The author states that "the book can be used as a graduate textbook in a three-phase fluidization engineering course or as a supplement textbook to a general fluidization engineering course". The occurrence of such specialized courses in graduate curricula is likely to be rare, and accordingly, it will find limited use as a textbook. Perhaps this is just as well, since in this reviewer's opinion, it would be difficult to teach from this book. In contrast to other, successful, textbooks on fluidization, the subject is not developed from any firm pedagogical basis which is supported by theory and experimental observation. Rather, the text is a wide-ranging compendium of descriptive material that is occasionally so broad and uneven in its treatment that the reader is unable to fit the written text into any sort of overall scheme or general framework. However, the broad coverage is likely to be very valuable to research engineers who need access to information about the behavior of three-phase reactor systems and to the background literature. Anyone seriously interested in the study or design of three-phase fluidized beds should own a copy of this book.

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Handbook of Hydraulic Resistance, by I. E. Idelchik (Edited by E. Fried). Hemisphere, Washington, D. C. (1986). 640 pp. ISBN 0-89116-284-4. $90.

The present edition of the *Handbook of Hydraulic Resistance* is a translation of the second Russian edition of 1975. The author claims that it differs markedly from the Russian first edition of 1960.

The first English edition of 1966 (*Handbook of Hydraulic Resistance*, Israel Program of Scientific Translations, Jerusalem, 1966) has been extensively used by engineers in English-speaking countries because there existed no English-language counterpart to this book.

The book is extremely detailed and has many illustrations of flow passages and diagrams and tables for pressure drop or pressure loss coefficients, which are so useful for the practising engineer in designing single-phase flow systems.

The book is based primarily on the Russian literature with very few references to Western literature. The non-Russian references are all pre-1970. A very useful book to have!

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Fluid Dynamics and Flow-induced Vibrations of Tube Banks, by A. Zukauskas, R. Ulinskas and V. Katinas (Edited by J. Karni). Hemisphere, Washington, D. C. (1988). 290 pp. ISBN 89116-686-6. $85.50.

This book is essentially a compilation of flow research performed in the Soviet Union on the characteristics of single-phase flow that lead to the vibration in heat exchanger tube bundles. This is the strength of the book. It is usually difficult for engineers outside the Soviet Union to access up-to-date Soviet scientific efforts. With this book, heat exchanger research engineers dealing with tube bundle flow phenomena can find in one source an excellent presentation of Soviet efforts.

It appears that considerable effort has been expended by Soviet researchers in attempting to experimentally determine flow details around individual tubes within bundles of varying geometric characteristics operating under a range of flow conditions. For example, considerable discussion and copious experimental results are presented on the effects of pitch, tube bundle geometry, such as staggered, in-line, radial etc., tube location within the bundle on the tube boundary layer separation point, tube to tube gap velocity distribution and tube circumferential pressure distribution. Also, considerable information is presented on the drag of various tube bundle geometries and the drag on individual tubes within a bundle as a function of flow and bundle geometric characteristics. There is similar discussion on results associated with yawed and finned tubes.

Unfortunately, much of this discussion on tube bundle flow characteristics, which accounts for approx. 75% of the book's content, is not shown to be directly related to tube bundle vibration susceptibility except on a somewhat phenomenological basis. One could conclude that much of the motivation behind the experimental work presented was heat transfer related research rather than attempting to understand flow-induced tube bundle vibration. Therefore, a design engineer attempting to evaluate a particular heat exchanger design for flow-induced vibration will find little usefulness in this book.

There is one chapter that discusses flow-induced tube vibration phenomena in tube bundles. At least for vortex shedding, attempts are made to relate tube local fluid dynamic phenomena discussed in previous chapters to various aspects of vortex shedding excitation of tubes.

The book contains seven chapters. The first is an introduction that lays the groundwork for future chapters by generally describing boundary layer flow phenomena in tube bundles along with first principal equations and empirical formulas. The second chapter briefly describes the experimental techniques used in the investigations that produced results presented in later chapters. Chapters 3–6 present the results of the experimental work which identifies boundary layer separation characteristics, tube drag characteristics, velocity, and pressure distributions within tube bundles for various operating conditions and tube bundle geometries, including tubes at a yaw angle with respect to the flow, rough vs smooth tube surfaces and finned tubes.

Chapter 7, entitled "Flow-induced Tube Vibrations", is the last chapter of the book and attempts to explain flow-induced vibration phenomena in tube bundles; providing the necessary semi-empirical formulas for use by engineers. The chapter is dominated by work in the areas of vortex shedding and turbulence-induced tube excitation. This is consistent with the theme of earlier chapters of the book. Since fluid elastic excitation of tube bundles is usually the predominant concern of engineers evaluating tube bundle susceptibility to excessive flow excitation, the book's brief discussion and lack of extensive up to date references of a non-Soviet nature in this area is a real shortfall.

The overall presentation of material in this book is above average relative to typical translations of Soviet technical literature. But, the book exhibits what many Soviet-authored journal articles and books suffer. In some cases, data are presented without clear or complete definition of plotted variables. There always appears to be something missing in the data, if it is presented at all, or in the corresponding discussion. This severely limits the materials' usefulness to the reader. An example of this is in Chap. 3 of the book. There a discussion is presented on the effect of upstream (i.e. free stream) turbulence on the excitation of the first and second tube rows of a bundle. A description of the test fixture utilized in the effort and the test procedure followed which resulted in the conclusions reached are not presented. In fact, plotted data to support the written conclusions are not presented for reader interrogation.

As stated earlier, the strength of this book is that it consolidates in one place the results of Soviet research in the area of flow-induced tube bundle vibration. The book should be especially useful to those researchers who recently have been attempting to apply computational fluid dynamics to predict the dynamic flow field within tube bundles that cause tube vibration. Soviet researchers have performed some good basic experimental research in attempting to identify flow structures that appear within tube bundles and correlate the existence of these structures with bundle geometry and operational flow parameters. This book is not very useful to the design engineer who must evaluate specific tube bundle designs for susceptibility to flow-induced tube vibration.

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