BOOKS

The Practical Use of Theory in Fluid Flow. Book I. Inertial Flows by Stuart W. Churchill, Etaner Press, 1980, 155 pages, $15.00

This monograph is the first in a series by the author intended to demonstrate the use of theoretical concepts for solving practical problems. Book I deals with theory applied to inertial flows characterized by high Reynolds and/or high Mach numbers.

The text begins with a discussion of reversible expansions and compressions based upon the results of a combination of Newton's second law of motion, conservation of mass, and the first and second laws of thermodynamics. The results of the opening chapter form the basis for much of the remainder of the book, which focusses upon practical problems of flow through venturi tubes, limiting rates of flow in pipes, jet propulsion, shock waves, detonation waves, surface waves, cavitation, incipient vaporization, and aerodynamic heating. The problems are discussed purposefully in terms of one-dimensional flow to circumvent hiding the principles of applying the theory in a cloud of mathematical manipulation generally required to solve problems in two- or three-dimensional flows.

The virtue of the book lies in its demonstration that theoretical developments can in fact lead to useful results. The development of the results is presented lucidly and concisely in terms of the mathematics. The book can be utilized best by an interested and involved reader. To profit fully from a book of this type, the reader should expect to supplement the test with outside reading from the suggested references as well as work a reasonable number of the supplied problems at the end of each chapter. Since the written text is quite brief it would be helpful to have a more complete list of references as supplementary reading, particularly for discussions such as that concerning reversible expansions and contractions. Although most thermodynamics texts do include essentially the same material, the author might recommend texts which are particularly lucid.

Given the stated goals for the series and an interested reader, the author has done a commendable job with this first volume. The series should find acceptance and use in both academic and industrial communities.

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Chemical Engineering Kinetics (3rd edition) by J. M. Smith McGraw Hill Book Company, 676 pages 1980, $30.50

This third edition of Smith's popular textbook retains the pedagogical and philosophical outlook of the previous edition. Indeed, one might say that it is more nearly a modification or updating of the second edition rather than a new edition *per se*.

That in itself is no bad thing, since for many university courses, Smith's book has been considered the ideal introductory text for the subject. As in the previous edition, the book abounds with example problems, most of them placed in a realistic industrial setting, many of them solved in full detail within the text itself and very few cast into the simplified notational form: $A \rightarrow B \rightarrow C$. Whether or not this approach is an aid or a hindrance to the mastery of the fundamentals of the subject is open to some discussion.

The structure and content of the previous edition is well-known to most readers and it is only necessary to outline those few areas which are different in this latest edition. The first five chapters still deal with a review of chemical kinetics and ideal homogeneous reactor design for isothermal and non-isothermal conditions. There is also a new small section on recycle reactors. As in the previous edition, the complications which can result from non-constant heats of reaction and heat capacities are ignored. The latest edition includes detailed application of Runge-Kutta methods to solve sets of differential equations—these are developed within the text itself and could be a distraction to some readers. Chapter 6, a characterization of nonideal flow in reactors is not significantly different from the previous edition.

The remainder of the book deals with heterogeneous reactor systems. Chapters 7–9 are a brief but adequate introduction to heterogeneous catalysis for chemical engineers with a few more examples than there were in the second edition. Chapters 10 and 11 deal, respectively, with interphase and intraphase heat and mass transfer effects; included here are expanded sections on multiphase reactors (especially trickle-beds), and models of fluidized-bed reactors with some new examples. Chapter 12 (on laboratory reactors) and 14 (on fluid-solid noncatalytic reactors) remain as in the earlier edition but some attempt has been made to expand Chapter 13 which deals with the complex problem of modelling and design of the important types of industrial reactors. Estimation of "effective" parameters and choice of suitable models is beyond the scope of most undergraduate courses and Smith has wisely kept the discussion at a fairly basic level.

The claim that the book now uses SI units throughout is far from correct; there is a random mixture of SI, cgs and US units, often within the same problem.

In summary, the latest edition of the book will continue to be popular for undergraduate students and practising engineers, but has little to add over the previous edition.

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Process Level Instrumentation and Control by Nicholas P. Cheremisinoff, Marcel Dekker, Inc., 1981; 252 pages; $29.75

This book is the second in a series devoted to engineering measurements and instrumentation. This particular volume covers the important subject of level measurement and control.

Level measurement is defined as the determination of the position of the interface between two phases when the phases are separated by gravity. Level measurement is classified into visual techniques, float-actuated devices, displacer devices, head devices, electrical methods, thermal methods, sonic methods, infrared devices, and nuclear devices. For each measurement method the basic principles, various embodiments, and commercial applications are covered. An extensive table of commercial applications of rotating paddles is included.

Level control is divided into two broad categories: (1) applications in which level is an important process variable and (2) applications in which flow stability from a vessel is the important variable. In the first category the control objective is to maintain near constant level in the presence of load changes. In the second category the exact level is unimportant except at the conditions where the vessel may run dry or overflow. Control terminology and the mathematical principles of control are briefly reviewed in Chapter 1. Types of control action and vessel dynamics are covered in Chapter 2. Specific control systems are covered with the various level measurement methods. Chapter 11 deals with valves and valve actuators as final control elements.

Safety considerations are addressed briefly in Chapter 2.

The book is an excellent and comprehensive treatment of level measurement and control. It is a valuable resource book for anyone with a need to detect and control levels and/or interfaces.

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