

# The Exergy Method Of Thermal Plant Analysis

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*Encyclopedia of Environmental Management, Four Volume Set* Sven Erik Jorgensen 2012-12-13 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  
*Thermal Power Plants* Paweł Madejski 2018-05-02 The demand for electricity and heat production is still largely covered by conventional thermal power plants based on fossil fuel combustion. Thermal power stations face a big challenge to meet the environmental requirements constantly keeping high process efficiency and

avoiding lifetime shortening of critical components. In recent years, many activities have been observed to reduce pollutant emissions and optimize performance in thermal power plants. Increased share of renewable sources of energy in domestic markets enforces flexible operation and fast adjustment to actual demand. Gas power plants start to play a very important role in this process, allowing for rapid change of load and emission reduction. Operation under changing load together with keeping emissions at the accurate level requires constantly introducing new solutions and technologies as well as carrying out many research and development activities for optimization of the electricity and heat production process. The edited book is aimed to present new technologies, innovative solutions, measurement techniques, tools and computational methods dedicated to thermal power plants in the light of new trends and challenges.

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 their

**Solutions Manual for the Exergy Method of Thermal Plant Analysis**

Tadeusz Jozef Kotas 1995-09

**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.

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 \* Thermo-economic Analysis and Evaluation \* Thermo-economic 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 thermo-economics. 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 problemsets, 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.

*Mediterranean Green Buildings & Renewable Energy* Ali Sayigh 2016-12-11 This book highlights scientific achievements in the key areas of sustainable electricity generation and green building technologies, as presented in the vital bi-annual World Renewable Energy Network's Med Green Forum. Renewable energy applications in power generation and sustainable development have particular importance in the Mediterranean region, with its rich natural resources and conducive climate, making it a perfect showcase to illustrate the viability of using renewable energy to satisfy all energy needs. The papers included in this work describe enabling policies and offer pathways to further develop a broad range of renewable energy technologies and applications in all sectors – for electricity production, heating and cooling, agricultural applications, water desalination, industrial applications and for the transport sector.

### **Thermodynamic Analysis and Optimization of Geothermal Power Plants**

Can Ozgur Colpan 2021-03-01 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, thermo-economic 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, along with optimization studies aimed at better efficiency, lower cost and lower

environmental impact. Addresses the complexities of thermodynamic assessment in almost all operational plant configurations, including solar-geothermal and multi-generation power plants Includes an exemplary range of case studies, from basic to integrated Provides modern optimization methods, including entropy-based, exergoeconomic, artificial neural networks and multi-objective particle swarm Covers environmental impact considerations and integration with renewable energy systems

*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.

**Exergy Method** Jan Szargut 2005-01-01 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.

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).

**Thermal Energy Storage Systems and Applications** Ibrahim Dinçer 2021-09-09 *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.

*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 CO<sub>2</sub> emissions from power generation plants in the United Arab Emirates are responsible for about 33% of the 200 million tons of the total CO<sub>2</sub> 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.

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

**Essentials of Oil and Gas Utilities** Alireza Bahadori 2016-02-03 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

*The Exergy Method of Thermal Plant Analysis* Tadeusz J Kotas The subject of this book, The Exergy Method also known as the Availability Analysis, is a method of thermodynamic analysis in which the basis of evaluation of thermodynamic losses follows from both the First and the Second Law of Thermodynamics rather than just the First Law. This book is particularly intended

for engineers and students specializing in thermal and chemical plant design or operation as well as applied scientists concerned with various aspects of conservation of energy. It introduces the subject in a manner which can be understood by anyone who is familiar with the fundamentals of Applied Thermodynamics. Numerous examples are used in the book to aid the reader in assimilating the basic concepts and in mastering the techniques. 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.

[Entropy Generation Through Heat and Fluid Flow](#) Adrian Bejan 1982-09-30 Good, No Highlights, No Markup, all pages are intact, Slight Shelfwear, may have the corners slightly dented, may have slight color changes/slightly damaged spine.

[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.

### **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.

### **Energy Systems and Environment**

Pavel Tsvetkov 2018-09-12 This book looks at environmental aspects of energy technologies, from common traditional sources in use, new sources, and emerging sources and technologies. The objective of this book is to serve as a one-stop comprehensive information resource on

energy and environment topics, from energy science to energy engineering to energy politics. Starting with science and technology topics we link them to economics and politics showcasing interconnections between energy sources, energy utilization, energy conversion, and sustainability under the common theme of energy and environment. The book achieves its objective by offering and integrating deeply technical and socioeconomics papers together on energy and environment topics.

### The Exergy Method of Energy Systems

**Analysis** John E. Ahern 1980

### *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

**Exergy Analysis for Energy Conversion Systems** Efstathios Michaelides 2021-01-31 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.

**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.

**Non-equilibrium Thermodynamics For Engineers (Second Edition)** Signe Kjelstrup 2017-02-15 Kjelstrup, Bedeaux, Johannessen, and Gross describe what non-equilibrium thermodynamics is in a simple and practical way and how it can add to engineering design. They explain how to describe proper equations of transport that are more precise than those used so far, and how to use them to understand the waste of energy resources in central process units in the industry. The authors introduce the entropy balance as an additional equation to use in engineering; to create consistent thermodynamic models, and to systematically minimize energy losses that are connected with the transport of heat, mass, charge and momentum. Non-equilibrium Thermodynamics for Engineers teaches the essence of non-equilibrium thermodynamics and its applications at a level comprehensible to engineering students, practitioner engineers, and scientists working on industrial problems. The book may be used as a textbook in basic engineering curricula or graduate courses.

**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 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, microgeneration 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 CO<sub>2</sub> 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

**Thermoeconomic Analysis of a New Geothermal Utilization CHP Plant in Tsetserleg, Mongolia** Purevsuren Dorj  
2005

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.

*Advances in Finite Time Thermodynamics* Lingen Chen 2004 Over 170 years ago, Sadi Carnot, a French engineer, published his famous article "Reflections on the motive power of fire" and established a new field of science: classical thermodynamics. Since 1985, the scholars in the Naval University of Engineering (from 1949 to 1998) have been making the research work in the field of finite time thermodynamics. This multi-

authored book deals with the recent advances of finite time thermodynamics in the Naval University of Engineering. It illustrates how the gap between thermodynamics, heat transfer, and fluid mechanics is bridged. It also illustrates how the gap between physics and engineering is bridged. The readers should find the papers informative and useful for analysis and design of thermodynamic systems with improved performance. The authors hope that this collection of work devoted to finite thermodynamics will provide encouragement for further research in the field.

*Power Plants in the Industry* Tolga Taner 2019-02-06 The main aim of this study is to present power plants for all fields of industry. The chapters collected in the book are contributions by invited researchers with long-standing experience in different research areas. I hope that the material presented here is understandable to a wide audience, not only energy and mechanical engineering specialists but also scientists from various disciplines. The book contains seven chapters in two sections: (1) "Power Plants

### **Primary Exergy Cost of Goods and Services**

Matteo Vincenzo Rocco 2016-08-19 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.

*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

Exergy, Energy System Analysis and Optimization - Volume III Christos A.

Frangopoulos 2009-05-13 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.

**Practical Approach to Exergy and Thermoeconomic Analyses of Industrial Processes** Enrique Querol 2012-11-15

Although the exergy method has been featured as the subject of many publishing papers in scientific and engineering journals and at conferences, very few comprehensive books on this subject have been published so far. Practical Approach to Exergy and Thermoeconomic Analyses of Industrial Processes details the exergetic and thermoeconomic analyses of industrial processes using Aspen Plus and a novel Microsoft Excel Application developed by the authors which can be applied to industrial processes across the board. Employing a practical approach to an innovative and complex energy process, every chapter contains extensive explanations of a complex and real case and numerous examples whose solution demonstrates the application of theory to a wide range of real and practical problems. Illustrations, tables and graphs support and illustrate the new methodology to build a deep understanding of the real employment of the fuel used and the cost formation and increase inside the process. Practical Approach to Exergy and Thermoeconomic Analyses of Industrial Processes provides users, students and practitioners of process analysis, power plant design and fuel use optimization, with a broad introduction and approach to computer aided process optimization. It also serves as a comprehensive guide to the operational application of the MHBOT to real cases analysis.

A Polygeneration Process Concept for Hybrid Solar and Biomass Power Plant Umakanta

Sahoo 2018-08-03 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.

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.

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

*Thermodynamics* 1980

**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