Combined Cycle Gas Turbine Problems And Solution

Combined-cycle Gas & Steam Turbine Power Plants
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Gas Turbine Performance
Thermal Engineering Studies with Excel, Mathcad and Internet
Gas Turbine Engineering Handbook
Advanced Energy Systems, Second Edition

SANIYA YARELI

Combined-cycle Gas & Steam Turbine Power Plants Simon and Schuster

Combined-cycle plants employing gas turbine cycles superimposed on conventional steam plants are well developed. Nearly 200 units are operating in the US on clean fuels (natural gas or distillate fuel oils) and giving overall thermal efficiencies as high as 42%. Future plants will have to use coal or coal-derived fuels, and this presents problems because gas turbines are very sensitive to particulates and contaminants in the fuel such as sulfur, potassium, lead, etc. If clean liquid or high-Btu gaseous fuels are made from coal, it appears that the conversion efficiency will be no more than 67%. Thus, the overall efficiency of utilization of coal would be less than if it were burned in a conventional steam plant unless the permissible gas turbine inlet temperature can be increased to approx. 1500°C (2732°F). Coupling a combined-cycle power plant directly to a low-Btu coal gasifier increases the fuel conversion efficiency and permits salvaging waste heat from the gasifier for feedwater heating in

the steam cycle. By using a gas turbine inlet temperature of 1315°C (2400°F), well above the current maximum of approx. 1040°C (1904°F), an overall efficiency of approx. 40% has been estimated for the integrated plant. However, as discussed in companion reports, it is doubtful that operation with gas turbine inlet temperatures above 1100°C (2012°F) will prove practicable in base-load plants.

The 1970 National Power Survey [of The] Federal Power Commission. -.: Technical Advisory Committee reports to the Federal Power Commission, prepared by the Generation Technical Advisory Committee, the Transmission Technical Advisory Committee, the Distribution Technical Elsevier

Provides an engaging and clearly structured source of information on the capture and storage of CO2 Designed to bridge the gap between the many disciplines involved in carbon dioxide emission management, this book provides a comprehensive yet easy-to-understand introduction to the subject of CO2 capture. Fit for graduate students, practicing process engineers, and others interested in the subject, it offers a clear understanding and overview of thermal power plants in particular and of carbon dioxide capture and storage (CCS) in general. Carbon Dioxide Emission Management in Power Generation starts with a discussion of the greenhouse effect, climate change, and CO2 emissions as the rationale for the concept of CCS. It then looks at the long-term storage of CO2. A chapter covering different fossil fuels, their usage, and properties comes next, followed by sections on: CO2 generation, usage and properties; power plant technologies; theory of gas separation; power plant efficiency calculations; and classification of CO2 capture methods. Other chapters examine: CO2 capture by gas absorption and other gas separation methods; removing carbon from the fuel; pre- and post-combustion CO2 capture in power cycles; and oxy-combustion CO2 capture in power cycles. - Discusses both CO2 capture technologies as well as power generation technologies -Bridges the gap between many different disciplines?from scientists, geologists and engineers, to economists -One of the few books that covers all the different sciences involved in the capture and storage of CO2 -Introduces the topic and provides useful information to the academic as well as professional reader Carbon Dioxide Emission Management in Power Generation is an excellent book for students who are interested in CO2 capture and storage, as well as for chemists in industry, environmental chemists, chemical engineers, geochemists, and geologists.

Flashback and Blowoff Characteristics of Gas Turbine Swirl Combustor CRC Press

This second edition to a popular first provides a comprehensive, fully updated treatment of advanced conventional power generation and cogeneration plants, as well as alternative energy technologies. Organized into two parts: Conventional Power Generation Technology and Renewable and Emerging Clean Energy Systems, the book covers the fundamentals, analysis, design, and practical aspects of advanced energy systems, thus supplying a strong theoretical background for highly efficient energy conversion. New and enhanced topics include: Large-scale solar thermal electric and photovoltaic (PV) plants Advanced supercritical and ultra-supercritical steam power generation technologies Advanced coal- and gas-fired power plants (PP) with

high conversion efficiency and low environmental impact Hybrid/integrated (i.e., fossil fuel + REN) power generation technologies, such as integrated solar combined-cycle (ISCC) Clean energy technologies, including "clean coal," H2 and fuel cell, plus integrated power and cogeneration plants (i.e., conventional PP + fuel cell stacks) Emerging trends, including magnetohydrodynamic (MHD)-generator and controlled thermonuclear fusion reactor technologies with low/zero CO2 emissions Large capacity offshore and on-land wind farms, as well as other renewable (REN) power generation technologies using hydro, geothermal, ocean, and bio energy systems Containing over 50 solved examples, plus problem sets, full figures, appendices, references, and property data, this practical guide to modern energy technologies serves energy engineering students and professionals alike in design calculations of energy systems.

Computational Optimization of Design and Variable Operation of CO2-capture-enabled Coal-natural Gas Power Plants PHI Learning Pvt. Ltd.

Conversion of Coal-Fired Power Plant to Cogeneration and Combined-Cycle presents the methodology, calculation procedures and tools used to support enterprise planning for adapting power stations to cogeneration and combined-cycle forms. The authors analyze the optimum selection of the structure of heat exchangers in a 370 MW power block, the structure of heat recovery steam generators and gas turbines. Conversion of Coal-Fired Power Plant to Cogeneration and Combined-Cycle also addresses the problems of converting existing power plants to dual-fuel gas-steam combined-cycle technologies coupled with parallel systems. Conversion of Coal-Fired Power Plant to Cogeneration and Combined-Cycle is an informative monograph written for researchers, postgraduate students and policy makers in power engineering.

Combined Cycle Systems for Near-Zero Emission Power Generation Amer Society of Mechanical

This comprehensive, best-selling reference provides the fundamental information you'll need to understand both the operation and proper application of all types of gas turbines. The full spectrum of hardware, as well as typical application scenarios are fully explored, along with operating parameters, controls, inlet treatments, inspection, troubleshooting, and more. The second edition adds a new chapter on gas turbine noise control, as well as an expanded section on use of inlet cooling for power augmentation and NOx control. The author has provided many helpful tips that will enable diagnosis of problems in their early stages and analysis of failures to prevent their recurrence. Also treated are the effects of the external environment on gas turbine operation and life, as well as the impact of the gas turbine on its surrounding environment.

Ericsson Cycle Gas Turbine Powerplants Elsevier

Problems and Detailed Solutions for Comprehensive Exam Prep Please note: As of October 25, 2019, the NCEES PE Mechanical Exam is NO LONGER open book. Up to date to the NCEES exam specifications and codes*, Thermal and Fluids Systems 6-Minute Problems contains 100 multiple-choice problems representative of the NCEES PE Mechanical Thermal and Fluids Systems exam format, scope of topics, and level of difficulty. Comprehensive step-by-step solutions for all problems demonstrate accurate and

efficient solving approaches to be used on exam day. Pair these problems with the Thermal & Fluids Systems Reference Manual and Practice Exams for a comprehensive review. This book is included in the PE Mechanical Thermal and Fluids Systems Exam Navigation Bundle. Topics Covered Energy/Power System Applications Hydraulic and Fluid Applications Principles About the Exam The NCEES PE Mechanical Exam is an 8-hour closed-book exam. It contains 40 multiple choice questions in the 4-hour morning session and 40 multiple choice questions in the 4-hour afternoon session. *NCEES does not specify which codes and standards the PE Mechanical Thermal and Fluids Systems exam will use. It is likely that the codes and standards needed are not affected by the differences from one edition to the next. Key Features: Organized into three sections: Principles, Hydraulic and Fluid applications, and Energy/Power System Applications. Each section contains problems pertaining to the knowledge areas within that division of the NCEES specifications. Each problem statement in this book, with its supporting information and answer choices, is presented in the same format as the problems encountered on the PE exam. Each problem includes a hint to provide direction in solving the problem. In addition to the correct solution, you will find an explanation of the faulty reasoning leading to the three incorrect answer choices. Binding: Paperback Publisher: PPI, A Kaplan Company

Practical Dispute Resolution Amer Society of Mechanical

The Gas Turbine Engineering Handbook has been the standard for engineers involved in the design, selection, and operation of gas turbines. This revision includes new case histories, the latest techniques, and new designs to comply with recently passed legislation. By keeping the book up to date with new, emerging topics, Boyce ensures that this book will remain the standard and most widely used book in this field. The new Third Edition of the Gas Turbine Engineering Hand Book updates the book to cover the new generation of Advanced gas Turbines. It examines the benefit and some of the major problems that have been encountered by these new turbines. The book keeps abreast of the environmental changes and the industries answer to these new regulations. A new chapter on case histories has been added to enable the engineer in the field to keep abreast of problems that are being encountered and the solutions that have resulted in solving them. Comprehensive treatment of Gas Turbines from Design to Operation and Maintenance. In depth treatment of Compressors with emphasis on surge, rotating stall, and choke; Combustors with emphasis on Dry Low NOx Combustors; and Turbines with emphasis on Metallurgy and new cooling schemes. An excellent introductory book for the student and field engineers A special maintenance section dealing with the advanced gas turbines, and special diagnostic charts have been provided that will enable the reader to troubleshoot problems he encounters in the field The third edition consists of many Case Histories of Gas Turbine problems. This should enable the field engineer to avoid some of these same generic problems

Operation, Maintenance, and Repair of Land-Based Gas Turbines Springer Science & Business Media

This comprehensive Handbook has been fully updated and expanded for the second edition. It covers all major aspects of power plant design, operation, and maintenance. The second edition includes not only an updating of the technology, which

has taken great leaps forward in the last decade, but also introduces new subjects such as Carbon Sequestration Technology, Chemical Treatment of Water used in Combined Cycle Power Plants, and extended treatments on Steam Turbines and Heat Recovery Steam Generators. A new Chapter has been introduced entitled, "Case Histories of Problems Encountered in Cogeneration and Combined Cycle Power Plants." This is an extensive treatise with 145 figures and photographs illustrating the many problems associated with Combined Cycle Power Plants and some of the solutions that have enabled plants to achieved higher efficiencies and reliability. This new edition assimilates subject matter of various papers, and sometimes diverse views, into a comprehensive, unified treatment of Combined Cycle Power Plants. Illustrations, with curves and tables are extensively employed to broaden the understanding of the descriptive text. The book has many special features which include comparison of various energy systems, latest cycles and power augmentation and improved efficiency techniques. All the major plant equipment used in Combined Cycle and Cogeneration Power Plants has been addressed.

Gas Turbine Engineering Handbook Elsevier

Primarily this book describes the thermodynamics of gas turbine cycles. The search for high gas turbine efficiency has produced many variations on the simple "open circuit" plant, involving the use of heat exchangers, reheating and intercooling, water and steam injection, cogeneration and combined cycle plants. These are described fully in the text. A review of recent proposals for a number of novel gas turbine cycles is also included. In the past few years work has been directed towards developing gas turbines which produce less carbon dioxide, or plants from which the CO2 can be disposed of; the implications of a carbon tax on electricity pricing are considered. In presenting this wide survey of gas turbine cycles for power generation the author calls on both his academic experience (at Cambridge and Liverpool Universities, the Gas Turbine Laboratory at MIT and Penn State University) and his industrial work (primarily with Rolls Royce, plc.) The book will be essential reading for final year and masters students in mechanical engineering, and for practising engineers.

The 1970 National Power Survey [of The] Federal Power Commission: Technical Advisory Committee reports to the Federal Power Commission, prepared by the Generation Technical Advisory Committee, the Transmission Technical Advisory Committee, the Distribution Technical Advisory Committee on Load Forecasting Methodology Elsevier

Climate change mitigation will require large reductions in CO2 emissions from electricity production. Some of these cuts will come from increased use of renewable energy resources, but it is likely that thermal power plants will be used for an extended period of time to maintain grid stability and accommodate seasonal variability in renewable generation. Therefore, thermal power plants with CO2 capture and storage (CCS) capability may coexist with renewable generation to provide reliable low-carbon electricity. Moreover, CCS-enabled facilities designed for constant operations are not necessarily optimal under the conditions that are likely to occur with increased renewable penetration. There is therefore a need to devise optimal designs and operating plans for flexible thermal power stations equipped with CCS. In this work, computational optimization is used to determine the design

and operating plan of a coal-natural gas power station with CO2 capture, under a CO2 emission performance standard. The facility consists of a coal power plant undergoing a retrofit with solvent-based post-combustion CO2 capture. The heat for CO2 capture solvent regeneration is provided by a combined cycle gas turbine (CCGT) designed for combined-heat-and-power service. Variable facility operations are represented by discrete operating modes dispatched using the electricity price-duration curve. Two problem formulations are considered. In the `simplified-capture' problem formulation, the CO2 capture system is represented using a single variable for capacity, while heat integration (including a detailed treatment of the heat recovery steam generator component of the CCGT) is optimized jointly with variable operations. In the `full-system' problem formulation, the detailed design of the CO2 capture system is optimized alongside a full treatment of heat integration and variable operations. To accomplish this, a computationally efficient proxy model of the CO2 capture system is developed that reproduces the behavior of a full-physics Aspen Plus model. Both problem formulations are incorporated in a bi-objective mixed-integer nonlinear program in which total capital requirement (TCR) is minimized and net present value (NPV) is maximized. Pareto frontiers are generated for six scenarios constructed from recent historical data from West Texas, the United Kingdom, and India. All six scenarios are considered using the simplified-capture problem formulation. The West Texas base scenario and the India scenario, which differ greatly from each other, are considered using the full-system problem formulation as well. Results between the two formulations are quite consistent and show that hourly electricity price variability and the choice of objective function can have a large effect on optimal design and planned operations. In the West Texas base scenario, which has high price variability, the maximum NPV facility in the full-system formulation (NPV of $201 million, TCR of $510 million) has a time-varying operating plan in which the CO2 capture system has a utilization factor of 66% (out of a maximum of 85%). In this scenario the minimum TCR facility (NPV of $101 million, TCR of $333 million) has a constant operating profile. In contrast, low price variability in the India scenario results in constant operations regardless of objective. Two advanced CO2 capture processes -- the mixed salt and piperazine processes -- are considered using the simplified-capture formulation for the West Texas base scenario. The advanced processes are shown to outperform the standard monoethanolamine (MEA) process, with the mixed salt process outperforming the MEA process by 16% for maximum NPV and 14% for minimum TCR. The full-system formulation using the MEA process provides generally similar results to those from the simplified-capture formulation in both the India and West Texas base scenarios. However, the inclusion of the detailed design of the CO2 capture process in the full-system problem formulation provides valuable design information, such as the effect of the integer nature of the number of CO2 capture trains. Taken in total, the results of this study highlight the value of applying computational optimization to consider integrated plant design and variable operations together.

Proceedings of the Workshop on Very High Efficiency Fuel Cell/gas Turbine Power Cycles Amer Society of Mechanical

Industrial Gas Turbines: Performance and Operability explains

important aspects of gas turbine performance such as performance deterioration, service life and engine emissions. Traditionally, gas turbine performance has been taught from a design perspective with insufficient attention paid to the operational issues of a specific site. Operators are not always sufficiently familiar with engine performance issues to resolve operational problems and optimise performance. Industrial Gas Turbines: Performance and Operability discusses the key factors determining the performance of compressors, turbines, combustion and engine controls. An accompanying engine simulator CD illustrates gas turbine performance from the perspective of the operator, building on the concepts discussed in the text. The simulator is effectively a virtual engine and can be subjected to operating conditions that would be dangerous and damaging to an engine in real-life conditions. It also deals with issues of engine deterioration, emissions and turbine life. The combined use of text and simulators is designed to allow the reader to better understand and optimise gas turbine operation. Discusses the key factors in determining the perfomance of compressors, turbines, combustion and engine controls Explains important aspects of gas and turbine perfomance such as service life and engine emissions Accompanied by CD illustrating gas turbine performance, building on the concepts discussed in the text

Generating Power at High Efficiency John Wiley & Sons

Combined cycle technology is used to generate power at one of the highest levels of efficiency of conventional power plants. It does this through primary generation from a gas turbine coupled with secondary generation from a steam turbine powered by primary exhaust heat. Generating power at high efficiency thoroughly charts the development and implementation of this technology in power plants and looks to the future of the technology, noting the advantages of the most important technical features – including gas turbines, steam generator, combined heat and power and integrated gasification combined cycle (IGCC) – with their latest applications. Reviews key developments in combined cycle technology Uses examples drawn from plants around the world Looks at how combined cycle technology can evolve to meet future energy needs

Handbook for Cogeneration and Combined Cycle Power Plants John Wiley & Sons

Challenges of Power Engineering and EnvironmentSpringer Science & Business Media

Advanced Gas Turbine Cycles Elsevier

This book does not give a prediction of what the efficiency will be of the energy use of industrial processes in the future. However, it does give an exploration of limits to the efficiency of current processes and an indication of what might be achieved if new technologies can be developed. At the Department of Science, Technology and Society of Utrecht University research had been done to the opportunities for improvement of the energy efficiency in the short term since the 1980's. This had resulted in a comprehensive database on energy efficient measures. This database and a possible application are described in Chapter 3 of this book. The use of the database induced new research themes around efficiency improvement, e.g. concerning barriers for implementation of measures. It was around 1993 that I did a preliminary study to the potential for efficiency improvement in

the long term. Historical analysis had shown us that the short term potential stayed constant over the years. It seemed to be replenished by the introduction of new technologies. This lead to the question whether there are limits to the efficiency, taking into account both thermodynamic considerations and ideas on the development and dissemination of new technologies.

100 Years of Power Plant Development Amer Society of Mechanical

This useful reference covers all major aspects of power plant design, operation, and maintenance. It covers cycle optimization and reliability, technical details on sizing, plant layout, fuel selection, types of drives, and performance characteristics of all major components in a cogeneration or combined cycle power plant. The author discusses design, fabrication, installation, operation, and maintenance. Many illustrations, curves, and tables are used throughout the text. Special features include: Comparison of various energy systems; latest cycles and power augmentation techniques; reviews and benefits of the latest codes; detailed analysis of available equipment; descriptions of all major equipment in CCPP; techniques for improving plant reliability and maintainability; testing and plant evaluation techniques; and advantages and disadvantages of fuels.

Cogeneration and Combined Cycle Plants--design, Interconnection, and Turbine Applications Morgan & Claypool Publishers

Overviews the thermodynamic design concepts behind the most common types of power generation plants. Termuehlen, who is retired from Siemens, shows how advances in power plant technologies--especially the large steam and gas turbine design--have improved the performance of power stations, and how problems have been overcome. Nuclear power, co-generation, combined-cycle, and coal gasification plants are described. The final chapter identifies available fuel sources, and examines the best technologies for converting fuel into electric power with the lowest adverse effect on the environment. c. Book News Inc.

Gas Turbine Combined Cycle Power Plants Cambridge University Press

This book is the proceedings of the International Conference on Power Engineering-2007. The fields of this book include power engineering and relevant environmental issues. The recent technological advances in power engineering and related areas are introduced. This book is valuable for researchers, engineers and students majoring in power engineering.

Challenges of Power Engineering and Environment Elsevier

This textbook has been designed for a one-semester course on Power Plant Engineering studied by both degree and diploma students of mechanical and electrical engineering. It effectively exposes the students to the basics of power generation involved in several energy conversion systems so that they gain comprehensive knowledge of the operation of various types of power plants in use today. After a brief introduction to energy fundamentals including the environmental impacts of power generation, the book acquaints the students with the working principles, design and operation of five conventional power plant systems, namely thermal, nuclear, hydroelectric, diesel and gas turbine. The economic factors of power generation with regard to estimation and prediction of load, plant design, plant operation, tariffs and so on, are discussed and illustrated with the help of

several solved numerical problems. The generation of electric power using renewable energy sources such as solar, wind, biomass, geothermal, tidal, fuel cells, magneto hydrodynamic, thermoelectric and thermionic systems, is discussed elaborately. The book is interspersed with solved problems for a sound understanding of the various aspects of power plant engineering. The chapter-end questions are intended to provide the students with a thorough reinforcement of the concepts discussed.

Gas Turbine Performance CRC Press

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.

Thermal Engineering Studies with Excel, Mathcad and Internet Springer Science & Business Media

A preliminary exploration of a potentially low-cost gas turbine thermodynamic cycle that appears capable of unprecedented efficiency. The cycle approximates an Ericsson cycle and uses stepwise expansions in turbines with intervening reheat and stepwise compression with intervening intercooling. At a peak cycle temperature of 1500 deg F, and using five stages of compression and expansion, a 50 percent thermal efficiency is attainable with previously demonstrated component performance. This performance requires no extremes of pressure or temperature, no new materials, and no fundamentally new techniques. The cycle is not complicated in comparison with advanced gas turbine/steam turbine cycles now being considered for high-efficiency fossil-fuel-fired plants. In addition, the low temperatures required by the Ericsson cycle would eliminate many problems presented by other cycles. This analysis indicates that detailed study of fuels and applications, design and plant layout, costs, and fuel processing losses for the Ericsson cycle approximation is warranted.

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