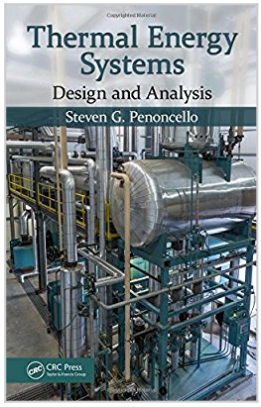

Thermal Energy Systems: Design and Analysis

By Steven G. Penoncello

Thermal Energy Systems: Design and Analysis By Steven G. Penoncello

Model a Thermal System without Lengthy Hand Calculations

Before components are purchased and a thermal energy system is built, the effective engineer must first solve the equations representing the mathematical model of the system. Having a working mathematical model based on physics and equipment performance information is crucial to finding a system's operating point. **Thermal Energy Systems: Design and Analysis** offers a fundamental working knowledge of the analysis and design of thermal-fluid energy systems, enabling users to effectively formulate, optimize, and test their own design projects.

Providing an understanding of the basic concepts of simulation and optimization, and introducing simulation and optimization techniques that can be applied to a system model, this text covers the basic foundations of thermal-fluid system analysis and design. It addresses hydraulic systems, energy systems, system simulation, and system optimization. In addition, it incorporates both SI and English units, and builds current state-of-the-art computer modeling skills throughout the book.

Topics covered include:

- Review of thermal engineering concepts
- Engineering economics principles
- Application of conservation and balance laws
- Review of fluid flow fundamentals
- Minor losses
- Series and parallel pipe networks
- Economic pipe diameter
- Pump performance and selection
- Cavitation
- Series and parallel pump systems
- The affinity laws for pumps

- Heat exchangers, LMTD, and e-NTU methods
- Regenerative HX, condensers, evaporators, and boilers
- Double-pipe heat exchangers
- Shell and tube heat exchangers
- Plate and frame heat exchangers
- Cross-flow heat exchangers
- Thermal energy system simulation
- Fitting component performance data
- Optimization using Lagrange multipliers
- Optimization using software

Thermal Energy Systems: Design and Analysis covers the concepts and the skills needed to plan, model, create, test, and optimize thermal systems; and to use computer simulation software through its use of Engineering Equation Solver (EES).

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Editorial Review

Review

"... includes a liberal number of examples throughout as well as an extensive list of student problems in each chapter. ... recommended as a text for an undergraduate mechanical engineering course as well as a reference for practical applications.umming Up: Recommended. Upper-division undergraduates and professionals/practitioners.
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?Dr. Anil Kumar Patil, Associate Professor, Mechanical Engg. DIT University Dehradun

"This book is well written and organized in a presentable form to provide an excellence in the design of thermo-fluid systems with the basic concepts, laws, tools and practical examples. The selection of topics is good and provides an attentive review of basic thermal fluid engineering fundamentals. It presents the engineering design process in a practical way with especially highlighted engineering economy concepts with optimization. It also covers numerical and computational methodologies with an introduction of EES software. Overall, it can be said the present book is well organized and useful for the persons from academia and industry (i.e., for designers and researchers)."
?Abhishek Saxena, Journal of Thermal Analysis and Calorimetry

About the Author

Steven G. Penoncello received his BS and MS in mechanical engineering from the University of North Dakota in 1978 and 1980, respectively. He received his PhD in mechanical engineering from the University of Idaho in 1986. Dr. Penoncello has been teaching courses and doing research in the thermal sciences since 1980. His research involves the determination of standard reference quality formulations for the calculation of the thermophysical properties of fluids and fluid mixtures of scientific and engineering interest. He has coauthored one book, two book chapters, and over 35 technical papers in the area of thermophysical properties.

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