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Book Review

Industrial Two-Phase Thermosyphons, by L. S. PIORO and I. L. PIORO, Begell House, Inc., New York, 288 pp. ISBN: 1-56700-064-9, cloth, 1997

This monograph is the most in-depth treatise published to date, of fundamental heat transfer processes in two-phase thermosyphons. The book is a major achievement of two well-known, international scientists, who present in comprehensive, yet concise form, their vast knowledge of the important and fast developing field of boiling and condensation phenomena pertaining to wickless heat pipes. The monograph covers the main aspects of effective heat transfer devices: development, research and application. It is an indispensable guide for designers, researchers, engineers and graduate students who need a complete overview of the modern fundamental principles and research in the field of two-phase thermosyphon technology.

The work contains four main parts with twenty-three chapters and an Appendix. The body of the publication features no less than 116 illustrations and 17 tables, in addition to the 46 tables and 512 references in the Appendix.

Part I deals with the basics: design, operating principles, the main characteristics, and the manufacturing technology of two-phase thermosyphons. The material is presented in a manner and style that makes it easy to understand the topic.

Part II covers the experimental techniques and fundamentals of heat transfer under boiling and condensation in different conditions. In addition to the more traditional topics of nucleate pool boiling, boiling in counterflow thermosyphons, forced convective boiling and condensation, some special cases are also examined, such as boiling in thin liquid films, in slot channels, under the influence of an electric field, affected by vibration, on surfaces with polymer coatings and boiling of liquids with surfactants—and many more. The authors also present some exceptional photographs of the boiling process inside glass and metal two-phase thermosyphons, to illustrate the ideal of "physical mechanism".

Part III is devoted mainly to maximum heat fluxes, or possible limitations for heat mass transfer inside different thermosyphon designs and under different conditions to those listed in Part II.

The latter two parts contain many theoretical and empirical correlations, equations, and formulae for determining heat transfer coefficients under boiling and condensation, as well as maximum heat fluxes under boiling in different conditions. For each particular case, the authors give comparisons and offer recommendations as to which one must be used in a specified range of changing parameters.

Part IV considers the industrial application of two-phase thermosyphons world-wide and is divided into three main chapters which concentrate on heat recovery from flue gases and other secondary sources, the utilisation of thermosyphons for cooling and thermal stabilisation purposes, thermosyphons in burners, and electro-hydrodynamic thermosyphons. Here, the authors provide the reader with a clear understanding of the advantages and disadvantages of each thermosyphon heat exchanger design and their applications, giving designers and engineers an excellent reference source for the future development and applications of two-phase heat transfer systems.

In the Appendix, thermophysical properties are presented together with other useful tables. These features and a large number of correlations allow the professionals to use this monograph not only as a reference tool but also as a handbook.

Industrial Two-Phase Thermosyphons is highly recommended as an invaluable source of fundamental heat transfer data for practising engineers and academic researchers working in the field of thermal engineering, as well as for graduate students. In its completeness, concision and lucidity, it is undoubtedly the modern authority on two-phase thermosyphon fundamentals and technology.

LEONARD L. VASILIEV
Porous Media Laboratory
A.V. Luikov Heat and Mass Transfer Institute
220072, P. Brovka 15
Minsk, Belarus