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# Heat Transfer Enhancement Using Triangular Fin In Heat Exchangers

Heat Transfer Enhancement

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# Heat Transfer Enhancement Of Heat Exchangers

**Jiří Jaromír Klemeš**



## **Heat Transfer Enhancement Of Heat Exchangers:**

*Heat Transfer Enhancement of Heat Exchangers* Sadik Kakaç, Arthur E. Bergles, F. Mayinger, Hafit Yüncü, 1999-03-31 Heat transfer enhancement in single phase and two phase flow heat exchangers is important in such industrial applications as power generating plant process and chemical industry heating ventilation air conditioning and refrigeration systems and the cooling of electronic equipment Energy savings are of primary importance in the design of such systems leading to more efficient environmentally friendly devices This book provides invaluable information for such purposes

**Emerging Topics in Heat Transfer** Qiuwang Wang, Yitung Chen, Bengt Sundén, 2013-11-06 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 turbulence thermal 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 trial 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

Heat Transfer Enhancement with Nanofluids Vincenzo Bianco, Oronzio Manca, Sergio Nardini, Kambiz Vafai, 2015-04-01 Nanofluids are gaining the attention of scientists and researchers around the world This new category of heat transfer medium improves the thermal conductivity of fluid by suspending small solid particles within it and offers the possibility of increased heat transfer in a variety of applications Bringing together expert contributions from

**Advances in Heat Transfer Enhancement** Sujoy Kumar Saha, Manvendra Tiwari, Bengt Sundén, Zan Wu, 2016-04-23 This Brief addresses the phenomena of heat transfer enhancement A companion edition in the Springer Brief Subseries on Thermal Engineering and Applied Science to three other monographs including Critical Heat Flux in Flow Boiling in Microchannels this volume is idea for professionals researchers and graduate students concerned with electronic cooling

**Heat Exchanger Network Retrofit Through Heat Transfer Enhancement** Yufei Wang, Robin Smith, 2012 Heat exchanger network retrofit plays an important role in energy saving in process industry Many design methods for the retrofit of heat exchanger networks have been proposed during the last three decades Conventional retrofit methods rely heavily on topology modifications which often results in a long retrofit duration and high initial costs Moreover the addition of extra surface area to the heat exchanger can prove difficult due to topology safety and downtime constraints These problems can be avoided through the use of heat

transfer enhancement in heat exchanger network retrofit This thesis develops a heuristic methodology and an optimization methodology to consider heat transfer enhancement in heat exchanger network retrofit The heuristic methodology is to identify the most appropriate heat exchangers requiring heat transfer enhancements in the heat exchanger network From analysis in the heuristic roles some great physical insights are presented The optimisation method is based on simulated annealing It has been developed to find the appropriate heat exchangers to be enhanced and to calculate the level of enhancement required The new methodology allows several possible retrofit strategies using different retrofit methods be determined Comparison of these retrofit strategies demonstrates that retrofit modification duration and pay back time are reduced significantly when only heat transfer enhancement is utilised Heat transfer enhancement may increase pressure drop in a heat exchanger The fouling performance in a heat exchanger will also be affected when heat transfer enhancement is used Therefore the implications of pressure drop and fouling are assessed in the proposed methodology predicated on heat transfer enhancement Methods to reduce pressure drop and mitigate fouling are developed to promote the application of heat transfer enhancement in heat exchanger network retrofit In optimization methodology considering fouling the dynamic nature of fouling is simulated by using temperature intervals It can predict fouling performance when heat transfer enhancement is considered in the network Some models for both heat exchanger and heat transfer enhancement are used to predict the pressure drop performance in heat exchanger network retrofit Reducing pressure by modifying heat exchanger structure is proposed in this thesis From case study the pressure drop increased by heat transfer enhancement can be eliminated by modifying heat exchanger structure

**Emerging Topics in Heat Transfer** Sundeun Bengt Chen Yi-Tung Wang Qiuwang, 2013-01-01 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 *Heat Transfer Enhancement in Heat Exchangers Network Retrofit* Monica Zanfir, X. X. Zhu, Centre for Process Integration, 1997 *Heat Transfer Enhancement in Plate and Fin Extended Surfaces* Sujoy Kumar Saha, Hrishiraj Ranjan, Madhu Sruthi Emani, Anand Kumar Bharti, 2019-06-24 This Brief deals with heat transfer and friction in plate and fin extended heat transfer enhancement surfaces It examines Offset Strip Fin OSF Enhancement Principle Analytically Based Models for  $j$  and  $f$  vs  $Re$  Transition from Laminar to Turbulent Region Correlations for  $j$  and  $f$  vs  $Re$  Use of OSF with Liquids Effect of Percent Fin Offset Effect of Burred Edges Louver fin heat transfer and friction correlations flow structure in the louver fin array analytical model for heat transfer and friction convex louver fin wavy fin 3D corrugated fin perforated fin pin fins and wire mesh types of vortex generators metal foam fin plain fin packings numerical simulation of various types of fins Performance Evaluation Criteria in Heat Transfer Enhancement Sujoy Kumar Saha, Hrishiraj Ranjan, Madhu Sruthi Emani, Anand Kumar Bharti, 2019-06-19 This Brief deals with Performance Evaluation Criteria PEC for heat exchangers single phase flow objective function and constraints algebraic formulation constant flow rate fixed flow area thermal resistance heat exchanger

effectiveness relations for St and f finned tube banks variations of PEC reduced exchanger flow rate exergy based PEC PEC for two phase heat exchangers work consuming work producing and heat actuated systems The authors explain Performance Criteria of Enhanced Heat Transfer Surfaces the ratio of enhanced performance to the basic performance and its importance for Heat Transfer Enhancement and efficient thermal management in devices *Heat Transfer Enhancement And Energy Conservation* Songshjiu Deng,2024-11-01 Heat transfer is close connected to the better utilization of thermal energy This book provides an international perspective on the status of heat transfer enhancement and energy conservation research development and applications It contains scientific papers from countries and areas including Bahrain Canada China France the Federal Republic of Germany Hong Kong Italy India Japan New Zealand Poland the United Kingdom the United States of America and Yugoslavia It is a valuable reference for anyone interested in heat transfer enhancement and energy conservation Heat Transfer Enhancement in Externally Finned Tubes and Internally Finned Tubes and Annuli Sujoy Kumar Saha,Hrishiraj Ranjan,Madhu Sruthi Emani,Anand Kumar Bharti,2019-07-26 This Brief deals with externally finned tubes their geometric parameters Reynolds number dimensionless variables friction factor plain plate fins on round tubes the effect of fin spacing correlations plain individually finned tubes circular fins with staggered tubes low integral fin tubes wavy fin enhanced plate fin geometries with round tubes Offset Strip Fins convex louver fins louvered fin perforated fin mesh fin vortex generator enhanced circular fin geometries spine or segmented fin wire loop fin flat extruded tubes with internal membranes plate and fin automotive radiators performance comparison numerical simulation advanced fin geometries hydrophilic coatings internally finned tubes and annuli spirally fluted and indented tube advanced internal fin geometries and finned annuli The book is ideal for professionals and researchers dealing with thermal management in devices **Heat Exchangers** S. M. Sohel Murshed,Manuel Matos Lopes,2017-04-26 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 Advanced Analytic and Control Techniques for Thermal Systems with Heat Exchangers Libor Pekar,2020-07-10 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 Stability Analysis Efficiency of HXs Fouling Effect Delay Phenomenon Robust Control Algebraic Control Geometric Control Optimal Control Fuzzy Control and Artificial Intelligence techniques Editor Libor Pekar and his team of global expert contributors combine 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 flexibility and 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 an 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 robust 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 and these 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 Focusses on advanced analytic and control techniques which have been investigated or applied to thermal systems with HXs and HXNs Includes practical applications and advanced ideas from leading experts in the field as well as case studies and tested problems and solutions

Heat Transfer Enhancement A. E. Bergles,1986      **Advances in Heat Exchangers** Laura Castro Gómez,Víctor Manuel Velázquez Flores,2019-02-20 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 sense the present book compiles some advances in the matter of design three chapters and working fluids one chapter An introductory chapter also is presented

**Heat Transfer Enhancement Techniques. With Special Attention to Passive Methods of Heat Transfer Enhancement** Chakole M.M.,2016-06-02 Heat exchangers are widely used in the industrial sector e g in the refrigeration air conditioning petrochemical and agricultural food industry The high cost of energy and material has resulted in an increased effort aimed at producing high performance heat exchanger equipment Passive methods of heat transfer enhancement do not need external power for enhancement One of these kinds of passive technique is twisted tape inserts that enhance the performance of heat exchangers Using multiple twisted tape inserts gives better enhancement than a single twisted tape insert Using nanofluid gives also better thermal performance than water Therefore nanofluid along with twisted tape inserts was used in this study For this study different combinations of multiple twisted tape inserts were designed and fabricated These different combinations contain dual triple and quadruple twisted tapes Directions of twists are also varied which enables to study the effect of different swirl flow generators Nanofluid is used with various volume concentrations of 0.07% 0.14% and 0.21% in order to investigate the effect of nanoparticle concentration on heat transfer enhancement Experimental investigation was carried out by having a constant heat flux condition and by varying the volume flow rate of flow from 2 to 10 lpm

**Introduction to Enhanced Heat Transfer** Sujoy Kumar Saha,Hrishiraj Ranjan,Madhu Sruthi Emani,Anand Kumar Bharti,2019-06-29 This Brief stands as a primer for heat transfer fundamentals in heat transfer enhancement devices the definition of heat transfer area passive and active enhancement techniques and their potential and benefits and commercial applications It further examines techniques

and modes of heat transfer like single phase flow and two phase flow natural and forced convection radiation heat transfer and convective mass transfer

**Advanced Applications in Heat Exchanger Technologies** Sunil Kumar, Kavita Rathore, Debjyoti Banerjee, 2025-08-13 Advanced Applications in Heat Exchanger Technologies presents the most recent developments in enhancing heat exchanger performance reliability and resilience including the implementation of Artificial Intelligence Machine Learning and Additive Manufacturing Covering the essential parts of many commercial endeavors ranging from aerospace to marine applications to oil and gas the book discusses various heat exchanger types and interdisciplinary industry applications It encompasses several different techniques such as nanofluids microchannel heat exchangers computer modeling advanced manufacturing and optimization The book addresses real world concerns that impact long term heat exchanger performance and dependability such as fouling corrosion prevention and maintenance measures This book is intended for researchers and graduate students who are interested in heat exchangers R D and the diverse range of industrial applications of heat exchanger technologies in contemporary practice

*Heat Exchangers* Kuppan Thulukkanam, 2024-02-29 Heat Exchangers Classification Selection and Thermal Design Third Edition discusses heat exchangers and their various applications such as refrigeration air conditioning automobiles gas turbines process industries refineries and thermal power plants With a focus on thermal design methods including rating and sizing the book covers thermohydraulic fundamentals and thermal effectiveness charts for various flow configurations and shell and tube heat exchangers It provides construction details geometrical features and correlations and thermo hydraulic details for tube fin plate fin air cooled shell and tube microchannel and plate heat exchangers and thermal design methods like rating and sizing The book explores additive manufacturing of heat exchangers printed circuit heat exchangers and heat transfer augmentation methods The book also describes recuperators and regenerators of gas turbine cycles waste heat recovery devices and phase change phenomena including boiling condensation and steam generation The book serves as a useful reference for researchers graduate students and engineers in the field of heat exchanger design including heat exchanger manufacturers

**Handbook of Process Integration (PI)** Jiří Jaromír Klemeš, 2013-07-31 Since its first development in the 1970s Process Integration PI has become an important methodology in achieving more energy efficient processes This pioneering handbook brings together the leading scientists and researchers currently contributing to PI development pooling their expertise and specialist knowledge to provide readers with a comprehensive and up to date guide to the latest PI research and applications After an introduction to the principles of PI the book reviews a wide range of process design and integration topics ranging from heat and utility systems to water recycling waste and hydrogen systems The book considers Heat Integration Mass Integration and Extended PI as well as a series of applications and case studies Chapters address not just operating and capital costs but also equipment design and operability issues through to buildings and supply chains With its distinguished editor and international team of expert contributors Handbook of Process Integration PI is a standard

reference work for managers and researchers in all energy intensive industries as well as academics with an interest in them including those designing and managing oil refineries petrochemical and power plants as well as paper pulp steel waste food and drink processors This pioneering handbook provides a comprehensive and up to date guide to the latest process integration research and applications Reviews a wide range of process design and integration topics ranging from heat and utility systems to water recycling waste and hydrogen systems Chapters also address equipment design and operability issues through to buildings and supply chains



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