BOOKS

Process Analysis and Simulation, David M. Himmelblau and Kenneth B. Bischoff, John Wiley and Sons, Inc., New York (1968). 348 pages, $17.50.

Recently, there have been many books written by engineering professors that seem to be monographs on a branch of physics or mathematics. They have some useful application to engineers but are not considered very interesting by physicists or mathematicians. Such books form an important part of the foundation of engineering, yet they are not really books about engineering. They are often written by specialists and might well lead one to ponder on whether there really is any difference between the study of science and engineering today.

By way of contrast, Himmelblau and Bischoff have written a book which is definitely concerned with engineering, *per se*. As indicated by the title, the techniques considered involve analysis rather than synthesis, and practically all the applications discussed are in mathematical terms. Nevertheless, a broad range of subjects is covered, and many interesting examples and problems from the chemical process industries are included.

Far from being a specialist, a practicing process engineer is often expected to know everything. **Process Analysis and Simulation** covers a range of subjects worthy of a latterday renaissance man, and it shows how the process engineer must call on many disciplines and techniques to solve his problems.

Some of the topics treated in the book are fundamentals of model building, the equations of change, population balance models, ordinary differential equations, partial differential equations, process dynamics, transfer functions, stability, mixing in chemical reactors, and systems analysis including Boolean matrices. The treatment is up-to-date and at a relatively difficult level. Although the authors have used the book for a senior course, I would think it to be more suited to a graduate course. It is especially valuable for the working engineer or teacher.

The authors have a passion for classification, and the book abounds in tables and diagrams which illustrate the structure of problems and models. This approach generally comes off pretty well. Many of the charts

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COMMUNICATIONS TO THE EDITOR

INFORMATION RETRIEVAL

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An analysis of oxygen absorption in a tubular membrane oxygenator, Buckles, R. G., E. W. Merrill, and E. R. Gilliland, **AIChE Journal, 14,** No. 5, p. 703 (September, 1968).

Keywords: A. Mass Transfer-8, Oxygen-1, 9, Blood-1, Design-4, Non-Newtonian Fluids-6, Nonlinear Models-7, Residence Time-6, Flow-6, Numerical Solutions-2, Membrane Oxygenator-4, 10.

Abstract: An analysis of oxygen absorption by blood flowing through a small oxygen-permeable fiber in steady state laminar flow is presented. The rigidity and geometry of the fibers eliminate unpredictable shunting and distention, permitting a more detailed analysis of blood-membrane factors than has previously been undertaken. The mathematical analysis treats the blood as a homogeneous, non-Newtonian fluid with a reversible nonlinear oxygen sink (erythrocytes). The differential equations are solved numerically and the results of the parametric analysis are presented.

Comparison of the experimental results to the model indicate that mixing due to the heterogeneous nature of blood is minimal and that the major limitation in oxygen absorption is the blood film. Means of reducing this resistance are discussed.

Coupled energy and multicomponent mass transfer in dispersions and suspension with residence time and size distributions, Gal-Or, Benjamin, and Lakshminarasimha Padmanabhan, **AIChE Journal, 14,** No. 5, p. 709 (September, 1968).

Key Words: A. Multicomponent-0, Mass Transfer-7, 8, Heat Transfer-7, 8, Dispersions-9, Suspensions-9, Interfacial-0, Multiphase Systems-9, Particle Size Distribution-6, Residence Time Distribution-6, Hold-up-6, Surface Active Agents-6, Mathematical Model-10, Drops-9, Bubbles-9, Particles-9, Transport Equation-10.

Abstract: An analytical solution for the transport equation is presented for the case of coupled energy and multicomponent mass transfer in an ensemble of spherical drops, bubbles or solid particles. The solution is used to evaluate the total interfacial transfer rates in a population with particle size and residence time distributions. Using matrix notation and appropriate transformations, the partial differential equations are solved for each phase by using an integral operator whose kernel is the residence time distribution for the flow system. The method of attack is illustrated by solving the transport equations for fine dispersions or suspensions with high holdup values and presence of adventitious surface active agents.

Convective diffusion in rotating disk systems with an imperfect semipermeable interface, Zeh, Dale W., and William N. Gill, **AIChE Journal, 14,** No. 5, p. 715 (September, 1968).

Key Words: A. Mass Transfer-8, Reverse Osmosis-4, 8, Ultrafiltration-4, 8, Hyperfiltration-4, 8, Rotating Disk-5, 8, Salt Water-1, 9, Salt-3, Salt Concentration-7, Semipermeable Membrane-5, 10, Potable Water-2.

Abstract: Solutions to the momentum and diffusion equations are obtained for rotating disk systems with an imperfect semipermeable interface, with direct application made to the reverse osmosis or hyperfiltration process of salt water purification. The equations are solved exactly, and a new technique for solving the momentum equations is described. An approximate solution to the diffusion equation is also obtained which is also applicable to the energy equation, and is shown to be accurate for Prandtl and Schmidt numbers ≥ 1, for a wide range of interfacial mass transfer, for all wedge-type flows as well as the rotating disk system.

Free tear sheets of the information retrieval entries in this issue may be obtained by writing to the New York Office.

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and lists of methods are backed up by a good set of references to more specialized books. This last feature alone is enough to win for the book a place in almost any chemical engineer's library.

The economic aspects of engineering are not treated at any length, so the reader will have to look elsewhere for a discussion of the optimization and tradeoffs that form another vital part of engineering.

The book is lucidly written, well produced, and seems relatively free of errors. In addition to its role as classifier and key to the literature, it has many sections which provide a fresh treatment of the subject matter, for example the section on population balances.

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