Heat Exchanger Design Handbook Second Edition | 3a483329f5257d8e125e44a31e8ead6

Heat Transfer Calculations

This comprehensive reference covers all the important aspects of heat exchangers (HEs): design and modes of operation and practical, large-scale applications in process, power, petroleum, transport, air conditioning, refrigeration, cryogenics, heat recovery, energy, and other industries. It includes over 400 drawings, diagrams, tables, and equations, making it a great resource for mechanical, chemical, and petrochemical engineers; process equipment and pressure vessel designers; and upper-level undergraduate and graduate students. This second edition includes updated material throughout; coverage of the latest advances in HE design techniques; expanded and updated coverage of materials selection; and a look at the latest fabrication techniques.

Heat Transfer

This book introduces the fundamental concepts of inverse heat transfer problems. It presents in detail the basic steps of four techniques of inverse heat transfer protocol, as a parameter estimation approach and as a function estimation approach. These techniques are then applied to the solution of the problems of practical engineering interest involving conduction, convection, and radiation. The text also introduces a formulation based on generalized coordinates for the solution of inverse heat conduction problems in two-dimensional regions.

Heating Design Guide

Researchers, practitioners, instructors, and students welcomed the first edition of Heat Exchangers: Selection, Rating, and Thermal Design for gathering into one place the essence of the information they need-information formerly scattered throughout the literature. While retaining the basic objectives and popular features of the bestselling first edition, this new edition brings every chapter up to date with the latest developments in the field.

Heat Transfer and Fluid Flow in Minichannels and Microchannels

Presented in ten edited chapters this book encompasses important emerging topics in heat transfer equipment, particularly heat exchangers. The chapters have all been selected by invitation only. Advances in high temperature equipment and small scale devices continue to be important as the involved heat transfer and related phenomena are often complex in nature and different mechanisms like heat conduction, convection, radiation and phase change as well as chemical reactions may occur simultaneously. The book treats various operating problems, like fouling, and highlights applications in heat exchangers and gas turbine cooling. In engineering design and development, reliable and accurate computational methods are required to replace or complement expensive and time consuming experimental trials and error work. Tremendous advancements in knowledge and competence have been achieved during recent years due to improved computational solution methods for non-linear partial differential equations, turbulence modelling advancement and developments of computers and computing algorithms to achieve efficient and rapid simulations. The chapters of the book thoroughly present such advancement in a variety of applications.

Fundamentals of Heat Exchanger Design

Heat exchangers with minichannel and microchannel flow passages are becoming increasingly popular due to their ability to remove large heat fluxes under single-phase and two-phase applications. Heat Transfer and Fluid Flow in Minichannels and Microchannels methodically covers gas, liquid, and electrokinetic flows, as well as flow boiling and condensation, in minichannel and microchannel applications. Examining biomedical applications as well, the book is an ideal reference for anyone involved in the design processes of microchannel flow passages in a heat exchanger. Each chapter is accompanied by a real-life case study New edition of the first book that solely deals with heat and fluid flow in minichannels and microchannels Presents findings that are directly useful to designers; researchers can use the information in developing new models or identifying research needs

Compact Heat Exchangers

Solve any mechanical engineering problem quickly and easily This trusted compendium of calculation methods delivers fast, accurate solutions to the toughest day-to-day mechanical engineering problems. You will find numbered, step-by-step procedures for solving specific problems together with worked-out examples that give numerical results for the calculation. Covers: Power Generation; Plant and Facilities Engineering; Environmental Control; Design Engineering; New Edition features methods for automatic and digital control; alternative and renewable energy sources; plastics in engineering design

Design and Operation of Heat Exchangers and their Networks

Completely revised and updated to reflect current advances in heat exchanger technology, Heat Exchanger Design Handbook, Second Edition includes enhanced figures and thermal effectiveness charts, tables, new chapter, and additional topical material while keeping the quality of the first edition. This second edition is a comprehensive reference for practicing engineers, research engineers, academic, students, and manufacturers involved in the design of heat exchangers. This updated edition includes over 400 drawings, diagrams, tables, and equations, and covers the latest developments in the field. A new chapter on the design and operation of heat exchanger networks provides a comprehensive guide to the design, operation, and maintenance of heat exchangers in all one volume.

Heat Exchanger Design Handbook

Completely updated, this graduate text describes the current state of boiling heat transfer and two-phase flow, in terms through which students can attain a consistent understanding. Prediction of real or potential boiling heat transfer behaviour, both in steady and transient states, is covered to aid engineering design of reliable and effective systems.

Heat Exchanger Design

Inverse Heat Transfer

This is a textbook illustrating thermal and hydraulic design of heat exchangers. The book shows how to apply the fundamentals of thermodynamics, heat transfer, and fluid dynamics for a systematic analysis of the phenomena in heat exchangers, important to energy effective operation in process plants. Beginning with illustrative examples detailing applications of fundamentals, the text then shows the influence of flow configuration on the performance of heat exchangers. Here the equations to calculate mean temperature difference and efficiency for stirred tank, parallel, counter- and cross flow and their combinations are derived and put together in a new and very compact way. In some cases, short computer programs are given to evaluate more complicated formulas or algorithms. Chapter 3 is comprised of seven fully worked out examples showing application of the fundamentals to thermal and hydraulic design, i.e. sizing of heat exchangers. It includes problems and worked examples and a self-study formal. The text should be useful to practicing engineers and also graduate students in chemical and mechanical engineering.

A HEAT TRANSFER TEXTBOOK

A single volume resource material incorporating material from the Heat Exchanger Design Handbook, the standard reference material which is only available in loose-leaf format.

Emerging Topics in Heat Transfer

Completely revised and updated to reflect current advances in heat exchanger technology, Heat Exchanger Design Handbook, Second Edition includes enhanced figures and thermal effectiveness charts, tables,
new chapter, and additional topics—all while keeping the qualities that made the first edition a centerpiece of information for practicing engineers, research, engineers, academicians, designers, and manufacturers. The book covers heat exchange between two or more fluids. See What’s New in the Second Edition: Updated information on pressure vessel codes, manufacturer’s association standards A new chapter on heat exchanger installation, operation, and maintenance practices. Chapter 2 now includes coverage of scraped surface, graphite-, coil wound-, microchannel-, and printed circuit heat exchangers. Thorugh revision of fabrication of shell and tube heat exchangers, heat transfer augmentation methods, fouling control concepts and inclusion of recent advances in PHA. New topics like E-Flow®, Helixchanger®, and Twistinh® heat exchanger, feedwater heater, steam surface condenser, rotary regenerators for HVAC applications, CTA brazing and cupro-nickel radiators. Without proper heat exchanger design, efficiency of cooling/heating system of plants and machineries, industrial processes and energy system can be compromised, and energy wasted. This thoroughly revised handbook offers comprehensive coverage of single-phase heat exchangers—selection, thermal design, mechanical design, corrosion and fouling, FIV, material selection and their fabrication issues, fabrication of heat exchangers, operation, and maintenance of heat exchangers—all in one volume.

Chemical Engineering Design
Cutting-edge heat transfer principles and design applied advances heat transfer concepts to your chemical, petrochemical, and refining equipment designs using the detailed information contained in this chapter. Filled with valuable graphs, tables, and charts, Heat Transfer in Process Engineering covers the latest analytical and empirical methods for use with current industry software. Select heat transfer equipment, make better use of design software, calculate heat transfer coefficients, troubleshoot your heat transfer process, and comply with design and construction standards. Heat Transfer in Process Engineering uses a direct focus on process equipment design. Design, rate, and specify design shell and tube, plate, and hanttan heat exchangers. Design, rate, and specify different types of condensers with tube or shellside condensation for partial fluids or multicomponent mixtures. Understand the principles and scientific methods of boiling heat transfer, with their limits on and applications to different types of reboiler design. Apply correlations for fired heater ratings, for radiant and convective zones, and calculate fuel efficiency. Obtain a set of useful Excel worksherts for process heat transfer calculations.

Thermal Design
This unique and comprehensive text considers all aspects of heat exchanger fouling from the basic science of how surfaces become fouled to very practical ways of mitigating the problem and from mathematical modelling of different fouling mechanisms to practical methods of heat exchanger cleaning. The problems that restrict the efficient operation of equipment are described and the costs, some of them hidden, that are associated with the fouling of heat exchangers are discussed. Some simple concepts and models of the fouling processes are presented as part of the introduction to the subject. Advice on the selection, design, installation and commissioning of heat exchangers to minimise fouling is given. A large part of the text is devoted to the use of chemical and other additives to reduce or eliminate the problem of fouling. Another large section is designed to give information on both on-line and off-line cleaning of heat exchangers. One of the difficulties faced by designers and operators of heat exchangers is anticipating the likely extent of fouling problems to be encountered with different flow streams. Another large section addresses the questions and describes methods that have been used in attempting to define fouling potential. The book concludes with a chapter on how fouling information can be obtained using plant data, field tests and laboratory studies.

Design and Operation of Heat Exchangers introduces an alternative design option for applications hindered by the operating limitations of metallic heat exchangers. The book covers the three main types, circular finned, square finned, and helical finned tube bundles. Based on extensive experimental studies and tested at leading design and research institutions, this handbook contains detailed experimental data, correlations, and design methods for designing and improving the performance of finned tube heat exchangers. It covers the three main types, circular finned, square finned, and helical finned tube bundles. Based on extensive experimental studies and tested at leading design and research institutions, this handbook provides an extensive set of materials for calculating and designing corrective surfaces from transversely finned tubes, with a particular emphasis on power plant applications. Provides a design manual for calculating heat transfer and aerodynamic resistance of convective heating surfaces fabricated in the form of tube bundles with transverse circular, square and helical fins. Presents calculations for finned surfaces operating under conditions of clean and dust-laden flows alike, including finned convective heating surfaces of boilers Includes a fully solved exercise at the end of the book, illustrating the top-down approach specially oriented to power plant heat exchanger designers.

Compact Heat Exchangers
Heat exchangers are a crucial part of aerospace, marine, cryogenic and refrigeration technology. These essays cover such topics as complicated flow arrangements, complex extended surfaces, two-phase flow and irreversibility in heat exchangers, and single-phase heat transfer.

Turbomachinery Fluid Dynamics and Heat Transfer
Handbook for Transversely Finned Tubes Heat Exchangers Design contains detailed experimental data, correlations, and design methods for designing and improving the performance of finned tube heat exchangers. It covers the three main types, circular finned, square finned, and helical finned tube bundles. Based on extensive experimental studies and tested at leading design and research institutions, this handbook provides an extensive set of materials for calculating and designing corrective surfaces from transversely finned tubes, with a particular emphasis on power plant applications. Provides a design manual for calculating heat transfer and aerodynamic resistance of convective heating surfaces fabricated in the form of tube bundles with transverse circular, square and helical fins. Presents calculations for finned surfaces operating under conditions of clean and dust-laden flows alike, including finned convective heating surfaces of boilers Includes a fully solved exercise at the end of the book, illustrating the top-down approach specially oriented to power plant heat exchanger designers.

Handbook of Mechanical Engineering Calculations, Second Edition
Presenting contributions from renowned experts in the field, this book covers research and development in fundamental areas of heat exchangers, which include design and theoretical development, experiments, numerical modeling and simulations. This book is intended to be a useful reference source and guide for researchers, postgraduate students, and engineers in the fields of heat exchangers, cooling, and thermal management.

Boiling Heat Transfer And Two-Phase Flow
Heat exchangers are essential in a wide range of engineering applications, including power plants, automobiles, airplanes, process and chemical industries, and heating, air conditioning and refrigeration systems. Revised and updated with new problem sets and examples. Heat Exchangers: Selection, Rating, and Thermal Design. Third Edition presents a systematic treatment of the various topics of heat exchangers, focusing on selection, thermal-hydraulic design, and rating. Topics discussed include: Classification of heat exchangers according to different criteria Basic design methods for sizing and rating of heat exchangers Single-phase forced convection correlations in channels Pressure drop and pumping power for heat exchangers and their piping circuit Design solutions for heat exchangers subject to fouling Double and multi-plate heat exchanger design methods Correlations for the design of two-phase flow heat exchangers Thermal design methods and processes for shell-and-tube, compact, and gasketed-plate heat exchangers Thermal Design of condensers and evaporators This third edition contains two new chapters. Micro/Nano Heat Transfer explores the thermal design fundamentals for microscale heat exchangers and the enhancement heat transfer methods for heat exchanger design with nano-fluids. It also examines single-phase forced convection correlations as well as flow friction factors for microchannel flows for heat transfer and pumping power calculations. Polymer Heat Exchangers introduces an alternative design option for applications hindered by the operating limitations of metallic heat exchangers. The appendices provide the thermophysical properties of various fluids. Each chapter contains examples illustrating thermal design methods and procedures and relevant nomenclature. End-of-chapter problems enable students to test their assimilation of the material.

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Concise Guide to Heat Exchanger Network Design

In the wake of energy crisis due to rapid growth of industries, the efficient heat transfer could play a vital role in energy saving. Industries, household equipment, transportation, offices, etc., all are dependent on heat exchanging equipment. Considering this, the book has incorporated different chapters on heat transfer phenomena, analytical and experimental heat transfer investigations, heat transfer enhancement and applications.

Heat Transfer Equipment Design

Heat Exchangers

Comprehensive and unique source integrates the material usually distributed among a half a dozen sources. * Presents a unified approach to modeling of new designs and develops the skills for complex engineering analysis. * Provides industrial insight to the applications of the basic theory developed.

Process Heat Transfer

Packed with laws, formulas, calculations solutions, enhancement techniques and rules of thumb, this practical manual offers fast, accurate solutions to the heat transfer problems mechanical engineers face every day. Audience includes Power, Chemical, and HVAC Engineers Step-by-step procedures for solving specific problems such as heat exchanger design and air-conditioning systems heat load Tabular information for thermal properties of fluids, gases, and solids

Fouling of Heat Exchangers

Indeed, today "second generation" enhancement concepts are routing in the automotive and refrigeration industries to obtain lower cost, smaller heat exchanger size, and higher energy efficiency in system operation. And the aerospace, process, and power generation industries are not far behind.

Heat Exchanger Design Handbook


Mass Transfer

The First Law of Thermodynamics states that energy can neither be created nor destroyed. Heat exchangers are devices built for efficient heat transfer from one fluid to another. They are widely used in engineering processes and include examples such as steam coolers, plate heat exchangers, boilers and condensers in power plants. Heat exchangers are becoming more and more important to manufacturers striving to control energy costs. Process Heat Transfer Rules of Thumb investigates the design and implementation of industrial heat exchangers. It provides the background needed to understand and master the commercial software packages used by professional engineers for design and analysis of heat exchangers. This book focuses on the types of heat exchangers most widely used by industry, namely shell- and-tube exchangers (including condensers, reboilers and vaporizers), air-cooled heat exchangers and double-pipe (hairpin) exchangers. It provides a substantial introduction to the design of heat exchanger networks using pinch technology, the most efficient strategy used to achieve optimal recovery of heat in industrial processes. Utilizing leading commercial software important to professional engineers designing heat exchangers illustrates design procedures using complete step-by-step worked examples Provides details on how to develop an initial configuration for a heat exchanger and how to systematically modify it to obtain a final design. Abundant example problems solved manually and with the integration of computer software

Heat Exchangers

Heat exchangers are important devices for engineering, research, and industry. Because of this, any improvement helps to optimize the whole process. Opportunity areas may be found in design, materials, or working fluids. In this case, the present book compiles some advances in the matter of design (three chapters) and working fluids (one chapter). An introductory chapter also is presented.

Handbook for Transversely Finned Tube Heat Exchanger Design

Heat exchangers are vital equipment in power producing plants; process and chemical industries; heating, ventilation, air-conditioning and refrigeration systems; and the cooling of electronics. This book focuses on thermohydraulic design, design processes, rating, and operational problems of various types of heat exchangers. One of the main objectives of this text is to introduce thermal design by describing various types of single phase and two phase heat exchangers. -- Special attention to the design of heat exchangers subject to fouling is presented -- An extensive appendix provides thermophysical properties of various fluids including the new refrigerants -- End of chapter worked examples illustrate thermal design methods and procedures -- End of chapter problems, including student design projects, enhance design applications.

Advances in Heat Exchangers

Heat Exchanger Design Guide: A Practical Guide for Planning, Selecting and Designing of Shell and Tube Exchangers takes users on a step-by-step guide to the design of heat exchangers in daily practice, showing how to determine the effective driving temperature difference for heat transfer. Users will learn how to calculate heat transfer coefficients for convective heat transfer, condensing, and evaporating using simple equations. Dew and bubble points and lines are covered, with all calculations supported with examples. This practical guide is designed to help engineers solve typical problems they might encounter in their day-to-day work, and will also serve as a useful reference for students learning about the field. The book is extensively illustrated with figures in support of the text and includes calculation examples to ensure users are fully equipped to select, design, and operate heat exchangers. Covers design method and practical correlations needed to design practical heat exchangers for process application. Includes geometrical calculations for the tube and shell side, also covering boiling and condensation heat transfer. Explores heat transfer coefficients and temperature differences. Designed to help engineers solve typical problems they might encounter in their day-to-day work, but also as a useful reference for students learning about the field.

Heat Exchangers

This book presents contributions from renowned experts addressing research and development related to the two important areas of heat exchangers, which are advanced features and applications. This book is intended to be a useful source of information for researchers, postgraduate students, academics, and engineers working in the field of heat exchangers research and development.

Heat Exchangers

This book presents the ideas and industrial concepts in compact heat exchanger technology that have been developed in the last 10 years or so. Historically, the development and application of compact heat exchangers and their surfaces has taken place in a piecemeal fashion in a number of rather unrelated areas, principally those of the automotive and prime mover, aerospace, cryogenic and refrigeration sectors. Much detailed technology, familiar in one sector, progressed only slowly over the boundary into another sector. This compartmentalisation was a feature both of the user industries themselves, and also of the supplier, or manufactoring industries. These barriers are now breaking down, with valuable cross-fertilisation taking place. One of the industrial sectors that is waking up to the challenges of compact heat exchangers is that broadly defined as the process sector. If there is a bias in the book, it is towards this sector. Here, in many cases, the technical challenges are severe, since high pressures and temperatures are often involved, and working fluids can be corrosive, reactive or toxic. The opportunities, however, are correspondingly high, since compacts can offer a combination of lower capital or installed cost, lower temperature differences (and hence running costs), and lower inventory. In some cases they give the opportunities for a radical re-think of the process design, by the introduction of process intensification (PI) concepts as combining process equipment and chemical unit. An example of this is reaction and heat exchange, which offers, among other advantages, significantly lower by product production. To stimulate future research, the book includes coverage of hitherto neglected approaches, such as that of the Second Law (of Thermodynamics), pioneered by Bejan and co-workers. The justification for this is that there is increasing interest in life-cycle and sustainable approaches to industrial activity as a whole, often involving energy (Second Law) analysis. Heat exchangers, being fundamental components of energy and process systems, are both savers and spenders of exergy, according to interpretation.

Hemisphere Handbook of Heat Exchanger Design

The proposed is written as a senior undergraduate or the first-year graduate textbook covering modern thermal devices such as steam sinks, thermoelectric generators and coolers, heat pipes, and heat exchangers as design components in larger systems. These devices are becoming increasingly important and fundamental in thermal design across such diverse areas as microelectronic cooling, green or thermal energy conversion, and thermal control and management in space, etc. However, there is no textbook available covering this range of topics. The proposed book may be used as a capstone design course after the fundamental courses such as thermodynamics, fluid mechanics, and heat transfer. The underlying concepts in this book cover the, 1) understanding of the physical mechanisms of the thermal devices with the essential formulas and detailed derivations, and 2) designing the thermal devices in conjunction with mathematical modeling, graphical optimization, and occasionally computational-fluid-dynamic (CFD) simulation. Important design examples are developed using the commercial software, MathCAD, which allows the students to easily reach the graphical solutions even with highly detailed processes. In other words, the design concept is embodied through the example problems. The graphical presentation generally provides designers or students with the rich and flexible solutions toward achieving the optimal design. A solutions manual will be provided.
Heat Exchangers

Heat exchangers are essential in a wide range of engineering applications, including power plants, automobiles, airplanes, process and chemical industries, and heating, air-conditioning, and refrigeration systems. Revised and fully updated with new problem sets, Heat Exchangers: Selection, Rating, and Thermal Design, Fourth Edition presents a systematic treatment of heat exchangers, focusing on selection, thermal-hydraulic design, and rating. Topics discussed include:

- Classification of heat exchangers
- Basic design methods of heat exchangers for sizing and rating problems
- Single-phase forced convection correlations for heat exchangers
- Pressure drop and pumping power for heat exchangers and piping circuits
- Design methods of heat exchangers subject to fouling
- Thermal design methods and processes for double-pipe, shell-and-tube, gasketed-plate, compact, and polymer heat exchangers
- Two-phase convection correlations for heat exchangers
- Thermal design of condensers and evaporators
- Micro/nanoheat transfer

The Fourth Edition contains updated information about microscale heat exchangers and the enhancement heat transfer for applications in heat exchanger design and experiment with nanofluids. The Fourth Edition is designed for courses/modules in process heat transfer, thermal systems design, and heat exchanger technology. This text includes full coverage of all widely used heat exchanger types. A complete solutions manual and figure slides of the text's illustrations are available for qualified adopting instructors.

Principles of Enhanced Heat Transfer


"This comprehensive reference covers all the important aspects of heat exchangers (HEs)—their design and modes of operation—and practical, large-scale applications in process, power, petroleum, transport, air conditioning, refrigeration, cryogenics, heat recovery, energy, and other industries. Reflecting the author's extensive practical experience..."