Ultra Supercritical Coal Power Plants Materials Technologies And Optimisation Woodhead Publishing Series In Energy

Clean Coal Engineering Technology
Modeling Creep-Fatigue-Environment Interactions in Steam Turbine Rotor Materials for Advanced Ultra-supercritical Coal Power Plants
Fundamentals and Applications of Supercritical Carbon Dioxide (SCO2) Based Power Cycles
Computational Modeling and Assessment Of Nanocoatings for Ultra Supercritical Boilers
Power Generation from Solid Fuels
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Sustainable Management of Coal Preparation
Clean Coal and Sustainable Energy
Characteristics and Costs
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Proceedings from the Fourth International Conference, October 25-28, 2004, Hilton Head Island, South Carolina
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Boiler Materials for Ultrasupercritical Coal Power Plants
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Boiler Materials for Ultrasupercritical Coal Power Plants

BARRERA RORY

Clean Coal Engineering Technology Woodhead Publishing

This book offers a detailed presentation of the principles and practice of life cycle impact assessment. As a volume of the LCA compendium, the book is structured according to the LCIA framework developed by the International Organisation for Standardisation (ISO)passing through the phases of definition or selection of impact categories, category indicators and characterisation models (Classification): calculation of category indicator results (Characterisation); calculating the magnitude of category indicator results relative to reference information (Normalisation); and converting indicator results of different impact categories by using numerical factors based on value-choices (Weighting). Chapter one offers a historical overview of the development of life cycle impact assessment and presents the boundary conditions and the general principles and constraints of characterisation modelling in LCA. The second chapter outlines the considerations underlying the selection of impact categories and

the classification or assignment of inventory flows into these categories. Chapters three through thirteen exploreall the impact categories that are commonly included in LCIA, discussing the characteristics of each followed by a review of midpoint and endpoint characterisation methods, metrics, uncertainties and new developments, and a discussion of research needs. Chapter-length treatment is accorded to Climate Change; Stratospheric Ozone Depletion; Human Toxicity; Particulate Matter Formation; Photochemical Ozone Formation; Ecotoxicity; Acidification; Eutrophication; Land Use; Water Use; and Abiotic Resource Use. The final two chapters map out the optional LCIA steps of Normalisation and Weighting.

Modeling Creep-Fatigue-Environment Interactions in Steam Turbine Rotor Materials for Advanced Ultra-supercritical Coal Power Plants Asian Development Bank

The U.S. Department of Energy (DOE) and the Ohio Coal Development Office (OCDO) have recently initiated a project aimed at identifying, evaluating, and qualifying the materials needed for the construction of the critical components of coal-fired boilers capable of operating at much higher efficiencies than current generation of supercritical plants. This increased efficiency is expected to be achieved principally through the use of ultrasupercritical steam conditions (USC). A

limiting factor in this can be the materials of construction. The project goal is to assess/develop materials technology that will enable achieving turbine throttle steam conditions of 760 C (1400 F)/35 MPa (5000 psi). This goal seems achievable based on a preliminary assessment of material capabilities. The project is further intended to build further upon the alloy development and evaluation programs that have been carried out in Europe and Japan. Those programs have identified ferritic steels capable of meeting the strength requirements of USC plants up to approximately 620 C (1150 F) and nickel-based alloys suitable up to 700 C (1300 F). In this project, the maximum temperature capabilities of these and other available high-temperature alloys are being assessed to provide a basis for materials selection and application under a range of conditions prevailing in the boiler. This report provides a quarterly status report for the period of October 1 to December 30, 2005. *Fundamentals and Applications of Supercritical Carbon Dioxide (SCO2) Based Power Cycles* Elsevier Absorption-Based Post-Combustion Capture of Carbon Dioxide provides a comprehensive and authoritative review of the use of absorbents for post-combustion capture of carbon dioxide. As fossil fuel-based power generation technologies are likely to remain key in the future, at least in the

short- and medium-term, carbon capture and storage will be a critical greenhouse gas reduction technique. Post-combustion capture involves the removal of carbon dioxide from flue gases after fuel combustion, meaning that carbon dioxide can then be compressed and cooled to form a safely transportable liquid that can be stored underground. Provides researchers in academia and industry with an authoritative overview of the amine-based methods for carbon dioxide capture from flue gases and related processes Editors and contributors are well known experts in the field Presents the first book on this specific topic

Computational Modeling and Assessment Of Nanocoatings for Ultra Supercritical Boilers Springer Science & Business Media

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.

Power Generation from Solid Fuels Elsevier

Coal-Fired Generation is a concise, up-to-date and readable guide providing an introduction to this traditional power generation technology. It includes detailed descriptions of coal fired

generation systems, demystifies the coal fired technology functions in practice as well as exploring the economic and environmental risk factors. Engineers, managers, policymakers and those involved in planning and delivering energy resources will find this reference a valuable guide, to help establish a reliable power supply address social and economic objectives. Focuses on the evolution of the traditional coal-fired generation Evaluates the economic and environmental viability of the system with concise diagrams and accessible explanations

Coal in the 21st Century

ASM International

Coal-fired power plants are a significant part of the nation's power generating capacity, currently accounting for more than 55% of the country's total electricity production. Extending the reliable lifetimes of fossil fired boiler components and reducing the maintenance costs are essential for economic operation of power plants. Corrosion and erosion are leading causes of superheater and reheater boiler tube failures leading to unscheduled costly outages. Several types of coatings and weld overlays have been used to extend the service life of boiler tubes; however, the protection afforded by such materials was limited approximately one to eight years. Power companies are more recently focused in achieving greater plant efficiency by increasing steam temperature and

pressure into the advanced-ultrasupercritical (A-USC) condition with steam temperatures approaching 760°C (1400°F) and operating pressures in excess of 35MPa (5075 psig). Unfortunately, laboratory and field testing suggests that the resultant fireside environment when operating under A-USC conditions can potentially cause significant corrosion to conventional and advanced boiler materials1-2. In order to improve reliability and availability of fossil fired A-USC boilers, it is essential to develop advanced nanostructured coatings that provide excellent corrosion and erosion resistance without adversely affecting the other properties such as toughness and thermal fatigue strength of the component material.

Advanced Applications

BoD – Books on Demand

Advances in Ultra-low Emission Control Technologies for Coal-Fired Power Plants discusses the emissions standards of dust, SO2, NOx and mercury pollution, also presenting the key technologies available to control emissions in coal-fired power plants. The practical effects of ultra-low emissions projects included help the reader understand related implications in plants. Emphasis is placed on 300MW subcritical, 600MW subcritical, 660MW supercritical and 1000MW ultra-supercritical coal-fired units. The influence of different pollutant control units, such as wet

electrostatic precipitator, desulfurization equipment and the electrostatic precipitator are also analyzed, and the pollutant levels before and after retrofitted ultra-low emissions are compared throughout. Provides a unique analysis of advanced technologies, such as dust-removal, desulfurization and denitrification used for ultra-low emissions in coal-fired power plants Introduces emission standards for dust, SO2, NOx and Mercury pollution from coal-fired power plants in China, the US and Europe Provides solutions to reducing emissions based on technological advances in China Analyzes the environmental and economic effects of these technologies

Sustainable Management of Coal Preparation Springer The continued use of coal as a means of generating electricity and an increasing demand for cleaner, more efficient energy production has led to advances in power plant technology. Ultra-supercritical coal power plants reviews the engineering, operation, materials and performance of ultra-supercritical coal power plants. Following a chapter introducing advanced and ultra-supercritical coal power plants, part one goes on to explore the operating environments, materials and engineering of ultra-supercritical coal power plants. Chapters discuss the impacts of steam conditions on plant materials and operation, fuel considerations and

burner design, and materials and design for boilers working under supercritical steam conditions. Chapters in part two focus on improving ultra-supercritical coal power plant performance and operability. Ash fouling, deposition and slagging in ultra-supercritical coal power plants are highlighted along with pollution control measures and the estimation, management and extension of the life of ultra-supercritical power plants. Further chapters provide an economic and engineering analysis of a 700°C advanced ultra-supercritical pulverised coal power plant and discuss CO2 capture-ready ultra-supercritical coal power plants. Ultra-supercritical coal power plants is a comprehensive technical reference for power plant operators and engineers, high-temperature materials scientists, professionals in the power industry who require an understanding of ultra-supercritical coal power plants and researchers and academics interested in the field. Provides a comprehensive reference on the developments, materials, design and operation of ultra-supercritical power plant Considers the degradation issues affecting this type of plant, as well as emissions control and CO2 capture technology; improved plant controls critical to improved operation and environmental performance Contains operational assessments for plant safety, plant life

management, and plant economics

Clean Coal and Sustainable Energy

Springer Science & Business Media

The U.S. Department of Energy (DOE) and the Ohio Coal Development Office (OCDO) have undertaken a project aimed at identifying, evaluating, and qualifying the materials needed for the construction of the critical components of coal-fired boilers capable of operating at much higher efficiencies than current generation of supercritical plants. This increased efficiency is expected to be achieved principally through the use of advanced ultrasupercritical (A-USC) steam conditions up to 760°C (1400°F) and 35 MPa (5000 psi). A limiting factor to achieving these higher temperatures and pressures for future A-USC plants are the materials of construction. The goal of this project is to assess/develop materials technology to build and operate an A-USC boiler capable of delivering steam with conditions up to 760°C (1400°F)/35 MPa (5000 psi). The project has successfully met this goal through a focused long-term public-private consortium partnership. The project was based on an R & D plan developed by the Electric Power Research Institute (EPRI) and an industry consortium that supplemented the recommendations of several DOE workshops on the subject of advanced materials. In view of the variety of skills and expertise required for the

successful completion of the proposed work, a consortium led by the Energy Industries of Ohio (EIO) with cost-sharing participation of all the major domestic boiler manufacturers, ALSTOM Power (Alstom), Babcock and Wilcox Power Generation Group, Inc. (B & W), Foster Wheeler (FW), and Riley Power, Inc. (Riley), technical management by EPRI and research conducted by Oak Ridge National Laboratory (ORNL) has been developed. The project has clearly identified and tested materials that can withstand 760°C (1400°F) steam conditions and can also make a 700°C (1300°F) plant more economically attractive. In this project, the maximum temperature capabilities of these and other available high-temperature alloys have been assessed to provide a basis for materials selection and application under a range of conditions prevailing in the boiler. A major effort involving eight tasks was completed in Phase 1. In a subsequent Phase 2 extension, the earlier defined tasks were extended to finish and enhance the Phase 1 activities. This extension included efforts in improved weld/weldment performance, development of longer-term material property databases, additional field (in-plant) corrosion testing, improved understanding of long-term oxidation kinetics and exfoliation, cyclic operation, and fabrication methods for waterwalls. In addition, preliminary work

was undertaken to model an oxyfuel boiler to define local environments expected to occur and to study corrosion behavior of alloys under these conditions. This final technical report provides a comprehensive summary of all the work undertaken by the consortium and the research findings from all eight (8) technical tasks including A-USC boiler design and economics (Task 1), long-term materials properties (Task 2), steam- side oxidation (Task 3), Fireside Corrosion (Task 4), Welding (Task 5), Fabricability (Task 6), Coatings (Task 7), and Design Data and Rules (Task 8).

Characteristics and Costs Butterworth-Heinemann

This report evaluates the economics and performance of two A-USC PC power plants; Case 1 is a conventionally configured A-USC PC power plant with superior emission controls, but without CO2 removal; and Case 2 adds a post-combustion carbon capture (PCC) system to the plant from Case 1, using the design and heat integration strategies from EPRI's 2015 report, "Best Integrated Coal Plant." The capture design basis for this case is "partial," to meet EPA's proposed New Source Performance Standard, which was initially proposed as 500 kg-CO2/MWh (gross) or 1100 lb-CO2/MWh (gross), but modified in August 2015 to 635 kg-CO2/MWh (gross) or 1400 lb-CO2/MWh (gross). This report draws upon the

collective experience of consortium members, with EPRI and General Electric leading the study. General Electric provided the steam cycle analysis as well as v the steam turbine design and cost estimating. EPRI performed integrated plant performance analysis using EPRI's PC Cost model.

Efficiency and Effectiveness BoD – Books on Demand 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.

Power Plants Elsevier
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 from the Fourth International Conference, October 25-28, 2004, Hilton Head Island, South Carolina
National Academies Press
Concern over the effects of airborne pollution, green house gases, and the impact of global warming has become a worldwide issue that

transcends international boundaries, politics, and social responsibility. The 2nd Edition of Coal Energy Systems: Clean Coal Technology describes a new generation of energy processes that sharply reduce air emissions and other pollutants from coal-burning power plants.
Coal is the dirtiest of all fossil fuels. When burned, it produces emissions that contribute to global warming, create acid rain, and pollute water. With all of the interest and research surrounding nuclear energy, hydropower, and biofuels, many think that coal is finally on its way out. However, coal generates half of the electricity in the United States and throughout the world today. It will likely continue to do so as long as it's cheap and plentiful [Source: Energy Information Administration]. Coal provides stability in price and availability, will continue to be a major source of electricity generation, will be the major source of hydrogen for the coming hydrogen economy, and has the potential to become an important source of liquid fuels. Conservation and renewable/sustainable energy are important in the overall energy picture, but will play a lesser role in helping us satisfy our energy demands today. Dramatically updated to meet the needs of an ever changing energy market, Coal Energy Systems, 2nd Edition is a single source covering policy and the engineering involved in implementing that policy. The book addresses many coal-related subjects of

interest ranging from the chemistry of coal and the future engineering anatomy of a coal fired plant to the cutting edge clean coal technologies being researched and utilized today. A 50% update over the first edition, this new book contains new chapters on processes such as CO2 capture and sequestration, Integrated Gasification Combined Cycle (IGCC) systems, Pulverized-Coal Power Plants and Carbon Emission Trading. Existing materials on worldwide coal distribution and quantities, technical and policy issues regarding the use of coal, technologies used and under development for utilizing coal to produce heat, electricity, and chemicals with low environmental impact, vision for utilizing coal well into the 21st century, and the security coal presents. Clean Liquids and Gaseous Fuels from Coal for Electric Power Integrated Gasification Combined Cycle (IGCC) systems Pulverized-Coal Power Plants Advanced Coal-Based Power Plants Fluidized-Bed Combustion Technology CO2 capture and sequestration

Energy for the Future ASM International

On cover & title page: In support of the G8 Plan of Action. Cleaner fossil fuels

Advanced Power Plant Materials, Design and Technology DIANE Publishing

The U.S. Department of Energy (DOE) and the Ohio Coal Development Office (OCDO) have recently initiated a project aimed at identifying, evaluating, and qualifying

the materials needed for the construction of the critical components of coal-fired boilers capable of operating at much higher efficiencies than current generation of supercritical plants. This increased efficiency is expected to be achieved principally through the use of ultrasupercritical steam conditions (USC). The project goal initially was to assess/develop materials technology that will enable achieving turbine throttle steam conditions of 760 C (1400 F)/35 MPa (5000 psi), although this goal for the main steam temperature had to be revised down to 732 C (1350 F), based on a preliminary assessment of material capabilities. The project is intended to build further upon the alloy development and evaluation programs that have been carried out in Europe and Japan. Those programs have identified ferritic steels capable of meeting the strength requirements of USC plants up to approximately 620 C (1150 F) and nickel-based alloys suitable up to 700 C (1300 F). In this project, the maximum temperature capabilities of these and other available high-temperature alloys are being assessed to provide a basis for materials selection and application under a range of conditions prevailing in the boiler. This report provides a quarterly status report for the period of July 1 to September 30, 2004. Life Cycle Impact Assessment National Academies Press The Ultrasupercritical

(USC) Steam Turbine Materials Development Program is sponsored and funded by the U.S. Department of Energy and the Ohio Coal Development Office, through grants to Energy Industries of Ohio (EIO), a non-profit organization contracted to manage and direct the project. The program is co-funded by the General Electric Company, Alstom Power, Siemens Power Generation (formerly Siemens Westinghouse), and the Electric Power Research Institute, each organization having subcontracted with EIO and contributing teams of personnel to perform the requisite research. The program is focused on identifying, evaluating, and qualifying advanced alloys for utilization in coal-fired power plants that need to withstand steam turbine operating conditions up to 760Â°C (1400Â°F) and 35 MPa (5000 psi). For these conditions, components exposed to the highest temperatures and stresses will need to be constructed from nickel-based alloys with higher elevated temperature strength than the highchromium ferritic steels currently used in today's high-temperature steam turbines. In addition to the strength requirements, these alloys must also be weldable and resistant to environmental effects such as steam oxidation and solid particle erosion. In the present project, candidate materials with the required creep strength at desired temperatures have been identified. Coatings that

can resist oxidation and solid particle erosion have also been identified. The ability to perform dissimilar welds between nickel base alloys and ferritic steels have been demonstrated, and the properties of the welds have been evaluated. Results of this three-year study that was completed in 2009 are described in this final report. Additional work is being planned and will commence in 2009. The specific objectives of the future studies will include conducting more detailed evaluations of the weld-ability, mechanical properties and repair-ability of the selected candidate alloys for rotors, casings and valves, and to perform scale-up studies to establish a design basis for commercial scale components. A supplemental program funded by the Ohio Coal Development Office will undertake supporting tasks such as testing and trials using existing atmospheric, vacuum and developmental pressure furnaces to define specific metal casting techniques needed for producing commercial scale components.

Advances in Materials Technology for Fossil Power Plants Springer Nature

Ultra-Supercritical Coal Power PlantsMaterials, Technologies and OptimisationElsevier

Boiler Materials for Ultrasupercritical Coal Power Plants Royal Society of Chemistry

Power Plant Instrumentation and Control Handbook, Second Edition, provides a contemporary resource on

the practical monitoring of power plant operation, with a focus on efficiency, reliability, accuracy, cost and safety. It includes comprehensive listings of operating values and ranges of parameters for temperature, pressure, flow and levels of both conventional thermal power plant and combined/cogen plants, supercritical plants and once-through boilers. It is updated to include tables, charts and figures from advanced plants in operation or pilot stage. Practicing engineers, freshers, advanced students and researchers will benefit from discussions on advanced instrumentation with specific reference to thermal power generation and operations. New topics in this updated edition include plant safety lifecycles and safety integrity levels, advanced ultra-supercritical plants with advanced firing systems and associated auxiliaries, integrated gasification combined cycle (IGCC) and integrated gasification fuel cells (IGFC), advanced control systems, and safety lifecycle and safety integrated systems. Covers systems in use in a wide range of power plants: conventional thermal power plants, combined/cogen plants, supercritical plants, and once through boilers Presents practical design aspects and current trends in instrumentation Discusses why and how to change control strategies when systems are updated/changed Provides instrumentation selection techniques

based on operating parameters. Spec sheets are included for each type of instrument Consistent with current professional practice in North America, Europe, and India All-new coverage of Plant safety lifecycles and Safety Integrity Levels Discusses control and instrumentation systems deployed for the next generation of A-USC and IGCC plants

Ultra-supercritical Coal Power Plants Ultra-Supercritical Coal Power PlantsMaterials, Technologies and Optimisation

Indonesia has achieved an impressive 84% electrification ratio, but faces significant challenges in reaching the remaining 16% of its households. This report describes Indonesia's electrification environment and identifies barriers to achieving universal electricity access. Principles drawn from international best practices such as government commitment, enabling institutional environments, adequate and sustainable financing, and stakeholder coordination are discussed in the context of Indonesia's energy sector. The report gives recommendations for establishing service standards, streamlining financing, setting appropriate targets, and monitoring and evaluation, as well as near-term steps to help achieve universal electricity access.

Engineering and Economic Analysis of an Advanced Ultra-Supercritical

Pulverized Coal Power Plant with and Without Post-Combustion Carbon Capture Task 7. Design and Economic Studies Academic Press For multi-user PDF licensing, please contact customer service. Energy touches our lives in countless ways and its costs are felt when we fill up at the gas pump, pay our home heating bills, and keep businesses both large and small running. There are long-term costs as well: to the environment, as natural resources are depleted and pollution contributes to global climate change, and to national security and independence, as many of the world's current energy sources are increasingly concentrated in geopolitically unstable regions. The country's challenge is to develop an energy portfolio that addresses these concerns while still providing sufficient, affordable energy reserves for the nation. The United States has enormous resources to put behind solutions to this energy challenge; the dilemma is to identify which solutions are the right ones. Before deciding which energy technologies to develop, and on what timeline, we need to understand them better. America's Energy Future analyzes the potential of a wide range of technologies for generation, distribution, and conservation of energy. This book considers technologies to increase energy efficiency, coal-fired power generation, nuclear power, renewable energy, oil and natural gas, and

alternative transportation fuels. It offers a detailed assessment of the associated impacts and projected costs of implementing each technology and categorizes them into three time frames for implementation.

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