Int. J. Heat Mass Transfer. Vol. 11, pp. 937–938. Pergamon Press 1968. Printed in Great Britain

BOOK REVIEWS

A. P. FRAAS and M. NECATI OZISIK, **Heat Exchanger Design,** 386 pp. John Wiley, New York (1965).

THE AUTHORS intend the book to "help practising engineers apply their formal backgrounds in fluid flow and heat transfer to the practical problems posed by the design, selection, testing or installation of many sorts of heat exchanger". The heat exchangers cover primarily a variety of shell and tube, plate–fin and finned tube units for industrial, aerospace and nuclear applications, with, to a lesser extent, packed bed units and cooling towers. Conventional steam boilers are described briefly but furnaces are outside the scope of the book. It is assumed that the reader has attained some knowledge of basic heat-transfer, fluid flow and types of exchanger from the familiar text books.

It is not intended to provide refined design data or "short-cut" design methods for the thermal designer or "rating engineer". Previously published heat-transfer and fluid-flow data are given for boiling, condensing and no-phase-change applications, but these serve chiefly to emphasize the important basic concepts so that the subsequent design examples can be understood more easily. The various types of heat exchanger are described and illustrated in some detail and this is supported by previously published information concerning fabrication, mechanical design, cost, flow-distribution problems and testing, both performance and structural, but is not intended to be a comprehensive manual for the structural designer. At the end of each chapter is a useful bibliography.

Having discussed thermal and structural design considerations, the authors provide a detailed analysis and thermal calculations for the design of sixteen different heat exchange units including such varied applications as a shell-and-tube marine oil cooler, steam generators for pressurized-water and gas-cooled reactors, space vehicle radiator and molten salt exchangers. Before presenting the design calculations in concise tabular form, the authors analyse each problem in detail; the function of the unit, the limitations imposed by fouling, corrosion, pressure, temperature, size, weight, materials of construction, fabrication problems, cost, etc. are discussed so that the basis of the final design can be appreciated more readily.

The text includes 106 photographs and drawings plus seventy-five charts and tables while at the end is a Handbook of 108 pages, representing nearly one-third of the book. Here a careful selection of published information provides typical heat-transfer, pressure-loss and physical-property data; but, in keeping with the practical nature of the book, there is much useful data covering tubeplate and bundle geometry, tubes, pipes, finned tubes, corrosion, stress analysis and cost.

It should be noted that the design of finned-tube air-cooled exchangers is not featured, despite the fact that cost curves and an illustration are given. Numerous air coolers have been installed in petroleum refineries in recent years, as an alternative to conventional water-cooled tubular exchangers when the available cooling water is scarce, costly, fouling or corrosive. The design and economics of air coolers versus water-cooled units is an interesting problem for the process engineer or designer. The "balance" of the book would have been improved by the inclusion of a self-contained section entitled, for example, "Material selection", covering corrosion, welding and other metallurgical considerations, together with the expansion of the section dealing with vessel structural design. Of particular interest are the sections dealing with vibration, noise and flow-distribution problems, because these relatively mundane factors can be overlooked by even experienced designers working against tight schedules in a competitive world. As a well-presented background to problems involving boiling and two-phase flow, the chapter entitled "Boiling heat transfer and flow stability" is notable.

There is a need for a single book dealing with the interrelated subjects of heat-exchanger thermal and structural design and this book will help to satisfy that need, although the reviewer would have preferred to see the structural-design data enlarged. The book will benefit the student, who wishes to probe more deeply into the subject, and also the inexperienced designer, both of whom could learn much from the authors' clarity of presentation alone.

E. A. D. SAUNDERS

F. H. H. VALENTIN, **Absorption in Gas–Liquid Dispersions: Some Aspects of Bubble Technology.** 212 pp. E. and F. N. Spon, London; Barnes and Noble, New York (1967). Price 55*s*.

THIS is a very valuable and timely book. Although a few review articles on bubbling processes have been published, knowledge gained over the past 15 years has largely remained available only from original papers scattered throughout the literature. Also, to many people, the field of gas–liquid dispersions must have appeared particularly difficult and confusing. So much so in fact that although a book on this topic has long been desirable, it has been a daunting subject on which to write. Fortunately Valentin has been prepared to take up this task. As Head of the Chemical Engineering Division of the Warren Spring Laboratory, which has made many notable contributions to the field of bubble technology, he is uniquely placed to provide an authoritative account.

The book opens by considering the formation of bubbles at a single orifice and then proceeds to the behaviour of