

Fundamentals Of Heat Exchanger Design

Researchers, practitioners, instructors, and students all 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 fi

Two-phase flow heat exchangers are vital components of systems for power generation, chemical processing, and thermal environment control. The art and science of the design of such heat exchangers have advanced considerably in recent years. This is due to better understanding of the fundamentals of two-phase flow and heat transfer in simple geometries, greater appreciation of these processes in complex geometries, and enhanced predictive capability through use of complex computer codes. The subject is clearly of great fundamental and practical importance. The NATO ASIAN Thermal-Hydraulic Fundamentals and Design of Two-Phase Flow Heat Exchangers was held in Povoia de Varzim (near Porto), Portugal, July 6-17, 1987. participating in the organization of" the ASI were the Department of Mechanical Engineering and the Clean Energy Research Institute, University of Miami; Universidade do Porto; and the Department of Mechanical Engineering, Aeronautical Engineering, and Mechanics, Rensselaer Polytechnic Institute. The ASI was arranged primarily as a high-level teaching activity by experts representing both academic and industrial viewpoints. The program included the presentation of invited lectures, a limited number of related technical papers and discussion sessions.

This book describes the fundamentals and applications of compact heat exchangers in energy generation. The text focuses on their efficiency impacts on power systems, particularly emphasizing alternative energy sources such as Concentrated Solar Power and nuclear plants. The various types of compact heat exchanger surfaces and designs are given thorough consideration before the author turns his attention to describing how these compact heat exchangers can be applied to innovative plant designs, and how to conduct operational and safety analyses to optimize thermal efficiency. The book is written at an undergraduate level, but will be useful to practicing engineers and scientists as well.

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

The proposed is written as a senior undergraduate or the first-year graduate textbook,covering modern thermal devices such as heat 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.

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.

Cutting-edge heat transfer principles and design applications Apply advanced heat transfer concepts to your chemical, petrochemical, and refining equipment designs using the detailed information contained in this comprehensive volume. 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 allows you to: Review heat transfer principles with a direct focus on process equipment design Design, rate, and specify shell and tube, plate, and hairpin heat exchangers Design, rate, and specify air coolers with plain or finned tubes Design, rate, and specify different types of condensers with tube or shellside condensation for pure fluids or multicomponent mixtures Understand the principles and correlations 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 worksheets for process heat transfer calculations

[Fouling of Heat Exchangers](#)

[Heat Transfer](#)

[Fundamentals and Techniques](#)

[Concise Guide to Heat Exchanger Network Design](#)

[Selection, Rating, and Thermal Design, Third Edition](#)

[Selection, Rating, and Thermal Design, Second Edition](#)

[Fundamentals of Heat Exchanger and Pressure Vessel Technology](#)

[Principles, Practice and Economics of Plant and Process Design](#)

[Plate Heat Exchangers](#)

[Advanced Analytic and Control Techniques for Thermal Systems with Heat Exchangers](#)

Conjugate Heat and Mass Transfer in Heat Mass Exchanger Ducts bridges the gap between fundamentals and recent discoveries, making it a valuable tool for anyone looking to expand their knowledge of heat exchangers. The first book on the market to cover conjugate heat and mass transfer in heat exchangers, author Li-Zhi Zhang goes beyond the basics to cover recent advancements in equipment for energy use and environmental control (such as heat and moisture recovery ventilators, hollow fiber membrane modules for humidification/dehumidification, membrane modules for air purification, desiccant wheels for air dehumidification and energy recovery, and honeycomb desiccant beds for heat and moisture control). Explaining the data behind and the applications of conjugated heat and mass transfer allows for the design, analysis, and optimization of heat and mass exchangers. Combining this recently discovered data into one source makes it an invaluable reference for professionals, academics, and other interested parties. A research-based approach emphasizing numerical methods in heat mass transfer Introduces basic data for exchangers' design (such as friction factors and the Nusselt/Sherwood numbers), methods to solve conjugated problems, the modeling of various heat and mass exchangers, and more The first book to include recently discovered advancements of mass transfer and fluid flow in channels comprised of new materials Includes illustrations to visually depict the book's key concepts

Basic heat transfer -- Compact heat exchangers -- Fundamentals of finite element and finite volume methods -- Finite element analysis of compact heat exchangers -- Generation of design data by CFD analysis -- Thermal and mechanical design of compact heat exchanger -- Manufacturing and qualification testing of compact heat exchanger

Thermal System Design and Simulation covers the fundamental analyses of thermal energy systems that enable users to effectively formulate their own simulation and optimal design procedures. This reference provides thorough guidance on how to formulate optimal design constraints and develop strategies to solve them with minimal computational effort. The book uniquely illustrates the methodology of combining information flow diagrams to simplify system simulation procedures needed in optimal design. It also includes a comprehensive presentation on dynamics of thermal systems and the control systems needed to ensure safe operation at varying loads. Designed to give readers the skills to develop their own customized software for simulating and designing thermal systems, this book is relevant for anyone interested in obtaining an advanced knowledge of thermal system analysis and design. Contains detailed models of simulation for equipment in the most commonly used thermal engineering systems Features illustrations for the methodology of using information flow diagrams to simplify system simulation procedures Includes comprehensive global case studies of simulation and optimization of thermal systems

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 Engineering: Fundamentals and Techniques reviews the core mechanisms of heat transfer and provides modern methods to solve practical problems encountered by working practitioners, with a particular focus on developing engagement and motivation. The book reviews fundamental concepts in conduction, forced convection, free convection, boiling, condensation, heat exchangers and mass transfer succinctly and without unnecessary exposition. Throughout, copious examples drawn from current industrial practice are examined with an emphasis on problem-solving for interest and insight rather than the procedural approaches often adopted in courses. The book contains numerous important solved and unsolved problems, utilizing modern tools and computational sources wherever relevant. A subsection on common issues and recent advances is presented in each chapter, encouraging the reader to explore a greater diversity of problems. Reveals physical solutions alongside their application in practical problems, with an aim of generating interest from reality rather than dry exposition Reviews pertinent, contemporary computational tools, including emerging topics such as machine learning Describes the complexity of modern heat transfer in an engaging and conversational style, greatly adding to the uniqueness and accessibility of the book

This innovative text emphasizes a "less-is-more" approach to modeling complicated systems such as heat transfer by treating them first as "1-node lumped models" that yield simple closed-form solutions. The author develops numerical techniques for students to obtain more detail, but also trains them to use the techniques only when simpler approaches fail. Covering all essential methods offered in traditional texts, but with a different order, Professor Sidebotham stresses inductive thinking and problem solving as well as a constructive understanding of modern, computer-based practice. Readers learn to develop their own code in the context of the material, rather than just how to use packaged software, offering a deeper, intrinsic grasp behind models of heat transfer. Developed from over twenty-five years of lecture notes to teach students of mechanical and chemical engineering at The Cooper Union for the Advancement of Science and Art, the book is ideal for students and practitioners across engineering disciplines seeking a solid understanding of heat transfer. This book also: · Adopts a novel inductive pedagogy where commonly understood examples are introduced early and theory is developed to explain and predict readily recognized phenomena · Introduces new techniques as needed to address specific problems, in contrast to traditional texts' use of a deductive approach, where abstract general principles lead to specific examples · Elucidates readers' understanding of the "heat transfer takes time" idea—transient analysis applications are introduced first and steady-state methods are shown to be a limiting case of those applications · Focuses on basic numerical methods rather than analytical methods of solving partial differential equations, largely obsolete in light of modern computer power · Maximizes readers' insights to heat transfer modeling by framing theory as an engineering design tool, not as a pure science, as has been done in traditional textbooks · Integrates practical use of spreadsheets for calculations and provides many tips for their use throughout the text examples This book insures the legacy of the original 1950 classic, Process Heat Transfer, by Donald Q. Kern. This second edition book is divided into three parts: Fundamental Principles; Heat Exchangers; and Other Heat Transfer Equipment/ Considerations. - Part I provides a series of chapters concerned with introductory topics that are required when solving heat transfer problems. This part of the book deals with topics such as steady-state heat conduction, unsteady-state conduction, forced convection, free convection, and radiation. - Part II is considered by the authors to be the "meat" of the book - addressing heat transfer equipment design procedures and applications. In addition to providing a more meaningful treatment of the various types of heat exchangers, this part also examines the impact of entropy calculations on exchanger design. - Part III of the book examines other related topics of interest, including boiling and condensation, refrigeration and cryogenics, boilers, cooling towers and quenchers, batch and unsteady-state processes, health & safety and the accompanying topic of risk. An Appendix is also included. What is new in the 2nd edition Changes that are addressed in the 2nd edition so that Kern's original work continues to remain relevant in 21st century process engineering include: - Updated Heat Exchanger Design - Increased Number of Illustrative Examples - Energy Conservation/ Entropy Considerations - Environmental Considerations - Health & Safety - Risk Assessment - Refrigeration and Cryogenics - Inclusion of SI Units

[A Problem-based Test Prep for Students](#)

[Fouling Science and Technology](#)

[Heat Transfer Equipment Design](#)

[Heat Transfer Engineering](#)

[Thermal-Hydraulic Fundamentals and Design](#)

[Heat Transfer and Fluid Flow in Minichannels and Microchannels](#)

[Direct Sizing and Stepwise Rating](#)

[Heat Transfer Modeling](#)

[Conjugate Heat and Mass Transfer in Heat Mass Exchanger Ducts](#)

[A HEAT TRANSFER TEXTBOOK](#)

The fourth edition of Ludwig's Applied Process Design for Chemical and Petrochemical Plants, Volume Three is a core reference for chemical, plant, and process engineers and provides an unrivalled reference on methods, process fundamentals, and supporting design data. New to this edition are expanded chapters on heat transfer plus additional chapters focused on the design of shell and tube heat exchangers, double pipe heat exchangers and air coolers. Heat tracer requirements for pipelines and heat loss from insulated pipelines are covered in this new edition, along with batch heating and cooling of process fluids, process integration, and industrial reactors. The book also looks at the troubleshooting of process equipment and corrosion and metallurgy. Assists engineers in rapidly analyzing problems and finding effective design methods and mechanical specifications Definitive guide to the selection and design of various equipment types, including heat exchanger sizing and compressor sizing, with established design codes Batch heating and cooling of process fluids supported by Excel programs

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 ideal as a useful reference for students learning about the field

This is a text/reference 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 is written in a self study format. The text should be useful to practicing engineers and also graduate students in chemical and mechanical engineering.

This book is unique in adopting a numerical approach to the thermal design of heat exchangers. The computation of mean temperature difference, with accommodation of longitudinal conduction effects, makes full optimisation of the exchanger core possible. Sets of three partial differential equations for both contra-flow and cross-flow are established, and form the bases from which a range of methods of direct-sizing and stepwise rating may proceed. Optimisation of an exchanger for steady-state operation is achieved by an approach which allows maximum utilisation of the allowable pressure losses. Transient methods are covered, including the Method of Characteristics, and the Single-Blow method of testing is treated. Numerous aspects of low and high temperature design are discussed, and extensive references to the literature are provided. Schematic algorithms are listed to allow students and practitioners to construct their own solutions, and spline-fitting of data is discussed.

*Fundamentals of Heat Exchanger Design*John Wiley & Sons

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 types 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-pipe 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 for applications to heat exchanger design with nanofluids. 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.

Plate-and-frame heat exchangers (PHEs) are used in many different processes at a broad range of temperatures and with a variety of substances. Research into PHEs has increased considerably in recent years and this is a compilation of knowledge on the subject. Containing invited contributions from prominent and active investigators in the area, it should enable graduate students, researchers, and research and development engineers in industry to achieve a better understanding of transport processes. Some guidelines for design and development are also included.

[Selection, Design and Operation](#)

[Heat Exchanger Design Guide](#)

[Chemical Engineering Design](#)

[Ludwig's Applied Process Design for Chemical and Petrochemical Plants](#)

[Studies and Applications](#)

[Two-Phase Flow Heat Exchangers](#)

[Design, Applications and Performance](#)

[A Practical Guide for Planning, Selecting and Designing of Shell and Tube Exchangers](#)

[Thermal Design of Heat Exchangers: A Numerical Approach](#)

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 to keeping the qualities that made the first edition a centerpiece of information for practicing engineers, research, engineers, academicians, designers, and manufacturers involved in heat exchange between two or more fluids. See What's New Edition: Updated information on pressure vessel codes, manufacturer's association standards A new chapter on heat exchanger installation, operation, and maintenance practices Classification chapter now includes coverage of scrapped su coil wound-, microscale-, and printed circuit heat exchangers Thorough revision of fabrication of shell and tube heat exchangers, heat transfer augmentation methods, fouling control concepts and inclusion of recent advances in PHEs New EMbaffle®, Helixchanger®, and Twistedtube® heat exchanger, feedwater heater, steam surface condenser, rotary regenerators for HVAC applications, CAB brazing and cupro-braze radiators Without proper heat exchanger design, efficiency

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, 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.

Advanced Analytic Control Techniques for Thermal Systems with Heat Exchangers presents the latest research on sophisticated analytic and control techniques specific for Heat Exchangers (HXs) and heat Exchanger Networks (HXNs), such as Model Predictive Control, Adaptive Control, Robust Control, Algebraic Control, Geometric Control, Optimal Control, Fuzzy Control and Artificial Intelligence techniques. Editor Libor Pekař and his team of global expert contribute their knowledge and experience of investigated and applied systems and processes in this thorough review of the most advanced networks, analyzing their dynamics, efficiency, transient features, physical properties, performance, feasibility, controllability. The structural and dynamic analyses and control approaches of HXNs, as well as energy efficient manipulation techniques are discussed, in addition to the design of the control systems through the full life cycle. This equips the reader with a deep understanding of the relevant theory in a variety of settings and scenarios and the confidence to apply that knowledge to solve problems in an academic or professional setting. Graduate students and early-mid career professionals require a comprehensive understanding of how to suitably design thermal systems with HXs and HXNs to achieve required performance levels, which this book offers in one consolidated reference. All examples and solved problems included have been tried and tested. Combined with the research driven theory provides professionals, researchers and students with the most recent techniques to maximize the energy efficiency and sustainability of existing and new thermal power systems. Analyses several advanced techniques, the theoretical background of these techniques and includes models, examples and results throughout. Focuses on advanced analytic and control techniques which have been investigated or applied to thermal systems with HXs. Includes practical applications and advanced ideas from leading experts in the field, as well as case studies and tested problems and solutions.

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 exchanger design, single-phase heat transfer.

Heat Exchangers find innumerable applications in process, power, petroleum, transport, air conditioning, refrigeration, cryogenics, heat recovery, energy, pharmaceuticals and other industries. Improper heat exchanger design can lead to huge losses, resulting in a declining overall plant efficiency. This small book provides the basis of thermal, fluid and mechanical design, material selection and manufacturing processes of heat exchangers.

The fouling of heat exchangers, reactors and catalysts remains one of the most urgent problems facing the process industries. Over the past ten years there has been limited research and investigation into the underlying mechanisms which cause fouling. This book provides a comprehensive review of the problem. For convenience, particularly in heat exchanger technology, the mechanisms involved have been subdivided into different subject areas. It is often the situation that individuals or groups of workers have concentrated efforts in one or two specialist areas and there is a need to integrate the ideas across the whole spectrum of the subject. In addition, topics such as adhesion and surface phenomena have not been properly taken into account up till now in the assessment of fouling processes. For this reason it was considered essential that the recognised experts from around the world, who are actively concerned with research, development and design in the field, should meet and exchange ideas and experience. Such a meeting was held at Alvor, Portugal, in May 1987, sponsored by the NATO Advanced Study Institutes Programme. In order to obtain a common basis for the work of the Advanced Study Institute, the whole technological field was reviewed right from the frontiers of present knowledge. Each invited contributor was asked to make an overall presentation covering his or her area of expertise.

Part I: Process design -- Introduction to design -- Process flowsheet development -- Utilities and energy efficient design -- Process simulation -- Instrumentation and process control -- Materials of construction -- Capital cost estimating and production costs -- Economic evaluation of projects -- Safety and loss prevention -- General site considerations -- Optimization in design -- Part II: Plant design -- Equipment selection, specification and design -- Design of pressure vessels, reactors and mixers -- Separation of fluids -- Separation columns (distillation, absorption and extraction) -- Specification and design of solids-handling equipment -- Heat transfer equipment -- Transport and storage of fluids.

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 proceeded 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 time into another sector. This compartmentalisation was a feature both of the user industries themselves, and also of the supplier, or manufacturing industries. These barriers are now breaking down, with valuable cross-fertilisation taking place. One of the 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 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 differentials (and hence running costs), and lower inventory. In some cases they give the opportunity for a radical re-think of the process design, by the introduction of process intensification (PI) concepts such as combining process elements in one unit. An example is the reaction and heat exchange, which offers, among other advantages, significantly lower by-product production. To stimulate future research, the author includes coverage of hitherto neglected approaches, such as that of the Second Law (or Exergy 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 exergy (Second Law) analysis. Heat exchangers, as fundamental components of energy and process systems, are both savers and spenders of exergy, according to interpretation.

[Fundamentals of Heat Exchanger Design](#)

[Thermal Design](#)

[Kern's Process Heat Transfer](#)

[Heat Transfer in Process Engineering](#)

[Thermal-hydraulic Fundamentals and Design](#)

[Heat Exchanger Design Handbook, Second Edition](#)

[Analysis, Design and Optimization Using FEM and CFD Approach](#)

[Heat Exchanger Design Handbook 2008: Fundamentals of heat and mass transfer](#)

[Heat Sinks, Thermoelectrics, Heat Pipes, Compact Heat Exchangers, and Solar Cells](#)

[Heat Exchangers](#)

Heat exchanger has increased immensely from the viewpoint of energy conservation, conversion, recovery, and successful implementation of new energy sources. Its importance is also increasing from the stand-point of environmental concerns such as thermal pollution, air pollution, water pollution, and waste disposal. Heat exchangers are used in the process, power, transportation, air-conditioning and refrigeration, cryogenic, heat recovery; alternate fuels, and manufacturing industries, as well as being key components of many industrial products available in the marketplace. The heat exchanger design equation can be used to calculate the required heat transfer surface area for a variety of specified fluids, inlet and outlet temperatures and types and configurations of heat exchangers, including counterflow or parallel flow. A value is needed for the overall heat transfer coefficient for the given heat exchanger, fluids, and temperatures. Heat exchanger calculations could be made for the required heat transfer area, or the rate of heat transfer for a heat exchanger of given area.

*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.*

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 to researchers, postgraduate students, and engineers in the fields of heat exchangers, cooling, and thermal management.

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 costs, 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 question 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.

[Thermal System Design and Simulation](#)

[Selection, Application, Design and Evaluation](#)

[A Festschrift for A.L. London](#)

[Compact Heat Exchangers](#)

[An Inductive Approach](#)

[Design, Experiment and Simulation](#)

[Advanced Features and Applications](#)