

and teaching book and at this he has succeeded admirably. Bemused readers of the first edition should know that the adventures of the Lavender Hill Philanthropic Society and other suitably outrageous propositions live on in this new edition and the author's analyses again lead him to conclude (for example, page 482) that even in chemical engineering S_{ex} and S_{in} may be encountered in close juxtaposition.

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A Handbook of Unit Operations, D. A. Blackadder and R. M. Nedderman, Academic Press, New York (1971). 284 pages. \$15.00.

This American edition of a British textbook presents an analysis of a selected group of unit operations. Graphical or mathematical (noncomputer) techniques are used exclusively. There is almost nothing on sources of experimental data needed in the analyses, and there is little discussion of design factors such as performance correlations, efficiency predictions, economic considerations, or equipment layouts. The authors state that they have addressed themselves to students wishing to become familiar with the methods of analyzing unit operations before proceeding to a detailed equipment or process design. The material covered is indicated by the chapter headings: "Distillation of Binary Systems," "Solvent Extraction," "Gas Absorption," "Multicomponent Systems," "Heat Exchangers," "Drying," "Evaporators," and "Filtration." Notably absent are chapters on fluid flow, heat transfer, and mass transfer. There are many worked examples but no problems for homework or self study except for an occasional suggestion in the text of some proof or variation for the student to work out. SI units are used throughout.

The structure of the book is stated to be that each new topic is first treated in simple terms. Then complications and variations are introduced, frequently as part of a sample problem. Few of these treatments would be easily grasped by a beginning student. Indeed, sometimes the first exposure to a topic is in terms of a rather complicated case, for example, the first drying example is a continuous counter-current, adiabatic, steady state dryer.

At other times, the treatment is done in a way which would be likely to mislead or confuse a student. For example, in the McCabe-Thiele method, the operating line is plotted with no attempt to explain or point out the reasoning for the point of intersection with the $y = x$ line. It is not clearly and promptly stated that the operating line is straight if the McCabe-Thiele assumptions apply. No satisfactory criteria for the applicability of the McCabe-Thiele assumptions and method are given.

Several of the examples given in the book should be of interest to the practicing engineer. The book as a whole may serve, in fact, as a convenient review or reference book of certain useful analytical techniques in unit operations calculations.

This book is unlikely to be attractive as a textbook to the North American student or professor. Nevertheless, it may be recommended to libraries and those individual engineers who want a concise compilation of selected desk methods of analyzing unit operations.

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Industrial Processing with Membranes, Robert E. Lacey and Sydney Loeb, Interscience, New York (1972). 348 pages. \$17.50.

This book is comprised of 13 chapters prepared by 15 contributors and edited by outstanding scientists in the membrane field Robert Lacey and Sydney Loeb. The stated purpose is to provide information which will enable consideration of membrane processes for industrial separations and to present basic principles to aid in the design and operation of membrane plants.

The scope of the book is limited to two membrane processes. One-third is devoted to electrically-driven processes. The other two-thirds is devoted to pressure-driven processes including reverse osmosis, ultrafiltration, and gas permeation.

I would characterize the book as being primarily useful to students and industrial workers interested in an introduction to the technology. For this purpose it has sufficient depth and detail of theory and basic principle, and is written in a clearly understandable and concise manner. One of its best attributes is copious referencing which en-

ables further searches on specific topics of interest to the reader.

From an engineering viewpoint, particularly for those with some experience in this area, the title may be misleading. The title implies industrial application, but the book does not really come through with any reality in this regard. For example, there are virtually no photographs in the book. The use of photographs and schematics to illustrate types of available equipment and typical installations could have been used to give the reader confidence that there is reality in the application of this technology. In addition, for clarity and understanding, the use of photographs and schematics is really a necessity, especially in view of the complexity of the apparatus generally available.

I must also comment that the limitations of the present state of the art are not emphasized. Such limitations as the refractivity of membranes to physical, chemical, and biological attack as these pertain to membrane life are barely mentioned. The basic problem of maximizing flux on the face of complex feed components, the formation of gel layers, and the management of flows to optimize flux are not given sufficient attention.

It seems to me that the limitations might very well have been emphasized by description of some of the larger scale industrial applications of the technology in these terms. For example, large demonstration plants are and have been in operation for utilizing reverse osmosis and electrodialysis for desalination. Typical economics and performance could have been tabularized for such installations to give the reader—particularly the engineer—a feel for the reality of the art. Several large commercial applications which were in existence at the time of the writing of the book are either not mentioned or given only slight attention; for example, the use of membrane processes in the treatment of electrophoretic paint, whey, and the production of high purity water.

I share the conviction of the authors that this new technology will find wide application in the process industries. This book goes part of the way toward illuminating the potential of industrial separation processes with membranes. I share the conviction of the authors that this technology will find wide application. This conviction could have been strengthened with more evidence of current industrial utility.

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