BOOKS

Chemical Engineering, Volume 2, Second Edition, J. M. Coulson and J. F. Richardson, Pergamon Press, Oxford (1968). 790 pages. $9.50.

The second edition of this standard work on the unit operations retains the general approach and flavor of the original, and succeeds admirably, as did its predecessor, in presenting a comprehensive overview of many subjects of great importance to the practicing chemical engineer.

The topics covered are the same as in the earlier edition, but the treatment of many has been substantially revised or expanded. The chapter on flow through packed beds, which has been completely rewritten, now includes a discussion of axial and radial dispersion. There are new descriptions of centrifuges, and an expanded treatment of sedimentation and thickening. Fluidization and hydraulic conveying now occupy separate chapters. The section on bubble-cap and sieve trays, as well as tray efficiency, is modernized, binary distillation now includes multiple feeds and sidestreams, and there are extensive discussions of spray and packed towers for liquid extraction, atomizers for spray driers, modern types of evaporators, and evaporator heat-transfer rates.

Most of the new material is excellently done. The new chapter on fluidization, for example, is probably the best textbook presentation of this subject outside of the specialized monographs that are available. The treatment of tray hydraulics is very comprehensive, but as might be expected, one can quarrel with some of the presentation. For example, the treatment of continuous thickeners omits discussion or reference to the significant new developments in their design. In the discussion of the use of open steam for rectification columns, the impression is given that the nonaqueous liquid is to be water insoluble, whereas in fact the treatment is for distillation of aqueous solutions. There is a moderately lengthy discussion of the mass-transfer rates for wetted-wall towers which are of only limited interest, but some of the correlations of packed-tower mass-transfer coefficients cannot be used because there is no corresponding discussion of the interfacial surface with which they must be associated. Some of those parts

(Continued on page 636)

(Continued from page 481)

(Continued from page 482)

of the old edition which have not been revised are now rather badly out of date, such as the treatment of liquid agitation and mechanically stirred extractors. In some cases, revision has been limited to addition to the bibliography with only passing reference to a few of the new entries.

Of course, it must be recognized that many of the subjects have remained astonishingly static for years, and modernization of these is then really impossible. And in a work of this size, covering in two volumes (the Preface promises a third) a great expanse of engineering knowledge, the extent and emphasis of revision understandably must reflect to some degree the particular interests of the authors.

The book is basically design oriented, much more so than the revised first volume, and on the whole relatively more elementary in its treatment. The explanations, mathematical derivations, and descriptions are exceptionally clear, supplemented by a great many good photographs and line drawings. Literature references and tables of notation have been put at the end of each chapter, rather than in groups as in the earlier edition. There are several more worked examples than before; 170 problems for student practice, 53 of them new; and a good index. Printing and format are first-rate. On the whole, this is a welcome and useful addition to any chemical engineer's library.

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An Introduction to Engineering and Engineering Design, Second Edition, Edward V. Krick, John Wiley & Sons, Inc., New York, $7.50. 220 pages.

Although this second edition follows the same general pattern and develops the same ideas as the first, it has been largely rewritten. Many of the examples and illustrations are also new. The number of pages in the second edition is practically the same as in the first but the larger page size made it possible to increase the content somewhat without increasing the pages.

Since many who might read this review are probably not familiar with the first edition, it seems in order to present a brief picture of the contents. The book is addressed primarily to students who might be contemplating engineering as a career and to students already enrolled in an engineering curriculum. In my opinion almost anyone

(Continued on page 637)

INFORMATION RETRIEVAL

(Continued from page 635)

Mass transport in porous materials under combined gradients of composition and pressure, King, C. Judson, and Robert D. Gunn, **AIChE Journal, 15,** No. 4, p. 507 (July, 1969).

Key Words: A. Porous Media-5, 8, Diffusion-8, Mass Transfer-8, Mass Transport-8, Helium-5, 9, Argon-5, 9, Nitrogen-5, 9, Slip Flow-8, Transition Flow-8, Knudsen Flow-8, Dusty Gas Model-8, Pressure-6.

Abstract: An expression is derived for the analysis of gas-phase mass transport in porous media in the presence of gradients in pressure and mole fraction. The behavior of porous media is contrasted with that of capillary tubes. A continuous-flow diffusion and permeation apparatus was employed for studies of mass transport in a fritted glass diaphragm. Measurements were obtained at varying levels of pressure and cover both isobaric binary diffusion and the permeation of pure gases and gas mixtures. These experimental results and previous data obtained by Hewitt and Sharratt and by Mason, et al. bear out the form of the equation and successfully provide independent checks of the three constants necessary to characterize a given porous medium.

Adsorption of carbon monoxide-nitrogen, carbon monoxide-oxygen and oxygen-nitrogen mixtures on synthetic zeolites, Danner, R. P., and L. A. Wenzel, **AIChE Journal, 15,** No. 4, p. 515 (July, 1969).

Key Words: A. Adsorption-8, Equilibrium-0, Separation-4, 8, Gases-1, Mixtures-1, Binary-0, Oxygen-1, Nitrogen-1, Carbon Monoxide-1, Molecular Sieves-5, Low Temperature-0, Composition-6, Adsorption Mechanism-10.

Abstract: Experimental results for the adsorption of the binary gas mixtures oxygen-nitrogen, oxygen-carbon monoxide and nitrogen-carbon monoxide on two synthetic zeolites are reported. In all these experiments the temperature was —200°F. and the total pressure was 1 atm. Also reported are the isotherms for the three pure gases on the two zeolites at —200°F. The results indicate that these zeolites have a surface selectivity which is independent of any sieving effect based on the size of the adsorbed molecules. It does not appear that the strong separations obtained can be explained in terms of the van der Waals forces which are generally believed to be dominant in physical adsorption. The available methods of predicting binary adsorption data from the pure gas isotherms have been examined.

A drop dispersal model for rinsing, Tallmadge, John A., and Sik U. Li, **AIChE Journal, 15,** No. 4, p. 521 (July, 1969).

Key Words: A. Mass Transfer-8, Film Distribution-8, Rinsing-8, Removal-8, Diffusion-8, Water-5, Drop Dispersal-8, Solutions-5, Transport-8, Mechanism-8, Time-6, Drop Volume-8, Diffusivity-6.

Abstract: A new theory for convection-free rinsing of flat plates was developed to include the drop dispersal mechanism as well as the previously considered diffusion mechanism. Cases where carry-over is unequal to dragout were also included in the model. Based on film distribution data, the model offers better agreement with rinse data. The effect of drain time on film distribution and bottom drop volume was also investigated.

The effect of surfactants on the flow characteristics of falling liquid films, Strobel, W. J., and Stephen Whitaker, **AIChE Journal, 15,** No. 4, p. 527 (July, 1969).

Key Words: A. Flow-7, 8, Liquids-9, Length-7, 8, Velocity- 7, 8, Waves-9, Falling Films-9, Valeric Acid-6, 9, Hexanoic Acid-6, 9, Surfactants-6.

Abstract: Experimental values of the wave length and wave velocity have been obtained for dilute solutions of valeric and hexanoic acid for a vertical falling liquid film. The wave length was unaffected by the surfactants for Reynolds numbers in the range 5 to 100; however, the wave velocity was decreased for increased surface concentrations of the two acids. The free surface velocity is greatly retarded by the adsorption of the surface agents.

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(Continued on page 637)