

# **Double Pipe Heat Exchanger Design**

**Samuel Jorge Marques Cartaxo**

## Hairpin Heat Exchangers Explained Samuel Jorge Marques

Cartaxo, Ph.d., Prof Samuel Jorge Marques Cartaxo Ph

D, 2015-08-20 The design of heat exchangers is crucial for the efficiency usage of energy in cooling or heating operations of industrial processes. The inappropriate heat exchanger sizing and analysis may cause environmental damage and significant energy waste in chemical process and power plants. This text covers the thermal-hydraulic design and performance rating of single-phase tubular (hairpin) heat exchangers of several types, including double-pipe, multi-tubes and finned heat exchangers. It presents a detailed compilation of single-phase convective and friction factor correlations established in the technical literature and by industrial practice, with special attention to their validity ranges and limiting assumptions to promote the most appropriate selection according to the specific design requirements. Highlighted features in this volume: \* Several worked examples explained step by step. \* A method for estimating the inner and outer wall temperatures on thick tubes. \* Special equations for estimating fluid exit temperatures in parallel flow and counterflow arrangements. \* A new method for estimating the pressure drop in double-pipe and multi-tube heat exchangers. \* Detailed fact sheet tables for most equations for estimating heat transfer coefficients, including errors bands. \* A number of proposed design problems, including the final answers. \* Graphs of physical properties of several gases and dozens of chemical components in liquid and vapor phase. \* Physical properties given both in SI and US-customary unit systems. The content is discussed with focus on the undergraduate student. Every effort was applied in order to clarify the presented subjects, both by balancing the level of description and the material format, yet preserving the technical accuracy. Accordingly, it is targeted to facilitate the learning process and understanding of the student challenged with the subject of heat exchanger in chemical engineering, mechanical engineering, and

other related engineering fields. The chapters contain a number of worked examples demonstrating the application of the presented design methods and procedures carefully. The student is guided during the decision-making stages involved in the heat exchanger design. An extensive nomenclature section is given in the beginning of the text to allow easy access during the reading. A set of problems at the end of the chapters allows the students to train and reinforce their skills about the learned subjects. Almost every problem is supplemented with the respective answers, in order to enable prompt verification of the student development. With the aim of being a self-sufficient volume, and optimize the student time while learning the subject matter, the appendices provide standard piping design data compiled from heat exchanger manufacturers. In addition, a comprehensive dataset of physical properties is given for several fluids, both in SI and US-customary units.

### **Advances in Structural and Multidisciplinary**

**Optimization** Axel Schumacher, Thomas Vietor, Sierk Fiebig, Kai-Uwe Bletzinger, Kurt Maute, 2017-12-04 The volume includes papers from the WSCMO conference in Braunschweig 2017 presenting research of all aspects of the optimal design of structures as well as multidisciplinary design optimization where the involved disciplines deal with the analysis of solids, fluids or other field problems. Also presented are practical applications of optimization methods and the corresponding software development in all branches of technology.

### **Process Heat Transfer** Robert W. Serth, Thomas

Lestina, 2014-01-27 Process Heat Transfer is a reference on 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 in the design and analysis of heat exchangers. This book focuses on types of heat exchangers most widely used by industry: 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. Utilizes leading commercial software. Get expert HTRI Xchanger Suite guidance, tips and tricks previously available via high cost professional training sessions. Details the development of initial configuration for a heat exchanger and how to systematically modify it to obtain an efficient final design. Abundant case studies and rules of thumb, along with copious software examples, provide a complete library of reference designs and heuristics for readers to base their own designs on.

**Heat Exchangers** E. A. D. Saunders, 1988 A description of the design, construction and applications of unfired heat exchangers used in the process industries, giving guidance on the merits and limitations of the different types, details of their materials of construction and cost and numerous examples of design calculations.

Heat Exchangers Sadik Kakaç, Hongtan Liu, Anchasa Pramuanjaroenkij, 2002-03-14 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 first edition, the second edition incorporates significant improvements and modifications. New in the Second Edition: Introductory material on heat transfer enhancement An application of the Bell-Delaware method New correlation for calculating heat transfer and friction coefficients for chevron-type plates Revision of many of the solved examples and the addition of several new ones The authors take a systematic approach to the subject of heat exchanger design, focusing on the fundamentals, selection, thermohydraulic design, design processes, and the rating and

operational challenges of heat exchangers. It introduces thermal design by describing various types of single-phase and two-phase flow heat exchangers and their applications and demonstrates thermal design and rating processes through worked examples, exercises, and student design projects. Much of the text is devoted to describing and exemplifying double-pipe, shell-and-tube, compact, gasketed-plate heat exchanger types, condensers, and evaporators.

Heat Exchanger Design Guide Manfred Nitsche,Raji Olayiwola Gbadamosi,2015-09-28 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

*Heat Exchangers* Sadik Kakaç,Hongtan Liu,Anchasa Pramuanjaroenkij,2012-03-01 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.

**Fundamentals of Heat Exchanger Design** Dusan P. Sekulic, Ramesh K. Shah, 2023-12-07 *Fundamentals of Heat Exchanger Design*, Second Edition builds upon the widely-used First Edition, a text often considered to be the most prominent single-volume heat exchanger text on the market. The new and

improved Second Edition serves as an equally comprehensive resource, updated to suit the latest technologies and design methods being used in the Heat Exchanger field. Written by First-Edition author Dusan P. Sekulic, this text addresses the latest developments in the industry, including a brand-new chapter on the manufacturing of compact heat exchangers. After opening with a basic introduction to heat exchanger types and design methods, the book goes on to cover more specialized topics such as the design of recuperators and regenerators, pressure drop analysis, geometric properties, flow friction, fouling and corrosion, and more. With many significant revisions throughout, this new edition offers more streamlined content while maintaining the consistent, detailed coverage of the fundamentals of the topic that readers appreciated in the First Edition. These unique features position the Second Edition of Fundamentals of Heat Exchanger Design as the ideal text for both engineering professionals and advanced students alike.

### **Heat Exchanger Design Handbook** Kuppan

Thulukkanam,2000-02-23 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 experienc

### *Fundamentals of Heat Exchanger Design* Ramesh K.

Shah,Dusan P. Sekulic,2003-08-11 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.

### **Tubular Heat Exchangers** Samuel Jorge Marques

Cartaxo,2022-04-19 This book explains basics from physical chemistry and fluid mechanics to understand, construct and apply

tubular heat exchangers for the (chemical) industry. Examples from practice highlight the required equations, physical properties and raise critical steps for the design of for example tubular double-pipe, multi-tubes and finned heat exchangers. Exercises and corresponding solutions deepen the gained knowledge and clarify the described theory.

*Heat Exchanger Design* Arthur P. Fraas, 1991-01-16 This Second Edition of the well-received work on design, construction, and operation of heat exchangers. Demonstrates how to apply theories of fluid mechanics and heat transfer to practical problems posed by design, testing, and installation of heat exchangers. Tables and data have been brought up to date, and there is new material on problems of vibration and fouling, and on optimization of energy use in the chemical process and manufacturing industries. Covers all basic principles of heat exchanger design, and addresses many specialized situations encountered in engineering applications.

**Design and Operation of Heat Exchangers and their Networks** Wilfried Roetzel, Xing Luo, Dezhen Chen, 2019-10-04 Design and Operation of heat Exchangers and Their Networks presents a comprehensive and detailed analysis on the thermal design methods for the most common types of heat exchangers, with a focus on their networks, simulation procedures for their operations, and measurement of their thermal performances. The book addresses the fundamental theories and principles of heat transfer performance of heat exchangers and their applications and then applies them to the use of modern computing technology. Topics discussed include cell methods for condensers and evaporators, dispersion models for heat exchangers, experimental methods for the evaluation of heat exchanger performance, and thermal calculation algorithms for multi-stream heat exchangers and heat exchanger networks. Includes MATLAB codes to illustrate how the technologies and methods discussed can be easily applied and developed. Analyses a range of different



models, applications, and case studies in order to reveal more advanced solutions for industrial applications. Maintains a strong focus on the fundamental theories and principles of the heat transfer performance of heat exchangers and their applications for complex flow arrangement.

**Heat Exchangers** Sadik Kakaç, Hongtan Liu, Anchasa Pramuanjaroenkij, 2020-01-21 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 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.

**Heat Exchangers** S. M. Sohel Murshed, Manuel Matos Lopes, 2017-04-27 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 Exchanger Design Handbook*, 1983

**An Investigation of Liquid-metal Heat Transfer in a Cocurrent-flow, Double-pipe, Heat Exchanger** Richard L. Merriam, 1965

**Kern's Process Heat Transfer** Ann Marie Flynn, Toshihiro Akashige, Louis Theodore, 2019-05-29 This edition ensures the legacy of the original 1950 classic, *Process Heat Transfer*, by Donald Q. Kern that by many is held to be the gold standard. 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, and the primary reason for undertaking this project. Other than minor updates, Part II remains relatively unchanged from the first edition. Notably, it includes Kern's original design methodology for double-pipe, shell-and-tube, and extended surface heat exchangers. Part II also includes boiling and condensation, boilers, cooling towers and quenchers, as well as newly designed open-ended problems. Part III of the book examines other related topics of interest, including refrigeration and cryogenics, batch and unsteady-state processes, health & safety, and the accompanying topic of risk. In addition, this part also examines the impact of entropy calculations on exchanger design. A 36-page Appendix includes 12 tables of properties, layouts and design factors. 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

*Heat Exchanger Design Handbook, Second Edition* Kuppam Thulukkanam, 2013-05-20 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 involved in 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 Classification chapter now includes coverage of scrapped surface-, graphite-, 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 topics like 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 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.

**The New Heat Transfer: Equipment design and analysis**

**Double Pipe Heat Exchanger Design** Book Review: Unveiling the Magic of Language

In an electronic era where connections and knowledge reign supreme, the enchanting power of language has become much more apparent than ever. Its ability to stir emotions, provoke thought, and instigate transformation is truly remarkable. This extraordinary book, aptly titled "**Double Pipe Heat Exchanger Design**," compiled by a very acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound effect on our existence. Throughout this critique, we will delve into the book's central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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