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In spite of the increasing presence of renewable energy sources, fossil fuels will remain the primary supply of the world's energy needs for the upcoming future. Modern gas-turbine based systems represent one of the most efficient large-scale power generation technology currently available. Alongside this, gas-turbine power plants operate with very low emissions, have flexible operational characteristics and are able to utilize a broad range of fuels. It is expected that gas-turbine based plants will play an important role as an effective means of converting combustion energy in the future as well, because of the vast potential energy savings. The numerical approach to the design of complex systems such as gas-turbines has gained a continuous growth of interest in the last few decades. This because simulations are foreseen to provide a tremendous increase in the combustor efficiency, fuel-flexibility and quality over the next future. In this dissertation, an advanced turbulent combustion technique is implemented and progressively developed for the simulation of all the features that are typically observed in stationary gas-turbine combustion, including hydrogen as a fuel. The developed turbulent combustion model retains most of the accuracy of a detailed simulation while drastically reducing its computational time. As a result of this work, the advancement of power generation plants can be accelerated, paving the way for future developments of alternative fuel usage in a cleaner and more efficient combustion.

Explore a thorough overview of the current knowledge, developments and outstanding challenges in turbulent combustion and application.

The primary human activities that release carbon dioxide (CO₂) into the atmosphere are the combustion of fossil fuels (coal, natural gas, and oil) to generate electricity, the provision of energy for transportation, and as a consequence of some industrial processes. Although aviation CO₂ emissions only make up approximately 2.0 to 2.5 percent of total global annual CO₂ emissions, research to reduce CO₂ emissions is urgent because (1) such reductions may be legislated even as commercial air travel grows, (2) because it takes new technology a long time to propagate into and through the aviation fleet, and (3) because of the ongoing impact of global CO₂ emissions. Commercial Aircraft Propulsion and Energy Systems Research develops a national research agenda for reducing CO₂ emissions from commercial aviation. This report focuses on propulsion and energy technologies for reducing carbon emissions from large, commercial aircraft—single-aisle and twin-aisle aircraft that carry 100 or more passengers—because such aircraft account for more than 90 percent of global emissions from commercial aircraft. Moreover, while smaller aircraft also emit CO₂, they make only a minor contribution to global emissions, and many technologies that reduce CO₂ emissions for large aircraft also apply to smaller aircraft. As commercial aviation continues to grow in terms of revenue-passenger miles and cargo ton miles, CO₂ emissions are expected to increase. To reduce the contribution of aviation to climate change, it is essential to improve the effectiveness of ongoing efforts to reduce emissions and initiate research into new approaches.

Rocket and air-breathing propulsion systems are the foundation on which planning for future aerospace systems rests. A Review of United States Air Force and Department of Defense Aerospace Propulsion Needs assesses the existing technical base in these areas and examines the future Air Force capabilities the base will be expected to support. This report also defines gaps and recommends where future warfighter capabilities not yet fully defined could be met by current science and technology development plans.

Techno-Economic Challenges of Green Ammonia as an Energy Vector presents the fundamentals, techno-economic challenges, applications, and state-of-the-art research in using green ammonia as a route toward the hydrogen economy. This book presents practical implications and case studies of a great variety of methods to recover stored energy from ammonia and use it for power, along with transport and heating applications, including its production, storage, transportation, regulations, public perception, and safety aspects. As a unique reference in this field, this book can be used both as a handbook by researchers and a source of background knowledge by graduate students developing technologies in the fields of hydrogen economy, hydrogen energy, and energy storage. Includes glossaries, case studies, practical concepts, and legal, public perception, and policy viewpoints that allow for thorough, practical understanding of the use of ammonia as energy carrier Presents its content in a modular structure that can be used in sequence, as a handbook, in individual parts or as a field reference Explores the use of ammonia, both as a medium for hydrogen storage and an energy vector unto itself

[A Review of United States Air Force and Department of Defense Aerospace Propulsion Needs](#)

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[Energy for the Future](#)

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[Advanced Turbulent Combustion Physics and Applications](#)

[GAS Turbine Combustion, Second Edition](#)

[Structure, Manufacturing, Properties and Applications](#)

[Gas Turbines for Electric Power Generation](#)

This book assesses the state of the art of coatings materials and processes for gas-turbine blades and vanes, determines potential applications of coatings in high-temperature

environments, identifies needs for improved coatings in terms of performance enhancements, design considerations, and fabrication processes, assesses durability of advanced coating systems in expected service environments, and discusses the required inspection, repair, and maintenance methods. The promising areas for research and development of materials and processes for improved coating systems and the approaches to increased coating standardization are identified, with an emphasis on materials and processes with the potential for improved performance, quality, reproducibility, or manufacturing cost reduction.

Vols. for 1977-19 include a section: Turbomachinery world news, called v. 1-

Cellular ceramics are a specific class of porous materials which includes among others foams, honeycombs, connected fibers, robocast structures and assembled hollow spheres. Because of their particular structure, cellular ceramics display a wide variety of specific properties which make them indispensable for various engineering applications. An increasing number of patents, scientific literature and international conferences devoted to cellular materials testifies to a rapidly growing interest of the technical community in this topic. New applications for cellular ceramics are constantly being put under development. The book, authored by leading experts in this emerging field, gives an overview of the main aspects related to the processing of diverse cellular ceramic structures, methods of structural and properties characterisation and well established industrial, novel and potential applications. It is an introduction to newcomers in this research area and allows students to obtain an in-depth knowledge of basic and practical aspects of this fascinating class of advanced materials. 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

There has been a remarkable difference in the research and development regarding gas turbine technology for transportation and power generation. The former remains substantially florid and unaltered with respect to the past as the superiority of air-breathing engines compared to other technologies is by far immense. On the other hand, the world of gas turbines (GTs) for power generation is indeed characterized by completely different scenarios in so far as new challenges are coming up in the latest energy trends, where both a reduction in the use of carbon-based fuels and the raising up of renewables are becoming more and more important factors. While being considered a key technology for base-load operations for many years, modern stationary gas turbines are in fact facing the challenge to balance electricity from variable renewables with that from flexible conventional power plants. The book intends in fact to provide an updated picture as well as a perspective view of some of the abovementioned issues that characterize GT technology in the two different applications: aircraft propulsion and stationary power generation. Therefore, the target audience for it involves design, analyst, materials and maintenance engineers. Also manufacturers, researchers and scientists will benefit from the timely and accurate information provided in this volume. The book is organized into three main sections including 10 chapters overall: (i) Gas Turbine and Component Performance, (ii) Gas Turbine Combustion and (iii) Fault Detection in Systems and Materials.

[Methods of Measurement for Equipment Used in Terrestrial Radio-relay Systems](#)

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[Proceedings of the Symposium on Properties of High Temperature Alloys, with Emphasis on Environmental Effects](#)

[The Oil Engine and Gas Turbine](#)

[Advanced Technologies for Gas Turbines](#)

The second edition of a comprehensive textbook that introduces turbomachinery and gas turbines through design methods and examples. This comprehensive textbook is unique in its design-focused approach to turbomachinery and gas turbines. It offers students and practicing engineers methods for configuring these machines to perform with the highest possible efficiency. Examples and problems are based on the actual design of turbomachinery and turbines. After an introductory chapter that outlines the goals of the book and provides definitions of terms and parts, the book offers a brief review of the basic principles of thermodynamics and efficiency definitions. The rest of the book is devoted to the analysis and design of real turbomachinery configurations and gas turbines, based on a consistent application of thermodynamic theory and a more empirical treatment of fluid dynamics that relies on the extensive use of design charts. Topics include turbine power cycles, diffusion and diffusers, the analysis and design of three-dimensional free-stream flow, and combustion systems and combustion calculations. The second edition updates every chapter, adding material on subjects that include flow

correlations, energy transfer in turbomachines, and three-dimensional design. A solutions manual is available for instructors. This new MIT Press edition makes a popular text available again, with corrections and some updates, to a wide audience of students, professors, and professionals.

Leadership in gas turbine technologies is of continuing importance as the value of gas turbine production is projected to grow substantially by 2030 and beyond. Power generation, aviation, and the oil and gas industries rely on advanced technologies for gas turbines. Market trends including world demographics, energy security and resilience, decarbonization, and customer profiles are rapidly changing and influencing the future of these industries and gas turbine technologies. Technology trends that define the technological environment in which gas turbine research and development will take place are also changing - including inexpensive, large scale computational capabilities, highly autonomous systems, additive manufacturing, and cybersecurity. It is important to evaluate how these changes influence the gas turbine industry and how to manage these changes moving forward. Advanced Technologies for Gas Turbines identifies high-priority opportunities for improving and creating advanced technologies that can be introduced into the design and manufacture of gas turbines to enhance their performance. The goals of this report are to assess the 2030 gas turbine global landscape via analysis of global leadership, market trends, and technology trends that impact gas turbine applications, develop a prioritization process, define high-priority research goals, identify high-priority research areas and topics to achieve the specified goals, and direct future research. Findings and recommendations from this report are important in guiding research within the gas turbine industry and advancing electrical power generation, commercial and military aviation, and oil and gas production.

This revised edition provides understanding of the basic physical, chemical, and aerodynamic processes associated with gas turbine combustion and their relevance and application to combustor performance and design. It also introduces the many new concepts for ultra-low emissions combustors, and new advances in fuel preparation and liner wall-cooling techniques for their success. It details advanced and practical approaches to combustor design for the clean burning of alternative liquid fuels derived from oil shades, tar sands, and coal. Additional topics include diffusers, combustion performance fuel injection, combustion noise, heat transfer, and emissions.

The development of clean, sustainable energy systems is one of the preeminent issues of our time. Most projections indicate that combustion-based energy conversion systems will continue to be the predominant approach for the majority of our energy usage, and gas turbines will continue to be important combustion-based energy conversion devices for many decades to come, used for aircraft propulsion, ground-based power generation, and mechanical-drive applications. This book compiles the key scientific and technological knowledge associated with gas turbine emissions into a single authoritative source. The book has three sections: the first section reviews major issues with gas turbine combustion, including design approaches and constraints, within the context of emissions. The second section addresses fundamental issues associated with pollutant formation, modeling, and prediction. The third section features case studies from manufacturers and technology developers, emphasizing the system-level and practical issues that must be addressed in developing different types of gas turbines that emit pollutants at acceptable levels.

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 performance of compressors, turbines, combustion and engine controls Explains important aspects of gas and turbine performance such as service life and engine emissions Accompanied by CD illustrating gas turbine performance, building on the concepts discussed in the text

[Gas Turbine Emissions](#)

[Paper](#)

[A Handbook of Air, Land and Sea Applications](#)

[Trends and Opportunities](#)

[ASME Technical Papers](#)

[Editor, John W. Sawyer](#)

[Progress in Gas Turbine Performance](#)

[Modern Gas Turbine Systems](#)

[Gas Turbine Technology](#)

[Environmentally-Benign Energy Solutions](#)

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

This book was developed directly from a series of Solar Turbines Incorporated internal short courses that were presented to an audience with a wide range of technical backgrounds, not necessarily related to turbomachinery. Thus, functional principles and physical understanding are emphasized, rather than the derivation of complicated mathematical equations. While the focus of this book is gas turbine theory, it is not intended to provide an in-depth knowledge of gas turbine aerodynamics or thermodynamics,

nor is it intended to make the reader an expert in the field of turbomachinery. Readers will benefit from the many topics and theories that pertain to the subject matter. The text emphasizes simplified explanations of complex physical theories. Hopefully, readers will utilize this book to develop an appreciation of the many engineering disciplines that are involved in the design and analysis of gas turbines. Readers are also encouraged to further investigate a wide range of topics by studying more specific, subject-matter literature.

This book provides high-quality research results and proposes future priorities for more sustainable development and energy security. It covers a broad range of topics on atmospheric changes, climate change impacts, climate change modeling and simulations, energy and environment policies, energy resources and conversion technologies, renewables, emission reduction and abatement, waste management, ecosystems and biodiversity, and sustainable development. Gathering selected papers from the 7th Global Conference on Global Warming (GCGW2018), held in Izmir, Turkey on June 24–28, 2018, it: Offers comprehensive coverage of the development of systems taking into account climate change, renewables, waste management, chemical aspects, energy and environmental issues, along with recent developments and cutting-edge information Highlights recent advances in the area of energy and environment, and the debate on and shaping of future directions and priorities for a better environment, sustainable development and energy security Provides a number of practical applications and case studies Is written in an easy-to-follow style, moving from the basics to advanced systems. Given its scope, the book offers a valuable resource for readers in academia and industry alike, and can be used at the graduate level or as a reference text for professors, researchers and engineers.

Covering basic theory, components, installation, maintenance, manufacturing, regulation and industry developments, Gas Turbines: A Handbook of Air, Sea and Land Applications is a broad-based introductory reference designed to give you the knowledge needed to succeed in the gas turbine industry, land, sea and air applications. Providing the big picture view that other detailed, data-focused resources lack, this book has a strong focus on the information needed to effectively decision-make and plan gas turbine system use for particular applications, taking into consideration not only operational requirements but long-term life-cycle costs in upkeep, repair and future use. With concise, easily digestible overviews of all important theoretical bases and a practical focus throughout, Gas Turbines is an ideal handbook for those new to the field or in the early stages of their career, as well as more experienced engineers looking for a reliable, one-stop reference that covers the breadth of the field. Covers installation, maintenance, manufacturer's specifications, performance criteria and future trends, offering a rounded view of the area that takes in technical detail as well as well as industry economics and outlook Updated with the latest industry developments, including new emission and efficiency regulations and their impact on gas turbine technology Over 300 pages of new/revised content, including new sections on microturbines, non-conventional fuel sources for microturbines, emissions, major developments in aircraft engines, use of coal gas and superheated steam, and new case histories throughout highlighting component improvements in all systems and sub-systems.

The U.S. Department of Energy (DOE) was given a mandate in the 1992 Energy Policy Act (EPACT) to pursue strategies in coal technology that promote a more competitive economy, a cleaner environment, and increased energy security. Coal evaluates DOE's performance and recommends priorities in updating its coal program and responding to EPACT. This volume provides a picture of likely future coal use and associated technology requirements through the year 2040. Based on near-, mid-, and long-term scenarios, the committee presents a framework for DOE to use in identifying R&D strategies and in making detailed assessments of specific programs. Coal offers an overview of coal-related programs and recent budget trends and explores principal issues in future U.S. and foreign coal use. The volume evaluates DOE Fossil Energy R&D programs in such key areas as electric power generation and conversion of coal to clean fuels. Coal will be important to energy policymakers, executives in the power industry and related trade associations, environmental organizations, and researchers.

[Proceedings of the ... International Conference on Power Industry Computer Applications](#)

[Techno-Economic Challenges of Green Ammonia as an Energy Vector](#)

[High Efficiency, Low Emission, Fuel Flexible Power Generation](#)

[The Design of High-Efficiency Turbomachinery and Gas Turbines, second edition, with a new preface](#)

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[Thermal Spray 2007: Global Coating Solutions: Proceedings of the 2007 International Thermal Spray Conference](#)

Modern gas turbine power plants represent one of the most efficient and economic conventional power generation technologies suitable for large-scale and smaller scale applications. Alongside this, gas turbine systems operate with low emissions and are more flexible in their operational characteristics than other large-scale generation units such as steam cycle plants. Gas turbines are unrivalled in their superior power density (power-to-weight) and are thus the prime choice for industrial applications where size and weight matter the most. Developments in the field look to improve on this performance, aiming at higher efficiency generation, lower emission systems and more fuel-flexible operation to utilise lower-grade gases, liquid fuels, and gasified solid fuels/biomass. Modern gas turbine systems provides a comprehensive review of gas turbine science and engineering. The first part of the book provides an overview of gas turbine types, applications and cycles. Part two moves on to explore major components of modern gas turbine

systems including compressors, combustors and turbogenerators. Finally, the operation and maintenance of modern gas turbine systems is discussed in part three. The section includes chapters on performance issues and modelling, the maintenance and repair of components and fuel flexibility. Modern gas turbine systems is a technical resource for power plant operators, industrial engineers working with gas turbine power plants and researchers, scientists and students interested in the field. Provides a comprehensive review of gas turbine systems and fundamentals of a cycle Examines the major components of modern systems, including compressors, combustors and turbines Discusses the operation and maintenance of component parts

Gas turbine engines will be the dominant essential technology in the next 20-year energy scenarios, either in stand-alone procedures or in combination with other energy generation apparatus. This book gives a comprehensive summary of gas turbine technology and describes some of the key developments that feature the gas turbine technology in various applications, like marine and aircraft propulsion, and industrial and stationary power generation. Thus, this book targets design, maintenance, analyst, and material engineers. Also, it will be highly beneficial to manufacturers, researchers and scientists due to the timely and correct knowledge presented in this book.

Fundamentals and Applications of Supercritical Carbon Dioxide (SCO₂) Based Power Cycles aims to provide engineers and researchers with an authoritative overview of research and technology in this area. Part One introduces the technology and reviews the properties of SCO₂ relevant to power cycles. Other sections of the book address components for SCO₂ power cycles, such as turbomachinery expanders, compressors, recuperators, and design challenges, such as the need for high-temperature materials. Chapters on key applications, including waste heat, nuclear power, fossil energy, geothermal and concentrated solar power are also included. The final section addresses major international research programs. Readers will learn about the attractive features of SCO₂ power cycles, which include a lower capital cost potential than the traditional cycle, and the compounding performance benefits from a more efficient thermodynamic cycle on balance of plant requirements, fuel use, and emissions. Represents the first book to focus exclusively on SCO₂ power cycles Contains detailed coverage of cycle fundamentals, key components, and design challenges Addresses the wide range of applications of SCO₂ power cycles, from more efficient electricity generation, to ship propulsion

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[Performance and Operability](#)

[Turbomachinery International](#)

[Technology Report and Product Directory, Land, Sea & Air](#)

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