MULTIPL. 10 K, START WITH DK,EK,SK,CV ON SATDLIQ.,
C     OTHERWISE, USE COEXST FOR START ON THE SATDLIQ., AND -
C     FINALLY, INTEGRATE ALONG ISOTHERM T FROM SATLIQ. TO POINT (P,T).
      COMMON/B3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      COMMON/B5/ DDSDT
      COMMON/B8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
      COMMON/B12/ DELS, DELCV
      DATA TCRT/425.16/
    1 FORMAT(1H0,9X,29HT NOT UNDER TCRT IN COMPLQ.  / )
    2 IF(T.LT.TCRT) GO TO 5
    3 PRINT 1
      STOP
    5 CALL COEXST
      DA = DEN
C     NOW INTEGRATE ALONG ISOTHERM T UP TO POINT (T,P).
   10 DB = FINDEN(T,P)
      DEN = DB
      DX = DB-DA
      IF(DX) 13,13,11
   11 N = DX*10 + 5
      E = E + EDELF(0,N,T,DA,DB)
   12 S = S + DELS
      CV = CV + DELCV
   13 H = E + 100*P/DB
      PX = PVTF(T,DB,1)
   14 CP = CV + 100*T/DPDD*(DPDT/DB)**2
   15 W = SQRT(WK*CP*DPDD/CV)
      RETURN
      END
```

```
      FUNCTION CSATXF(T)
C     N-BUTANE, VIA SSATFIT AND SSATF(T),  JULY, 1978.
C     CSATF(T) = X*DSSATF(X)/DX,    X ≡ T/TCRT.
C     FOR SSAT = A + B*(1-X)**ES + C*LN(X) + D*X + E*X2 + F*X3,
C     CSAT = -ES*B*X/(1-X)**(1-ES) + C + D*X + 2*E*X2 + 3*F*X3.
      DATA ES,TCRT,B,C/0.50,425.16,-35.1425285,92.4274005/
      DATA D,E,F/62.3909664,-51.4000625,31.1204971/
    1 FORMAT(1H0,9X,3HT =,F10.5, 14H IN CSATXF(T).  / )
    2 IF(TCRT-T) 3,4,5
    3 PRINT 1, T
      STOP
    4 CSATXF = 0
      RETURN
    5 X = T/TCRT
      X2 = X*X
      XE = (1-X)**(1-ES)
    6 CSATXF = -ES*B*X/XE + C + D*X + 2*E*X2 + 3*F*X*X2
    9 RETURN
      END
```

```
      FUNCTION CVSATF(T)
C     N-BUTANE CV ON SATLIQ. BOUNDARY. AUG. 7, 1978 AT 9.32.
C     FOR USE FROM T = 355 UP TO TCRT.
C     CVS = A + B*X + C*X2*LN(1 + EC/(1-X)),  X ≡ T/TCRT.
      DATA EC, TCRT / 53.0, 425.16/
      DATA A, B, C / 68.86999, 18.92882, 6.855379 /
    1 FORMAT(1H0,9X,3HT =,F10.5, 14HIN CVSATF(T).  / )
    2 IF(T.LT.TCRT) GO TO 4
    3 PRINT 1, T
      STOP
    4 X = T/TCRT
      X2 = X*X
      XL = ALOG(1+EC/(1-X))
    5 CVSATF = A + B*X + C*X2*XL
      RETURN
      END
```

```
      FUNCTION DELTAF(T,D)
C     GET (T*DP/DT - D*DP/DD) FOR THE J-T INVERSION CURVE.
      COMMON/B1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/B3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
    1 IF(T-TCRT) 2,4,4
    2 DL = DLIQF(T)
      IF(D-DL) 3,3,4
    3 DELTAF = 1.0E+100
      RETURN
    4 P = PVTF(T,D,1)
    5 DELTAF = ABS (T*DPDT-D*DPDD)
      RETURN
      END
```

```
      FUNCTION DGASF(T)
C     FOR N-BUTANE, R.D.G., JULY, 1978.
C     VALID FOR TC=425.16, DC=3.900, PC=37.9611994, ONLY.
C     DESIGNED FOR ZSAT = 1 AT LOW DENSITIES, 5/29/77.
C     USE ZSAT = PS/DS/GK/TS WITH VAPOR PRESSURES, AND ZCRT.
C     Z = 1 + (ZCRT-1)*PI*F(X)/X/X.
C     F(X) = 1 + A1*VE + A2*V + A3*EXP(-EGX/V).
C     NOTE ZSM1 FOR FUGACTY, NOT IN COMMON HERE.
      COMMON/B3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      COMMON/B5/ DDSDT
      COMMON/B13/ ZCRT,ZSAT,DZSDT,ZFX, FRT,DFRTDT
      DIMENSION AV(3)
      DATA DCRT, TCRT, PCRT / 3.90, 425.16, 37.961199413 /
      DATA EG, EGX, GKK / 0.35, 2.60, 0.083145 /
      DATA AV / -0.87075081, 1.14934828, 99.16551154/
      DATA QST / 0.00 /
    1 FORMAT(1H0,9X,3HT =,F12.5, 11H IN DGASF.  / )
    2 IF(TCRT-T) 3,4,5
    3 PRINT 1, T
      DGASF = 1.0/QST
      RETURN
    4 DGASF = DCRT
      DDSDT = 1.0E+10
      RETURN
    5 ZN = ZCRT-1
      PC = PCRT
      P = PSATF(T)
    6 PI = P/PC
      PIT = DPSDT/PC
    7 TC = TCRT
      X = T/TC
      X2 = X*X
      V = 1-X
      V1 = -1
    8 VE = V**EG
      VE1 = -EG*VE/V
    9 EGXV = EGX/V
      IF(EGXV.LE.290) GO TO 11
   10 XP1 = 0
      XP = 0
      GO TO 12
   11 XP = EXP(-EGXV)
      XP1 = -EGXV*XP/V
   12 F = 1.0 + AV(1)*VE + AV(2)*V + AV(3)*XP
   13 F1 = AV(1)*VE1 - AV(2) + AV(3)*XP1
      ZFX = F
   15 ZSM1 = ZN*PI*F/X2
      Z = 1 + ZSM1
      ZSAT = Z
   16 DZDT = (PI*(F1-2*F/X)/TC + F*PIT)*ZN/X2
      DZSDT = DZDT
   17 DGASF = P/T/Z/GKK
   18 DDSDT = (DPSDT - P/T - P*DZDT/Z)/T/Z/GKK
      RETURN
      END
```

```
      FUNCTION DLIQF(T)
C     FOR N-BUTANE, RDG., JUNE, 1978.
C     DEN = DCRT + YNL*(X + (XE-X)*Y),    YNL = DTRP - DCRT.
C     Y = A1 + A2*X2 + A3*X3.
      COMMON/B5/ DDSDT
      DIMENSION AW(3)
      DATA EL / 0.35 /
      DATA DCRT, DTRP, TTRP, TCRT /3.90, 12.65, 134.86, 425.16/
      DATA AW / 0.802377995, -0.139053759, 0.057353024/
    1 FORMAT(1H0,9X,26HDLIQF = 0, T EXCEEDS TCRT.  / )
    2 IF(TCRT-T) 3,4,5
    3 PRINT 1
      STOP
    4 DLIQF = DCRT
      DDSDT = -1.0E+10
      RETURN
    5 XN=TCRT-TTRP
      X=(TCRT-T)/XN
      X2 = X*X
      DXDT = -1.0/XN
    6 XE = X**EL
      V = XE - X
      V1 = EL*XE/X - 1
    8 Y = AW(1) + AW(2)*X2 + AW(3)*X*X2
      YNL = DTRP - DCRT
    9 Y1 = 2*AW(2)*X + 3*AW(3)*X2
   11 DLIQF = DCRT + YNL*(X + V*Y)
   12 DDSDT = YNL*(1 + V*Y1 + V1*Y)*DXDT
      RETURN
      END
```

```
      FUNCTION EDELF(L,N,T,DA,DB)
C     SPECIAL REVISION FOR VERY LOW DENSITIES.
C     GET CHANGE OF E, S, CV WITH DENSITY ALONG ISOTHERMS.
C     GET EDELF, DELS, DELCV FROM DA TO DB ON ISOTHERM T.
      COMMON/B1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/B3/DPDT,D2PDT2,DPSDT, CPMDT, DPDD,DPDR,DTSDR,DTHDR
      COMMON/B12/ DELS, DELCV
      COMMON/B13/ ZCRT,ZSAT,DZSDT,ZFX, FRT,DFRTDT
      DATA G / 0.083145 /
    1 ZK = 1.0 - 1/ZCRT
      RK = G*TCRT/DCRT
      CV = 0
      E = 0
      S = 0
    2 DX = (DB-DA)/N
      IF(DX.EQ.0) GO TO 30
    3 DO 15 J=1,N
      DN = DA + (J-0.5)*DX
    4 DXN = DX/DN/DN
      P = PVTF(T,DN,0)
      CV = CV - D2PDT2*DXN
    5 IF(DN.GE.DCRT) GO TO 9
    7 E = E + (ZK*ZSAT*ZFX + FRT - T*DFRTDT)*RK*DX
      GO TO 10
    9 E = E + (P - T*DPDT)*DXN
   10 IF(L.NE.0) GO TO 12
   11 S = S - DPDT*DXN
      GO TO 15
   12 S = S + (G - DPDT/DN)*DX/DN
   15 CONTINUE
   16 EDELF = 100*E
      DELS = 100*S
      DELCV = 100*T*CV
      RETURN
   30 EDELF = 0
      DELF = 0
      DELS = 0
      DELCV = 0
      RETURN
      END
```

```
      FUNCTION FINDEN(T,P)
C     ON ISOTHERM T, FIND DEN, MOL/L, TO MINIMIZE (P-PC) VIA EQNSTATE.
      COMMON/B1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/B3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      DATA DM, GKK / 13.5, 0.083145 /
   41 FORMAT(1HO,9X,32HFINDEN = 0,  FAILS TO CONVERGE.  / )
   42 FORMAT(1HO,9X,34HFINDEN = DCRT, DP/DR ZERO OR NEG.  / )
   43 FORMAT(1HO,9X,39HFINDEN = 0, DOUBLE-VALUED AT P = PSAT.  / )
      IF(P.LE.0) GO TO 35
    1 IF(T-TCRT) 2,5,8
    2 DG=DGASF(T)
      DL=DLIQF(T)
      PS=PSATF(T)
      IF(P-PS) 3,32,4
    3 D = DG/2
      GO TO 11
    4 D = (DL+DTRP)/2
      GO TO 11
    5 DL=DCRT
      DG=DL
      PS=PCRT
      IF(P-PS) 6,33,7
    6 D = DCRT/2
      GO TO 11
    7 D = 2*DCRT
      GO TO 11
    8 IF(T.GE.450.0) GO TO10
    9 PC = PVTF(T,DCRT,0)
      IF(P-PC) 6,33,7
   10 D = DCRT
   11 DO 30 J=1,50
      DP=P-PVTF(T,D,1)
      IF(ABS (DP/P)-1.0E-6) 31,31,12
   12 IF(DPDD.LE.0) GO TO 34
   13 DD = DP/DPDD
      IF(ABS (DD/D)-1.0E-6) 31,31,14
   14 D = D + DD
      IF(D.GT.0.0) GO TO 16
   15 D = P/GKK/T
      GO TO 30
   16 IF(D.LE.DM) GO TO 18
   17 D = DM
      GO TO 30
   18 IF(T-TCRT) 19,24,30
   19 IF(P.GE.PS) GO TO 22
   20 IF(D.LE.DG) GO TO 30
   21 D = DG
      GO TO 30
   22 IF(D.GE.DL) GO TO 30
   23 D = DL
      GO TO 30
   24 IF(P.GE.PCRT) GO TO 27
   25 IF(D.LT.DCRT) GO TO 30
   26 D = DCRT - 0.02
      GO TO 30
   27 IF(D.GT.DCRT) GO TO 30
   28 D = DCRT + 0.02
   30 CONTINUE
      PRINT 41
      STOP
   31 FINDEN = D
      RETURN
   32 PRINT 43
      STOP
   33 FINDEN = DCRT
      RETURN
   34 FINDEN = DCRT
      PRINT 42
      RETURN
   35 D2PDT2=0
      FINDEN=0
      DPDT=0
      DPDD=GKK*T
      DPDR=DPDD*DTRP
   36 RETURN
      END
```

```
      FUNCTION FINDTM(P)
C     GIVEN P ON THE MELTING LINE, FIND T FOR N-BUTANE.
      COMMON/B1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      DATA A, E / 3634.0, 2.210 /
    1 X = (P-PTRP)/A + 1
      FINDTM = TTRP*X**(1.0/E)
      RETURN
      END



      FUNCTION FINDTS(P)
C     GIVEN VAPOR PRESSURE P, ITERATE T TO MINIMIZE (P-PC).
      COMMON/B1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/B3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
    1 FORMAT(1H0,9X,32HFINDTS = 0,  FAILS TO CONVERGE.  / )
    2 FORMAT(1H0,9X,29HFINDTS = 0,  P EXCEEDS PCRT.  / )
    3 IF(P-PCRT) 4,11,12
    4 T = 300
      DO 9 J=1,50
      DP = P - FSATF(T)
      ADP = ABS (DP)
    5 IF(ADP/P-1.0E-6) 10,6,6
    6 IF(ADP/DPSDT/T-1.0E-6) 10,7,7
    7 T = T + DP/DPSDT
      IF(T-TCRT) 9,9,8
    8 T = TCRT
    9 CONTINUE
      PRINT 1
      STOP
   10 FINDTS = T
      RETURN
   11 FINDTS = TCRT
      RETURN
   12 PRINT 2
      STOP
      END



      SUBROUTINE GENOUS
C     GIVEN P,T FOR THE HOMOGENOUS DOMAIN -
C     GET DEN AND FUNCTIONS AT ANY TEMPERATURE.
      COMMON/B3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      COMMON/B8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
      COMMON/B12/ DELS, DELCV
      COMMON/B99/ TI,EZZ, EZ,SZ,CVZ, HZ,CPZ
      DATA Q, G / 1.01325, 0.083145 /
    3 TI = T
      CALL IDEAL
      IF(P.LE.0) GO TO 10
    4 DB = FINDEN(T,P)
      DEN = DB
      N = DB*20 + 10
    5 E = EZZ + EZ + EDELF(1,N,T,0,DB)
      H = E + 100*P/DB
    6 S = SZ + DELS - 100*G*ALOG(G*T*DB/Q)
    7 CV = CVZ + DELCV
      PX = PVTF(T,DB,1)
    8 CP = CV + 100*T/DPDD*(DPDT/DB)**2
    9 W = SQRT(WK*CP*DPDD/CV)
      RETURN
   10 DEN=0
      S=0
      E = EZZ + EZ
      H = E + 100*G*T
      CV=CVZ
      CP=CPZ
   12 W = SQRT(WK*CP*G*T/CV)
      RETURN
      END
```

```
      SUBROUTINE IDEAL
C     N-BUTANE, VIA DATA OF CHEN ET AL (1975).
C     CPZ/R = 4 + (A1 + A2/X + A3/X2 + . . . )*EXP(-E/X),    X = T/100.
      COMMON/B99/ TI,EZZ, EZ,SZ,CVZ, HZ,CPZ
      DIMENSION A(5)
      DATA R, SI, HI, E / 8.31450, 37.3495, 7.7980, 2.37 /
      DATA A / 41.1109726,-139.304011, 257.297067,
     1 -170.730596, 40.0321709/
    1 NK = 5
      XI = TI/100
      XP = EXP(-E/XI)
    2 CP = 4.0
      DO 3 K=1,NK
    3 CP = CP + A(K)*XP*XI**(1-K)
C     NUMERICAL INTEGRATION FOR HZ/R, SZ/R  -
    5 S = 0
      H = 0
      N = ABS(TI-300)/4 + 4
      DX = (XI-3)/N
    6 DO 10 J=1,N
      X = 3.0 + (J-0.5)*DX
      XP = EXP(-E/X)
    7 CPX = 4.0
      DO 8 K=1,NK
    8 CPX = CPX + A(K)*XP*X**(1-K)
    9 H = H + CPX*DX
      S = S + CPX*DX/X
   10 CONTINUE
      H = (HI*3 + H)/XI
      S = SI + S
C     CONVERT TO JOULES, MOLES, KELVINS.
   11 HZ = R*TI*H
      EZ = HZ - R*TI
      SZ = R*S
   12 CPZ = R*CP
      CVZ = CPZ - R
      RETURN
      END
```

```
      SUBROUTINE IDLTRM
C     GIVEN P,T, GET THERMOFUNCTIONS AT VERY LOW PRESSURE.
      COMMON/B8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
      COMMON/B99/ TI,EZZ, EZ,SZ,CVZ, HZ,CPZ
      DATA Q, G / 1.01325, 0.083145 /
    1 TI = T
      CALL IDEAL
      GT = G*T
      DEN = P/GT
    2 E = EZZ + EZ
      H = E + 100*GT
      S = SZ - 100*G*ALOG(P/Q)
    3 CV = CVZ
      CP = CPZ
      W = SQRT(WK*CP*GT/CV)
      RETURN
      END
```

```
      SUBROUTINE ISOTRM
C     PRINTOUT THE CRITICAL ISOTHERM.
      COMMON/B1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/B3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      COMMON/B4/XB1,XB2, XC1,XC2, XE1,XE2, DXBDR,DXCDR,DXEDR
      COMMON/B6/ TSAT, THETA, PSAT
    1 FORMAT(1H1,14X,21HTHE CRITICAL ISOTHERM //
     1 6X,4HTC =,F7.2, 6H, DC =,F5.2, 6H, PC =,F11.7,
     2 23H. AT THE C.P., DPS/DT =, F8.5, 9H, DP/DT =,F8.5//
     3 6X,4HD/DC,9X,5HTS/TC,9X,5HPS/PC,10X,4HP/PC,9X,5HDP/DR,4X,6HDTS/DR
     4,4X,6HDTH/DR,4X,6HDPS/DR,4X,6HDXB/DR,4X,6HDXC/DR )
    2 FORMAT(2X,F8.2, 3F14.10, F14.9, 5F10.5)
    3 PC = PVTF(TCRT,DCRT,0)
    4 PRINT 1, TCRT,DCRT,PCRT, DPSDT,DPDT
      DO 8 J=1,51
    5 DR = 0.74 + 0.01*J
      DN = DR*DCRT
    6 PR = PVTF(TCRT,DN,1)/PCRT
      DPSDR = DPSDT*DTSDR
    7 TSN = TSAT/TCRT
      PSN = PSAT/PCRT
    8 PRINT 2, DR, TSN,PSN, PR,DPDR, DTSDR,DTHDR,DPSDR, DXBDR,DXEDR
    9 RETURN
      END
```

```
      SUBROUTINE JTLOCS
C     DERIVE THE J-T INVERSION CURVE.  USE ROUTINE DELTAF(T,DI).
      COMMON/B1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      DIMENSION TT(99),PP(99),DN(99)
      DATA A, B, TZ / 2.60, 0.58, 5.0 /
    1 FORMAT(1H1,16X,46HTHE JOULE-THOMSON INVERSION LOCUS FOR N-BUTANE
     1 //17X,3HT,K,5X,5HP,BAR,5X,5HMOL/L,7X,3HT,K,5X,5HP,BAR,5X,5HMOL/L)
    2 FORMAT(10X,I10, F10.1, F10.2,  I10, F10.1, F10.2)
    5 TA = 340
      NP = 52
    6 PRINT 1
      DO 25 I=1,NP
      DX = 1.6
    7 T = TA + 10*I
      U = T/TZ
      DI = EXP(A-B*U)
   10 IF(T-TCRT) 11,12,12
   11 DL = DLIQF(T)
      IF(DI-DL) 25,12,12
   12 SS = DELTAF(T,DI)
      DO 20 IT=1,18
   14 D=DI-DX
      SL=DELTAF(T,D)
      D=DI+DX
      SP=DELTAF(T,D)
   15 IF(SS-SL) 18,16,16
   16 IF(SP-SL) 19,17,17
   17 SS = SL
      DI = DI - DX
      GO TO 20
   18 IF(SS-SP) 20,20,19
   19 SS = SP
      DI = DI + DX
   20 DX = DX/2
   23 TT(I) = T
      DN(I) = DI
      PP(I) = PVTF(T,DI,0)
   25 CONTINUE
      N = NP/2
      DO 29 J=1,N
   26 IT = TT(J)
      ITT = TT(J+N)
   29 PRINT 2, IT,PP(J),DN(J), ITT,PP(J+N),DN(J+N)
   30 RETURN
      END
```

```
      SUBROUTINE PEEK
C     EXAMINE BEHAVIOR OF THE COEFFICIENTS.
C     B(S) = B1 + B2*EXP(BE*S),  E(S) = E1*(S-1)*(S-ER)*EXP(-GA*S**IX).
C     WHERE,    R = DEN/DTRP,   S = DEN/DCRT.
      COMMON GK,GKK, B1,B2,B3,B4, E1,ER, IX
      COMMON/B1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/B6/ TSAT, THETA, PSAT
    4 FORMAT(1H1,14X,31HEQUATION OF STATE, COEFFICIENTS //
     1 15X,6HDGAT =,E15.9/
     2 15X,6HDTRP =,F8.4, 8H, TTRP =,F8.3, 8H, PTRP =,E16.9/
     3 15X,6HDCRT =,F8.4, 8H, TCRT =,F8.3, 8H, PCRT =,F13.9//
     4 15X,4HAL =,F6.3, 6H, BE =,F6.3, 6H, GA =,F6.3/
     5 15X,4HDE =,F6.3, 6H, EP =,F6.3, 6H, ER =,F6.3, 6H, IX =I3//
     6 13X,4F16.11/ 13X,F16.11/)
    5 FORMAT(15X,5HMOL/L 6X,4HTSAT,5X,5HTHETA 6X,4HPSAT,9X,1HB,9X,1HC )
    6 FORMAT(10X,F10.1, 3F10.3, F10.4, F10.5)
   10 PRINT 4, DGAT, DTRP,TTRP,PTRP, DCRT,TCRT,PCRT,
     1 AL,BE,GA,DE,EP, ER,IX, B1,B2,B3,B4, E1
   11 PRINT 5
      DO 20 J=1,25
      DN = 0.5*J
   12 R = DN/DTRP
      S = DN/DCRT
      SN = S-1
      IF(ER) 13,14
   13 SR = S - ER
      GO TO 15
   14 SR = 1
   15 S2 = S*S
      S3 = S*S2
      SX = S**IX
   16 B = B1 + B2*EXP(BE*S)
   18 E = E1*SN*SR*EXP(-GA*SX)
   19 TS=TSATF(DN)
      TSAT=TS
      TH=THETAF(DN)
      PS=PSATF(TS)
   20 PRINT 6, DN, TS,TH,PS, B,E
      RETURN
      END
```

```
      FUNCTION PMELTF(T)
C     N-BUTANE MELT-LINE.  REEVES, SCOTT, AND BABB(JR),
C     J. CHEM. PHYS. 40(12), 3662 (1964).
      COMMON/B1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/B3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      DATA A, E / 3634.0, 2.210 /
    1 X = T/TTRP
      XE = X**E
      PMELTF = PTRP + A*(XE-1)
    2 DPMDT = A*E*XE/X/TTRP
      RETURN
      END
```

```
      SUBROUTINE PRINT
C     PRINTOUT ISOCHORES AND ISOTHERMS.
      COMMON/B1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/B3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
    1 FORMAT(I5, 2F10.0)
    5 FORMAT(1X)
    6 FORMAT(1H1,16X,15HTHE ISOCHORE AT, F6.2, 6H MOL/L //
     1 17X,3HT,K,5X,5HP,BAR,5X,5HDP/DD,5X,5HDP/DT,4X,7HD2P/DT2)
    7 FORMAT(10X,F10.3, 2F10.3, F10.4, F11.5)
    8 FORMAT(1H1,14X,15HTHE ISOTHERM AT, F7.2, 7H DEG. K //
     1,10X,5HMOL/L,5X,5HP,BAR,5X,5HDP/DD,5X,5HDP/DT,5X,7HD2P/DT2 )
    9 FORMAT(5X,F10.3, 2F10.3, F10.4, F12.6)
C     PRINTOUT THE ISOCHORES.
   20 DO 60 I=1,14
      IF(I.NE.1) GO TO22
   21 DN = 0.5
      GO TO 30
   22 IF(I.NE.5) GO TO 24
   23 DN = DCRT
      GO TO 30
   24 IF(I.NE.14) GO TO 26
   25 DN = DTRP
      GO TO 30
   26 DN = I - 1
   30 PRINT 6, DN
      TS = TSATF(DN)
      PS = PVTF(TS,DN,1)
   31 PRINT 7, TS, PS, DPDD, DPDT, D2PDT2
   40 IF(I.GE.10) GO TO 42
   41 IT = 8
      GO TO 50
   42 IF(I.GE.12) GO TO 44
   43 IT = 4
      GO TO 50
   44 IF(I.GE.14) GO TO 46
   45 IT = 2
      GO TO 50
   46 IT = 1
   50 DO 59 J=136,700,IT
      TT = J
      IF(TT-TS) 59,59,52
   52 PP = PVTF(TT,DN,1)
      IF(PP.GT.720) GO TO 60
   58 PRINT 7, TT,PP, DPDD, DPDT, D2PDT2
   59 CONTINUE
   60 CONTINUE
C     PRINTOUT THE ISOTHERMS.
  100 DO 130 I=1,99
      READ 1, IDD, TT,DX
      IF(IDD) 101,999,101
  101 PRINT 8, TT
      PM = PMELTF(TT)
  102 IF(TT-TCRT) 103,103,104
  103 DG = DGASF(TT)
      DL = DLIQF(TT)
  104 L = 0
      DS = DX
  110 DO 120 N=1,1500
      DN = N*DS
      IF(TT-TCRT) 111,111,117
  111 IF(DN.LT.DG.OR.DN.GT.DL) GO TO 117
  112 L = L + 1
      IF(L.NE.1) GO TO 120
  113 PG=PVTF(TT,DG,1)
      PRINT 9, DG,PG,DPDD,DPDT,D2PDT2
  114 PRINT 5
  115 PL=PVTF(TT,DL,1)
      PRINT 9, DL,PL,DPDD,DPDT,D2PDT2
  116 GO TO 120
  117 PP = PVTF(TT,DN,1)
      IF(PP.GT.PM.OR.PP.GT.720) GO TO 130
  119 PRINT 9, DN,PP, DPDD, DPDT, D2PDT2
  120 CONTINUE
  130 CONTINUE
  999 RETURN
      END
```

```
      FUNCTION PSATF(T)
C     N-BUTANE VAPOR PRESSURE, BAR.  R.D.G., (JULY, 1978).
C     LN(P) = A + B*U + C*X + D*X2 + E*X3 + F*X*(1-X)**EPP.
C     WHERE,   X = T/TCRT,  U = (1-1/X).
      COMMON/B3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      DATA EPP,TCRT,A,B/1.85,425.16,14.45037296,9.50878339/
      DATA C,D,E,F /-35.95072289, 41.89821096,-16.76129646, 11.70758279/
    1 FORMAT(1H0,9X,25HT ABOVE TCRT IN PSATF(T).  / )
    2 X = T/TCRT
      X2 = X*X
      X1T = 1.0/TCRT
    3 U = 1.0 - 1/X
      U1T = 1.0/X/T
    4 V = 1.0 - X
      IF(V) 7,8,9
    7 PRINT 1
      STOP
    8 Z1 = 0
      Z = 0
      GO TO 10
    9 Z = V**EPP
      Z1 = -EPP*Z/V
   10 CONTINUE
   12 PL = A + B*U + C*X + D*X2 + E*X*X2 + F*X*Z
   13 PL1T = B*U1T + (C + 2*D*X + 3*E*X2 + F*(X*Z1 + Z))*X1T
   15 PSATF = EXP(PL)
      DPSDT = PL1T*PSATF
      RETURN
      END

      SUBROUTINE PVTDAT
C     N-BUTANE EQNSTATE JULY 25, 1978 AT 11.29.
C     NEW XEF, DGASF, EDELF, FOR LOW DENSITIES.
C     P - PSAT = S*GK*(T-TSAT) + S*S*GK*TCRT*F(S,T),
C     F(S,T) = B(S)*XBF(S,T) + E(S)*XEF(S,T)    W = (1-TH/T),
C     XBF(S,T) = SQRT(X)*LN(T/TSAT),   XEF(S,T) = PSI - PSISAT, WHERE -
C     PSI(S,T) = DE*EXP(EP*(1-X)) + (1-DE)*(1 - W + W*LN(W)).
C     B(S) = B1 + B2*EXP(BE*S),   R = DEN/DTRP,   S = DEN/DCRT.
C     E(S) = E1*(S-1)*EXP(-GA*S**IX).
      COMMON GK,GKK, B1,B2,B3,B4, E1,ER, IX
      COMMON/B1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/B8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
      COMMON/B13/ ZCRT,ZSAT,DZSDT,ZFX, FRT,DFRTDT
      COMMON/B99/ TI,EZZ, EZ,SZ,CVZ, HZ,CPZ
   17 WM = 58.1243
      Q = 1.01325
      QP = Q/14.69595
      EPP = 1.85
   18 TTRP=134.86
      DTRP=12.65
      PTRP=PSATF(TTRP)
   19 TCRT=425.16
      DCRT=3.900
      PCRT=PSATF(TCRT)
   20 GKK = 0.083145
      GK = GKK*DCRT
      ZCRT = PCRT/DCRT/GKK/TCRT
   21 IX=4
      AL=1
      BE=0.80
      GA=0.30
      DE=2./3.
      EP=3
      ER=0
   22 B1=0.35427006233
      B2=0.26628373954
      B4=0
      B3=0
      E1=0.42192906133
   23 DGAT = DGASF(TTRP)
      CALL PEEK
      CALL ISOTRM
   24 WK = 100000/WM
      EZZ = 22580.3
C     GET BOILING POINT TEMP., VAP. AND LIQ. DENSITIES.
   50 FORMAT(1H1,9X,23HBOILING POINT, N-BUTANE  //
     1,10X,4HTB =,F10.5/,10X,4HDG =,F10.7/,10X,4HDL =,F10.5)
   51 TBP = FINDTS(1.01325)
      DGB=DGASF(TBP)
      DLB=DLIQF(TBP)
   52 PRINT 50, TBP, DGB, DLB
   99 RETURN
      END
```

```
      FUNCTION PVTF(T,D,M)
C     N-BUTANE EQNSTATE, PVTF ≡ P,BAR.
C     NOTE, M=0 RETURNS DP/DT, D2P/DT2.  M=1 RETURNS ALSO DP/DD.
C     P-PSAT = S*GK*(T-TSAT) + S*S*GK*TCRT*F(S,T),  WHERE -
C     F(S,T) ≡ B(S)*XBF(S,T) + E(S)*XEF(S,T),  AND -
C     B(S) ≡ B1 + B2*EXP(BE*S),  E(S) ≡ E1*(S-1)*(S-ER)*EXP(-GA*S**IX).
C     WHERE,   R ≡ DEN/DTRP,  S ≡ DEN/DCRT.
      COMMON GK,GKK, B1,B2,B3,B4, E1,ER, IX
      COMMON/B1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/B3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      COMMON/B4/XB1,XB2, XC1,XC2, XE1,XE2, DXBDR,DXCDR,DXEDR
      COMMON/B6/ TSAT, THETA, PSAT
      COMMON/B13/ ZCRT,ZSAT,DZSDT,ZFX, FRT,DFRTDT
    1 R = D/DTRP
      S = D/DCRT
      SN = S-1
      IF(ER) 2,3
    2 SR = S - ER
      SR1 = 1
      GO TO 4
    3 SR = 1
      SR1 = 0
    4 S2 = S*S
      S3 = S*S2
      SX = S**IX
    5 GK = DCRT*GKK
      TC = TCRT
      DSDR = DTRP/DCRT
    6 RG = S*GK
      GKT = GK*TC
    7 TS=TSATF(D)
      TSAT=TS
      PS=PSATF(TS)
      PSAT=PS
      THETA=THETAF(D)
    8 XB = XBF(T,D)
      XE = XEF(T,D)
    9 XPB = EXP(BE*S)
      B = B1*S2 + B2*S2*XPB
   10 XP = EXP(-GA*SX)
      SM = SN*SR*S2
      E = E1*SM*XP
   12 F = B*XB + E*XE
      F1 = B*XB1 + E*XE1
      F2 = B*XB2 + E*XE2
   13 PVTF = PS + RG*(T-TS) + GKT*F
      FRT=F/S2
      DFRTDT=F1/S2/TC
   14 DPDT = RG + GK*F1
      D2PDT2 = GK*F2/TC
      IF(M) 15,30,15
   15 BD = (2*B1*S + B2*(BE*S2 + 2*S)*XPB)*DSDR
   16 SM1 = SR*S2 + SN*SR1*S2 + SN*SR*2*S
      XP1 = -IX*GA*SX/S
   17 ED = E1*(SM*XP1 + SM1)*XP*DSDR
   20 F1 = B*DXBDR + BD*XB    +    E*DXEDR + ED*XE
   26 DPDR = (DPSDT-RG)*DTSDR + (T-TS)*GK*DSDR + GKT*F1
   27 DPDD = DPDR/DTRP
   30 RETURN
      END


      FUNCTION QVAPXF(T)
C     N-BUTANE, ADJUSTED JULY 27, 1978, AT 06.58, R.D.G.
C     FOR 85 WEIGHTED DATA (INCL. CLAPEYRON), RMS = 0.39 PCT.
C     QVAP/1000 = A*X + (XE-X)*(B + C*X/XE + D*X),  WHERE -
C     X ≡ (TC-T)/(TC-TT),    XE ≡ X**E.
      DATA E,TTRP,TCRT,XN/0.30,134.86,425.16,290.30/
      DATA A,B,C,D/28.725885,18.498277,40.071066,-37.359808/
    1 FORMAT(1H0,9X,28HT EXCEEDS TCRT IN QVAPXF(T).  / )
    2 IF(TCRT-T) 3,4,5
    3 PRINT 1
      STOP
    4 QVAPXF = 0
      RETURN
    5 X = (TCRT-T)/XN
      XE = X**E
    6 Q = A*X + (XE-X)*(B + C*X/XE + D*X)
    7 QVAPXF = Q*1000
      RETURN
      END
```

```
      FUNCTION SSATF(T)
C     N-BUTANE SATLIQ ENTROPY, J/MOL/K.
C     SSAT = A1 + A2*(1-X)**ES + A3*LN(X) + A4*X + A5*X2 + A6*X3.
C     WHERE -  X = T/TCRT,  AND E = 0.3 APPROX.
      DIMENSION AS(6)
      DATA NFS, ES, TCRT / 6, 0.50, 425.16 /
      DATA AS / 253.5952114, -35.1425285, 92.4274005,
     1 62.3909664, -51.4000625, 31.1204971/
    1 FORMAT(1H0,9X,3HT =,F10.5, 13H IN SSATF(T).  / )
    2 IF(T.LE.TCRT) GO TO 4
    3 PRINT 1, T
      STOP
    4 X = T/TCRT
      SM = 0
      DO 5 K=4,NFS
    5 SM = SM + AS(K)*X**(K-3)
    7 SSATF = AS(1) + AS(2)*(1-X)**ES + AS(3)*ALOG(X) + SM
    9 RETURN
      END

      SUBROUTINE TABLIQ
C     TABULATE THE N-BUTANE SATURATED LIQUID FUNCTIONS.
      COMMON/B1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/B3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      COMMON/B5/ DDSDT
      COMMON/B6/ TSAT, THETA, PSAT
      COMMON/B8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
      COMMON/B9/DNG,EG,HG,SG, CVG,CPG,WG, DPGDT,DPGDD
      DIMENSION TSA(60), PSA(60)
    4 FORMAT(1H1 13X,39HPROPERTIES OF SATURATED LIQUID N-BUTANE //
     1 14X,1HT,10X,1HP,5X,3HDEN,3X,5HV,LIQ,6X,5HV,GAS,5X,6HDPS/DT,3X,
     2 6HDDL/DT,4X,5HDP/DT,6X,5HDP/DD,2X,5HQ,VAP /
     3 10X,5HDEG K,8X,3HBAR,3X,5HMOL/L,3X,5HL/MOL,6X,5HL/MOL,6X,5HBAR/K
     4 2X,7HMOL/L/K,4X,5HBAR/K,2X,9HBAR-L/MOL,2X,5HJ/MOL )
    5 FORMAT(5X,F10.3, E11.4, F8.3, F8.5, 2E11.4, F9.5, F9.3, E11.4, I7)
   11 FORMAT(1H1,13X,39HPROPERTIES OF SATURATED LIQUID N-BUTANE //
     1 14X,1HT,11X,1HP,9X,1HE,9X,1HH,9X,1HS,
     2 6X,2HCV,6X,2HCS,6X,2HCP,6X,1Hw /
     3 10X,5HDEG K,9X,3HBAR,5X,5HJ/MOL,5X,5HJ/MOL,3X,7HJ/MOL/K
     4,1X,7HJ/MOL/K,1X,7HJ/MOL/K,1X,7HJ/MOL/K,2X,5HM/SEC )
   12 FORMAT(5X,F10.3, E12.4, 2F10.1, F10.3, 3F8.2, I7)
C     FOR PAGE ONE OF TABLIQ.
C     REPLACE T = 275 BY BOILING-POINT AT J = 29.
  130 PRINT 4
      NP = 59
  131 DO 150 J=1,NP
      IF(J.NE.1) GO TO 133
  132 T = TTRP
      GO TO 139
  133 IF(J.NE.29) GO TO 135
  134 T = FINDTS(1.01325)
      GO TO 139
  135 IF(J.NE.NP) GO TO 138
  136 T = TCRT
      DL = DCRT
      DG = DL
      DDLDT = 0
  137 VL = 1.0/DCRT
      VG = VL
      GO TO 141
  138 T = 130 + 5*J
  139 DL = DLIQF(T)
      DDLDT = DDSDT
  140 DG = DGASF(T)
      VG = 1/DG
      VL = 1/DL
  141 TSA(J) = T
      PX = PVTF(T,DL,1)
  147 PS = PSAT
      PSA(J) = PS
      IQX = QVAPXF(T)
  150 PRINT 5, T,PS,DL,VL,VG, DPSDT,DDLDT, DPDT,DPDD, IQX
C     FOR PAGE TWO OF TABLIQ.
C     USE COEXST AT ALL TEMPS.
  160 PRINT 11
      DO 170 J=1,NP
      P = PSA(J)
      T = TSA(J)
  164 CALL COEXST
      IW = W
  170 PRINT 12, T,P, E,H,S, CV,CSAT,CP, IW
  999 RETURN
      END
```

```
      FUNCTION THETAF(DEN)
C     THETA = TSAT*EXP(U(S)).
C     LET Q = (S-1)/(ST-1),   WHERE ST = DTRP/DCRT,  THEN -
C     IF S < 1, U = AL*Q**3,     IF S > 1,  U = -AL*Q**3,
      COMMON/B1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/B3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      COMMON/B6/ TSAT, THETA, PSAT
    1 S = DEN/DCRT
      DSDR = DTRP/DCRT
      C = DSDR-1
    2 Q = (S-1)/C
      Q2 = Q*Q
      U = AL*Q*Q2
    3 U1 = AL*3*Q2*DSDR/C
      IF(Q) 5,9,4
    4 U = -U
      U1 = -U1
    5 XP = EXP(U)
      THETAF = TSAT*XP
    6 DTHDR = (TSAT*U1 + DTSDR)*XP
      RETURN
    9 THETAF = TCRT
      DTHDR = 0
      RETURN
      END
```

```
      FUNCTION TSATF(DEN)
C     ITERATE T TO MINIMIZE (DEN-DCALC) VIA DGASF(T), DLIQF(T).
      COMMON/B1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/B3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      COMMON/B5/ DDSDT
      DATA Q, FN / 2.0, 6.3890561 /
C     NOTE,   FN = EXP(Q) - 1.0.
    1 FORMAT(1H0,9X,24HTSATF FAILS TO CONVERGE.  / )
    2 D=DEN
      S=D/DCRT
      YN=TCRT/TTRP-1
      IF(DEN-DCRT) 3,30,4
    3 ST=DGAT/DCRT
      F=ALOG(S)/ALOG(ST)*((1-S)/(1-ST))**2
      GO TO 5
    4 ST=DTRP/DCRT
      U=((S-1)/(ST-1))**3
      F=(EXP(Q*U)-1)/FN
    5 T = TCRT/(1 + YN*F)
    6 DO 15 J=1,50
      IF(DEN-DCRT) 7,30,8
    7 DD = D - DGASF(T)
      GO TO 9
    8 DD = D - DLIQF(T)
    9 IF(ABS(DD/D).LT.1.0E-7) GO TO 16
   10 DT = DD/DDSDT
      IF(ABS(DT/T).LT.1.0E-7) GO TO 16
   11 T = T + DT
      IF(T) 12,12,13
   12 T = TTRP
      GO TO 15
   13 IF(T.LT.TCRT) GO TO 15
   14 T = TCRT - 0.10
   15 CONTINUE
      PRINT 1
      STOP
   16 TSATF = T
      DTSDR = DTRP/DDSDT
      RETURN
   30 TSATF = TCRT
      DTSDR = 0
      RETURN
      END
```

```
      FUNCTION XBF(T,D)
C     XBF = SQRT(T/TC)*LN(T/TS) = Q(T)*Z(R,T),
      COMMON/B1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/B3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      COMMON/B4/XB1,XB2, XC1,XC2, XE1,XE2, DXBDR,DXCDR,DXEDR
      COMMON/B6/ TSAT, THETA, PSAT
    1 TC = TCRT
      TS = TSAT
      X = T/TC
    2 U = T/TS
      U1X = TC/TS
      U1R = -U*DTSDR/TS
    3 Z = ALOG(U)
      Z1R=U1R/U
      Z1X=U1X/U
      Z2X=-Z1X*Z1X
    4 Q = SQRT(X)
      Q1 = 0.5/Q
      Q2 = -Q1/2/X
    5 XBF = Q*Z
      DXBDR = Q*Z1R
      XB1 = Q*Z1X + Q1*Z
    6 XB2 = Q*Z2X + Q1*2*Z1X + Q2*Z
      RETURN
      END

      FUNCTION XEF(T,D)
C     XEF ≡ PSI - PSISAT,  PSI ≡ A*F(T) + B*H(R,T),  W ≡ (1-TH/T),  AND -
C     F(T) ≡ EXP(C*(1-X)),   H(R,T) ≡ (1 - W + W*LN(W)).
      COMMON/B1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/B3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      COMMON/B4/XB1,XB2, XC1,XC2, XE1,XE2, DXBDR,DXCDR,DXEDR
      COMMON/B6/ TSAT, THETA, PSAT
    1 A=DE
      B=1-A
      C=EP
      TC=TCRT
      TS=TSAT
      TH=THETA
    2 X = T/TC
      XS = TS/TC
      XS1 = DTSDR/TC
    3 W = 1.0 - TH/T
      IF(W) 30,30,4
    4 F = EXP(C*(1-X))
      F1 = -C*F
      F2 = -C*F1
    5 W1R = -DTHDR/T
      W1X = TH/T/X
      W2X = -2*W1X/X
    6 G = ALOG(W)
      H = W*G - W + 1
      H1R = G*W1R
    7 H1X = G*W1X
      H2X = G*W2X + W1X*W1X/W
   10 P = A*F + B*H
      P1R = B*H1R
   11 XE1 = A*F1 + B*H1X
      XE2 = A*F2 + B*H2X
   15 WS = 1.0 - TH/TS
      IF(WS) 16,16,17
   16 HS = 1
      FS = 1
      HS1 = 0
      FS1 = 0
      GO TO 21
   17 WS1 = (TH*DTSDR/TS - DTHDR)/TS
      GS = ALOG(WS)
   18 HS = WS*GS - WS + 1
      HS1 = GS*WS1
   20 FS = EXP(C*(1-XS))
      FS1 = -C*XS1*FS
   21 PS = A*FS + B*HS
      PS1 = A*FS1 + B*HS1
   25 XEF = P - PS
      DXEDR = P1R - PS1
      RETURN
   30 XEF = 0
      XE1 = 0
      XE2 = 0
      DXEDR = 0
      RETURN
      END
```

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Thermophysical properties of n-butane are tabulated at integral temperatures along isobars over the entire range of fluid states. Results for the compressed liquid, from the triple- to the boiling-point, have been estimated by use of the highly-constrained, nonanalytic equation of state, because experimental P-ρ-T data are lacking in this region. Only available, published physical properties data are used in this work.

17. KEY WORDS *(six to twelve entries; alphabetical order; capitalize only the first letter of the first key word unless a proper name; separated by semicolons)*

Densities; enthalpies; entropies; equation of state; internal energies; isobars; isochores; isotherms; Joule-Thomson inversion; latent heats of vaporization; melting line; n-butane; orthobaric densities; specific heats; speeds of sound; vapor pressures.

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