Combined Cycle Gas Turbine Problems And Solution

Computational Optimization of Design and Variable Operation of CO2-capture-enabled Coal-natural Gas Power Plants
Advanced Gas Turbine Cycles
Summary of the Development of Open-cycle Gas Turbine-steam Cycles
Combined Cycle Systems for Near-Zero Emission Power Generation
The Gas Turbine Handbook
Handbook for Cogeneration and Combined Cycle Power Plants
Advanced Energy Systems, Second Edition
Combined Power Plants
Gas Turbine Engineering Handbook
Modern Gas Turbine Systems
Proceedings of the Department of Energy Advanced Gas Turbine Central Power Systems Workshop
Handbook for Cogeneration and Combined Cycle Power Plants
Gas Turbine Combined Cycle Power Plants
Ericsson Cycle Gas Turbine Powerplants
Gas Turbine Engineering Handbook
POWER PLANT ENGINEERING
Industrial Gas Turbines
Combined-cycle Gas & Steam Turbine Power Plants
Flashback and Blowoff Characteristics of Gas Turbine Swirl Combustor
Conversion of Coal-Fired Power Plants to Cogeneration and Combined-Cycle
Gas Turbine Performance
Cogeneration and Combined Cycle Plants--design, Interconnection, and Turbine Applications
Challenges of Power Engineering and Environment
PPI Thermal and Fluids Systems Six-Minute Problems eText - 1 Year
Potential for Industrial Energy-Efficiency Improvement in the Long Term
Gas Turbines for Electric Power Generation

100 Years of Power Plant Development
Process Plant Machinery
Practical Dispute Resolution
Thermal Engineering Studies with Excel, Mathcad and Internet
Federal Register
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
Industrial Cogeneration
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
Proceedings of the International Conference on Soft Computing for Problem Solving (SocProS 2011) December 20-22, 2011
Proceedings of the Workshop on Very High Efficiency Fuel Cell/gas Turbine Power Cycles
Carbon Dioxide Emission Management in Power Generation
Operation, Maintenance, and Repair of Land-Based Gas Turbines
Energy Research Abstracts

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Computational Optimization of Design and Variable Operation of CO2-capture-enabled Coal-natural Gas Power Plants Elsevier
Challenges of Power Engineering and EnvironmentSpringer Science & Business Media
Advanced Gas Turbine Cycles Elsevier
The U.S. Department of Energy's (DOE's) Morgantown Energy Technology Center (METC) held a workshop on October 19, 1995, to explore the subject of Very High Efficiency Fuel Cell/Gas Turbine Power Plants. The combination of these two technologies has the potential for enormous synergies in that it offers a solution to two important problems: the low efficiency and relatively high nitrogen oxides (NO[sub x]) emissions of small gas turbines, and the high cost of small fuel-cell power plants. Small gas turbines, with capacities of less than 10 megawatts (MW), typically have efficiencies in the 25 to 30 percent range. Small fuel cells are predicted to cost$1,000 to 1,500 per kilowatt (kW) when commercially available in the years after 2000. If the early

efforts are successful in commercializing these products, the foundation will be laid for scaling up the technology to large-scale power plants. This is important since the combination, at the scale of 200 MW or more, can achieve efficiencies of 75 percent or more. This is significantly higher than other technologies for generating electricity from natural gas. As a result, carbon dioxide (CO[sub 2]) emissions could also be significantly reduced. In comparison, the best currently available, large scale, combined-cycle power plants have an efficiency of about 58 percent. That level will likely increase to 60 to 62 percent over the next decade, as a result of the Advanced Turbine System (ATS) program sponsored by DOE. The highest efficiencies currently projected for several fuel cell technologies, which are now under development, are in the range of 55 to 65 percent for stand-alone, fuel-cell power plants. The presentations focused on the cycle analysis studies that have been done as well as suggestions from gas turbine and fuel cell vendors on how to arrange these components in practical and reliable configurations. Individual projects have been processed separately for the United States Department of Energy databases.

Summary of the Development of Open-cycle Gas Turbine-steam Cycles John Wiley & Sons

Process Plant Machinery provides the mechanical, chemical or plant engineer with the information needed to choose equipment best suited for a particular process, to determine optimum efficiency, and to conduct basic troubleshooting and maintenance procedures. Process Plant Machinery is a unique single-source reference for engineers, managers and technical personnel who need to acquire an understanding of the machinery used in modern process plants: prime movers and power transmission machines; pumping equipment; gas compression machinery; and mixing, conveying, and separation equipment. Starting with an overview of each class, the book quickly leads the reader through practical applications and size considerations into profusely illustrated component descriptions. Where necessary, standard theory is expertly explained in shortcut formulas and graphs. Maintainability and vulnerability concerns are dealt with as well. Fully updated with all new equipment available Comprehensive Coverage Multi-industry relevance

Combined Cycle Systems for Near-Zero Emission Power Generation Elsevier

A significant addition to the literature on gas turbine technology, the second edition of Gas Turbine Performance is a lengthy text covering product advances and technological developments. Including extensive figures, charts, tables and formulae, this book will interest everyone concerned with gas turbine technology, whether they are designers, marketing staff or users.

The Gas Turbine Handbook Elsevier

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.

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

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

Advanced Energy Systems, Second Edition Springer Science & Business Media

Combined cycle power plants are one of the most promising ways of improving fossil-fuel and biomass energy production. The combination of a gas and steam turbine working in tandem to produce power makes this type of plant highly efficient and allows for CO2 capture and sequestration before combustion. This book provides a comprehensive review of the design, engineering and operational issues of a range of advanced combined cycle plants. After introductory chapters on basic combined cycle power plant and advanced gas turbine design, the book reviews the main types of combined cycle system. Chapters discuss the technology, efficiency and emissions performance of natural gas-fired combined cycle (NGCC) and integrated gasification combined cycle (IGCC) as well as novel humid air cycle, oxy-combustion turbine cycle systems. The book also reviews pressurised fluidized bed combustion (PFBC), externally fired combined cycle (EFCC), hybrid fuel cell turbine (FC/GT), combined cycle and integrated solar combined cycle (ISCC) systems. The final chapter reviews techno-economic analysis of combined cycle systems. With its distinguished editor and international team of contributors, Combined cycle systems for near-zero emission power generation is a standard reference for both industry practitioners and academic researchers seeking to improve the efficiency and environmental impact of power plants. Provides a comprehensive review of the design, engineering and operational issues of a range of advanced combined cycle plants Introduces basic combined cycle power plant and advanced gas turbine design and reviews the main types of combined cycle systems Discusses the technology, efficiency and emissions performance of natural gas-fired combined cycle (NGCC) systems and integrated gasification combined cycle (IGCC) systems, as well as novel humid air cycle systems and oxy-combustion turbine cycle systems

Combined Power Plants Simon and Schuster
This book covers the design, analysis, and optimization of the cleanest, most efficient fossil fuel-fired electric power generation technology at present and in the foreseeable future. The book contains a wealth of first principles-based calculation methods comprising key formulae, charts, rules of thumb, and other tools developed by the author over the course of 25+ years spent in the power generation industry. It is focused exclusively on actual power plant systems and actual field and/or rating data providing a comprehensive picture of the gas turbine combined cycle technology from performance and cost perspectives. Material presented in this book is applicable for research and development studies in academia and government/industry laboratories, as well as practical, day-to-day problems encountered in the industry (including OEMs, consulting engineers and plant operators).
Gas Turbine Engineering Handbook Morgan & Claypool Publishers
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.
Modern Gas Turbine Systems Amer Society of Mechanical
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. *Proceedings of the Department of Energy Advanced Gas Turbine Central Power Systems Workshop* Amer Society of Mechanical Gas turbines are extensively used in combined cycle power systems. These form about 20% of global power generating capacity, normally being fired on natural gas, but this is expected in the future to move towards hydrogen enriched gaseous fuels to reduce CO2 emissions. Gas turbine combined cycles can give electrical power generation efficiencies of up to 60%, with the aim of increasing this to 70% in the next 10 to 15 years, whilst at the same time substantially reducing emissions of contaminants such as NOx. The gas turbine combustor is an essential and critical component here. These are universally stabilized with swirl flows, which give very wide blowoff limits, and with appropriate modification can be adjusted to give very low NOx and other emission. Lean premixed combustion is commonly used at pressures between 15 to 30 bar, these even out hot spots and minimise formation of thermal NOx. Problems arise because improving materials technology/improved cooling techniques allow higher turbine inlet temperatures, hence higher efficiencies, but with the drawback of potentially higher emissions and stability problems. This PhD study has widely investigated and analysed two different kinds of gas turbine swirl burners. The research has included experimental investigation and computational simulation. Mainly, the flashback and blowoff limits have been comprehensively analysed to investigate their effect upon swirl burner operation. The study was extended by using different gas mixtures, including either pure gas or a combination of more than one gas like natural gas, methane, hydrogen and carbon dioxide. The first combustor is a 100 kW tangential swirl combustor made of stainless steel that has been experimentally and theoretically analysed to study and mitigate the effect of flashback phenomena. The use of a central fuel injector, cylindrical confinement and exhaust sleeve are shown to give large benefits in terms of flashback resistance and acts to reduce and sometimes eliminate any coherent structures which may be located along the axis of symmetry. The Critical Boundary Velocity Gradient is used for characterisation of flashback, both via the original Lewis and von Elbe formula and via new analysis using CFD and investigation of boundary layer conditions just in front of the flame front. Conclusions are drawn as to mitigation technologies. It is recognized how isothermal conditions produce strong Precessing Vortex Cores that are fundamental in producing the ii final flow field, whilst the Central Recirculation Zones are dependent on pressure decay ratio inside the combustion chamber. Combustion conditions showed the high similarity between experiments and simulation. Flashback was demonstrated to be a factor highly related to the strength of the Central Recirculation Zone for those cases where a Combustion Induced Vortex Breakdown was allowed to enter the swirl chamber, whilst cases where a bluff body impeded its passage showed a considerable improvement to the resistance of the phenomenon. The use of nozzle constrictions also reduced flashback at high Reynolds number (Re). All these results were intended to contribute to better designs of future combustors. The second piece of work of this PhD research included comprehensive experimental work using a generic swirl burner

(with three different blade inserts to give different swirl numbers) and has been used to examine the phenomena of flashback and blowoff in the swirl burner in the context of lean premixed combustion. Cylindrical and conical confinements have been set up and assembled with the original design of the generic swirl combustor. In addition to that, multi-fuel blends used during the experimental work include pure methane, pure hydrogen, hydrogen / methane mixture, carbon dioxide/ methane mixture and coke oven gas. The above investigational analysis has proved the flashback limits decrease when swirl numbers decrease for the fuel blends that contain 30% or less hydrogen. Confinements would improve the flashback limit as well. Blowoff limits improve with a lower swirl number and it is easier to recognise the gradual extinction of the flame under blowoff conditions. The use of exhaust confinement has created a considerable improvement in blowoff. Hydrogen enriched fuels can improve the blowoff limit in terms of increasing heat release, which is higher than heat release with natural gas. However, the confinements complicate the flashback, especially when the fuel contains a high percentage of hydrogen. The flashback propensity of the hydrogen/methane blends becomes quite strong. The most important features in gas turbines is the possibility of using different kinds of fuel. This matter has been discussed extensively in this project. By matching flashback/blowoff limits, it has been found that for fuels containing up to 30% of hydrogen, the designer would be able to switch the same gas turbine combustor to multifuels whilst producing the same power output.

Handbook for Cogeneration and Combined Cycle Power Plants Springer Science & Business Media

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.

Gas Turbine Combined Cycle Power Plants Elsevier

Everything you wanted to know about industrial gas turbines for electric power generation in one source with hard-to-find, hands-on technical information.

Ericsson Cycle Gas Turbine Powerplants Springer Science & Business Media

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 Engineering Handbook Cambridge University Press

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.

POWER PLANT ENGINEERING 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.

Industrial Gas Turbines Elsevier

This case study explores actions of an account manager of an important maintenance agreement and a field service engineer, both newly assigned to resolve reliability issues with a set of gas turbines and a deteriorated relationship with their client. The case walks the reader through a logical and practical methodology from collection of data to proposing corrective actions in engineering and account management. The case study provides discussions on gas turbine combustion technology, combustion air emissions, commissioning, and performance degradation as background for the exercise. A reading assignment is included for understanding. Answers to exercises are provided to check comprehension. The authors propose using this case study in university study, or in industry as an individual or group assignment.

Combined-cycle Gas & Steam Turbine Power Plants Challenges of Power Engineering and Environment
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

Flashback and Blowoff Characteristics of Gas Turbine Swirl Combustor 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.
Conversion of Coal-Fired Power Plants to Cogeneration and Combined-Cycle Elsevier
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.