

longest section, 16 pages, deals with the wetting tensiometer for obtaining contact angles. This uses a motor-driven plate, slowly moving vertically into and out of a liquid. The existence of a significant spreading pressure of adsorbed gas films on solids which are partially covered with a liquid is asserted. Chappuis stresses that this conclusion disagrees with the views of others such as Zisman, Good, Fawkes, and Neumann.

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**Heat Exchangers** (Edited by S. Kakac, A. E. Bergles and F. Mayinger), Hemisphere (McGraw Hill), New York (1981), 1131 pp., \$95.00.

The book *Heat Exchangers* edited by Kakac, Bergles and Mayinger, represents an archival record of the NATO Advanced Study Institute, held in 1980. It is divided into eight main parts: classification of heat exchangers; thermal hydraulic fundamentals survey for both single- and two-phase flows; design considerations, concerning rating, sizing and optimization of heat exchangers; current status regarding advanced surface selection and performance; operational considerations regarding transient response, dynamic behavior, vibrations and fouling; unresolved problems and suggestions for further research and development.

In the first part, classification of heat exchangers is addressed. It is a self contained chapter, illustrating most of the common heat exchangers encountered in process industry. It can be utilized as an introductory chapter for any course on heat exchangers, even for undergraduate students.

The second and third parts deal with the thermal hydraulic fundamentals of air cooled, staggered and in line tube bundles, yawed tube bundles, compact, concurrent flow double pipe, plate and fluidized bed heat exchangers. These chapters seem to be aimed towards heat transfer engineers in industry since it assumes an *a priori* deep knowledge of the foregoing subjects. It suggests, in most chapters, cook-book formulae typical to a handbook and provides no easy way to comprehend basic principles of the given data.

The fourth part deals with heat exchangers design. By far this part of the book seems to be the most significant. Both numerical and analytical approaches are illustrated for the most commonly used heat exchangers. It lacks, however, a discussion of cost effectiveness. This very important topic seems to be ignored almost totally in the book.

The fifth part presents a short up-to-date survey on advanced surface selection and performance. The general principles and direction of current research is provided in two introductory chapters on single- and two-phase heat transfer augmentation.

Guidelines and words of caution are included in a subsequent chapter on the application of heat transfer augmentation techniques. The backbone of these chapters is a full and useful list of numerous references. However, only a brief discussion is made on the various techniques and no real insight is provided. The reader is repeatedly referred to other sources for further discussion and only one chapter describes in full a novel technique to enhance heat transfer by a new form of plate fin.

Operational considerations are presented in the sixth part. This part is addressed to some of the most difficult aspects of heat exchanger practice, namely, transient response, dynamic behavior, vibration and fouling. Consequently, it is often overlooked by engineers. Since this book seems to be aimed mainly towards design and field engineers in the process industry, incorporation of this chapter in the book is vital.

One must make some comments on the insufficient work invested in the editing of a book so highly priced. Some small chapters could easily be omitted with no effect on the book's content. Some chapters are redundant (for example, two chapters on fouling of heat exchangers), some are addressed to very particular problems, some rely upon references from a particular source.

There is no systematic way of presenting nomenclature, references and captions of figures. Consequently, the readability of the book is somewhat reduced.

However, there is no doubt that the book provides the engineer in process industry as well as the teacher in the university with a useful, updated and comprehensive reference on heat exchangers.

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