BOOK REVIEWS

Standard methods of hydraulic design for power boilers

V. A. Lokshin, D. F. Peterson and A. L. Schwarz
New York, Hemisphere Publishing Corp, 1987, 345 pp., $52.50

The title of this book does not belie its content. The beautifully designed and excellently presented material comprises hardly more and certainly no less, than a set of formulae and associated graphs, charts, tables and nomograms of associated empirical data and experiential standard-practice assumptions, presented in a logical sequence. Fore-knowledge of the overall arrangement and of the detailed geometry of the plant under consideration is taken for granted. Accordingly, this is certainly not a book for the student seeking to enhance this understanding of the fundamentals of two-phase flow. Rather, it is a very well-presented set of design procedures of the sort that should reside in all design offices. As such, it will clearly be unacceptable *in toto* to established businesses, who themselves must already have their own comprehensive techniques and procedures. However, such is the wealth of detail in this book, that they might find data of interest and, moreover, find some topics that give "food for thought" with respect to aspects of design for which it is feasible to attempt to establish design rules.

The presentation of formulae, some of bewildering comprehensiveness, but nevertheless always clear, occupies about half the book. Topics include calculation of pressure drops, safety of steam boilers, design of natural-circulation boiler units, design of once-through boiler units, design of multiple forced-circulation boiler units, calculation of feedwater economizers, design of steam superheaters, design of controls for steam superheaters (that title is misleading; little more is covered than the determination of the ranges over which parameters must be controlled), and design of pipelines.

Thermal aspects are but briefly touched upon, in a short appendix entitled "Determination of absorbed heat fluxes for boiler elements and tubes" and with the qualification, "In the case of discrepancies between the recommendations provided in the present Appendix and the generally-accepted standard heat transfer calculation techniques, the latter should be followed." A second short appendix provides general recommendations for the design of hydraulic circuits but again with qualifications, "... the recommendations cannot provide a solution to any particular problem, or save the designer the trouble of looking for individual solutions to a series of problems in every specific instance." The final appendix (some 74 pages long) presents very complete calculations illustrating the practical application of some of the material presented in the body of the book. The book is rounded off by a comprehensive set of steam tables and allied data, and a collection of nomograms which assist in the application of some of the formulae.

There's no denying that this is an impressive and attractive book. If accepted for what it is, namely a source of totally unreferenced information concerning the calculation of the hydraulic aspects of boilers and their components, then it could provide a sometimes very useful source of reference. In addition, the very items for which formulae are provided can serve to remind the designer of considerations which may be important to him when he applies his own techniques and procedures. Notably, each chapter contains a section on safety.

R. D. Tyler

Flow induced vibration of circular cylindrical structures

Shoei-Sheng (S. S.) Chen
Hemisphere Publishing Corp., Washington D.C., 1987, 464 pp.

This is the most authoritative, complete and well-written book on the general subject of flow-induced vibration of single tubular elements as well as tubular clusters and structures in single phase fluids. A virtual "must" for the serious student, researcher, as well as designer of system components subject to flow-induced vibration, it represents the summary of an extensive research program at the Argonne National Laboratories since 1967.

The prime merit of this book is that it summarizes the results of extensive research of the past two decades, which are otherwise scattered in individual papers and symposia (some of which are hard to obtain) and organizes this material in a uniform entity. The material is presented in 11 Chapters and three Appendixes. A brief Introduction (Chapter 1, 17 pages) covers typical examples and basic mechanisms of flow-induced vibrations.

Chapters 2, 3 and 4 deal with the vibration phenomena in "quiescent fluids" for single cylinders multiple cylinders and circular shells respectively. Fluid inertia and fluid damping are discussed in great detail. Chapter 5 and 6 deal with "axial flow" effects inside and on the outside of single tubes and tubular clusters.

Tube vibration in "crossflow" is probably of the most general importance. It is also the most difficult one to predict due to the variety of excitation mechanisms, which include turbulent buffeting, vortex shedding, dynamic instability and acoustic resonance. These subjects are covered in Chapter 7 (single cylinder), Chapter 8 (cylindrical arrays) and Chapter 9 (two cylinders). Fluid elastic instability, the prime cause of tube vibration in baffled flow (shell and tube heat exchangers and similar flow systems), is covered in great detail in Chapter 10. The prediction methods for the critical flow velocity and the respective "stability maps" presented in this chapter are now recognized as standard best practice.

Chapter 11 offers brief instructions to apply the methods in practical design. Appendixes A, B and C contain the mathematics which would have otherwise disrupted the text. In conclusion, this book will remain a classic reference for a long time.

J. Taborek

Heat transfer of finned tube bundles in crossflow

J. Stasiulevicius and A. Skrinska, edited by A. Zukauskas and G. Hewitt
Hemisphere Publishing Corp., New York, 1988, 224 pp.

The book is published within the series *Experimental and Applied Heat Transfer Guide Books*. It is the translation of a book with the same title in Russian, sixth in the series "Thermophysics of the Academy of Sciences of the Lithuanian SSR, Mintis, Vilnius, 1974.

This book is concerned with heat transfer and drag for tubes with high circular and continuous spiral fins only. It is more than a report on experiments but it is not actually a guide book on the whole field as suggested by its title.

The authors carefully collected and reproduced everything they could find from the literature on circular fins,

starting with the conduction of heat in a finned tube through the effect of the thermal conductivity of the tube supporting the fins up to the variation of the heat transfer coefficient around the circumference of the fin.

They describe in detail their experimental arrangement and the extensive experimental study with bundles of tubes with spiral fins at Reynolds numbers of the flowing air from 10^4 to 10^6. The effect of fin geometry on heat transfer and hydraulic drag was investigated with 12 staggered bundles. The effect of bundle configuration was studied with 9 such bundles. The nonuniformity in distribution of heat transfer over a fin surface at high Re was investigated experimentally on tubes with spiral and circular fins, placed in the first and then in the fifth longitudinal row of a bundle, respectively.

The great scientific value of the book lies in the tabulated experimental results which are given in the Appendix. The resulting correlations for heat transfer and pressure drop for turbulent single phase flow through bundles of finned tubes were published in 1983 by Zukauskas and coauthors in the well known *Heat Exchanger Design Handbook* from Hemisphere.

It is a good book for specialists in heat transfer. Well informed people have worked with the contents since 1974 because the Russian language is not a very high barrier. Now this material is also available to people who don't want to take the trouble to interpret experimental results which are described in a foreign language. Only a few subscripts that are not translated will confuse them.

V. Gnielinski

Flow visualization IV

Edited by Claude Veret
Hemisphere Publishing, New York, 918 pp., £149.95

The International Symposium on Flow Visualization is one of a number of specialty conferences that seem to be currently in vogue. This is the fourth of a series, held in Paris in August 1986, and has sustained a record that attests to its success and is evidence of a burgeoning activity in an important field.

Experimental techniques for providing a visual image of the flow have always formed a natural adjunct to more conventional means of gathering data. What gives rise to this present explosive interest in flow visualization is a capability of quantifying the basically subjective analysis through the power of digital processing and analysis. Coupled with this are the relatively newly discovered techniques associated with lasers and holographic imaging to go along with the more conventional approaches, such as interferometry and Schlieren methods. The researcher who wishes to exploit flow visualization now has at hand a formidable array of techniques. The results achieved, as quick perusal of this volume will show, can be astonishingly useful and very often beautiful. There is no doubt that our understanding and appreciation of the physics of many flows have been singularly enhanced by the use of flow visualization.

I am enthusiastic about this series of conferences. The sharing of information, quickly, in a field which is advancing rapidly is essential. The papers are short but succinct, certainly long enough to get the important points across. The proceedings of these conferences should be recommended reading for all those interested in the general area of fluid mechanics and heat transfer, regardless of their particular approach to the subject.

J. F. Keffer

Turbulent shear flows 5

Edited by F. Durst, B. E. Launder, J. L. Lumley, F. W. Schmidt and J. H. Whielaw
Springer-Verlag, Berlin, 360 pp.

Symposia on turbulent shear flows are held every two years, alternately in the United States and Western Europe, bringing together specialists in the broad area represented by such flows. Selected papers from these meetings are published in book form a year or so after the meeting. The present volume is the fifth in this series and contains papers presented at Cornell University August 7–9, 1985 grouped under four topical headings: Homogeneous and simple flows, Free flows, Wall flows, and Reacting flows.

One of the great virtues of the books in this series is the introductory article by a distinguished specialist providing an overview, a perspective on the articles which follow in each heading. In this volume such articles are written by A. E. Perry, R. J. Adrian, P. Bradshaw and N. Peters.

Of the 26 papers in this volume only two, those by Saripalli concerned with experiments on the normal impingement of a pair of circular jets and by Coupland and Priddin concerned with the large scale computation of turbulent combustion in a real combustor, are of a directly applied nature. The other papers involve the usual flows of fundamental interest, jets, wakes, mixing layers, channels and boundary layers. The contributions are nearly equally divided between largely experimental and largely computational efforts. There are no strictly theoretical papers. There is only one paper with a geophysical emphasis, that by J. J. Rohr *et al.* reporting experimental results on turbulence downstream of a grid in a stably stratified water tunnel.

The one distinction setting the present volume apart is the sad one of its dedication to Professor S. Corrsin whose death in 1986 is a great loss to the turbulence community. His many contributions to the subject will continue to be referenced for years to come and his many students will continue the research directions he initiated.

These volumes make valuable additions to the turbulence literature, and the organizers of the symposia and the publishers of these volumes should be encouraged to continue their issuance. I look forward to the proceedings of the Sixth Symposium.

P. A. Libby

Papers presented at the Second International Conference on Laser Anemometry Advances and Applications, Strathclyde, September, 1987

BHRA, The Fluid Engineering Center, Cranfield, UK

This volume contains photo reproductions of five invited papers and forty-three contributed papers that were presented at the Strathclyde Conference on Laser Anemometry. The invited papers, each approximately twenty pages long, span a wide range of topics including refractive index matching techniques (A. Dybbs and R. V. Edwards), applications of LDA to computational fluid mechanics (A. Gosman), internal combustion engines (G. Wigley), particle sizing (W. Bachalo), and three-dimensional measurements (A. Boutier). The contributed papers are principally concerned with applications of laser Doppler anemometry in flow measurements and, to a lesser extent, development new to LDA techniques and instruments. Topics include fiber optics, photon correlation, signal processors, diode lasers and signal processors. There are also several papers on non-Doppler, incoherent single-point methods, and three papers on whole field methods, i.e., particle image velocimetry and the "Doppler picture" technique of Srulijes and coworkers. Measurements of particle size and/or particle velocity are discussed in six papers.

The invited papers contain valuable general information about the respective