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BOOK REVIEWS

M. N. IVANOVSKII, V. P. SOROKIN and I. V. YAGODKIN, **The Physical Principles of Heat Pipes** (translated by R. Berman and G. Rice). Oxford University Press, New York, 1982.

THE NUMBER of books dealing with heat pipe technology is not large and therefore a new volume in this field is to be welcomed. This book is a translation of a Russian text, which was originally published in 1978 and this fact inevitably dates some of the contents. The Russian authors work at Physicoenergetics Institute of the State Committee on the Use of Atomic Energy and to a great extent this background is reflected in their selection of material.

The book starts rather inauspiciously with an unnumbered introductory chapter with numbered sections, 1.1, 1.2, etc. Then follows 'Chapter 1' with, of course, identical numbered sections 1.1, 1.2, etc.—a slight editorial slip-up here, I think.

In the following chapters the theory of heat pipe operation is considered in detail with approximately one third of the book concentrating on the hydrodynamics of liquid/vapour systems. Experimental results are also included to support the theoretical predictions. The majority of the results derive from tests with liquid metals, particularly sodium, and are therefore in a rather specialised field.

An appendix is included to demonstrate calculation methods for heat pipes. The appendix is rather unsatisfactory as it repeats some of the material presented in the previous chapters. The authors stress the advantage of using the computer for calculations and include several of their own programs as illustration. The programs are difficult to understand with no explanatory statements included in the listings to assist the uninitiated. It would have been far better to illustrate the calculation procedures with specific worked examples and leave out the program details.

Apart from these criticisms, the book is difficult to fault; the translation is excellent and reads very well indeed; quality paper, a clear typeface and good binding result in a very attractive book. A quality product from Oxford University Press at a quality price of £30.

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B. V. KARLEKAR and R. M. DESMOND, **Heat Transfer.** West Publishing Co., St. Paul, Minnesota, 1982, 2nd edn., xiii + 799 pp. + solutions manual, 417 pp.

THIS book is designed for a first-level undergraduate course in heat transfer, that can be used for a single course given in a quarter or a semester system, or as a two-course sequence in a quarter system.

The contents are organized in 11 chapters, with the following headings:

1. Introduction to Heat Transfer
2. Steady-state One-dimensional Heat Conduction
3. Two-dimensional Steady-state Conduction
4. Transient Heat Conduction
5. Numerical Methods in Heat Conduction
6. Thermal Radiation
7. Fluid Flow Background for Convective Heat Transfer
8. Forced Convection
9. Natural Convection
10. Heat Transfer with Change of Phase
11. Heat Exchangers

Appendices: Appendix A–H
Answers to Selected Problems
Index.

Homework problems (both in English Engineering System and SI units) and references follow each chapter.

Chapter 1 presents a thorough introduction to the general subject, including conduction, convection, radiation, energy balance and the First Law of Thermodynamics. Chapter 2 deals with one-dimensional heat conduction, including systems with heat sources, a summary of thermal resistances, and heat transfer from rectangular, triangular and circumferential fins. Although not implied by the title, this chapter presents also the three-dimensional heat conduction equation. This equation is subsequently reduced to its one-dimensional form, and is applied to two of the one-dimensional problems considered earlier. From the teaching point of view this is useful, as it shows how the reduction process leads to the same differential equation, obtained by purely one-dimensional considerations.

Chapter 3 discusses two-dimensional conduction, including graphical analysis and analytical solutions. Chapter 4 contains material on transient conduction including chart and analytical solutions for plane wall, heat-balance integral and two- and three-dimensional transient systems. The next chapter presents numerical methods in heat conduction and is particularly well documented. It includes sample programs for computing the temperature distribution in a radial fin, for which the heat-transfer coefficient is a function of temperature, for a rectangular-plate problem and for a one-dimensional unsteady heat-conduction problem.

Chapter 6 is devoted to radiation, and Chapter 7 provides a fluid flow background to forced convection (laminar and turbulent flow in tubes, flow over a flat plate, integral and differential analysis of the laminar boundary layer, flows across a cylinder, a sphere and across banks of tubes). Chapter 8 is devoted to forced convection, including the presentation of design correlations for forced convection through tubes, over flat plates, across a tube and across tube banks. Chapter 9 deals with natural convection, presenting the integral method of solution and the differential formulation of the vertical wall problem; and design correlations for vertical and horizontal flat plates, inclined surfaces, rectangular blocks, spheres, vertical and horizontal cylinders.

Chapter 10 introduces the subject of heat transfer with change of phase (filmwise and dropwise condensation, boiling heat transfer) and Chapter 11 the analysis of heat exchangers (parallel-flow, counter-flow and multiple-pass heat exchangers, heat exchanger effectiveness, fouling factors for heat transfer surfaces and variable overall heat-transfer coefficient). The 13 appendices are devoted to units and dimensions, conversion factors and property values given in both English and SI systems of units. Answers to selected problems and a subject index close this book.

I particularly appreciate the way the authors have presented their material starting from specific situations, followed by their generalization. This philosophy is stated by the authors in the Preface to the First Edition and is followed throughout the text. I also share the authors' feeling that an engineering student who reads the material for the first time is lost, unless he is told beforehand the objective of the particular section and the ways or steps involved in achieving it. The text design quality is good, the book is very well printed and illustrated, and the sample problems as well as the homework problems are well thought out and interesting. There is also a hand-