BOOKS

Mechanics of Viscoelastic Fluids, Stefan Zahorski, Martinus Nijhoff Publishers, 1982, 336 pages, $69.50.

This text presents as its goal "an exposition of the fundamentals of the mechanics of viscoelastic fluids and its relations with modern continuum mechanics". In it, the author has attempted to blend theoretical tensor representations with experimental rheological studies. The result is a text that is somewhat specialized; being most appropriate for a doctoral level course in Chemical Engineering, or a doctoral level course for Engineering Mechanics majors, or as a resource for industrial researchers involved in rheological activities. The mathematical approaches are beyond the competence of most undergraduates and masters level students. References are reasonably well done. However, there is a difficulty in that most (with the exception of the author) end in 1979 or earlier. Hence, there is a large time gap in the literature cited. An appendix summarizing the more recent literature would be helpful. Also, an author index would assist the reader. The author offers some positive features as, for example, his discussion of invariance and objectivity which nicely summarizes some of the less well known features of viscoelastic fluids. On the other hand his chart classifying viscoelastic fluids is very difficult to decipher and is confusing. The use of experimental data is beneficial. However, a better and expanded use of the experiments cited would have helped this approach. Overall, the text does a good job for a limited audience.

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Analysis and Evaluation of Extended Surface Thermal Systems, Allan D. Kraus, Hemisphere Publishing Co., 1982, 560 pages, $69.95

This book is a comprehensive treatment of steady state conduction heat transfer in arrays of extended surfaces, including cascades, clusters, and parallel arrangements of fins and spines. Entirely mathematical in nature and borrowing generously from the concepts of network analysis and graph theory, the book is unique in its coverage and approach. The subject is developed from the basic concepts straight through to a program listing of the generalized treatment, well-larded with comments and warnings to the user.

In a formal sense, all the reader needs to bring to this book is a need for complex extended surface analysis (e.g., for cooling electronic equipment or tracing heat dissipation in a complex structure) and the rudiments of matrix algebra. But to derive maximum benefit and protect himself, the reader must also keep in mind the severe restrictions and consequent departures from real world conditions implied by the formulations (steady state, constant and uniform convective heat transfer coefficients, negligible or constant contact resistances, uniform cooling medium temperature). It is strictly for the specialist and the reference library, but there it will stand without much competition.

The book is rigorously—almost ruthlessly—organized and detailed. It is mostly reproduced from camera-ready typed mats with generous spacing, very few typographical errors, and adequate if somewhat crude drawings. (Some shading got lost in reproduction.) In Chapter 10 and Appendix B, some material is reproduced from inferior computer printout and requires concentration to read.

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Applied Heat Transfer by V. Ganapathy 1st. Ed., PennWell Publishing Co., P.O. Box 1260, Tulsa, Oklahoma 74101, USA (1982) pages 667, $69.95

The purpose of the book is to give simple and handy methods for the design of various heat transfer equipment used in the process and power industries, with the aid of numerous charts, nomograms and solved examples in each chapter. It has two parts, one containing 6 chapters taking up 424 pages and the balance containing 12 appendices.

Chapter 1 "Fuels and Combustion" (45 pages) covers the characteristics of various fuels and combustion calculation using the mole and Btu methods, calculations of the adiabatic flame temperature, economics and efficiency using several examples.

Chapter 2 "Boiler Furnace Design" (62 pages) discusses the furnace types and construction as well as the influence of fuel (oil, gas, coal or combination fuel) on the furnace design. Heat transfer and pressure drop in 2-phase flow and boiling are also discussed. However, no mention is made of the complicated nature and the current intense research interests in these fields which would have, sort of, cautioned the designer that the field is still wide open and the designs in some special situations may be widely off. Only simple "how-to" correlations are presented which may well have been the intention of the author.

Chapter 3 "Superheater and Reheater Design" (41 pages) discusses the important problem of steam temperature control since it affects the performance of steam turbines. Design and performance (rating) calculation methods are then discussed.

Chapter 4 "Waste-Heat Recovery Equipment Design" (130 pages) is the longest chapter. Waste heat recovery in various process industries, such as H_2, H_2SO_4, HNO_3, etc., is discussed and the design methods are presented.

Chapter 5 "Heat Exchanger Design" (110 pages) deals with shell-&-tube heat exchangers using plain or finned tubes, air-coolers and plate heat exchangers. Many books have been written on such topics and the depth upon which the open literature is available does not appear to have been surveyed. Examples using Kern and Bell methods are given. Air-cooled heat exchangers are covered in only 10 pages, so the details are missing. In the case of the plate heat exchangers, it should have been mentioned that the actual design correlations are proprietary and that those available openly are only for the specific units made by specific companies and do not apply to the whole range made by even that company, to say nothing about the whole field. In the index of this chapter, there is an error of 2 in the pagination of the subheadings.

Chapter 6 "Fired Heater Design" (37 pages) deals with the design of fired heaters, furnaces, platen superheaters, economizers, etc.

There are 12 appendices covering properties of flue gases and their estimation, properties of fluids (non-flue gases and liquids); estimation of heat transfer coefficients in tubes, in cross-flow and also non-luminous heat-transfer coefficient; design calculations using finned tubes; calculations of pressure and draft loss, LMTD correction factor and efficiency, tube thickness, and flow induced vibrations. Units conversion factors are also given.

This is a good book with lots of charts, nomograms and solved examples in the chapters and in many appendices. A user can come up with good design estimates in most cases using the simple procedures illustrated. Amongst the drawbacks are the incomplete references where often the volume and/or page numbers of a journal article have been left out. Some references, such as No. 14 on p. 386 are old, newer editions having been released in the late Seventies. A serious drawback is the lack of references for many important design correlations. A cross-check becomes difficult if a user wishes to find the limitations on their application or simply double check the exponents such as 0.681 or 0.8267 appearing in some correlations.

Despite the above drawbacks, this book is a very welcome one and should find a place in all the companies designing, fabricating and/or using such equipment. The price may reduce the enthusiasm of the practicing engineers to own a personal copy.

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