

Kotas Exergy Method Of Thermal Plant Analysis

Dieses Fach- und Lehrbuch behandelt die Grundlagen der Brennstoffzellen. Dabei werden die chemischen Grundlagen in leicht verständlicher Form dargestellt. Einen Schwerpunkt des Buchs bilden die verschiedenen Brennstoffzellentypen und deren technische Anwendung. Im Kapitel "Gaserzeugung" werden konventionelle und alternative Methoden und Konzepte behandelt. Eine aktuelle Marktübersicht von Anbietern gibt zuverlässige Informationen zu diesem Thema. Die überarbeitete und aktualisierte zweite Auflage berücksichtigt zahlreiche konstruktive Ergänzungsvorschläge aus Leserzuschriften. Dabei wurden die Grundlagen ausführlicher behandelt und durch Rechenbeispiele ergänzt. In der Marginalspalte findet der Leser praxisnahe Zusatzinformationen und die Tabellen bringen Bezüge zur aktuellen Forschung.

A comprehensive assessment of the methodologies of thermodynamic optimization, exergy analysis and thermoeconomics, and their application to the design of efficient and environmentally sound energy systems. The chapters are organized in a sequence that begins with pure thermodynamics and progresses towards the blending of thermodynamics with other disciplines, such as heat transfer and cost accounting. Three methods of analysis stand out: entropy generation minimization, exergy (or availability) analysis, and thermoeconomics. The book reviews current directions in a field that is both extremely important and intellectually alive. Additionally, new directions for research on thermodynamics and optimization are revealed.

Bringing together a wealth of knowledge, the Handbook of Environmental Management, Second Edition, gives a comprehensive overview of environmental problems, their sources, their assessment, and their solutions. Through in-depth entries, and a topical table of contents, readers will quickly find answers to questions about pollution and management issues. This six-volume set is a reimagining of the award-winning Encyclopedia of Environmental Management, published in 2013, and features insights from more than 500 contributors, all experts in their fields. The experience, evidence, methods, and models used in studying environmental management is presented here in six stand-alone volumes, arranged along the major environmental systems. Features of the new edition: The first handbook that demonstrates the key processes and provisions for enhancing environmental management. Addresses new and cutting-edge topics on ecosystem services, resilience, sustainability, food-energy-water nexus, socio-ecological systems and more. Provides an excellent basic knowledge on environmental systems, explains how these systems function and offers strategies on how to best manage them. Includes the most important problems and solutions facing environmental management today. In this second volume, Managing Air Quality and Energy Systems, the reader is introduced to the general concepts and processes of the atmosphere, with its related systems. This volume explains how these systems function and provides strategies on how to best manage them. It serves as an excellent resource for finding basic knowledge on the atmosphere, and includes important problems and solutions that environmental managers face today. This book practically demonstrates the key processes, methods, and models used in studying environmental management.

The European Symposium on Computer Aided Process Engineering (ESCAPE) series presents the latest innovations and achievements of leading professionals from the industrial and academic communities. The ESCAPE series serves as a forum for engineers, scientists, researchers, managers and students to present and discuss progress being made in the area of computer aided process engineering (CAPE). European industries large and small are bringing innovations into our lives, whether in the form of new technologies to address environmental problems, new products to make our homes more comfortable and energy efficient or new therapies to improve the health and well being of European citizens. Moreover, the European Industry needs to undertake research and technological initiatives in response to humanity's "Grand Challenges," described in the declaration of Lund, namely, Global Warming, Tightening Supplies of Energy, Water and Food, Ageing Societies, Public Health, Pandemics and Security. Thus, the Technical Theme of ESCAPE 21 will be "Process Systems Approaches for Addressing Grand Challenges in Energy, Environment, Health, Bioprocessing & Nanotechnologies."

Quantifying exergy losses in the energy supply system of buildings reveals the potential for energy improvement, which cannot be discovered using conventional energy analysis. Thermoeconomics combines economic and thermodynamic analysis by applying the concept of cost (an economic concept) to exergy, as exergy is a thermodynamic property fit for this purpose, in that it combines the quantity of energy with its quality factor. Exergy Analysis and Thermoeconomics of Buildings applies exergy analysis methods and thermoeconomics to the built environment. The mechanisms of heat transfer throughout the envelope of buildings are analyzed from an exergy perspective and then to the building thermal installations, analyzing the different components, such as condensing boilers, absorption refrigerators, microcogeneration plants, etc., including solar installations and finally the thermal facilities as a whole. A detailed analysis of the cost formation process is presented, which has its physical roots firmly planted in the second law of thermodynamics. The basic principles and the rules of cost allocation, in energy units (exergy cost), in monetary units (exergoeconomic cost), and in CO₂ emissions (exergoenvironmental cost), based on the so-called Exergy Cost Theory are presented and applied to thermal installations of buildings. Clear and rigorous in its exposition, Exergy Analysis and Thermoeconomics of Buildings discusses exergy analysis and thermoeconomics and the role they could play in the analysis and design of building components, either the envelope or the thermal facilities, as well as the diagnosis of thermal installations. This book moves progressively from introducing the basic concepts to applying them. Exergy Analysis and Thermoeconomics of Buildings provides examples of specific cases throughout this book. These cases include real data, so that the results obtained are useful to interpret the inefficiencies and losses that truly occur in actual installations; hence, the assessment of their effects encourages the manner to improve efficiency. Applies exergy analysis methods for the installation of

building thermal facilities equipment components, including pipes, valves, heat exchangers, boilers and heat pumps Helps readers determine the operational costs of heating and cooling building systems Includes exergy analysis methods that are devoted to absorption refrigerators, adsorption cooling systems, basic air conditioning processes, ventilation systems and solar systems, either thermal and PV Discusses the direct application of exergy analysis concepts, including examples of buildings with typical heating, DHW and air conditioning installations

Winner of an Outstanding Academic Title Award from CHOICE Magazine Encyclopedia of Environmental Management gives a comprehensive overview of environmental problems, their sources, their assessment, and their solutions. Through in-depth entries and a topical table of contents, readers will quickly find answers to questions about specific pollution and management issues. Edited by the esteemed Sven Erik Jørgensen and an advisory board of renowned specialists, this four-volume set shares insights from more than 500 contributors—all experts in their fields. The encyclopedia provides basic knowledge for an integrated and ecologically sound management system. Nearly 400 alphabetical entries cover everything from air, soil, and water pollution to agriculture, energy, global pollution, toxic substances, and general pollution problems. Using a topical table of contents, readers can also search for entries according to the type of problem and the methodology. This allows readers to see the overall picture at a glance and find answers to the core questions: What is the pollution problem, and what are its sources? What is the "big picture," or what background knowledge do we need? How can we diagnose the problem, both qualitatively and quantitatively, using monitoring and ecological models, indicators, and services? How can we solve the problem with environmental technology, ecotechnology, cleaner technology, and environmental legislation? How do we address the problem as part of an integrated management strategy? This accessible encyclopedia examines the entire spectrum of tools available for environmental management. An indispensable resource, it guides environmental managers to find the best possible solutions to the myriad pollution problems they face. Also Available Online This Taylor & Francis encyclopedia is also available through online subscription, offering a variety of extra benefits for researchers, students, and librarians, including: Citation tracking and alerts Active reference linking Saved searches and marked lists HTML and PDF format options Contact us to inquire about subscription options and print/online combination packages. US: (Tel) 1.888.318.2367 / (email) e-reference@taylorandfrancis.com International: (Tel) +44 (0) 20 7017 6062 / (email) online.sales@tandf.co.uk

Energy Optimization in Process Systems and Fuel Cells, Third Edition covers the optimization and integration of energy systems, with a particular focus on fuel cell technology. With rising energy prices, imminent energy shortages, and the increasing environmental impacts of energy production, energy optimization and systems integration is critically important. The book applies thermodynamics, kinetics and economics to study the effect of equipment size, environmental parameters, and economic factors on optimal power production and heat integration. Author Stanislaw Sieniutycz, highly recognized for his expertise and teaching, shows how costs can be substantially reduced, particularly in utilities common in the chemical industry. This third edition contains substantial revisions and modifications, with new material on catalytic reactors, sorption systems, sorbent or catalyst regenerators, dryers, and more. Presents a unified approach to the optimization and integration of energy systems Includes a large number of examples treating dynamical systems Provides exposition showing the power of thermodynamics Contains a large number of maximum power analyses and their extensions

A companion book to the textbook The Exergy Method of Thermal Plant Analysis. This Companion Book presents model solutions to the questions taken from Appendix G of the main textbook. Since the Exergy Method is a relatively new area of Applied Thermodynamics it was thought that the presentation of model solutions of problems of various types would be of some help both to teachers and to self-teaching students. The advantages of the use of exergy analysis were demonstrated by pointing out and quantifying thermodynamic losses of various plant components and plant configurations. These were discussed at the end of the solutions under Comments. It is hoped that this will give students a deeper understanding of the nature of irreversibilities of various kinds and their effect on plant performance. Dr Tadeusz J. Kotas joined the Department of Mechanical Engineering of Queen Mary College as a member of teaching staff in 1957. His main areas of interest were Mechanics of Fluids and Applied Thermodynamics, obtaining a PhD degree for his work in the former subject. His work in the latter subject focused on the Exergy Method, contributing to its development through his research and publications and to its dissemination through courses which he ran in Britain and in a number of European countries for practicing engineers and academics.

Dieses Lehrbuch beinhaltet die wichtigsten Themen zur dezentralen Energieerzeugung. Dezentrale Energiesysteme und deren thermodynamische, betriebliche, wirtschaftliche und ökologische Grundlagen werden ausführlich dargestellt und kritisch diskutiert. Das Buch geht auf ein sehr breites Spektrum von verschiedenen Technologien ein. Neben konventionellen Energietechniken zur Wärme- und Stromerzeugung werden vor allem die Kraft-Wärme-Kopplung, innovative Technologien wie Brennstoffzellen und die Nutzung regenerativer Energien mit ihrer jeweiligen besonderen Bedeutung für kleine, dezentrale Systeme beschrieben. Es werden Einsatzgebiete und Wege aufgezeigt, auf denen die Entwicklung und Einführung innovativer, dezentraler Technologien vorangebracht werden kann. Außerdem beschreibt das Buch umfassend, wie die wirtschaftlichen Nachteile kleiner, dezentraler Versorgungsanlagen beispielsweise durch die Kraft-Wärme-Kopplung oder die Verschaltung zu "virtuellen Kraftwerken" zu kompensieren sind.

Green energy is essential to the development of a sustainable society but its output can be unstable. It is therefore necessary to develop a network where both conventional and green energy systems cooperate to generate a stable, compound supply. Compound Energy Systems: Optimal Operation Methods describes the construction and operation of compound energy systems using the latest optimization methods. The authors examine the combination of traditional and alternative energy systems, which is becoming an increasingly popular solution to green energy. Important factors such

as cost, efficiency and dynamic characteristics are all considered. The green energy sources discussed include fuel cells, bioethanol reformers, geo-thermal heat pumps, solar cells and wind power. This book, a distillation of information only touched upon in other books, is aimed at undergraduate and postgraduate students, scientists, engineers and industrialists with an interest in the field.

The global warming phenomenon as a significant sustainability issue is gaining worldwide support for development of renewable energy technologies. The term "polygeneration" is referred to as "an energy supply system, which delivers more than one form of energy to the final user." For example, electricity, cooling and desalination can be delivered from a polygeneration process. The polygeneration process in a hybrid solar thermal power plant can deliver electricity with less impact on the environment compared to a conventional fossil fuel-based power generating system. It is also THE next generation energy production technique with the potential to overcome the undesirable intermittence of renewable energy systems. In this study, the polygeneration process simultaneous production of power, vapor absorption refrigeration (VAR) cooling and multi-effect humidification and dehumidification (MEHD) desalination system from different heat sources in hybrid solar-biomass (HSB) system with higher energy efficiencies (energy and exergy), primary energy savings (PES) and payback period are investigated, focusing on several aspects associated with hybrid solar-biomass power generation installations, such as wide availability of biomass resources and solar direct normal irradiance (DNI), and other technologies. Thermodynamic evaluation (energy and exergy) of HSB power has also been investigated, along with the VAR cooling system, the modelling, simulation, optimization and cost analysis of the polygeneration hybrid solar biomass system, all accompanied by multiple case studies and examples for practical applications. This volume provides the researcher, student and engineer with the intellectual tool needed for understanding new ideas in this rapidly emerging field. The book is also intended to serve as a general source and reference book for the professional (consultant, designer, contractor etc.) who is working in the field of solar thermal, biomass, power plant, polygeneration, cooling and process heat. It is a must-have for anyone working in this field.

Schnell und bequem auffindbare, wissenschaftlich fundierte, somit verlässliche, neutrale und umfassende Information zu modernen Energietechnologien stellt dieses Handbuch bereit. Im Vordergrund stehen dabei die naturwissenschaftlich-technischen Aspekte, jedoch auch Ökonomie, Ökologie und Gesellschaft werden angemessen berücksichtigt. Das Werk wendet sich vor allem an Studenten, Wissenschaftler und Fachleute aus Naturwissenschaft und Technik, die sich in bestimmte Themen einlesen oder nur rasch etwas nachschlagen wollen. Es ist jedoch so verständlich geschrieben, dass es sich auch den mit Energiefragestellungen befassten Nicht-Technikern erschließt. Dem Herausgeber ist ein Werk "aus einem Guss" gelungen, wobei es von der detaillierten Fachkenntnis zahlreicher namhafter Beitragsautoren profitiert.

In the region comprising Turkey and Greece, people have been using water from geothermal sources for bathing and washing of clothes since ancient times. This region falls within the Alpine-Himalayan orogenic belt and hence is a locus of active volcanism and tectonism and experiences frequent seismic events. This volcanic and tectonic activity has given rise to over 1500 geothermal springs. Its importance was recognized decades ago and the geothermal water is now being utilized for district heating, industrial processing, domestic water supply, balneology and electric power generation. The geothermal potential in this region is large. In Turkey alone it is estimated to be more than 31500 MWt while the proven potential is 4078 MWt. At present 2084 MWt is being utilized for direct applications in Turkey and 135 MWt in Greece. In Turkey electricity is produced for 166 MW installed capacity, whereas in Greece geothermal energy is presently not used for electricity production despite its potential. This book discusses the geochemical evolution of the thermal waters and thermal gases in terms of the current volcano-tectonic setting and associated geological framework that makes the region very important to the geothermal scientific community. The book explains, in a didactic way, the possible applications, depending on local conditions and scales, and it presents new and stimulating ideas for future developments of this renewable energy source. Additionally, the book discusses the role(s) of possible physicochemical processes in deep hydrothermal systems, the volatile provenance and relative contributions of mantle and crustal components to total volatile inventories. It provides the reader with a thorough understanding of the geothermal systems of this region and identifies the most suitable solutions for specific tasks and needs elsewhere in the world. It is the first time that abundant information and data from this region, obtained from intensive research during the last few decades, is unveiled to the international geothermal community. Thus, an international readership, in the professional and academic sectors, as well as in key institutions that deal with geothermal energy, will benefit from the knowledge from geothermal research and experiences obtained from the Aegean Region.

Every oil and gas refinery or petrochemical plant requires sufficient utilities support in order to maintain a successful operation. A comprehensive utilities complex must exist to distribute feedstocks, discharge waste streams, and remains an integrated part of the refinery's infrastructure. Essentials of Oil and Gas Utilities explains these support systems and provides essential information on their essential requirements and process design. This guide includes water treatment plants, condensate recovery plants, high pressure steam boilers, induced draft cooling towers, instrumentation/plant air compressors, and units for a refinery fuel gas and oil systems. In addition, the book offers recommendations for equipment and flow line protection against temperature fluctuations and the proper preparation and storage of strong and dilute caustic solutions. Essentials of Oil and Gas Utilities is a go-to resource for engineers and refinery personnel who must consider utility system design parameters and associated processes for the successful operations of their plants. Discusses gaseous and liquid fuel systems used to provide heat for power generation, steam production and process requirements Provides a design guide for compressed air systems used to provide air to the various points of application in sufficient quantity and quality and with adequate pressure for efficient operation of air tools or other pneumatic devices. Explains the water systems utilized in plant operations which include water treatment systems or raw water and plant water system; cooling water circuits for internal combustion engines, reciprocating compressors, inter-cooling and after-

cooling facilities; and "Hot Oil" and "Tempered Water" systems

Exergy, Energy System Analysis, and Optimization theme is a component of the Encyclopedia of Energy Sciences, Engineering and Technology Resources which is part of the global Encyclopedia of Life Support Systems (EOLSS), an integrated compendium of twenty one Encyclopedias. These three volumes are organized into five different topics which represent the main scientific areas of the theme: 1. Exergy and Thermodynamic Analysis; 2. Thermo-economic Analysis; 3. Modeling, Simulation and Optimization in Energy Systems; 4. Artificial Intelligence and Expert Systems in Energy Systems Analysis; 5. Sustainability Considerations in the Modeling of Energy Systems. Fundamentals and applications of characteristic methods are presented in these volumes. These three volumes are aimed at the following five major target audiences: University and College Students, Educators, Professional Practitioners, Research Personnel and Policy Analysts, Managers, and Decision Makers and NGOs.

Despite the vast research on energy optimization and process integration, there has to date been no synthesis linking these together. This book fills the gap, presenting optimization and integration in energy and process engineering. The content is based on the current literature and includes novel approaches developed by the authors. Various thermal and chemical systems (heat and mass exchangers, thermal and water networks, energy converters, recovery units, solar collectors, and separators) are considered. Thermodynamics, kinetics and economics are used to formulate and solve problems with constraints on process rates, equipment size, environmental parameters, and costs. Comprehensive coverage of dynamic optimization of energy conversion systems and separation units is provided along with suitable computational algorithms for deterministic and stochastic optimization approaches based on: nonlinear programming, dynamic programming, variational calculus, Hamilton-Jacobi-Bellman theory, Pontryagin's maximum principles, and special methods of process integration. Integration of heat energy and process water within a total site is shown to be a significant factor reducing production costs, in particular costs of utilities for the chemical industry. This integration involves systematic design and optimization of heat exchangers and water networks (HEN and WN). After presenting basic, insight-based Pinch Technology, systematic, optimization-based sequential and simultaneous approaches to design HEN and WN are described. Special consideration is given to the HEN design problem targeting stage, in view of its importance at various levels of system design. Selected, advanced methods for HEN synthesis and retrofit are presented. For WN design a novel approach based on stochastic optimization is described that accounts for both grassroots and revamp design scenarios. Presents a unique synthesis of energy optimization and process integration that applies scientific information from thermodynamics, kinetics, and systems theory Discusses engineering applications including power generation, resource upgrading, radiation conversion and chemical transformation, in static and dynamic systems Clarifies how to identify thermal and chemical constraints and incorporate them into optimization models and solutions

Renewable Energy Powered Desalination Handbook: Applications and Thermodynamics offers a practical handbook on the use of renewable technologies to produce freshwater using sustainable methods. Sections cover the different renewable technologies currently used in the field, including solar, wind, geothermal and nuclear desalination. This coverage is followed by an equally important clear and rigorous discussion of energy recovery and the thermodynamics of desalination processes. While seawater desalination can provide a climate-independent source of drinking water, the process is energy-intensive and environmentally damaging. This book provides readers with the latest methods, processes, and technologies available for utilizing renewable energy applications as a valuable technology. Desalination based on the use of renewable energy sources can provide a sustainable way to produce fresh water. It is expected to become economically attractive as the costs of renewable technologies continue to decline and the prices of fossil fuels continue to increase. Covers renewable energy sources, such as nuclear, geothermal, solar and wind powered desalination and energy storage and optimization Includes energy recovery schemes, optimization and process controls Elaborates on the principles of thermodynamics and second law efficiencies to improve process performance, including solar desalination Explains global applicability of solar, wind, geothermal and nuclear energy sources with case studies Discusses renewable energy-desalinated water optimization schemes for island communities

The exergy method makes it possible to detect and quantify the possibilities of improving thermal and chemical processes and systems. The introduction of the concept thermo-ecological cost (cumulative consumption of non-renewable natural exergy resources) generated large application possibilities of exergy in ecology. This book contains a short presentation on the basic principles of exergy analysis and discusses new achievements in the field over the last 15 years. One of the most important issues considered by the distinguished author is the economy of non-renewable natural exergy. Previously discussed only in scientific journals, other important new problems highlighted include: calculation of the chemical exergy of all the stable chemical elements, global natural and anthropogenic exergy losses, practical guidelines for improvement of the thermodynamic imperfection of thermal processes and systems, development of the determination methods of partial exergy losses in thermal systems, evaluation of the natural mineral capital of the Earth, and the application of exergy for the determination of a pro-ecological tax. A basic knowledge of thermodynamics is assumed, and the book is therefore most appropriate for graduate students and engineers working in the field of energy and ecological management.

Das Buch vermittelt die Grundlagen der Technischen Thermodynamik anhand zahlreicher praktischer Beispiele. Es überzeugt durch die klare und strukturierte Darstellung und durch seine didaktische Orientierung an großen amerikanischen Lehrbüchern. Die Studierenden lernen, - technische Prozesse anhand von Idealprozessen zu begreifen und anschließend die Belange realer Prozesse zu berücksichtigen - thermodynamische Prozesse und Maschinen zu verstehen und analytisch zu behandeln - Bilanzgleichungen der Erhaltungsgrößen Masse und Energie auf technische Probleme anzuwenden - mit thermodynamischen Diagrammen umzugehen. Die 2. Auflage wurde grundlegend neu bearbeitet und erweitert. Neu hinzugekommen ist ein Kapitel zur Anwendung bei technischen Prozessen sowie die Behandlung der Adsorptionskältemaschine und -wärmepumpe, außerdem einige log p,h-Diagramme und Stoffwerttabellen. Beispielberechnungen und Stoffwertprogramme für ideale Gase und Rauchgase unter Berücksichtigung der Dissoziation können im Internet herunter geladen werden. Dieses etablierte Lehrbuch der Technischen Thermodynamik liegt, nach grundlegender Überarbeitung, in der 16. Auflage vor. Es bietet eine gründliche Einführung in die Thermodynamik und ihre technischen Anwendungen in der Energie- und Verfahrenstechnik. Der Schwerpunkt dieses Lehrbuchs liegt in der verständlichen Darstellung der durch den ersten und zweiten Hauptsatz der Thermodynamik gegebenen Grundlagen. Die hierauf aufbauenden Energie- und Entropiebilanzgleichungen ermöglichen die energetische und exergetische Analyse von Prozessen und Zustandsänderungen. Daher sind Energie und Entropie zentrale Begriffe der Thermodynamik, die in den ersten Kapiteln des Buches ausführlich eingeführt werden. In einem zweiten Schwerpunkt des Lehrbuchs werden die Beziehungen, welche die Energie- und Entropiewerte aus messbaren Zustandsgrößen wie Druck und Temperatur zugänglich machen, eingehend erläutert. Ein dritter Schwerpunkt

ist den thermodynamischen Aspekten wichtiger energie- und verfahrenstechnischer Anwendungen gewidmet. Praxisnah werden Strömungsprozesse, thermische Stofftrennverfahren, Verbrennungsprozesse und Verbrennungskraftanlagen wie z.B. Gasturbinenanlagen, Brennstoffzellen, thermische Kraftwerke, Kälteanlagen und Wärmepumpen behandelt.

This book comprises select proceedings of the International Conference on Future Learning Aspects of Mechanical Engineering (FLAME 2018). The book gives an overview of recent developments in the field of thermal and fluid engineering, and covers theoretical and experimental fluid dynamics, numerical methods in heat transfer and fluid mechanics, different modes of heat transfer, multiphase transport and phase change, fluid machinery, turbo machinery, and fluid power. The book is primarily intended for researchers and professionals working in the field of fluid dynamics and thermal engineering.

The Exergy Method of Thermal Plant Analysis Elsevier

A comprehensive and rigorous introduction to thermal system design from a contemporary perspective Thermal Design and Optimization offers readers a lucid introduction to the latest methodologies for the design of thermal systems and emphasizes engineering economics, system simulation, and optimization methods. The methods of exergy analysis, entropy generation minimization, and thermoeconomics are incorporated in an evolutionary manner. This book is one of the few sources available that addresses the recommendations of the Accreditation Board for Engineering and Technology for new courses in design engineering. Intended for classroom use as well as self-study, the text provides a review of fundamental concepts, extensive reference lists, end-of-chapter problem sets, helpful appendices, and a comprehensive case study that is followed throughout the text. Contents include: * Introduction to Thermal System Design * Thermodynamics, Modeling, and Design Analysis * Exergy Analysis * Heat Transfer, Modeling, and Design Analysis * Applications with Heat and Fluid Flow * Applications with Thermodynamics and Heat and Fluid Flow * Economic Analysis * Thermoeconomic Analysis and Evaluation *

Thermoeconomic Optimization Thermal Design and Optimization offers engineering students, practicing engineers, and technical managers a comprehensive and rigorous introduction to thermal system design and optimization from a distinctly contemporary perspective. Unlike traditional books that are largely oriented toward design analysis and components, this forward-thinking book aligns itself with an increasing number of active designers who believe that more effective, system-oriented design methods are needed. Thermal Design and Optimization offers a lucid presentation of thermodynamics, heat transfer, and fluid mechanics as they are applied to the design of thermal systems. This book broadens the scope of engineering design by placing a strong emphasis on engineering economics, system simulation, and optimization techniques. Opening with a concise review of fundamentals, it develops design methods within a framework of industrial applications that gradually increase in complexity. These applications include, among others, power generation by large and small systems, and cryogenic systems for the manufacturing, chemical, and food processing industries. This unique book draws on the best contemporary thinking about design and design methodology, including discussions of concurrent design and quality function deployment. Recent developments based on the second law of thermodynamics are also included, especially the use of exergy analysis, entropy generation minimization, and thermoeconomics. To demonstrate the application of important design principles introduced, a single case study involving the design of a cogeneration system is followed throughout the book. In addition, Thermal Design and Optimization is one of the best news sources available for meeting the recommendations of the Accreditation Board for Engineering and Technology for more design emphasis in engineering curricula. Supported by extensive reference lists, end-of-chapter problem sets, and helpful appendices, this is a superb text for both the classroom and self-study, and for use in industrial design, development, and research. A detailed solutions manual is available from the publisher.

The Exergy Method of Thermal Plant Analysis aims to discuss the history, related concepts, applications, and development of the Exergy Method - analysis technique that uses the Second Law of Thermodynamics as the basis of evaluation of thermodynamic loss. The book, after an introduction to thermodynamics and its related concepts, covers concepts related to exergy, such as physical and chemical exergy, exergy concepts for a control method and a closed-system analysis, the exergy analysis of simple processes, and the thermocentric applications of exergy. A seven-part appendix is also included. Appendices A-D covers miscellaneous information on exergy, and Appendix E features charts of thermodynamic properties. Appendix F is a glossary of terms, and Appendix G contains the list of references. The text is recommended for physicists who would like to know more about the Exergy Method, its underlying principles, and its applications not only in thermal plant analysis but also in certain areas.

A comprehensive depository of all information relating to the scientific and technological aspects of Shale Gas and Alternative Energy Conveniently arranged by energy type including Shale Gas, Wind, Geothermal, Solar, and Hydropower Perfect first-stop reference for any scientist, engineer, or student looking for practical and applied energy information Emphasizes practical applications of existing technologies, from design and maintenance, to operating and troubleshooting of energy systems and equipment Features concise yet complete entries, making it easy for users to find the required information quickly, without the need to search through long articles

Comprehensively covers conventional and novel drying systems and applications, while keeping a focus on the fundamentals of drying phenomena. Presents detailed thermodynamic and heat/mass transfer analyses in a reader-friendly and easy-to-follow approach Includes case studies, illustrative examples and problems Presents experimental and computational approaches Includes comprehensive information identifying the roles of flow and heat transfer mechanisms on the drying phenomena Considers industrial applications, corresponding criterion, complications, prospects, etc. Discusses novel drying technologies, the corresponding research platforms and potential solutions An essential resource for optimizing energy systems to enhance design capability, performance and sustainability Optimization of Energy Systems comprehensively describes the thermodynamic modelling, analysis and optimization of numerous types of energy systems in various applications. It provides a new understanding of the system and the process of defining proper objective functions for determination of the most suitable design parameters for achieving enhanced efficiency, cost effectiveness and sustainability. Beginning with a general summary of thermodynamics, optimization techniques and optimization methods for thermal components, the book goes on to describe how to determine the most appropriate design parameters for more complex energy systems using various optimization methods. The results of each chapter provide potential tools for design, analysis, performance improvement, and greenhouse gas emissions reduction. Key features: Comprehensive coverage of the modelling, analysis and optimization of many energy systems for a variety of applications. Examples, practical applications and case studies to put theory into practice. Study problems at the end of each chapter that foster critical thinking and skill development. Written in an easy-to-follow style, starting with simple systems and moving to advanced energy systems and their complexities. A unique resource for understanding cutting-edge research in the thermodynamic analysis and optimization of a wide range of energy systems, Optimization of Energy Systems is suitable for graduate and senior undergraduate students, researchers, engineers, practitioners, and scientists in the area of energy systems.

Safety in the process industries is critical for those who work with chemicals and hazardous substances or processes. The field of loss prevention is, and continues to be, of supreme importance to countless companies, municipalities and governments around the world, and Lees' is a detailed reference to defending against hazards. Recognized as the standard work for chemical and process engineering safety professionals, it provides the most complete collection of information on the theory, practice, design elements, equipment, regulations and laws covering the field of process safety. An entire library of alternative books (and cross-referencing systems) would be needed to replace or improve upon it, but everything of importance to safety professionals, engineers and managers can be found in this all-encompassing three volume reference instead. The process safety encyclopedia, trusted worldwide for over 30 years Now available in print and online, to aid

searchability and portability Over 3,600 print pages cover the full scope of process safety and loss prevention, compiling theory, practice, standards, legislation, case studies and lessons learned in one resource as opposed to multiple sources

During the last two decades many research and development activities related to energy have concentrated on efficient energy use and energy savings and conservation. In this regard, Thermal Energy Storage (TES) systems can play an important role, as they provide great potential for facilitating energy savings and reducing environmental impact. Thermal storage has received increasing interest in recent years in terms of its applications, and the enormous potential it offers both for more effective use of thermal equipment and for economic, large-scale energy substitutions. Indeed, TES appears to provide one of the most advantageous solutions for correcting the mismatch that often occurs between the supply and demand of energy. Despite this increase in attention, no book is currently available which comprehensively covers TES. Presenting contributions from prominent researchers and scientists, this book is primarily concerned with TES systems and their applications. It begins with a brief summary of general aspects of thermodynamics, fluid mechanics and heat transfer, and then goes on to discuss energy storage technologies, environmental aspects of TES, energy and exergy analyses, and practical applications. Furthermore, this book provides coverage of the theoretical, experimental and numerical techniques employed in the field of thermal storage. Numerous case studies and illustrative examples are included throughout. Some of the unique features of this book include: * State-of-the art descriptions of many facets of TES systems and applications * In-depth coverage of exergy analysis and thermodynamic optimization of TES systems * Extensive new material on TES technologies, including advances due to innovations in sensible- and latent-energy storage * Key chapters on environmental issues, sustainable development and energy savings * Extensive coverage of practical aspects of the design, evaluation, selection and implementation of TES systems * Wide coverage of TES-system modelling, ranging in level from elementary to advanced * Abundant design examples, case studies and references In short, this book forms a valuable reference resource for practicing engineers and researchers, and a research-oriented text book for advanced undergraduate and graduate students of various engineering disciplines. Instructors will find that its breadth and structure make it an ideal core text for TES and related courses.

We live in interesting times in which life as we know it is being threatened by manmade changes to the atmosphere in which we live. On the global scale, concern is focused on climate change due to greenhouse gas emissions, and on a national scale, atmospheric pollution produced by combustion processes is of concern. A possible approach is through the development of new ideas and innovative processes to the current practices. Among the available options, multi-generation processes such as the trigeneration cycle, battery storage system, solar power plants and heat pumps have been widely studied, as they potentially allow for greater efficiency, lower costs, and reduced emissions. On the other hand, some researchers had been working to increase the potential of energy generation process through heat recovery under the steam generator, organic Rankine cycle, and absorption chillers. In this Special Issue on "Thermal Systems" of fundamental or applied and numerical or experimental investigation, many new concepts in thermal systems and energy utilization were explored and published as original research papers in this "Special Issue".

Thermal Energy Storage Technologies for Sustainability is a broad-based overview describing the state-of-the-art in latent, sensible, and thermo-chemical energy storage systems and their applications across industries. Beginning with a discussion of the efficiency and conservation advantages of balancing energy demand with production, the book goes on to describe current state-of-the art technologies. Not stopping with description, the authors also discuss design, modeling, and simulation of representative systems, and end with several case studies of systems in use. Describes how thermal energy storage helps bridge the gap between energy demand and supply, particularly for intermittent power sources like solar, wind, and tidal systems Provides tables, illustrations, and comparative case studies that show applications of TES systems across industries Includes a chapter on the rapidly developing field of viable nanotechnology-based thermal energy storage systems

In recent years, the sustainability and safety of perishable foods has become a major consumer concern, and refrigeration systems play an important role in the processing, distribution, and storage of such foods. To improve the efficiency of food preservation technologies, it is necessary to explore new technological and scientific advances both in materials and processes. The Handbook of Research on Advances and Applications in Refrigeration Systems and Technologies gathers state-of-the-art research related to thermal performance and energy-efficiency. Covering a diverse array of subjects—from the challenges of surface-area frost-formation on evaporators to the carbon footprint of refrigerant chemicals—this publication provides a broad insight into the optimization of cold-supply chains and serves as an essential reference text for undergraduate students, practicing engineers, researchers, educators, and policymakers.

International Conference on Advances in Power Generation from Renewable Energy Sources (APGRES-2020)

Exergy: Energy, Environment and Sustainable Development, Third Edition provides a systematic overview of new and developed systems, new practical examples, problems and case studies on several key topics ranging from the basics of thermodynamic concepts to advanced exergy analysis techniques in a wide range of applications. With an ancillary online package and solutions manual, this reference connects exergy with three essential areas in terms of energy, environment and sustainable development. As such, it is a thorough reference for professionals who are solving problems related to design, analysis, modeling and assessment. Connects exergy with three essential areas in terms of energy, environment and sustainable development Provides a number of illustrative examples, practical applications and case studies Written in an easy-to-follow style, starting from the basics to advanced systems

Thermal Energy Storage Systems and Applications Provides students and engineers with up-to-date information on methods, models, and approaches in thermal energy storage systems and their applications in thermal management and elsewhere Thermal energy storage (TES) systems have become a vital technology for renewable energy systems and are increasingly being used in commercial and industrial applications including space and water heating, cooling, and air conditioning. TES technology has the potential to be a sustainable, cost-effective, and eco-friendly approach for facilitating more effective use of thermal equipment and correcting the imbalance that can occur between the supply and demand of energy. The Third Edition of Thermal Energy Storage: Systems and Applications contains detailed coverage of new methodologies, models, experimental works, and methods in the rapidly growing field. Extensively revised and updated throughout, this comprehensive volume covers integrated systems with energy storage options, environmental impact and sustainability, design, analysis, assessment criteria, advanced tools in exergy and extended exergy, and more. New and expanded chapters address topics such as renewable energy systems in which thermal energy storage is essential, sensible and latent TES systems, and numerical modelling, simulation, and analysis of TES systems.

Integrating academic research and practical information, this new edition: Discusses a variety of practical TES applications, their technical features, and potential benefits Explores recent developments and future directions in energy storage technologies Covers the latest generation of thermal storage systems and a wide range of applications Features new chapters, case studies, and chapter problems throughout the text Includes pertinent background information on

thermodynamics, fluid flow, and heat transfer Contains numerous illustrative examples, full references, and appendices with conversion factors and thermophysical properties of various materials Thermal Energy Storage: Systems and Applications, Third Edition is the perfect textbook for advanced undergraduate and graduate courses in mechanical, chemical, and electrical engineering, and a highly useful reference for energy engineers and researchers.

This three-volume handbook provides an overview of the key aspects of micro process engineering. Volume 1 covers the fundamentals, operations and catalysts, volume 2 examines devices, reactions and applications, with volume 3 rounding off the trilogy with system, process and plant engineering. Fluid dynamics, mixing, heat/mass transfer, purification and separation microstructured devices and microstructured reactors are explained in the first volume. Volume 2 segments microreactor design, fabrication and assembly, bulk and fine chemistry, polymerisation, fuel processing and functional materials into understandable parts. The final volume of the handbook addresses microreactor systems design and scale-up, sensing, analysis and control, chemical process engineering, economic and eco-efficiency analyses as well as microreactor plant case studies in one book. Together, this 3-volume handbook explains the science behind micro process engineering to the scale-up and their real life industrial applications.

Pressurized fluidized bed combustion (PFBC) is one of the newest of the coal-based generation technologies available commercially. This authoritative volume contains an excellent balance of the theoretical and practical aspects of PFBC technology, including economics, the fundamental theory of plant design and sorbent characterization, using the results obtained from a wide range of pilot-scale and full-scale demonstration units

This book describes the Exergy-based Input – Output (ExIO) framework, a comprehensive methodology for assessing the primary fossil fuels requirements for the production of goods and services within a given economy from a lifecycle perspective. In the ExIO approach, exergy is assumed to be the best suited thermodynamic metric for characterizing fossil fuels. The mathematical formulation of ExIO is based on Input-Output analysis, which defines boundaries in time and space for any system or product analyzed, encompassing its entire lifecycle. The Hybrid-ExIO approach has been developed to increase the accuracy of results and to analyze energy systems in detail, leading to the definition of criteria and indicators for identifying and optimizing the primary fossil fuels requirements of system products. Lastly, the Bioeconomic ExIO model has been proposed to account for the side effects that the working hours required for producing goods and services have on the total primary fossil fuels consumption. As such, the book will be of considerable interest to both researchers and engineers in industry, offering them essential guidelines on the utilization of exergy and thermoeconomic analysis.

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