Thermal Power Plant Simulation And Control Researchgate

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JOHNNY BEST

Thermal Cycles of Heat Recovery Power Plants Springer Science & Business Media
Design of Solar Thermal Power Plants introduces the basic design methods of solar thermal power plants for technicians engaged in solar thermal power generation engineering. This book includes the author’s theoretical investigation and study findings in solar heat concentrators, a performance evaluation of solar thermal collectors, a numerical simulation of the heat transfer process between complex geometrics, heat transfer through radiation, and more. Containing theoretical descriptions of solar concentrators and receivers, practical engineering examples, and detailed descriptions of site selections for solar thermal power plants, this book has a strong theoretical and practical value for readers. Contains practical guidance and applications, making it more useful and user-friendly for CSP engineers Includes theoretical investigation in solar heat concentrators, performance evaluation of solar thermal collectors, and the numerical simulation of heat transfer between complex geometrics with practical applications
Introduction to the simulation of power plants for EBSILON®Professional Version 15 Springer Science & Business Media
"This Simulator laboratory (SIMLAB) book was created to provide ancillary resources for Thermodynamics and Thermal Power Plant Simulator courses. It is intended to act as a collection of exercises to help our students merge the theory covered in the classroom with the practice performed in the labs"--BC Campus website.
Thermal System Design and Simulation EOLSS Publications
Thermal Power Plant: Design and Operation deals with various aspects of a thermal power plant, providing a new dimension to the subject, with focus on operating practices and

troubleshooting, as well as technology and design. Its author has a 40-long association with thermal power plants in design as well as field engineering, sharing his experience with professional engineers under various training capacities, such as training programs for graduate engineers and operating personnel. Thermal Power Plant presents practical content on coal-, gas-, oil-, peat- and biomass-fueled thermal power plants, with chapters in steam power plant systems, start up and shut down, and interlock and protection. Its practical approach is ideal for engineering professionals. Focuses exclusively on thermal power, addressing some new frontiers specific to thermal plants Presents both technology and design aspects of thermal power plants, with special treatment on plant operating practices and troubleshooting Features a practical approach ideal for professionals, but can also be used to complement undergraduate and graduate studies

Thermal Power Plants Springer

This book describes a numerical model developed for the power block of a Parabolic Trough type concentrating solar power plant. The entire book can be broken down into four main categories: 1. Theory of Concentrating Solar Power plants and relevant research. 2. Development of the design model and performance model 3. Integration of Numerical Model into Simulation Tool 4. Results and Discussion The book intends to present the concepts used to develop the thermodynamic model and understand the intrinsic behind it. With the help of descriptive figures and tables the theory behind the model and its working is explained. The results are compared with data from other institutes and papers for validation of the model.

Design of Solar Thermal Power Plants Mdpi AG

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.

An Introduction to Thermal Power Plant Engineering and Operation EOLSS Publications

As interest for clean renewable electric power technologies grows, a number of parabolic trough power plants of various configurations are being considered for deployment around the globe. It is essential that plant designs be optimized for each specific application. The optimum design must consider the capital cost, operations and maintenance cost, annual generation, financial requirements, and time-of-use value of the power generated. Developers require the tools for evaluating tradeoffs between these various project elements. This paper provides an overview of a computer model that is being used by scientists and developers to evaluate the tradeoff between cost, performance, and economic parameters for parabolic trough solar power plant technologies. An example is included that shows how this model has been used for a thermal storage design optimization.

Modeling and Simulation of Thermal Power Plants with ThermoSysPro Springer

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.

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

This book explains the modelling and simulation of thermal power plants, and introduces readers to the equations needed to model a wide range of industrial energy processes. Also featuring a wealth of illustrative, real-world examples, it covers all types of power plants, including nuclear, fossil-fuel, solar and biomass. The book is based on the authors’ expertise and experience in the theory of power plant modelling and simulation, developed over many years of service with EDF. In more than forty examples, they demonstrate the component elements involved in a broad range of energy production systems, with detailed test cases for each chemical, thermodynamic and thermo-hydraulic model. Each of the test cases includes the following information: • component description and parameterization data; • modelling hypotheses and simulation results; • fundamental equations and correlations, with their validity domains; • model validation, and in some cases, experimental validation; and • single-phase flow and two-phase flow modelling equations, which cover all water and steam phases. A practical volume that is intended for a broad readership, from students and researchers, to professional engineers, this book offers the ideal handbook for the modelling and simulation of thermal power plants. It is also a valuable aid in understanding the physical and chemical phenomena that govern the operation of power plants and energy processes.

Exergy Analysis of A Natural Gas Fired Thermal Power Plant Academic Press

Faced with an ever-growing resource scarcity and environmental regulations, the last 30 years have witnessed the rapid development of various renewable power sources, such as wind,

tidal, and solar power generation. The variable and uncertain nature of these resources is well-known, while the utilization of power electronic converters presents new challenges for the stability of the power grid. Consequently, various control and operational strategies have been proposed and implemented by the industry and research community, with a growing requirement for flexibility and load regulation placed on conventional thermal power generation. Against this background, the modelling and control of conventional thermal engines, such as those based on diesel and gasoline, are experiencing serious obstacles when facing increasing environmental concerns. Efficient control that can fulfill the requirements of high efficiency, low pollution, and long durability is an emerging requirement. The modelling, simulation, and control of thermal energy systems are key to providing innovative and effective solutions. Through applying detailed dynamic modelling, a thorough understanding of the thermal conversion mechanism(s) can be achieved, based on which advanced control strategies can be designed to improve the performance of the thermal energy system, both in economic and environmental terms. Simulation studies and test beds are also of great significance for these research activities prior to proceeding to field tests. This Special Issue will contribute a practical and comprehensive forum for exchanging novel research ideas or empirical practices that bridge the modelling, simulation, and control of thermal energy systems. Papers that analyze particular aspects of thermal energy systems, involving, for example, conventional power plants, innovative thermal power generation, various thermal engines, thermal energy storage, and fundamental heat transfer management, on the basis of one or more of the following topics, are invited in this Special Issue: • Power plant modelling, simulation, and control; • Thermal engines; • Thermal energy control in building energy systems; • Combined heat and power (CHP) generation; • Thermal energy storage systems; • Improving thermal comfort technologies; • Optimization of complex thermal systems; • Modelling and control of thermal networks; • Thermal management of fuel cell systems; • Thermal control of solar utilization; • Heat pump control; • Heat exchanger control.

Control, Simulation, and Monitoring of Thermal Processes in Power Plants Springer Science & Business Media

Exergy is a thermodynamic potential use in measuring useful energy. Exergy analysis is a thermodynamic analysis technique based on the second law of thermodynamics which provides an alternative and illuminating means of assessing and comparing processes and systems rationally and meaningfully.The performance of engineering systems is degraded by the presence of irreversibilities and the entropy production. The thermal plant was simulated using HYSYS simulation software and Excel spreadsheet was used for the energy and exergy analyses and optimization. The energy and exergy values generated were used in carrying out the efficiencies and irreversibilities of the Power Plant.

Power Plant Synthesis Springer

Thermal System Design and Simulation covers the fundamental analyses of thermal energy systems that enable users to effectively formulate their own simulation and optimal design procedures. This reference provides thorough guidance on how to formulate optimal design constraints and develop strategies to solve them with minimal computational effort. The book uniquely illustrates the methodology of combining information flow diagrams to simplify system simulation procedures needed in optimal design. It also includes a comprehensive presentation on dynamics of thermal systems and the control systems needed to ensure safe operation at varying loads. Designed to give readers the skills to develop their own customized software for simulating and designing thermal systems, this book is relevant for anyone interested in obtaining an advanced knowledge of thermal system analysis and design. Contains detailed models of simulation for equipment in the most commonly used thermal engineering systems Features illustrations for the methodology of using information flow diagrams to simplify system simulation procedures Includes comprehensive global case studies of simulation and optimization of thermal systems

Modelling and Simulation of Thermal Power Plants Woodhead Publishing

Thermal Power Plants: Modeling, Control, and Efficiency Improvement explains how to solve highly complex industry problems regarding identification, control, and optimization through integrating conventional technologies, such as modern control technology, computational intelligence-based multiobjective identification and optimization, distributed computing, and cloud computing with computational fluid dynamics (CFD) technology. Introducing innovative methods utilized in industrial applications, explored in scientific research, and taught at leading academic universities, this book: Discusses thermal power plant processes and process modeling, energy conservation, performance audits, efficiency improvement modeling, and efficiency optimization supported by high-performance computing integrated with cloud computing Shows how to simulate fossil fuel power plant real-time processes, including boiler, turbine, and generator systems Provides downloadable source codes for use in CORBA C++, MATLAB®, Simulink®, VisSim, Comsol, ANSYS, and ANSYS Fluent modeling software Although the projects in the text focus on industry automation in electrical power engineering, the methods can be applied in other industries, such as concrete and steel production for real-time process identification, control, and optimization.

Thermal Power Plant Springer Science & Business Media

EBSILON®Professional is a powerful modeling system developed for the simulation of thermodynamic cycles. It is suitable as a tool for plant planning, design and optimization of thermal power plants with a steam process or a gas turbine process as well as plants with renewable energies (biomass, wind energy, solar energy and geothermal energy). The introduction describes the basic principles and the working steps to create a model of the plant. Furthermore, the work with the internal programming environment EbsScript and the handling of the calculation of time series is presented.

Numerical Simulation for Next Generation Thermal Power Plants Springer

This monograph presents new methodologies to improve power plants' efficiency, by using automatic control algorithms. This will lead to an improvement in companies’ profit and also in the quality of their final product. A trans-Atlantic combination of authors ensures an unusually wide range of perspectives.

Thermal Power Plant Performance Analysis CRC Press

The book provides highly specialized researchers and practitioners with a major contribution to mathematical models’ developments for energy systems. First, dynamic process simulation models based on mixture flow and two-fluid models are developed for combined-cycle power plants, pulverised coal-fired power plants, concentrated solar power plant and municipal waste incineration. Operation data, obtained from different power stations, are used to investigate the capability of dynamic models to predict the behaviour of real processes and to analyse the influence of modeling assumptions on simulation results. Then, a computational fluid dynamics (CFD) simulation programme, so-called DEMEST, is developed. Here, the fluid-solid, particle-particle and particle-wall interactions are modeled by tracking all

individual particles. To this purpose, the deterministic Euler-Lagrange/Discrete Element Method (DEM) is applied and further improved. An emphasis is given to the determination of inter-phase values, such as volumetric void fraction, momentum and heat transfers, using a new procedure known as the offset-method and to the particle-grid method allowing the refinement of the grid resolution independently from particle size. Model validation is described in detail. Moreover, thermochemical reaction models for solid fuel combustion are developed based on quasi-single-phase, two-fluid and Euler-Lagrange/MP-PIC models. Measurements obtained from actual power plants are used for validation and comparison of the developed numerical models.
Simulation Factors Involved in Ocean Thermal Power Plants MDPI
Thermal Power Pants (Volume III) has been derived from the work of several professors in the nuclear and power industry all of whom have been directly involved with the industry as managers or consultants. The text has been written as educational material and many of the individual chapters have been written as course material for advanced university courses. Also several chapters include material related to plant operation which is prescribed for operator training. Hence it bridges the gap between academic study and practical training. While it is not intended to be comprehensive in all respects it does provide an overview of the topic with sufficient technical depth for a general understanding of power plant technology and a basis for further study in a particular area. When used as a reference in this way each chapter can stand alone and be read independently of the others. Overall it meets the general philosophy of EOLSS in providing a source of knowledge for sustainable development and technological progress for educators and decision makers
Advances in Steam Turbines for Modern Power Plants CRC Press
Advances in Steam Turbines for Modern Power Plants, second edition, provides a fully revised and updated comprehensive review of steam turbine design, optimization, analysis and measurement. Editor Tadashi Tanuma and his team of expert contributors from around the globe have updated each chapter to reflect the latest research and experiences in the field, to help progress thermal power generation to meet sustainability goals. This book presents modern technologies for the design and development of steam turbines that supply affordable, reliable and stable power with much lower CO2 emissions. With the addition of two new chapters on ‘Steam turbine mechanical design and analysis for high temperature, large and rapid change of temperature conditions’ and ‘Steam valves with low pressure losses’ this edition will support students, researchers and professional engineers in designing and developing their own economical and environmentally concerned thermal power plants. Fully updated to include the latest research and examples from around the globe Includes brand new chapters, case studies, photographs, data, analysis and models Chapters on the design and development of Steam Turbines are written by experienced design engineers who provide first-hand experience and lessons learned.
Numerical Simulation of Power Plants and Firing Systems
Bentham Science Publishers
This Special Issue aims to cover the recent research results being developed, both theoretically and experimentally, on the laboratory, pilot, and industrial scale about thermal processes in power plants. This reprint focuses on thermal and flow processes and their impact on highly efficient and low-emission electricity generation and heat production in thermal power plants. Special attention is given to steam condensers and separators for application in thermal power plants, development systems and tools for heat production forecasting in combined heat and power plants, presenting such ideas as the negative CO2 emission gas power plant cycle and production of gas fuels by sewage sludge gasification as well as about methods and techniques for CO2 capture. The research investigation results can find implementation in real-scale power technologies such as steam power plants, gas power plants, nuclear power plants, and hybrid power plants based on renewable energy sources.
System Advisor Model (SAM) Simulation Modeling of a Concentrating Solar Thermal Power Plant with Comparison to Actual Performance Data John Wiley & Sons
Thermal Cycles of Heat Recovery Power Plants presents information about thermal power plant cycles suitable for waste heat recovery (WHR) in modern power plants. The author covers five thermal power cycles: organic Rankine cycle (ORC), organic flash cycle (OFC), Kalina cycle (KC), steam Rankine cycle (SRC) and steam flash cycle (SFC) with the working fluids of R123, R124, R134a, R245fa, R717 and R407C. The handbook helps the reader to understand the latest power plant technologies suitable for utilizing the waste heat generated by thermal industrial processes. Key Features: - Comprehensive modeling, simulation, analysis and optimization of 5 power cycle types with different working fluids - Clear information about the processes and solutions of thermal power cycles to augment the power generation with improved energy conversion. - Simple, reader friendly presentation - bibliographic references after each chapter for further reading This handbook is suitable for engineering students in degree courses and professionals in training programs who require resources on advanced thermal power plant operation and optimal waste heat recovery processes, respectively. It is also a handy reference for energy conversion efficiency in heat recovery power plants. The book is also of interest to any researchers interested in industrial applications of thermodynamic processes.
Optimisation of Industrial Processes at Supervisory Level Notion Press
The liberalization process, tightening environmental standards and the need for replacing aged power plants force European utilities to optimize their future generation mix. Power plants are real assets and as a consequence the power plant park of a utility firm equals a portfolio of different generation assets. This thesis adds to the understanding how to identify an efficient generation portfolio through time by assuming a non-constant feasible set. According to our results a combination of conventional thermal and renewable energies turn out to be efficient in terms of expected value and risks. Therefore, implementing a strategy based on renewable energies which cause less CO2 per MWh generated electricity clearly pays off. Potential readership includes scholars from energy economics and energy finance as well as interested practitioners involved in these areas.