Book Review

THERMAL DESIGN AND OPTIMIZATION
Adrian Bejan, George Tsatsaronis and Michael Moran, John Wiley & Sons, New York, 1996, 542 pp, indexed

This book concerns the design of thermal systems that typically experience work and/or thermal interactions with their surroundings. Thermal systems (e.g. freezers, cooking appliances, furnaces and heat pumps) are composed of compressors, pumps, turbines, heat exchangers, chemical reactors, etc. These components are interconnected to form networks by conduits carrying the working substances, usually gases or liquids.
In Chapter 1, a concentrated effort has been made to present a contemporary view of design ideas and design methodology. In Chapter 2, a thermodynamic model for a cogeneration system case study is provided, with a discussion of piping system design. For readers with a limited background in engineering thermodynamics, heat transfer and engineering economics, reviews are provided in Chapters 2, 4 and 7, respectively. Chapter 3 affords a discussion of design guidelines evolving from reasoning through use of the second law of thermodynamics and, in particular, the energy concept.
Chapters 4, 5 and 6 contain design-related material, on topics such as degrees of freedom, design constraints, thermodynamic optimization and heat exchanger design. In these chapters, the role of second law reasoning in design is emphasized. Chapters 5 and 6 also illustrate the effectiveness of elementary modeling in design. In Chapter 7, detailed engineering economic evaluations enter the presentation explicitly and are featured in the remainder of the book. Chapter 8 presents a powerful and systematic design approach that combines the energy concepts of engineering thermodynamics with principles of engineering economics. Energy costing methods are introduced and applied in this chapter. The optimization of thermal systems is based on a careful consideration of the capital investment costs, the operating costs, and the costs associated with the destruction and loss of energy. Chapter 9 provides discussions of the pinch method for the design of heat exchanger networks and the iterative optimization of complex systems.
The book provides a comprehensive introduction to thermal system design and optimization for engineering students at a senior level, and for managers and practising engineers working in the energy field. The book can be suggested for use in a capstone design course, in a technical elective course, and for self-study. Sufficient end-of-chapter problems are provided for these uses. A design case study of a cogeneration system is considered throughout the book for continuity of the presentation.

Prof. Zsolt Fonyo

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