

Volume 3 on Thermal and Hydraulic Design is probably the most difficult to present because, in contrast to Vols 1, 2, and 5 which are scientific information, Vol. 3 includes general discussion of the approach to design and methods used by designers and practical aspects. But this volume is likely to be of particular value to all users. The difference is apparent in the presentation, Vol. 3 consisting of separate articles by a number of experienced engineers each giving their own views, with a certain amount of overlapping. The 'art' aspect of design first appears here. A wide range of types of heat exchangers is described, and specialists will find interest in general reading as well as in their own field. Many types are dealt with only briefly, as for example specialist boiling equipment, regeneration, and furnaces.

It would be interesting to have had more information from experienced designers on practical aspects of fouling, reliability, overhaul and maintenance, environmental effects and general experience of operation.

Volume 4 entitled Mechanical Design of Heat Exchangers, although similar to Vol. 3 in that it includes both theory and practice, is easier to present because much of it deals with design problems more familiar to engineers generally, such as choice of material, stressing, fabrication, testing, vibration. Several contributors give useful accounts of methods used, and included are some special types such as cooling towers and agitated vessels. The scope for future extension is considerable, especially if experienced authors from different industries and countries can be brought in.

Volume 5, on Properties of Fluids and Solids, is more straightforward and easier to present because it consists of scientific data, but it will be of great value especially since it includes many newer fluids. It brings together data not easy to find, and is certainly one of the most important parts. The layout is good, and the lists of references and index will be much used.

In conclusion, the handbook does credit to the team which conceived the project, and brought it to reality, a big task which must have involved a lot of time and effort.

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R. H. S. WINTERTON, *Thermal Design of Nuclear Reactors*. Pergamon Press, Oxford, 1981, 200 pp., £7.50.

This book, of about 180 pages, consists of two introductory chapters, six chapters dealing with the principles of thermal design and their application, and two final chapters dealing with peripheral issues.

The first chapter sets out the necessary reactor physics and the second describes the main reactor types, namely PWR, BWR, AGR and sodium cooled FBR, in sufficient detail to act as a foundation for the rest of the book. Both introductory chapters suffer from being short.

Of the six chapters dealing with the main theme of the book, three set out the groundwork of heat transfer and fluid mechanics and three deal with its application to 'fuel rod design', 'safety analysis' and 'core thermohydraulic design'. I think it is a pity that the groundwork is not based on the unified approach offered by the continuity, Navier-Stokes and energy equations; instead radial conduction and fluid flow are developed from first principles and forced convection is treated using the  $\pi$  theorem. No doubt, two-phase flows are adequately dealt with using this approach, and the author did not aim to cover numerical prediction methods for which the governing equations are necessary. However, forced

convection represents a significant part of the book and in my view is rather sterile because of the approach adopted.

The application of the groundwork is either by correlations or simple physical models. The reader is steered very well through the maze which the prediction of two-phase pressure drop often presents to the uninitiated, and some advanced topics are dealt with. The penultimate chapter deals with the arrangement of steam cycles and the final chapter with fusion reactors. Problems and answers are given in Chapters 3-9 and some useful physical properties are included in appendices.

On the whole I found this an interesting and provocative book, perhaps too provocative in a few instances because of statements and generalizations which would require much effort to verify. It should prove useful in teaching final year undergraduate and postgraduate students, with more rigorous but much less readable textbooks in support.

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W. W. DURGIN (Editor), *Flow: Its Measurement and Control in Science and Industry*. ISA, Vol. 2, 1981, 867 pp.

This book documents the proceedings of the second symposium on 'Flow—Its Measurement and Control in Science and Industry', held in St Louis, Missouri, 23-26 March 1981. The first symposium (Vol. 1) took place in 1971 and it was the stated intention of the present symposium to focus on advances over the intervening ten years.

The papers proper are preceded by summaries of invited lectures in the areas of: flow measurement standards; accuracy; real fluid effects; standardization; and there then follow various invited panel reports.

The main body of the publication comprises some 65 papers under the following headings:

1. Flow Characteristics and Fluid Velocity Measurement Techniques—covering basic flow measurements in closed conduits and velocimetry instrumentation.
2. Fluid Metering and Control Techniques—involving a range of flowmeter applications, e.g. a differential flowmeter to sense differences of 0.1 ml in 1000 ml, valves and control, and pulsating/unsteady flow.
3. Flow Measuring Devices—dealing with differential pressure devices, critical flow venturis/nozzles, turbine meters, two-phase flow measurements, electromagnetic and ultrasonic flowmeters.
4. Environmental Flow Measurement—covering open channel flow measurements, e.g. in flat water surface gradients, and measurements in 'internal' flows, e.g. mine regulators.
5. Standards, Traceability, and Facilities—calibration and methods relating to liquids and gases.

As one would expect, the essential drive of all the papers is the accurate determination of flow and velocity in a wide range of situations. A number of interesting and unusual flow problems are considered.

The whole publication would benefit greatly from an index since the reader will inevitably be seeking information on specific subjects.

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