

The Exergy Method Of Thermal Plant Analysis

Solutions Manual for the Exergy Method of Thermal Plant Analysis Tadeusz Jozef Kotas 1995-09

Alternative Energy and Shale Gas Encyclopedia Jay H. Lehr 2016-04-06 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

Design and Performance Optimization of Renewable Energy Systems Mamdouh Assad 2021-01-12 Design and Performance Optimization of Renewable Energy Systems provides an integrated discussion of issues relating to renewable energy performance design and optimization using advanced thermodynamic analysis with modern methods to configure major renewable energy plant configurations (solar, geothermal, wind, hydro, PV). Vectors of performance enhancement reviewed include thermodynamics, heat transfer, exergoeconomics and neural network techniques. Source technologies studied range across geothermal power plants, hydroelectric power, solar power towers, linear concentrating PV, parabolic trough solar collectors, grid-tied hybrid solar PV/Fuel cell for freshwater production, and wind energy systems. Finally, nanofluids in renewable energy systems are reviewed and discussed from the heat transfer enhancement perspective. Reviews the fundamentals of thermodynamics and heat transfer concepts to help engineers overcome design challenges for performance maximization Explores advanced design and operating principles for solar, geothermal and wind energy systems with diagrams and examples Combines detailed mathematical modeling with relevant computational analyses, focusing on novel techniques such as artificial neural network analyses Demonstrates how to maximize overall system performance by achieving synergies in equipment and component efficiency

The Exergy Method of Energy Systems Analysis John E. Ahern 1980

Exergy Ibrahim Dincer 2012-12-31 This book deals with exergy and its applications to various energy systems and applications as a potential tool for design, analysis and optimization, and its role in minimizing and/or eliminating environmental impacts and providing sustainable development. In this regard, several key topics ranging from the basics of the thermodynamic concepts to advanced exergy analysis techniques in a wide range of applications are covered as outlined in the contents. Offers comprehensive coverage of exergy and its applications, along with the most up-to-date information in the area with recent developments 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

Advances in Applied Mechanical Engineering Hari Kumar Voruganti 2020-02-01 This book presents select peer reviewed proceedings of the International Conference on Applied Mechanical Engineering Research (ICAMER 2019). The books examines various areas of mechanical engineering namely design, thermal, materials, manufacturing and industrial engineering covering topics like FEA, optimization, vibrations, condition monitoring, tribology, CFD, IC engines, turbo-machines, automobiles, manufacturing processes, machining, CAM, additive manufacturing, modelling and simulation of manufacturing processing, optimization of manufacturing processing, supply chain management, and operations management. In addition, recent studies on composite materials, materials characterization, fracture and fatigue, advanced materials, energy storage, green building, phase change materials and structural change monitoring are also covered. Given the contents, this book will be useful for students, researchers and professionals working in mechanical engineering and allied fields.

Thermal Design and Optimization Adrian Bejan 1995-12-12 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 newsources 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.

Exergy Analysis for Energy Conversion Systems Efstathios Michaelides 2021-04-08 Discover a straightforward and holistic look at energy conversion and conservation processes using the exergy concept with this thorough text. Explains the fundamental energy conversion processes in numerous diverse systems, ranging from jet engines and nuclear reactors to human bodies. Provides examples for applications to practical energy conversion processes and systems that use our naturally occurring energy resources, such as fossil fuels, solar energy, wind, geothermal, and nuclear fuels. With more than one-hundred diverse cases and solved examples, readers will be able to perform optimizations for a cleaner environment, a sustainable energy future, and affordable energy generation. An essential tool for practicing scientists and engineers who work or do research in the area of energy and exergy, as well as graduate students and faculty in chemical engineering, mechanical engineering and physics.

Exergy Analysis of Thermal, Chemical, and Metallurgical Processes Jan Szargut 1988

Thermal Power Plants Mohammad Rasul 2013-04-17 Thermal power plants are one of the most important process industries for engineering professionals. Over the past decades, the power sector is facing a number of critical issues; however, the most fundamental challenge is meeting the growing power demand in sustainable and efficient ways. Practicing power plant engineers not only look after operation and maintenance of the plant, but, also look after range of activities including research and development, starting from power generation to environmental aspects of power

plants. The book *Thermal Power Plants - Advanced Applications* introduces analysis of plant performance, energy efficiency, combustion, heat transfer, renewable power generation, catalytic reduction of dissolved oxygen and environmental aspects of combustion residues. This book addresses issues related to both coal fired and steam power plants. The book is suitable for both undergraduate and research higher degree students, and of course for practicing power plant engineers.

The Efficiency of Industrial Processes V. M. Brodyansky 1994 Hardbound. The subject of this book is the exergy analysis of the efficiency of processes involving energy and matter transformations. Efficiency is one of the most important criteria used in evaluating the performance of all types of processing plants; in particular those of the energy and chemical industries. The beauty of the exergetic approach to thermodynamic analysis is that it permits a universally applicable definition of efficiency and is free of contradictions in its treatment of numerous and diverse systems. The book provides the reader with the quantitative methods and calculations of efficiency considered to be applicable to different systems and their components. Methods, procedures and instructions for using the efficiency analysis in optimizing the performance of thermal, chemical and other industrial plants are also given. Numerous examples are used in the book to aid the reader in understanding the concepts of efficiency, exergy and thei

Emerging Trends in Mechanical Engineering L. M. Das 2020-12-11 This book consists of select proceedings of the International Conference on Emerging Trends in Mechanical and Industrial Engineering (ICETMIE) 2019. It covers current trends in thermal, design, industrial, production and other sub-disciplines of mechanical engineering. This volume focuses on different areas of design engineering including computational mechanics, computational fluid dynamics, finite elements in modelling, simulation, analysis and design, kinematics and dynamics of rigid bodies, micro- and nano-mechanics, solid mechanics and structural mechanics, vibration and acoustics, applied mechanics, and biomechanics. It also covers various topics from thermal engineering including refrigeration plants, heat exchangers, heat pumps and heat pipes, combined heat and power and advanced alternative cycles, polygeneration, combustion processes, heat transfer, solar cells, solar thermal power plants, and the integration of renewable energy with conventional processes. This book will be useful for students, researchers as well as professionals working in the area of mechanical engineering, especially thermal engineering and engineering design and other allied areas.

Advances in Automation Andrey A. Radionov 2020-02-18 This book reports on innovative research and developments in automation. The chapters spans a wide range of disciplines, including communication engineering, power engineering, control engineering, instrumentation, signal processing and cybersecurity. Emphasis is given to methods and findings aimed at fostering better control and monitoring of industrial and manufacturing processes, and improving safety. Based on the International Russian Automation Conference, held in September 8-14, 2019, in Sochi, Russia, the book provides academics and professionals with a timely overview and extensive information on the state of the art in the field of automation and control systems, and is expected to foster new idea, as well as collaboration between different groups in different countries.

Entropy Generation Minimization Adrian Bejan 2013-10-29 This book presents the diverse and rapidly expanding field of Entropy Generation Minimization (EGM), the method of thermodynamic optimization of real devices. The underlying principles of the EGM method - also referred to as "thermodynamic optimization," "thermodynamic design," and "finite time thermodynamics" - are thoroughly discussed, and the method's applications to real devices are clearly illustrated. The EGM field has experienced tremendous growth during the 1980s and 1990s. This book places EGM's growth in perspective by reviewing both sides of the field - engineering and physics. Special emphasis is given to chronology and to the relationship between the more recent work and the pioneering work that outlined the method and the field. Entropy Generation Minimization combines the fundamental principles of thermodynamics, heat transfer, and fluid mechanics. EGM applies these principles to the modeling and optimization of real systems and processes that are characterized by finite size and finite time constraints, and are limited by heat and mass transfer and fluid flow irreversibilities. Entropy Generation Minimization provides a straightforward presentation of the principles of the EGM method, and features examples that elucidate concepts and identify recent EGM advances in engineering and physics. Modern advances include the optimization of storage by melting and solidification; heat exchanger design; power from hot-dry-rock deposits; the on & off operation of defrosting refrigerators and power plants with fouled heat exchangers; the production of ice and other solids; the maximization of power output in simple power plant models with heat transfer irreversibilities; the minimization of refrigerator power input in simple models; and the optimal collection and use of solar energy.

Solutions of Problems in the Exergy Method of Thermal Plant Analysis Tadeusz J. Kotas 2012 Preface to the Solution of the Problems (iii) -- Appendix G Problems (pp 288-319) -- Solutions of the Problems (pp 1-125).

Advanced Thermodynamics for Engineers D. Winterbone 1996-11-01 Although the basic theories of thermodynamics are adequately covered by a number of existing texts, there is little literature that addresses more advanced topics. In this comprehensive work the author redresses this balance, drawing on his twenty-five years of experience of teaching thermodynamics at undergraduate and postgraduate level, to produce a definitive text to cover thoroughly, advanced syllabuses. The book introduces the basic concepts which apply over the whole range of new technologies, considering: a new approach to cycles, enabling their irreversibility to be taken into account; a detailed study of combustion to show how the chemical energy in a fuel is converted into thermal energy and emissions; an analysis of fuel cells to give an understanding of the direct conversion of chemical energy to electrical power; a detailed study of property relationships to enable more sophisticated analyses to be made of both high and low temperature plant and irreversible thermodynamics, whose principles might hold a key to new ways of efficiently covering energy to power (e.g. solar energy, fuel cells). Worked examples are included in most of the chapters, followed by exercises with solutions. By developing thermodynamics from an explicitly equilibrium perspective, showing how all systems attempt to reach a state of equilibrium, and the effects of these systems when they cannot, the result is an unparalleled insight into the more advanced considerations when converting any form of energy into power, that will prove invaluable to students and professional engineers of all disciplines.

Exergy Analysis and Thermoeconomics of Buildings Jose M Sala-Lizarraga 2019-10-01 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

Design Analysis of Thermal Systems R. F. Boehm 1987-03-05 Here is the first book to introduce, at the senior-undergraduate and graduate levels, key aspects of the analysis of thermal systems appropriate for computer-aided design. Extensive examples and problems emphasize modelling and

computer applications while synthesizing material on thermodynamics, heat transfer, and fluid mechanics. Features thorough coverage of second law analytical techniques, extensive material on numerical simulation and optimization, and an excellent description of cost analysis for thermal system design. Topics covered include the curvefitting of physical data, applications of the second law of thermodynamics, the concept and process of steady-state flowsheeting, the solving of n algebraic equations in n unknowns in both linear and nonlinear systems, the art of preliminary cost estimation, and techniques of optimization. Appendixes give dozens of project ideas and cover most of the introductory ideas found in an engineering economics text.

The Exergy Method of Thermal Plant Analysis T. J. Kotas 2013-10-22 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.

Application of Exergy Tolga Taner 2018-06-06 The main scope of this study is to emphasize exergy efficiency in all fields of industry. The chapters collected in the book are contributed by invited researchers with a long-standing experience in different research areas. I hope that the material presented here is understandable to a wide audience, not only energy engineers but also scientists from various disciplines. The book contains seven chapters in three sections: (1) "General Information about Exergy," (2) "Exergy Applications," and (3) "Thermoeconomic Analysis." This book provides detailed and up-to-date evaluations in different areas written by academics with experience in their fields. It is anticipated that this book will make a scientific contribution to exergy workers, researchers, academics, PhD students, and other scientists in both the present and the future.

Exergetic, Energetic and Environmental Dimensions Ibrahim Dincer 2017-10-06 This edited book looks at recent studies on interdisciplinary research related to exergy, energy, and the environment. This topic is of prime significance - there is a strong need for practical solutions through better design, analysis and assessment in order to achieve better efficiency, environment and sustainability. Exergetic, Energetic and Environmental Dimensions covers a number of topics ranging from thermodynamic optimization of energy systems, to the environmental impact assessment and clean energy, offering readers a comprehensive reference on analysis, modeling, development, experimental investigation, and improvement of many micro to macro systems and applications, ranging from basic to advanced categories. Its comprehensive content includes: Comprehensive coverage of development of systems considering exergy, energy, and environmental issues, along with the most up-to-date information in the area, plus recent developments New developments in the area of exergy, including recent debate involving the shaping of future directions and priorities for better environment, sustainable development and energy security Provides a number of illustrative examples, practical applications, and case studies Introduces recently developed technological and strategic solutions and engineering applications for professionals in the area Provides numerous engineering examples and applications on exergy Offers a variety of problems that foster critical thinking and skill development

Exergy Method Jan Szargut 2005 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.

Thermodynamic Optimization of Complex Energy Systems Adrian Bejan 2012-12-06 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.

Thermodynamics Elias P. Gyftopoulos 2005-01-01 Designed by two MIT professors, this authoritative text transcends the limitations and ambiguities of traditional treatments to develop a deep understanding of the fundamentals of thermodynamics and its energy-related applications. Basic concepts and applications are discussed in complete detail, with attention to generality, rigorous definitions, and logical consistency. More than 300 solved problems span a wide range of realistic energy systems and processes.

Thermodynamics and the Destruction of Resources Bhavik R. Bakshi 2011-04-11 This book is a unique, multidisciplinary effort to apply rigorous thermodynamics fundamentals, a disciplined scholarly approach, to problems of sustainability, energy, and resource uses. Applying thermodynamic thinking to problems of sustainable behavior is a significant advantage in bringing order to ill-defined questions with a great variety of proposed solutions, some of which are more destructive than the original problem. The articles are pitched at a level accessible to advanced undergraduates and graduate students in courses on sustainability, sustainable engineering, industrial ecology, sustainable manufacturing, and green engineering. The timeliness of the topic, and the urgent need for solutions make this book attractive to general readers and specialist researchers as well. Top international figures from many disciplines, including engineers, ecologists, economists, physicists, chemists, policy experts and industrial ecologists among others make up the impressive list of contributors.

Electrical Power & Energy Systems Jin Yue Yan 2012-05-14 Volume is indexed by Thomson Reuters CPCI-S (WoS). The First International Conference on Energy and Environmental Protection (ICEEP 2012) was organized by the Inner Mongolia University in Hohhot, China, and took place on the 23rd and 24th June, 2012. The ICEEP2012 brought together experts from a range of disciplines, with the intent of discussing problems and their solutions, of identifying new issues, of shaping future directions for research in these areas, as well as helping industrial users to apply advanced techniques. The present volumes contain selected papers which provide up-to-date, comprehensive and worldwide state-of-the art knowledge in the fields of Engineering Thermophysics; Thermal Engineering; Power Machinery and Engineering; Fluids, Fluid Machinery and Engineering; HVAC, Air Conditioning and Refrigeration; Power Systems and Automation; High Voltage and Insulation Technology; Motors and Electrical; Electrical Theory and Electrical Devices; Power Electronics and Power Drives.

Optimization of Energy Systems Ibrahim Dincer 2017-05-15 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.

Exergy Silvio de Oliveira Junior 2012-11-02 Bridging the gap between concepts derived from Second Law of Thermodynamics and their application to Engineering practice, the property exergy and the exergy balance can be a tool for analyzing and improving the performance of energy conversion processes. With the exergy analysis it is possible to evaluate the performance of energy conversion processes not only on a thermodynamics basis but also by including production costs and environmental aspects and impacts of the studied processes. This comprehensive approach of the use of energy has, as one of the most important feature, the identification of sustainable ways of energy resources utilization. Based on the fundamentals of the exergy concept, its calculation, graphical representations and exergy balances evaluation, *Exergy: Production Cost And Renewability* describes the application of detailed exergy and thermoeconomic analysis to power plants and polygeneration systems, petroleum production and refining plants (including hydrogen production), chemical plants, biofuel production routes, combined production of ethanol and electricity, aircraft systems design, environmental impact mitigation processes and human body behavior. The presented case studies aim at providing students, researchers and engineers with guidelines to the utilization of the exergy and thermoeconomic analysis to model, simulate and optimize real processes and industrial plants.

Proceedings of the International Conference on Soft Computing for Problem Solving (SocProS 2011) December 20-22, 2011 Kusum Deep 2012-04-13 The objective is to provide the latest developments in the area of soft computing. These are the cutting edge technologies that have immense application in various fields. All the papers will undergo the peer review process to maintain the quality of work.

Thermodynamic Optimization of Complex Energy Systems Adrian Bejan 1999-04-30 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.

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Sustainable Hydrogen Production Ibrahim Dincer 2016-08-05 Sustainable Hydrogen Production provides readers with an introduction to the processes and technologies used in major hydrogen production methods. This book serves as a unique source for information on advanced hydrogen generation systems and applications (including integrated systems, hybrid systems, and multigeneration systems with hydrogen production). Advanced and clean technologies are linked to environmental impact issues, and methods for sustainable development are thoroughly discussed. With Earth's fast-growing populations, we face the challenge of rapidly rising energy needs. To balance these we must explore more sustainable methods of energy production. Hydrogen is one key sustainable method because of its versatility. It is a constituent of a large palette of essential materials, chemicals, and fuels. It is a source of power and a source of heat. Because of this versatility, the demand for hydrogen is sure to increase as we aim to explore more sustainable methods of energy. Furthermore, Sustainable Hydrogen Production provides methodologies, models, and analysis techniques to help achieve better use of resources, efficiency, cost-effectiveness, and sustainability. The book is intellectually rich and interesting as well as practical. The fundamental methods of hydrogen production are categorized based on type of energy source: electrical, thermal, photonic, and biochemical. Where appropriate, historical context is introduced. Thermodynamic concepts, illustrative examples, and case studies are used to solve concrete power engineering problems. Addresses the fundamentals of hydrogen production using electrical, thermal, photonic, and biochemical energies Presents new models, methods, and parameters for performance assessment Provides historical background where appropriate Outlines key connections between hydrogen production methods and environmental impact/sustainable development Provides illustrative examples, case studies, and study problems within each chapter

Geothermal Energy Systems Ibrahim Dincer 2021-03-25 Geothermal Energy Systems provides design and analysis methodologies by using exergy and enhanced exergy tools (covering exergoenvironmental, exergoeconomic, exergetic life cycle assessment, etc.), environmental impact assessment models, and sustainability models and approaches. In addition to presenting newly developed advanced and integrated systems for multigenerational purposes, the book discusses newly developed environmental impact assessment and sustainability evaluation methods and methodologies. With case studies for integrated geothermal energy sources for multigenerational aims, engineers can design and develop new geothermal integrated systems for various applications and discover the main advantages of design choices, system analysis, assessment and development of advanced geothermal power systems. Explains the ability of geothermal energy power systems to decrease global warming Discusses sustainable development strategies for using geothermal energy sources Provides new design conditions for geothermal energy sources-based district energy systems

Performance indices of a power plant using exergy-based analyses Zin Eddine Dadach 2017-11-08 Technical Report from the year 2017 in the subject Physics - Other, language: English, abstract: The objective of this applied industrial research was to conduct an exergy-based analysis for an Open Cycle Gas Turbine in Abu Dhabi in order to evaluate its performance under design conditions and during summer weather conditions. The first explanation for this investigation is that CO₂ emissions from power generation plants in the United Arab Emirates are responsible for about 33% of the 200 million tons of the total CO₂ emitted in 2013 in the country. The second reason for this industrial project is that the standard conditions used for the design of gas turbines are 288K, sea level atmospheric pressure and 60% relative humidity. However, the average summer weather conditions in Abu Dhabi are T=316K and a relative humidity of 50%. As a consequence, the effects of summer weather conditions on different performance indices of the power plant were also studied.

Exergy Analysis for Energy Conversion Systems Efstathios Michaelides 2021-04-08 Discover a straightforward and holistic look at energy conversion and conservation processes using the exergy concept with this thorough text. Explains the fundamental energy conversion processes in numerous diverse systems, ranging from jet engines and nuclear reactors to human bodies. Provides examples for applications to practical energy conversion processes and systems that use our naturally occurring energy resources, such as fossil fuels, solar energy, wind, geothermal, and nuclear fuels. With more than one-hundred diverse cases and solved examples, readers will be able to perform optimizations for a cleaner environment, a sustainable energy future, and affordable energy generation. An essential tool for practicing scientists and engineers who work or do research in the area of energy and exergy, as well as graduate students and faculty in chemical engineering, mechanical engineering and physics.

Exergy Analysis of Thermal, Chemical, and Metallurgical Processes Jan Szargut 1988 In addition to the exergy analysis of thermal processes, e.g. heat engines and commercial power stations, for which the methods described have been long established, the book considers the chemical and

metallurgical process industries. Charts and tables are provided for the determination of the exergy of many typical substances. Examples are drawn from the fields of thermal, chemical and metallurgical engineering and the exergetic efficiency of typical processes is calculated. The book also discusses the application of the exergy concept to the problem of the economical optimization of complex plants and the implications to the environment of pollution due to external exergy losses. An Instructor's Manual is available which contains outline solutions to the problems listed at the end of each chapter.

Exergy, Energy System Analysis and Optimization - Volume I Christos A. Frangopoulos 2009-05-18 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. Thermoeconomic 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.

Exergy of Biomass Yaning Zhang 2020 Determination of the exergy of biomass is the first step to evaluate and study the fuel characteristics, transfer processes and utilization systems of biomass from exergy aspect. This book aims to present up-to-date research on the exergy of biomass. Chapter 1 (Resources and Advantages of Biomass) mainly introduces the definition and classification of biomass as well as the resources and advantages of biomass. Chapter 2 (Equations for Estimating the Exergy of Biomass) mainly presents the various equations proposed or developed to estimate the exergy of biomass and these include the simple, complicated and developed equations. Chapter 3 (Analysis of the Exergy of Biomass) mainly defines the basic knowledge for the exergy characteristics (moisture related exergy, ash related exergy, S related exergy, LHV related exergy and total exergy) and distribution (percentages of moisture related exergy, ash related exergy, S related exergy and LHV related exergy) of biomass. Chapter 4 (Exergy of Woody Biomass) mainly presents the basic properties of woody biomass (i.e., moisture content, ash content, ash compositions, elemental compositions and heating values) as well as the exergy characteristics and distribution of woody biomass. HHV related relationship, LHV related relationship and ash related relationships are also proposed to estimate the exergy of woody biomass. Chapter 5 (Exergy of Rice Husk) mainly presents the basic properties of rice husk (i.e., moisture content, ash content, ash compositions, elemental compositions and heating values) as well as the exergy characteristics and distribution of rice husk. HHV related relationship and LHV related relationship are then proposed to estimate the exergy of rice husk. Chapter 6 (Exergy of Rice Straw) mainly presents the basic properties of rice straw (i.e., moisture content, ash content, ash compositions, elemental compositions and heating values) as well as the exergy characteristics and distribution of rice straw. HHV related relationship and LHV related relationship are then proposed to estimate the exergy of rice straw. Chapter 7 (Exergy of Cereal Straw) mainly presents the basic properties of cereal straw (i.e., moisture content, ash content, ash compositions, elemental compositions, and heating values) as well as the exergy characteristics and distribution of cereal straw. HHV related relationship and LHV related relationship are then proposed to estimate the exergy of cereal straw. Hopefully, the content of this book can supply a good guide to the up-to-date research on the exergy of biomass.

Encyclopedia of Ecology Brian D. Fath 2014-11-03 The groundbreaking Encyclopedia of Ecology provides an authoritative and comprehensive coverage of the complete field of ecology, from general to applied. It includes over 500 detailed entries, structured to provide the user with complete coverage of the core knowledge, accessed as intuitively as possible, and heavily cross-referenced. Written by an international team of leading experts, this revolutionary encyclopedia will serve as a one-stop-shop to concise, stand-alone articles to be used as a point of entry for undergraduate students, or as a tool for active researchers looking for the latest information in the field. Entries cover a range of topics, including: Behavioral Ecology Ecological Processes Ecological Modeling Ecological Engineering Ecological Indicators Ecological Informatics Ecosystems Ecotoxicology Evolutionary Ecology General Ecology Global Ecology Human Ecology System Ecology The first reference work to cover all aspects of ecology, from basic to applied Over 500 concise, stand-alone articles are written by prominent leaders in the field Article text is supported by full-color photos, drawings, tables, and other visual material Fully indexed and cross referenced with detailed references for further study Writing level is suited to both the expert and non-expert Available electronically on ScienceDirect shortly upon publication

Thermodynamic Analysis and Optimization of Geothermal Power Plants Can Ozgur Colpan 2021-02-19 Thermodynamic Analysis and Optimization of Geothermal Power Plants guides researchers and engineers on the analysis and optimization of geothermal power plants through conventional and innovative methods. Coverage encompasses the fundamentals, thermodynamic analysis, and optimization of geothermal power plants. Advanced thermodynamic analysis tools such as exergy analysis, thermoeconomic analysis, and several thermodynamic optimization methods are covered in depth for different configurations of geothermal power plants through case studies. Interdisciplinary research with relevant economic and environmental dimensions are addressed in many of the studies. Multiobjective optimization studies aimed at better efficiency, lower cost, and a lower environmental impact are also discussed in this book. Addresses the complexities of thermodynamic assessment in almost all operational plant configurations, including solar-geothermal and multigeneration power plants Includes an exemplary range of case studies, from basic to integrated Provides modern optimization methods including exergoeconomic, artificial neural networks, and multiobjective particle swarm Covers environmental impact considerations and integration with renewable energy systems

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