

kinetic information about the readily hydrolysed Pb(IV), but an abundance of data concerning yields of its oxidation products. Both aspects have been explored for Mn(VII) and Cr(VI) and are well documented.

Although references to more recent work are included, the text is comprehensive only to the end of 1963 and this leads to some infelicities. On page 9 we are told that, "Ordinary alcohols . . . are inert to manganic oxidation", while on page 214 are recorded parameters for such a reaction. There are also a few mistakes in the index and references. The many equations are free from typographical error, but on page 188 oxidation by a free radical R^{\cdot} is alleged to give R^+ .

These are minor blemishes, however, and this book is recommended to all those who are, or intend to become, active in this field.

T. J. KEMP

REACTOR TECHNOLOGY

Reactor Handbook

Vol. 4: Engineering. Edited by S. McLain and J. H. Martens. Second edition. Pp. xvii + 857. (New York and London: Interscience Publishers, a Division of John Wiley and Sons, 1964.) 192s.

WHEN reading through an omnibus like Volume 4 of the U.S. Atomic Energy Commission's *Reactor Handbook*, one feels that to write a completely satisfactory single text covering the whole field of nuclear engineering is probably an impossible task. A number of major engineering disciplines, for example, fluid mechanics, thermodynamics, and structures, must presumably receive a treatment which achieves some compromise between a formal presentation and development of basic principles, and the empiricism often needed to solve practical problems. In addition, specialist technologies, such as shielding and fuel element design, must be covered, and qualitative accounts of reactor systems and components are required.

The present book, which weighs 4.25 lb., contains twenty-one chapters, written by 252 contributors, comprising a total of about 500,000 words, with nearly 2,000 references. It contains rather empirical discussions of the basic principles of fluid mechanics and heat transfer, and an outline of the application of structural analysis to reactor design. Descriptive accounts are given of water, liquid metal and molten salt fuelled systems. Chapters are also included on fuel elements, shielding, control and instrumentation, coolant treatment, safety, and remote handling. The treatment throughout has a bias towards water reactors and American work generally.

The book is reasonably easy to read since the text is, for the most part, clearly written and logically arranged, with adequate indexing and listing of chapter contents, helpful diagrams, and abundant references. Certain sections are of particular merit, for example, the comprehensive treatment of natural convection in Chapter 2 and the indication in Chapter 5 of the wide range of considerations affecting fuel element performance.

It is not possible to mention every relevant aspect in a book of this kind, but more serious omissions include such topics as thermal conduction and radiation, heat transfer from roughened or extended surfaces, power cycle analysis, pre-stressed concrete pressure vessels, economic aspects of reactor performance and the application of computers to reactor design; moreover, some worked examples would be helpful in the presentation of basic principles, for example, in the chapters on fluid mechanics and heat transfer. Reactor safety is given a somewhat superficial treatment in one chapter, and a brief reference to transients occurs in the chapter on thermal analysis. The chapter on structural analysis includes an inadequate discussion of the significance of different kinds of stress, without any reference to A.S.M.E. Boiler and Pressure Vessel Code, Section III, which treats

this subject in some detail. No discussion of reactor control philosophy is given in the chapter on control and instrumentation, although details of particular designs of control rod mechanism are provided. The references quoted at the end of each chapter are usually pre-1961, and some of the information included is also rather outdated. Sometimes the interests, and energies, of individual contributors are reflected; for example, only thirty references on reactor safety are listed, whereas 478 references appear at the end of the chapter on remote handling.

The book is well produced and contains a great deal of information, not all of which is complete or up to date, but which nevertheless provides a convenient first reference for the student, or for the worker who is new to some field of nuclear engineering. It does not seem, and probably is not intended, to be of great value to the experienced worker or specialist.

J. F. PEARSON

High-Intensity Ultrasonics

Industrial Applications. By Basil Brown and John E. Goodman. Pp. viii + 235. (London: Iliffe Books, Ltd.; Princeton, N.J.: D. Van Nostrand Company, Inc., 1965.) 55s. net.

THIS book is a survey of the industrial applications of high intensity ultrasound. Two introductory chapters deal with propagation and absorption and the phenomenon of cavitation—a process of fundamental importance in many industrial applications. In fact, as one reads this book, one finds that the application of high intensity ultrasound is very often the application of cavitation processes.

Two chapters follow on the generation of high intensity ultrasound, the first concerned with mechanical methods (whistles of various kinds) and the second with magnetostrictive and piezoelectric techniques.

The second half of the book deals in detail with applications. Ultrasonic cleaning and emulsification (homogenization) are treated, followed by soldering, drilling and welding. Metal fatigue testing is described and the use of ultrasound for grain refining from the molten metal discussed. The book ends with a chapter on chemical and biological effects. Among those described are the hydrolysis of esters, the dispersal of solid catalysts and the extraction of cell contents in experimental biology.

Throughout the book the intention has been to maintain a practical slant, making it useful to the industrial worker lacking in extensive physical knowledge. In general, this aim has been achieved; there are many useful tables of data and a good collection of references. Less happy is the "plain man's guide" to the physical background of the subject. What, for example, is meant by the statement that in the case of a longitudinal wave (page 2) the "movement" of a vibrating body is communicated to the medium, or that (page 10) "in a liquid the viscosity is equivalent to the rigidity". If it is the authors' opinion that such misleading statements are acceptable against the reader's technological background one must feel uneasy on the point at which simplification becomes half-truth. There is also some confusion (pages 27–28) between the use of the ultrasonic wave as a diffraction grating and its visualization by the Schlieren technique. As a further example of lack of precision in a simple description, we are told (page 59) that the generation of sound in a Galton whistle is due to the vibration of the lip of the cavity resonator.

Some clarity—and a great deal of truth—has been sacrificed in attempting to play to an imagined gallery of "industrial" engineers and scientists. The skilled writer should be able to adjust his emphasis so as to present facts as clearly and truthfully to the industrial workers of Joule's native town as to the alleged "ivory-tower" scientists of my laboratory.