Book Reviews

Heat Exchangers

Compact Heat Exchangers. By W. M. Kays and A. L. London. McGraw-Hill Book Company, Inc., New York, N. Y., 1958. 156 pp. $6.

REVIEWED BY E. R. G. ECKERT[1]

THE book presents friction factors and Stanton numbers for 88 heat-exchanger configurations together with a text explaining the parameters and their use in design calculations. This extensive compilation is the result of research which has been conducted chiefly at Stanford University since 1945. The book contains the following chapters: 1 Introduction; 2 Heat exchanger analysis; 3 Effects of temperature dependent fluid properties; 4 Abrupt contraction and expansion, pressure loss coefficients; 5 Analytical solutions for flow in tubes; 6 Summaries of analyses and experiments for simple geometries; 7 Experimental methods; 8 Heat transfer surface geometry; 9 Heat transfer and flow friction design data.

Chapter 2 contains tables and diagrams for the effectiveness of heat exchangers with various flow arrangements. The designer of heat-transfer equipment can either use the results in Chap. 9 if his geometry is identical with one of the investigated surfaces, or he can deduce heat-transfer performance and pressure loss from the information contained in Chaps. 4 and 6. The presentation of the data for a wide variety of geometries on a unified basis is of great help to the user; it makes, however, some arbitrary decisions unavoidable. Some of the following remarks have to be considered in this light. Others concern a few minor shortcomings in the text which can easily be corrected in a new edition.

The Prandtl numbers and heat conductivities for air contained in Table 25 and Figure 114 are too small, especially at higher temperatures, according to recent investigations. Nothing has been mentioned in Chaps. 5 and 6 on the circumferential distribution of the wall temperature in the rectangular ducts. Recent research has shown that for some duct shapes even average heat-transfer coefficients depend strongly on this boundary condition, especially in laminar flow. Two methods are today primarily in use to account for a temperature dependence of the properties appearing in the dimensionless parameters—to introduce the properties at a reference temperature, or to include a temperature ratio in the relation describing Nusselt number and friction factor. The reference temperature method has proved its value in high-temperature heat transfer for boundary-layer flow and it has also been successfully applied to duct flow. The critical remarks about this method contained in the book appear, therefore, unjustified. The term "number of exchanger heat transfer units" and the notation NTU appear somewhat lengthy and may even lead to confusion in equations. This reviewer feels that it would be very desirable to replace it by a simpler name and notation.

The reports and publications on which this book is based are being used extensively by companies manufacturing heat-exchanger equipment. Design engineers will therefore certainly welcome that this valuable information is now conveniently available in book form.

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Structures

Hyperstatic Structures, Vol. 1. By J. A. L. Matheson. Academic Press, Inc., New York, N. Y., 1959. $15.50.

REVIEWED BY D. C. DRUCKER[2]

THE student of the theory of structures taught in the conventional way as a myriad collection of unrelated theorems and techniques will welcome this text. As the author states, "the purpose of this book is to show how all these theorems fit together into a coherent pattern," some based on equilibrium and some on compatibility approaches.

A knowledge of the elementary theory of structures is assumed and the principle of minimum potential energy for conservative systems is chosen as the starting point. Although inelastic action is then somewhat troublesome to handle and the reviewer much prefers to start instead with the general theorem of virtual work, there is no question but that this is one of the outstanding texts on structures written in English.

The main part of the book consists of the interrelated sections on Castigliano's, Bettis', Mohr's, and Maxwell's theorems, moment distribution, slope deflection, and plastic collapse techniques, and the discussion of trusses, frames, and arches. They are supplemented by a chapter on elastic stability written by N. W. Murray, and a chapter on matrix and computing methods by R. K. Livesley.

Volume 2 will contain worked examples and problems for solution.

Mechanisms

Mechanism and Motion. By K. H. Hunt. John Wiley & Sons, Inc., New York, N. Y., 1959. Cloth, $5^1/_2 \times 9$ in., xiv and 114 pp., illus. $4.25.

REVIEWED BY BURTON PAUL[3]

IN REFERENCE to the study of mechanisms the author states in his preface: "This small subject has been becoming smaller; it has been suffering a decline at a time when nearly every part of the engineering curriculum has been going through a process of active rationalization. The work in kinematic analysis of mechanisms is often uninspired and antiquated. . . ." This quotation reflects a state of affairs equally true of the situation in this country as it is of the British universities, for which the book has been primarily designed. Therefore any attempt to correct the situation will be warmly welcomed by all those seriously concerned with the teaching or practice of mechanical analysis and design.

The book commences with a chapter on vector methods and consistently uses Gibbsian vector notation in the following chapters which cover the vector equations of relative motion, velocity and acceleration images, criteria of freedom and constraint, analysis of specific plane mechanisms, and space mechanisms. The concluding chapter deals with additional topics in plane

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