BOOK REVIEWS

Heat transfer science and technology

B. X. Wang

Hemisphere Publishing, New York, 1987, 944 pp., $139.95 (US and Canada)

This book might be more appropriately titled *Proceedings of the International Symposium on Heat Transfer*, held October 15–18, 1985 in Beijing, China. Participants of the conference came from around the world, with about 50 percent from the People's Republic of China. The production of the book is typical camera-ready copy and is of uniform high quality. Over one hundred papers are presented with topics ranging over the whole spectrum of heat transfer. Approximately 60–70 percent of the papers offer experimental data on the various phenomena involved. One may ask how this compares with other symposia volumes and the ultimate extensive volumes of the International Heat Transfer Conference. My estimate is that it compares very well because of the large amount of experimental data included.

As with other "international" conferences, keynote papers are published which set the tone for the conference. My recommendation is for the reader to go directly to papers of interest without any intervening keynote stop.

The book is certainly recommended to all libraries of universities and industries which have any heat transfer activity at all. It offers very good insight into the heat transfer work being performed in the People's Republic of China.

J. P. Holman

Mechanical engineers handbook

Edited by Myer Kutz

Wiley-Interscience, 1986

Comprehensive handbooks, such as this new addition, must out of necessity, buy compromises between subjects covered, depth of treatment and amount of data presented in order to keep the number of pages, the thickness and weight of the tome reasonable. The purpose of a handbook is to serve as an up-to-date reference work for both the practicing engineer and student. The handbook must both be authoritative and cover the topics in a comprehensive manner, providing the needed technical detail for the practicing engineer so that he does not have to search for the needed data or information in textbooks. This handbook is directed to the broad-based mechanical engineer, ranging from the designer of machines to the operator of plants, to the manager of manufacturing operations. The book covers the mechanical, fluid and thermal fields of mechanical engineering with reasonable balance. The manufacturing and management aspects of the mechanical engineer's work receive a somewhat greater emphasis than we find in competing handbooks, in recognition of this country's current concern with our declining productivity posture vis-à-vis foreign industry.

In reviewing the handbook chapter-by-chapter, I find, not surprisingly, that some chapters are exceptionally informative and complete, such as the lubrication chapter and the chapters on dynamic systems and controls. The chapters on fluid mechanics, solid mechanics, thermodynamics and heat transfer are useful in a textbook sense, but lack data; for example, the Fluids chapter should have tables and plots on viscosity, density, etc. for different fluids and shock tables. On the other hand, the chapter on steel, although informative in a textbook sense, lacks useful strength data which is in distinct contrast to the chapters on nickel alloys and titanium alloys. I find the lack of data on screw threads, threaded fasteners, pipes, tubes and other machine elements particularly annoying. Some of the chapters lack a bibliography to provide guidance for further study, e.g., noise measurement and control.

The book differs from the classical mechanical engineering handbooks in its broader sweep of topics and its tendency to neglect important details for either the practicing engineer or the engineering student. However, it contains much useful information of modern mechanical engineering, i.e., computer usage and interfacing, modern analysis methods, and modern manufacturing methods. The book is attractive and carefully prepared as well as very readable, although it lacks the excellent technical illustrations so useful in *Mark's Handbook*.

As a practicing engineer, would I buy and frequently use the book? My answer is yes, but I would keep my latest copy of *Mark's Handbook* nearby.

G. Reethof

Aerothermodynamics of low pressure steam turbines and condensers

M. J. Moore and C. V. Sieverding

Hemisphere Publishing, New York, 290 pp., $59.95 (US and Canada)

The design of a low pressure steam turbine is one of the most challenging aerodynamic problems one can consider due to the coexistence of many fluid mechanics disciplines. The flow velocities vary from subsonic to supersonic, the flow is highly 3-dimensional, viscous effects significantly influence overall performance and the flow consists of a two-phase medium. Further, high efficiency performance is a major consideration which leads immediately to the need for high accuracy in the computation of all aerodynamic phenomenae.

This book is a collection of edited lectures presented at the von Karman Institute, organized into eight chapters which collectively address all the significant aerodynamic design areas encountered in the design of low pressure steam turbines and condensers. The articles are authored by experts renown in their field from Europe and the United States. About half the authors are associated with equipment manufacturers, while the other half come from universities or the British central research organization, CEGB. The book is logically organized and very readable.

In the introductory sections, in the areas of low pressure turbine design and condenser design, an overview of the primary design considerations are given. These introductory sections, although somewhat oriented toward the authors' organization, commercial strategy and experience, are nevertheless very helpful in identifying and defining the considerations which a turbine or condenser designer must deal with. These sections would be very helpful to a turbine or condenser designer, particularly those with limited experience. The remaining sections are discussions of state-to-the-art methods in particular areas such as through-flow design methods, calculation of 3D inviscid flows, and calculation of 3D viscous flows. Of particular interest are several sections dealing with the computation of wet steam flow and the development of instrumentation to be used for obtaining measurements in wet steam. Also of special interest are sections dealing with

the aerodynamic design of the stationary low pressure components, including the turbine inlet section and the exhaust system, as well as the condenser. These components are often designed more on the basis of test data and art rather than on theoretical considerations.

Although there are other books which address various aerothermodynamic problems encountered in the design of low pressure steam turbines and condensers, this is one of the few books available which puts virtually all aspects together under one cover. This book is a very good state-of-the-art review and should be a welcome source of information for any researcher or designer working in the area.

K. E. Robbins

Instrumentation for complex fluid flows

Nicholas P. Cheremisinoff
Technomic, Lancaster, Pennsylvania, 1986, 374 pp., $49

This book is addressed primarily to graduate research students and laboratory researchers in the fields of aeronautics, chemical, civil, and mechanical engineering and geophysical fluids mechanics. The level of the book is that of a survey, with many laboratory methods for the quantitative measurements of fluid flow being described at an introductory level. The author is particularly interested in methods for measurements of turbulence and two-phase flows and certain interfacial flow phenomena. The book also discusses signal processing and laboratory automation in chapters that supplement the main topic of sensor techniques for measurement of fluid velocity, particle size and motion, and interface motion.

The level of detail is sufficient to introduce the basic principles of the instruments and the breadth of coverage is quite good. The book does not, however, go into detail enough to acquaint the reader with an intimate knowledge of the techniques. Moreover, there are often fundamental errors in statements which could be very misleading; for example, descriptions of certain phenomena sometimes indicate trends exactly opposite to those that are known to occur. These mistakes may cause an unfamiliar reader great difficulty. The reader would be well-advised to use the book primarily as an introductory survey to become acquainted with many different types of measurement techniques, and pursue details of these techniques from other sources. Despite the errors, the book is worth having on one's shelf.

R. J. Adrian

The chemical engineering guide to heat transfer, volumes 1 and 2

Edited by Kenneth J. McNaughton
Hemisphere Publishing, vol. 1: 362 pp., $49.95; vol. 2: 300 pp., $49.50

This two-volume set is a collection of reprints from *Chemical Engineering*. The reprinted articles date from 1979 to 1985, and cover a very wide range of heat transfer topics including basic equipment such as fired heaters, boilers, refrigeration systems, cooling towers, agitated vessels, and dryers. More exotic subjects addressed include heat pipes, hydraulic turbines, solar ponds, and microwave dryers. There are also topics which some heat transfer engineers might regard as "gatecrashers," namely steam traps, steam tracing, and insulation.

The main emphasis, however, is on heat exchangers and, especially, shell and hube heat exchangers.

The two substantial, well-printed, solidly bound, quarto-sized volumes are entitled respectively "Plant Principles" and "Equipment," titles which are rather vague and, as it turns out, somewhat irrelevant as regards the contents. Classifying such a large and diverse range of articles must be quite a difficult task, but classify them the editor does, fairly successfully, under six headings in each volume: Heat Exchangers, Shell & Tube Equipment, Design, Heat Recovery, Steam, and Cost in volume 2; Boilers, Cooling, Heating & Insulation, Condensers, Dryers, and Other Equipment in volume 2.

Those familiar with *Chemical Engineering* will know that it specializes in articles of an intensively practical nature written by practicing engineers who are anxious to share many years of hard work and often painful, experience with colleagues. Prospective readers looking for good heat transfer science will, therefore, be disappointed. Indeed, the articles in this collection which fall down flattest are those where the authors are attempting to be at their most scientific. For example, several articles on calculating multipass log mean temperature differences are largely taken up by the tedious algebra found in many standard texts.

Sympathy, however, must be extended to the many Hewlett Packard HP-67 buffs contributing to the book who labored long and hard, programming thermal design methods from Kern and others, only to find their efforts overtaken by the mid-eighties generation of personal computers and associated sophisticated software.

Where the books really do score, however, is in the collected experience of specialists who, over the years, have had to select, design, buy, construct, operate, and troubleshoot all kinds of heat exchangers and other equipment. Much of this hands-on experience is never put in writing except in magazine articles, and is unlikely to be found in the more academic texts.

Also hard to find elsewhere, and very useful, are the articles on cost estimation. Although the information contained in these is now a few years out of date, the application of a judicious factor to account for recent, mercifully small, rises in costs should render these estimation methods still very helpful.

This set is, then, very much for the practicing engineer in the oil and gas industry, and probably more for the operating company generalist rather than the contracting/manufacturing specialist.

C. Norman