BOOK REVIEWS

Chemical Engineering: a Review for the P.E. Exam

By W. E. Crockett, John Wiley & Sons, New York, 1986, 269 pp., $31.95

This book is an outgrowth of a P.E. exam preparatory course that Dr. Crockett has taught and perfected over the past ten years in West Virginia. The book jacket claims, "The bottom line: Every chemical engineer who has used this book has passed the P.E. exam. (Based on a recent survey taken over the last three years.)" Inasmuch as the book was published this year, we assume the survey covered those who had taken Dr. Crockett's course and used the course notes that eventually evolved into the book.

Although the book appears to be excellent, we have serious doubts that "the bottom line" will apply to chemical engineers who use this book to prepare for the P.E. exam on their own. The statistics quoted probably apply to a select group of individuals who were well-prepared for the exam by other factors besides this book, such as a good basic chemical engineering education and by a good instructor in the review course itself.

This book could serve as the required textbook for a review course for the P.E. exam. The book is organized into the seven major areas covered by the exam: thermodynamics, process design, mass transfer, heat transfer, chemical kinetics, fluid flow and engineering economics. Within each area the basic theory is reviewed in a concise but rather sketchy form. A list of standard reference books is given. These references are an indispensable supplement to this book because of the cursory treatment of the theory, and because no basic design data have been included. Almost no example problems are presented to illustrate how to apply the theory. Each major area contains some old NCEE examination problems (supposedly typical of the present exam) together with the solutions and suggested strategy for solving. Fifty-seven problems are given which seems rather minimal.

The problem solving techniques could have incorporated some practical approaches, such as using the pipe flow alignment chart in *Perry's Handbook* for pressure drop calculations, or judgment, such as Problem E in the engineering economics section that involves a choice between two paints. Both cost the same p.s.f. covered, but Paint B will last longer and can be applied with less labor. Paint B is the obvious choice. Why bother to calculate an annual cost per square foot based on money valued at 10% per annum?

A brief comparison was made with the other major competing book, *Chemical Engineering for Professional Engineers Examinations* by Prabhudesai and Das (McGraw Hill). Prabhudesai contains appreciably more material with greater depth of theory, numerous example problems and some limited basic design data. However, Prabhudesai lacks the NCEE examination problems that are a necessary part of the review preparation.

Dr. Crockett has authored an excellent review text for the P.E. exam, but one's chances of passing the exam will be improved by using supplementary reference books and by taking a review course that offers more problem solving.

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Unsteady Processes in Catalytic Reactors

By Y. S. Matros Elsevier, 1985, 364 pp. $81.50.

This book is concerned with the study of the behavior of a packed-bed reactor under either steady or transient operation. The first part of the book is concerned with the development of an understanding of the chemical and physical rate processes that occur in the reactor and the use of information about the relevant time scales to select a mathematical design model that is neither oversimplified nor overly complex. The second part discusses the optimal design and operation of a packed-bed reactor under either steady state, transient or forced periodic operation.

The emphasis in the book is on physical arguments and application of mathematical models. While the key ideas of the mathematical analysis are presented, the details are often omitted. Many examples illustrate the application of the mathematical models to practical situations.

The book is based mainly on Soviet work and point of view. The literature citations also favor Russian studies, and there are some glaring omissions of key Western papers. Many problems discussed here are not covered in Western books and complement the Western literature on the subject.

The English translation by the author is awkward at time's and some sentences are incomprehensible. The book contains a rather large number of typographical errors and the lack of a notation table is a serious deficiency.

Academic and industrial Western reactor-design experts will find the book an excellent guide to unfamiliar and interesting Russian work in the area. The material about the hierarchical development of mathematical models would fit well into any graduate course of mathematical modeling and anslysis.

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Instructors of introductory courses on polymer science have faced difficult book selection choices for at least the last twenty years. The shadow of P.J. Flory's definitive 1953 book, *Principles of Polymer Chemistry,* was very long and indeed, I do not know of a responsible instructor who, even today, does not recommend Flory to students at a very early stage in their studies.

However, the ensuing three and a half decades has seen several revolutions in polymer science and an explosion in the number of polymer science textbooks. Owing to the breadth of the field, few are being written with the broad and authoritative coverage of Flory.

Sperling's book covers the physical chemistry and solid-state physics of polymers. The book is excellent in its choice of subjects and in its style of presentation for undergraduate students. It is too elementary, due to its considerable breadth even after focusing on things physical, to be satisfying to a reader desiring knowledge in depth on any particular subject. How-

ever, references to recent literature are abundant.

Strong points in this book include its coverage of relatively modern developments in polymer science, such as small angle neutron and x-ray scattering, reptation, multicomponent polymers and failure mechanisms; new sets of homework problems; and good illustrations. It has nine chapters covering topics ranging from solution to solid-state structures and properties.

The reader looking for the next Flory will be disappointed; the reader looking for an undergraduate textbook companion to an introductory course will find a strong contender.

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Scaleup of Chemical Processes

Edited by Attilio Bisio and Robert Kabel, John Wiley & Sons, New York, 699 pp., $69.95.

This book may serve as a valuable reference for individuals involved in the scaleup of a specific process but is of questionable value for individuals interested in learning the art of scaleup. In the preface of the book the editors state their assumption that, "few readers will read the entire book at one sitting." This reviewer found those words prophetic as interest in reading the book waned in the initial chapters.

The book is written in 18 chapters by 17 different authors. This approach leads to some chapters that are considerably easier to read than others. For instance, the chapters discussing stagewise and continuous mass transfer processes written by J. R. Fair are an excellent summary of mass transfer calculation techniques, but they have little discussion of scaleup procedures. By contrast, the chapter on mathematical modeling written by D. M. Himmelblau was difficult to read. It contained a series of lists of tasks needed to complete a model with equal emphasis given to the important task of determining the needed accuracy of the model and to the relatively unimportant task of selection of a computer programming language.

The history of process scaleup is rich with successful and not-so-successful examples that illustrate the need to consider factors beyond geometric scaleup. The authors have not used this history to add emphasis and to maintain reader interest. The chapter discussing selection of reactor type by R. L. Kabel makes frequent reference to literature documenting case histories but requires the reader to dig out the original writing.

This is an example of technical writing that is useful primarily to readers already skilled in the art. It contains sufficient detail to be useful in carrying out a specific task, but lacks the overview that would make it useful as a learning tool.

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Computer Aided Chemical Thermodynamics of Gases and Liquids: Theory, Models, Programs

By Paul Benedek and Ferenc Olti, Wiley Interscience, 731 pp., $85.00.

Computer Aided Chemical Thermodynamics is an attempt to present the subject of thermodynamics in a way that takes advantage of the proliferation of personal computers. This necessarily allows one to cover a wide variety of problems that are too complex or tedious for hand calculations. Such an approach is particularly appropriate in thermodynamics as one often encounters trial and error solutions.

The book is informally divided into four sections. The first presents the elements of classical and quantum mechanics. The second section introduces the concepts of temperature, pressure, and energy, including equations of state and the Zeroth and First Laws of Thermodynamics. The third section introduces entropy, the Second Law, and the remaining thermodynamic variables. This section also presents an introduction to statistical thermodynamics; throughout the book, concepts of molecular thermodynamics are used to emphasize similarities and differences in behavior. The fourth section presents specific models and shows how they can be used to calculate thermodynamic properties for pure substances and for mixtures.

In general, I liked the order, organization, and emphasis placed on the various sections. The authors tend to present the material as statements of fact rather than in a didactic fashion and hence, coupled with the fact that there are no example problems or homework problems, the book is more suitable as a handbook for working engineers than as a textbook. Though I did not object to this aspect of the authors' style, the authors, editors, and reviewers seem to have done a rather poor job in preparing this book for publication. The book obviously was written by people who are not fluent in English; at places the language detracts significantly from the flow of ideas. Further, because of the rather officious style, the authors often make statements in a tone that implies they are general when they are not. For example, they state that the reduced second virial coefficient is a universal function of reduced temperature (which it is not), and that arithmetic mean mixing rule for 'b' in van der Waals' equation leads to mixing without change in volume (which it does not). Also, there are statements that are wrong, e.g. a statement that pure substances or mixtures of hard spheres behave as ideal gases.

Given the amount of misinformation, misleading information, and the difficulty I had reading this book, I cannot recommend that anyone purchase it.

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