BOOK REVIEWS

Selection of books for review is based on the editor's opinions regarding possible reader interest and on the availability of the book to the editor. Occasional selections may include books on topics somewhat peripheral to the subject matter ordinarily considered acceptable.

Air Movement and Vacuum Devices

Editors Mahesh V. Bhatia and Paul N. Cheremisinoff

Publisher Technomic Publishing Company, Westport, Connecticut (1981)

Pages 323

Price $35.00

Reviewer Thomas R. Rehm

The book is a series of six chapters, each written by a different author on "Fans and Blowers," "Compressor Applications and Selection," "Centrifugal Compressors," "The Liquid-Ring Vacuum Pump," "Jet Ejectors and Condensors," and "Positive Displacement Compressors."

The material presented in these chapters is primarily in text and graph/picture form. Selected, but by no means complete, equations are given for certain applications. Much of the text is devoted to peripherals and mechanical components that are ancillary to the main apparatus.

The book is written for a low level of technical background. As such, it would be appropriate for a new operations technician or a manager without engineering fundamentals, primarily in an already operating facility.

A major shortcoming is the often poorly written and noncohesive style of material presentation. The first chapter is particularly poor. On the other hand, material in some of the latter chapters is very well presented and is clearly written. On the whole, however, the book is lightweight.

Thomas R. Rehm (PhD, University of Washington) has been a professor of chemical engineering at the University of Arizona since 1966. Special areas of interest are mass transfer, equipment and process design, and computer applications to design. He has industrial experience with UOP, Chevron, and Monsanto.

Energy and Sea Power

Editors D. Walsh and M. Cappellari

Publisher Pergamon Press, Inc., New York (1981)

Pages 200

Price $25.00

Reviewer Efstathios E. Michaelides

This is a collection of 11 articles presented at the 8th Annual Pacific Coast Sea Power Forum. The subjects addressed are nontechnical, written basically by company executives and officers of the armed forces.

The articles cover the following topics: the present (1979) and future energy needs of the world; the burden of increased energy prices on the U.S. economy; the hydrocarbons to be produced by offshore drilling; regulatory and environmental aspects of offshore drilling; naval power needed to protect oil shipments and the corresponding merchant marine buildup; military mobility and its energy needs; the application of ocean thermal energy conversion in the military; the necessary engineering skills for offshore production to extend to arctic regions; energy-efficient ship design; and the needs of the shipbuilding industry to support the ocean-energy development.

The originality of the book lies in the fact that it brings together the military, economic, political, and technical considerations of offshore oil exploration and oil transportation. It will be useful to high-level managers of energy-related companies. It may also appeal to the energy engineer who pursues a global understanding of the nontechnical energy problems.

The book is well written with many tables and charts on energy production and consumption. However, there are very few references for those who wish to study the subjects in depth. One major drawback of the book is that the material was written in 1980, before the recent drop in oil prices. Because of this, a lot of the information contained is obsolete and some predictions on the future prices and oil demand are inaccurate.

Efstathios E. Michaelides (BA, engineering science and economics, University of Oxford, United Kingdom, 1977; MS, 1979, and PhD, 1980, engineering science, Brown University) has been an assistant professor in the Department of Mechanical and Aerospace Engineering, University of Delaware, since 1980. His research interests include multiphase flow, energy conversion, geothermal energy applications, and irreversible thermodynamics. He has contributed about 40 papers to the scientific and technical literature.

Fast Breeder Reactors: An Engineering Introduction

Author A. M. Judd

Publisher Pergamon Press, Inc., New York (1981)

Pages 161

Price $12.50 paperback; $25.00 hardcover

Reviewer R. A. Karam

This book contains five chapters: 1, Physics; 2, Fuel; 3, Engineering; 4, Coolant Circuits and Steam Plants; and 5, Safety. Although the author intended the book for the newcomer to the study of fast breeder reactors (FBRs), it is definitely not written for beginners. Nor is it very useful to experts. It may fill a void for those who are in the middle.

The introduction of the book is eight pages long and contains the usual justifications for breeders. It also contains errors and omissions with respect to metallic fuel development. The author states, p. 7, "...as they (FBRs) were built it began to be recognized that they would be the end-point of the development of metallic-fueled fast reactors." He further states that it is difficult to find a cladding material that is compatible with both fuel and coolant temperatures >250°C (bottom of p. 7 and top of p. 8). The author must surely have known about metallic fuel development at Argonne National Laboratory, where he was stationed once in the late 1960s or early 1970s. Results of research on metallic fuel were available early in 1979 and appeared in *Nuclear Technology*, Vol. 47, p. 7 (Jan. 1980). Another publication by Seidel and Walter, ASME 80-2/N.E.-23 (1980) proclaimed as a title, "EBR-II Metallic Driver Fuel—A Live Option." The operating temperatures discussed in these publications were 550°C, not 250°C.

Chapter 1 is the physics chapter and contains 41 pages with 22 figures. Topics include the following: multigroup diffusion theory, fundamental mode calculations, resonances, perturbation theory, flux distribution, breeding, fuel compositions, control rods, reactivity coefficients, and shield design. On p. 11, the author tells us that there is no need for cell calculations to predict the effects of heterogeneity (in fast reactors). On pp. 16-21, he implies (Eq. 1.20) that energy self-shielding is important in the resonance region. Nothing was said about why resonance self-shielding is important in energy but not space. Logical deduction would conclude that if one is important the other must also be important.

The treatment of each topic in Chap. 1 is very brief. For example, resonance treatment is covered in three and one-half pages, perturbation theory in two and one-half, shield design in one-half page. The presentations are not particularly lucid.

Chapter 2 contains 24 pages which include 16 figures and 2 tables. It is devoted to fuel and treats temperature distribution, thermal conductivity, gap conductance, fuel swelling, manufacturing process, oxygen potential, sealed and vented fuels, fuel element design, reprocessing, carbide fuel, recrystalization, thermal and irradiation creep, fuel cladding interaction, plutonium and oxygen migration, fission product behavior, and cladding corrosion. Each subject matter is described briefly and factually. The material would perhaps be a valuable quick reference to scientists who are not familiar with some of the engineering practices.

Chapter 3 is entitled "Engineering" and contains 30 pages including 21 figures and 2 tables. The major categories that Chap. 3 addresses are: core heat transfer, structural materials, core structure, and dynamics and instrumentation. The chapter contains by and large useful information; ambiguity in the text and in some of the figures, however, does creep in on several occasions. As an example, Fig. 3.14 is purported to show the corrosion and wear of stainless steel due to the flow of sodium. In this figure, the ordinate is given as "volume concentration" with no units and the abscissa as "distance, m" running from 0 to 15. There is no text description of the figure and the caption is of no help. It is not possible to decipher the meaning, the value, or the significance of the data in Fig 3.14.

Chapter 4 is devoted to coolant circuits and the steam plant. It contains 24 pages of descriptive materials including 18 figures. The topics treated are: primary circuit (pool and loop layout); pumps; reactor vessel; heat exchangers; hydrogen, oxygen, and impurity control; steam generator design; leak detection; and steam cycle design. The material is introductory and reasonably done.

The final chapter is concerned with liquid-metal fast breeder reactor (LMFBR) safety. It discusses inherent safety features of LMFBRs, protective systems, and hypothetical accidents. The chapter is 17 pages long.

The author appears to have consulted primarily books for his material. The large body of information available in journals and periodicals was not exhaustively searched. The writing style is not exactly blessed with clarity and the book contains numerous typographical errors. On the plus side, the book contains useful descriptions of LMFBR systems not found in other recent books on the same subject.

R. A. Karam is a professor of nuclear engineering at the Georgia Institute of Technology. His interests are breeder concepts and neutron transport.