

Thermal Performance Modeling Of Cross Flow Heat Exchangers Springerbriefs In Applied Sciences And Technology

This new book focuses on important research related to the mathematical modelling of engineering and environmental processes, manufacturing, and industrial systems. It includes heat transfer, fluid mechanics, CFD, and transport phenomena; solid mechanics and mechanics of metals; electromagnets and MHD; reliability modelling and system optimisation; finite volume, finite element, and boundary element procedures; decision sciences in an industrial and manufacturing context; civil engineering systems and structures; mineral and energy resources; relevant software engineering issues associated with CAD and CAE; and materials and metallurgical engineering.

This book deals with certain aspects of material science, particularly with the release of thermal energy associated with bond breaking. It clearly establishes the connection between heat transfer rates and product quality. The editors then sharply draw the thermal distinctions between the various categories of welding processes, and demonstrate how these distinctions are translated into simulation model uniqueness. The book discusses the incorporation of radiative heat transfer processes into the simulation model.

Conjugate Heat and Mass Transfer in Heat Mass Exchanger Ducts bridges the gap between fundamentals

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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

Still the Most Complete, Up-To-Date, and Reliable Reference in the Field Drying is a highly energy-intensive operation and is encountered in nearly all industrial sectors. With rising energy costs and consumer

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demands for higher quality dried products, it is increasingly important to be aware of the latest developments in industrial drying technology. Explores and brings together the existent body of knowledge on building performance analysis. Building performance is an important yet surprisingly complex concept. This book presents a comprehensive and systematic overview of the subject. It provides a working definition of building performance, and an in-depth discussion of the role building performance plays throughout the building life cycle. The book also explores the perspectives of various stakeholders, the functions of buildings, performance requirements, performance quantification (both predicted and measured), criteria for success, and the challenges of using performance analysis in practice. Building Performance Analysis starts by introducing the subject of building performance: its key terms, definitions, history, and challenges. It then develops a theoretical foundation for the subject, explores the complexity of performance assessment, and the way that performance analysis impacts on actual buildings. In doing so, it attempts to answer the following questions: What is building performance? How can building performance be measured and analyzed? How does the analysis of building performance guide the improvement of buildings? And what can the building domain learn from the way performance is handled in other disciplines? Assembles the current body of knowledge on building performance analysis in one unique resource. Offers deep insights into the complexity of using building performance analysis throughout the

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entire building life cycle, including design, operation and management. It contributes an emergent theory of building performance and its analysis. Building Performance Analysis will appeal to the building science community, both from industry and academia. It specifically targets advanced students in architectural engineering, building services design, building performance simulation and similar fields who hold an interest in ensuring that buildings meet the needs of their stakeholders.

The automobile is an icon of modern technology because it includes most aspects of modern engineering, and it offers an exciting approach to engineering education. Of course there are many existing books on introductory fluid/aero dynamics but the majority of these are too long, focussed on aerospace and don't adequately cover the basics. Therefore, there is room and a need for a concise, introductory textbook in this area. Automotive Aerodynamics fulfils this need and is an introductory textbook intended as a first course in the complex field of aero/fluid mechanics for engineering students. It introduces basic concepts and fluid properties, and covers fluid dynamic equations.

Examples of automotive aerodynamics are included and the principles of computational fluid dynamics are introduced. This text also includes topics such as aeroacoustics and heat transfer which are important to engineering students and are closely related to the main topic of aero/fluid mechanics. This textbook contains complex mathematics, which not only serve as the foundation for future studies but also provide a road map for the present text. As the chapters evolve, focus is

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placed on more applicable examples, which can be solved in class using elementary algebra. The approach taken is designed to make the mathematics more approachable and easier to understand. Key features: Concise textbook which provides an introduction to fluid mechanics and aerodynamics, with automotive applications Written by a leading author in the field who has experience working with motor sports teams in industry Explains basic concepts and equations before progressing to cover more advanced topics Covers internal and external flows for automotive applications Covers emerging areas of aeroacoustics and heat transfer Automotive Aerodynamics is a must-have textbook for undergraduate and graduate students in automotive and mechanical engineering, and is also a concise reference for engineers in industry.

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.

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,

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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 to 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.

The Handbook of Clean Energy Systems brings together an international team of experts to present a comprehensive overview of the latest research, developments and practical applications throughout all areas of clean energy systems. Consolidating information which is currently scattered across a wide variety of literature sources, the handbook covers a

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broad range of topics in this interdisciplinary research field including both fossil and renewable energy systems.

The development of intelligent energy systems for efficient energy processes and mitigation technologies for the reduction of environmental pollutants is explored in depth, and environmental, social and economic impacts are also addressed. Topics covered include:

Volume 1 - Renewable Energy: Biomass resources and biofuel production; Bioenergy Utilization; Solar Energy; Wind Energy; Geothermal Energy; Tidal Energy. Volume

2 - Clean Energy Conversion Technologies:

Steam/Vapor Power Generation; Gas Turbines Power Generation; Reciprocating Engines; Fuel Cells;

Cogeneration and Polygeneration. Volume 3 - Mitigation Technologies: Carbon Capture; Negative Emissions

System; Carbon Transportation; Carbon Storage;

Emission Mitigation Technologies; Efficiency

Improvements and Waste Management; Waste to

Energy. Volume 4 - Intelligent Energy Systems: Future

Electricity Markets; Diagnostic and Control of Energy

Systems; New Electric Transmission Systems; Smart

Grid and Modern Electrical Systems; Energy Efficiency

of Municipal Energy Systems; Energy Efficiency of

Industrial Energy Systems; Consumer Behaviors; Load

Control and Management; Electric Car and Hybrid Car;

Energy Efficiency Improvement. Volume 5 - Energy

Storage: Thermal Energy Storage; Chemical Storage;

Mechanical Storage; Electrochemical Storage; Integrated

Storage Systems. Volume 6 - Sustainability of Energy

Systems: Sustainability Indicators, Evaluation Criteria,

and Reporting; Regulation and Policy; Finance and

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Investment; Emission Trading; Modeling and Analysis of Energy Systems; Energy vs. Development; Low Carbon Economy; Energy Efficiencies and Emission Reduction.

Key features: Comprising over 3,500 pages in 6 volumes, HCES presents a comprehensive overview of the latest research, developments and practical applications throughout all areas of clean energy systems, consolidating a wealth of information which is currently scattered across a wide variety of literature sources. In addition to renewable energy systems, HCES also covers processes for the efficient and clean conversion of traditional fuels such as coal, oil and gas, energy storage systems, mitigation technologies for the reduction of environmental pollutants, and the development of intelligent energy systems.

Environmental, social and economic impacts of energy systems are also addressed in depth. Published in full colour throughout. Fully indexed with cross referencing within and between all six volumes. Edited by leading researchers from academia and industry who are internationally renowned and active in their respective fields. Published in print and online. The online version is a single publication (i.e. no updates), available for one-time purchase or through annual subscription.

The fabrication of MEMS has been predominately achieved by etching the polysilicon material. However, new materials are in large demands that could overcome the hurdles in fabrication or manufacturing process.

Although, an enormous amount of work being accomplished in the area, most of the information is treated as confidential or privileged. It is extremely hard

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to find the meaningful information for the new or related developments. This book is collection of chapters written by experts in MEMS and NEMS technology. Chapters are contributed on the development of new MEMS and NEMS materials as well as on the properties of these devices. Important properties such as residual stresses and buckling behavior in the devices are discussed as separate chapters. Various models have been included in the chapters that studies the mode and mechanism of failure of the MEMS and NEMS. This book is meant for the graduate students, research scholars and engineers who are involved in the research and developments of advanced MEMS and NEMS for a wide variety of applications. Critical information has been included for the readers that will help them in gaining precise control over dimensional stability, quality, reliability, productivity and maintenance in MEMS and NEMS. No such book is available in the market that addresses the developments and failures in these advanced devices.

The 5th International Congress on Design and Modeling of Mechanical Systems (CMSM) was held in Djerba, Tunisia on March 25-27, 2013 and followed four previous successful editions, which brought together international experts in the fields of design and modeling of mechanical systems, thus contributing to the exchange of information and skills and leading to a considerable progress in research among the participating teams. The fifth edition of the congress (CMSM ?2013), organized by the Unit of Mechanics, Modeling and Manufacturing (U2MP) of the National School of Engineers of Sfax, Tunisia, the Mechanical Engineering Laboratory (MBL) of the National School of Engineers of Monastir, Tunisia and the Mechanics Laboratory of Sousse (LMS) of the National

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School of Engineers of Sousse, Tunisia, saw a significant increase of the international participation. This edition brought together nearly 300 attendees who exposed their work on the following topics: mechatronics and robotics, dynamics of mechanical systems, fluid structure interaction and vibroacoustics, modeling and analysis of materials and structures, design and manufacturing of mechanical systems. This book is the proceedings of CMSM ?2013 and contains a careful selection of high quality contributions, which were exposed during various sessions of the congress. The original articles presented here provide an overview of recent research advancements accomplished in the field mechanical engineering.

Set III of this encyclopedia is a new addition to the previous Sets I and II. It contains 26 invited chapters from international specialists on the topics of numerical modeling of two-phase flows and evaporation, fundamentals of evaporation and condensation in microchannels and macrochannels, development and testing of micro two-phase cooling systems for electronics, and various special topics (surface wetting effects, microfin tubes, two-phase flow vibration across tube bundles). The chapters are written both by renowned university researchers and by well-known engineers from leading corporate research laboratories. Numerous 'must read' chapters cover the fundamentals of research and engineering practice on boiling, condensation and two-phase flows, two-phase heat transfer equipment, electronics cooling systems, case studies and so forth. Set III constitutes a 'must have' reference together with Sets I and II for thermal engineering researchers and practitioners.

The heat transfer and analysis on laser beam, evaporator coils, shell-and-tube condenser, two phase flow, nanofluids, complex fluids, and on phase change are significant issues in a design of wide range of industrial processes and devices.

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This book includes 25 advanced and revised contributions, and it covers mainly (1) numerical modeling of heat transfer, (2) two phase flow, (3) nanofluids, and (4) phase change. The first section introduces numerical modeling of heat transfer on particles in binary gas-solid fluidization bed, solidification phenomena, thermal approaches to laser damage, and temperature and velocity distribution. The second section covers density wave instability phenomena, gas and spray-water quenching, spray cooling, wettability effect, liquid film thickness, and thermosyphon loop. The third section includes nanofluids for heat transfer, nanofluids in minichannels, potential and engineering strategies on nanofluids, and heat transfer at nanoscale. The fourth section presents time-dependent melting and deformation processes of phase change material (PCM), thermal energy storage tanks using PCM, phase change in deep CO₂ injector, and thermal storage device of solar hot water system. The advanced idea and information described here will be fruitful for the readers to find a sustainable solution in an industrialized society. The content of this book covers several up-to-date topics in fluid dynamics, computational modeling and its applications, and it is intended to serve as a general reference for scientists, engineers, and graduate students. The book is comprised of 30 chapters divided into 5 parts, which include: winds, building and risk prevention; multiphase flow, structures and gases; heat transfer, combustion and energy; medical and biomechanical applications; and other important themes. This book also provides a comprehensive overview of computational fluid dynamics and applications, without excluding experimental and theoretical aspects. With this second revised and extended edition, the readers have a solid source of information for designing state-of-the-art turbomachinery components and systems at hand. Based on fundamental principles of turbomachinery thermo-fluid

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mechanics, numerous CFD based calculation methods are being developed to simulate the complex 3-dimensional, highly unsteady turbulent flow within turbine or compressor stages. The objective of this book is to present the fundamental principles of turbomachinery fluid-thermodynamic design process of turbine and compressor components, power generation and aircraft gas turbines in a unified and compact manner. The book provides senior undergraduate students, graduate students and engineers in the turbomachinery industry with a solid background of turbomachinery flow physics and performance fundamentals that are essential for understanding turbomachinery performance and flow complexes. While maintaining the unifying character of the book structure in this second revised and extended edition all chapters have undergone a rigorous update and enhancement. Accounting for the need of the turbomachinery community, three chapters have been added, that deal with computationally relevant aspects of turbomachinery design such as boundary layer transition, turbulence and boundary layer.

This e-book is a compilation of papers presented at the Mechanical Engineering Research Day 2015 (MERD'15) - Melaka, Malaysia on 31 March 2015.

In modern industries, electrical energy conversion systems consist of two main parts: electrical machines and power electronic converters. With global electricity use at an all-time high, uninterrupted operation of electrical power converters is essential. Reliability in Power Electronics and Electrical Machines: Industrial Applications and Performance Models provides an in-depth analysis of reliability in electrical energy converters as well as strategies for designing dependable power

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electronic converters and electrical machines. Featuring a comprehensive discussion on the topics of reliability design and measurement, failure mechanisms, and specific issues pertaining to quality, efficiency, and durability, this timely reference source offers practical examples and research-based results for use by engineers, researchers, and advanced-level students. This monograph introduces a numerical computational methodology for thermal performance modeling of cross-flow heat exchangers, with applications in chemical, refrigeration and automobile industries. This methodology allows obtaining effectiveness-number of transfer units (e-NTU) data and has been used for simulating several standard and complex flow arrangements configurations of cross-flow heat exchangers. Simulated results have been validated through comparisons with results from available exact and approximate analytical solutions. Very accurate results have been obtained over wide ranges of NTU and C^* values in all cases. The proposed procedure constitutes a useful research tool for both theoretical and experimental studies of cross-flow heat exchangers. The following are the unique features of the book: - The monograph includes the computational code named HETE (Heat Exchanger Thermal Effectiveness) in Chapter 5. A version of this code is available for downloading. - The computational procedure could be used for reducing experimental data using the effectiveness - NTU (e-NTU) method in research and industrial laboratories. - Even after more than one century in heat exchanger research, the search for new

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flow arrangements with higher effectiveness still is an unsolved problem. The present methodology could be a useful tool in pursuing that goal.

Thermofluid Modeling for Sustainable Energy

Applications provides a collection of the most recent, cutting-edge developments in the application of fluid mechanics modeling to energy systems and energy efficient technology. Each chapter introduces relevant theories alongside detailed, real-life case studies that demonstrate the value of thermofluid modeling and simulation as an integral part of the engineering process. Research problems and modeling solutions across a range of energy efficiency scenarios are presented by experts, helping users build a sustainable engineering knowledge base. The text offers novel examples of the use of computation fluid dynamics in relation to hot topics, including passive air cooling and thermal storage. It is a valuable resource for academics, engineers, and students undertaking research in thermal engineering. Includes contributions from experts in energy efficiency modeling across a range of engineering fields Places thermofluid modeling and simulation at the center of engineering design and development, with theory supported by detailed, real-life case studies Features hot topics in energy and sustainability engineering, including thermal storage and passive air cooling Provides a valuable resource for academics, engineers, and students undertaking research in thermal engineering 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,

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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.

Doctoral Thesis on the topic of Modeling and Performance Analysis of Alternative Heat Exchangers for Heavy Vehicles Popular Science Description: Low fuel consumption, and reduced exhaust emissions, as well as improved performance and durability become much more important than before for the vehicle industry. These requirements lead to a number of additional equipment installed in the vehicles. All these efforts increase the operating temperature in the engine compartment and reduce the available free space in the vehicle. In order to keep the engine working at its optimal condition, a huge amount of heat has to be removed from the engine to the surrounding air. In modern heavy vehicles, this heat is so huge that a conventional heat exchanger (HEX) cannot handle it easily. In addition, more and more electric powertrains are introduced to heavy vehicles. Because of the increased demand in cooling power, a larger heat exchanger size with a huge cooling surface area is required for the vehicle cooling system. However, the space in such vehicles is limited. It is impossible to increase the size of the conventional HEX to

dissipate the required amount of heat from the vehicle. All these factors imply a need for a revolution of the HEX design in vehicles. Based on literature review, there are two ideas available for developing an alternative heat exchanger for heavy vehicles: 1) Changing the position of heat exchangers: Moving the HEX from the front of the vehicles to the roof of the driver compartment, which might increase the possibility to increase the size of the HEX. Based on the air flowing direction and the engine coolant direction, a countercurrent flow HEX is introduced at the roof position instead of a cross flow HEX. 2) Introducing new materials: Using graphite foam as a thermal material for HEXs in vehicles. Nowadays aluminum HEXs are very common in the vehicle industry. Due to the increasing cooling power and the space limitation in vehicles, a highly compact HEX is required. Graphite foam has even higher thermal conductivity, large specific surface area, and low density. These characteristics imply that graphite foam is a potentially good thermal material for HEXs (instead of the conventional aluminum HEX). However, due to its porous structure, the flow resistance of graphite foam is very high. In order to find an appropriate fin configuration with good performance in the HEX, a computational method is applied to simulate the performance of the HEX with different fin configurations. The numerical model is verified by

experimental results from literature. The analysis of the results shows: 1) The overall size and weight of a countercurrent flow HEX can be reduced compared to the cross flow HEX because of the high power density and high compactness factor achieved by the countercurrent flow HEX. 2) Because of the high thermal conductivity and low density of the graphite foam, the graphite foam wavy corrugated fin provides higher power density and higher compactness factor than an aluminum louver fin. A graphite foam fin with two-side dimples exhibits higher coefficient of performance (COP) than an aluminum louver fin, and it becomes very efficient in energy saving. Thus, the graphite foam has a very high potential as an alternative material for heat exchanger applications. The countercurrent flow HEXs made from graphite foam can be designed to be much lighter and smaller than the convectional cross flow aluminum HEXs. A light and compact HEX is not only good for the thermal management of the vehicle, but also it reduces the weight of the vehicle which has an effect on the fuel consumption and overall cost. The present work is based on a research project "Development of new cooling systems for heavy vehicles - for reduced fuel consumption and lower carbon dioxide emission," which has been financially supported partly by the Swedish Energy Agency (STEM).

Underground Cable Thermal Backfill documents the

proceedings of the "Symposium on Underground Cable Thermal Backfill," held in Toronto, Canada, 17-18 September 1981. The symposium brought together research, design, and installation engineers from utilities, cable manufacturers, and universities to present and discuss developments in the field. The contributions of researchers at the symposium are organized into five chapters. Chapter 1 presents an overview of the state-of-the-art of cable backfill materials and soil thermal property measurements. The papers in Chapter 2 deal with developments in cable backfill materials. These include materials stabilized with moisture substitutes, pumpable materials, and materials stabilized with bound water. Chapter 3 covers thermal property measurements of soils and backfills. Through the automation of measurements and analysis using microprocessor based instruments and better control of experimental conditions, substantial improvements have been made in the area of measurement technology. Chapter 4 reports developments in the study of soil thermal stability and the implication thereof for thermal cable design. Chapter 5 discusses various aspects of thermal cable design, including methods for incorporating historical weather records to predict worst case soil and backfill thermal conductivities. This volume should serve as a useful introduction to the subject of cable thermal design for engineers involved in underground transmission and

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distribution systems.

Solar Chimney Power Plant Generating Technology presents the latest advanced solar chimney power generating technologies to help engineers acquire a comprehensive understanding of the fundamental theories, technologies, and applications of solar chimney power generating systems. The book includes comprehensive theories, very detailed technologies, and many well-illustrated, basic configurations of different types of systems, enabling readers to understand the fundamental theory, the design methods of solar chimney systems, and the basic parameters of the construction and operation of these systems. Includes comprehensive theories, very detailed technologies, and many basic configurations of different types of systems Covers the basic mechanisms of fluid flow, heat transfer, power output, energy storage, and operational procedures of SCPPS (solar chimney power plant system) turbines Focuses on thermodynamic theory, helio-aero-gravity effect, fluid flow and heat transfer characteristics, design for SC turbine, energy storage, and the effect of ambient crosswinds Sound knowledge of the latest research results in the thermodynamics and design of thermoelectric devices, providing a solid foundation for thermoelectric element and module design in the technical development process and thus serving as an indispensable tool for any application

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development. The text is aimed mainly at the project developer in the field of thermoelectric technology, both in academia and industry, as well as at graduate and advanced undergraduate students. Some core sections address the specialist in the field of thermoelectric energy conversion, providing detailed discussion of key points with regard to optimization. The international team of authors with experience in thermoelectrics research represents such institutes as EnsiCaen Université de Paris, JPL, CalTech, and the German Aerospace Center. [Copyright: 9fbdc72ccab3f6b22974cf4acf770241](https://doi.org/10.1007/978-1-4939-9874-1)