(Continued from page 283)

INFORMATION RETRIEVAL

Key Words: Absorption-H, Mass Transfer-H, Reactions-H, Rates-H, Chlorine-I, Halogens-I, Liquid Phase-I, Hydrolysis-I, Chlorine-A, Water-A, Columns (Process)-J, Absorption-, Wetted Wall-, Pressure-F, Partial-, Flow-F, Rates-, Velocities-F, Rates-G, Reactions-G, Constants-G, Mass Transfer-G, Coefficients-G, Predictions-H, Mass Transfer-I, Rates-I, Coefficients-I, Unsteady State-J, Theory-J, Penetration-J, IBM-709-J, Computers-J.

Abstract: The rate of absorption of chlorine into water has been studied in a short wetted-wall column. This system is characterized by absorption with simultaneous liquid-phase chemical reaction. The effect of chlorine partial pressure and liquid flow rate on the ratio of the absorption coefficient accompanied by hydrolysis reaction to that for physical absorption alone is presented. The experimental results are compared with penetration theory predictions obtained by the use of an IBM-709 digital computer.

Reference: Brian, P. L. T., J. E. Vivian, and A. G. Habib, **A.I.Ch.E. Journal, 8,** No. 2, p. 205 (May, 1962).

Key Words: Critical-H, Temperature-H, Pressure-H, Mixtures-H, Binary-I, Ternary-I, Properties (Characteristics)-I, Physical Properties-I, Thermodynamics-I, State (Conditions)-I, Phase Diagrams-I, Phases-I, Diagrams-I, Methane-A, Ethane-A, Butane-A, Hydrocarbons-A, Cells-J, Pressure-, Visual-.

Abstract: An experimental unit has been designed and constructed for the study of critical phenomena in multicomponent systems. The unit has been built to utilize a new visual PVT cell of the liquid piston type, capable of operation at temperatures up to 300°F. and pressures up to 10,000 lb./sq. in. Critical temperatures and pressures have been determined for two binary mixtures of ethane and n-butane, and for six different compositions of the methane-ethane-n-butane system. The results for the six ternary mixtures are compared with critical values predicted by methods available in the literature. The complete critical locus for the ternary system also is presented.

Reference: Forman, J. C., and George Thodos, **A.I.Ch.E. Journal, 8,** No. 2, p. 209 (May, 1962).

Key Words: Vector Analysis-H, Analyzing-H, Operations-I, Stages-I, Mass Transfer-I, Mixing-I, Separation-I, Mathematics-I, Differences-J, Methods-J, Techniques-J.

Abstract: A fundamental unified approach from vectorial considerations is presented from which the usual rectangular and triangular difference point methods are derived as special cases. The approach is then extended to yield other difference point methods including some of higher order. The results are applicable to blending, distillation, extraction, foam fractionation, and other operations.

Reference: Lemlich, Robert, and R. A. Leonard, **A.I.Ch.E. Journal, 8,** No. 2, p. 214 (May, 1962).

(Continued on page 286)

Reply

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The derivations presented by Vohr and by Lamb and White illustrate the use of the momentum and energy balances in specifying the irreversible losses, and as emphasized by Lamb and White the viscous dissipation losses are not to be confused with the term involving the total wall shearing force.

In our momentum balance we have chosen to relate a static pressure drop for the two-phase flow into components of head and momentum, and a residual which is called *frictional two-phase pressure drop.* For the past fifteen years the attention of most investigators working with two-phase flow has been with this residual term [as presented in our communication *A.I.Ch.E. Journal, 7,* 174 (1961)].

What rewards would be gained by attempting to focus the attention on the dissipation term have yet to be spelled out.

A Note on Unsteady Forced Convection Heat Transfer

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Recently Siegel (2) and Sparrow and Siegel (3) investigated unsteady heat transfer in laminar and turbulent flow where the disturbance was due to time dependent wall temperatures. The unsteady problem with time dependent entrance conditions caused by disturbances on the upstream side of the thermal entrance is perhaps of greater interest to chemical engineers, since the method of solution can be extended to solve transient problems involving chemical reactions in flow systems. This will be considered briefly here.

Since the solution for unsteady laminar heat transfer may be obtained in an identical manner, turbulent heat transfer in tubes will be discussed. The solutions satisfy the transient integral energy equation; however they converge to exact steady state solutions to the differential energy equation at $t = o$ and $t = \infty$. For simplicity a step change in entrance temperature is assumed to occur at $t = o$. Hence the initial condition is the steady state temperature distribution corresponding to given values of T_o and T_w. Since fluid properties are considered constant, the velocity distribution is unaffected by the change in entrance temperature.

The transient energy equation is

$$\frac{\partial T}{\partial t} + u\frac{\partial T}{\partial x} = \frac{1}{r}\frac{\partial}{\partial r}\left[r(\alpha + \epsilon_h)\frac{\partial T}{\partial r}\right] \tag{1}$$

for fully developed turbulent flow in tubes. In dimensionless form and integrated from 0 to r_o^+, Equation (1) becomes

$$\frac{1}{r_o^{+2}}\frac{\partial}{\partial t^+}\left[\int_o^{r_o^+} r^+\theta\, dr^+\right] + \frac{1}{2r_o^+}\frac{\partial}{\partial x^+}\left[\int_o^{r_o^+} r^+u^+\theta\, dr^+\right] = \frac{r_o^+}{N_{Pr}}\left(\frac{\partial\theta}{\partial r^+}\right)_{r_o^+} \tag{2}$$

where

$$\theta = \frac{T - T_w}{T_o - T_w}$$

Initially the exact steady state solution obtains and is given by

$$\theta(0, x^+, r^+) = \sum_{n=1}^{\infty} Cn\, \phi_n\, (r^+)\, e^{-(4\beta_n^2 x^+/N_{Re})} \tag{3}$$

(Continued on page 286)