BOOK REVIEWS

Low Reynolds Number Flow Heat Exchangers

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Lectures at the fourth NATO Advanced Study Institute on heat transfer† addressed many issues relevant to the design and analysis of compact heat exchanges such as analytical and experimental treatments of laminar flow in various geometries, non-Newtonian flow, numerical analysis, heat transfer augmentation, and fouling.

The twenty invited lecturers included some of the most well-respected names in the heat transfer community; their lectures, as presented in this 1016 page book, were designed to be reviews of the current state-of-knowledge of low-Reynolds-number-flow heat exchangers. As with any proceedings, however, the lectures are actually separate technical papers, each of which addresses a more or less specific topic. The book is not, therefore, a textbook or a handbook for design of compact heat exchangers. Nevertheless, a designer or academic who is interested in problems associated with low-Reynolds-number-flow devices may find the book a useful addition to his personal technical library. It seems most likely, however, that the papers presented in these proceedings will be utilized as individual contributions to the literature on this topic and that this book, which costs $125.00, will be accessed primarily from the shelves of larger libraries.

This collection of papers does form a comprehensive body of knowledge and is well organized. The section on the fundamentals of low-Reynolds-number forced convection includes reviews of all the concepts and classical analytical solutions of the problems of laminar internal flows, as well as experimental techniques and results. Accordingly, an engineer utilizing this volume can choose to review the basics while investigating the more recent developments in the field. Chemical and process engineers may be interested to see a section of this book devoted to low-Reynolds-number non-Newtonian flows.

The section on numerical analysis, which includes two papers each by S. V. Patankar and D. B. Spalding, outlines the current state-of-the-art in calculating fluid flow and heat and mass transfer for situations arising in complex duct flows.

One issue which is central to low-Reynolds number heat transfer, augmentation techniques, is covered in depth. The low heat transfer coefficients typically associated with laminar flows, particularly in the gas phase, combined with the desire to minimize the size, cost and pressure drop of these heat exchangers necessitates careful consideration of the available augmentation technologies. Many such possibilities are discussed, along with the performance evaluation criteria which must be considered before deciding on a particular enhancement strategy.

Sections on compact and noncompact heat exchangers, with an emphasis on design methodology, follow. Fouling is also discussed in a separate section. Criticisms of current practice in heat exchanger design with regard to fouling resistances are listed and improvements are suggested, including laminar flow modelling of the fouling processes.

The book ends with an up-to-date discussion of research needs in low-Reynolds number heat exchangers.

This volume forms a comprehensive reference for designers and researchers who have an interest in low Reynolds number heat transfer. The book is well organized and the papers, for the most part, are well written, which is not surprising after scanning the list of authors. The book is attractively printed and readable. Interested persons should track down a copy for personal consideration.

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Cavitation

This 298 page compilation of the conference proceedings from 2nd International Conference on Cavitation† contains 35 papers. Their authors are from many countries including USA, UK, Japan, Poland, France, Germany, India, and Sweden. The subjects cover the general field of cavitation quite completely. Such subjects as flow effects, erosion, noise, bubble dynamics, and nucleation are substantially treated. In addition to centrifugal pumps, treatments of marine propellors, jet pumps, valves, journal bearings, and rotodynamic pumps are included. Although most papers concern water, antifreeze mixtures, lubricants, and liquid metals (magnetic field effects) are treated. Another unusual effect discussed is luminescence.

It is not possible to discuss individual papers in this brief review, but I strongly recommend that the volume should be available to all active researchers in the cavitation field.

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