

Organic Rankine Cycle Technology All Energy

This report assesses the state-of-the-art of commercially available organic Rankine cycle (ORC) hardware from a literature search and industry survey. Engineering criteria for applying ORC technology are established, and a set of nomograms to enable the rapid sizing of the equipment is presented. A comparison of an ORC system with conventional heat recovery techniques can be made with a nomogram developed for a recuperative heat exchanger. A graphical technique for evaluating the economic aspects of an ORC system and conventional heat recovery method is discussed; also included is a description of anticipated future trends in organic Rankine cycle R & D. (Author). Most conventional cryogenic refrigerators and liquefiers operate with pure fluids, the major exception being natural gas liquefiers that use mixed refrigerant processes. The fundamental aspects of mixed refrigerant processes, though very innovative, have not received the due attention in open literature in view of commercial interests. Hundreds of patents exist on different aspects of mixed refrigerant processes. However, it is difficult to piece together the existing information to choose an appropriate process and an optimum composition or a given application. The aim of the book is to teach (a.) the need for refrigerant mixtures, (b.) the type of mixtures that can be used for different refrigeration and liquefaction applications, (c.) the different processes that can be used and (d.) the methods to be adopted for choosing the components of a mixture and their concentration for different applications.

A comprehensive depository of all information relating to the scientific and technological aspects of Shale Gas and Alternative Energy Conveniently arranged by energy type including Shale Gas, Wind, Geothermal, Solar, and Hydropower Perfect first-stop reference for any scientist, engineer, or student looking for practical and applied energy information Emphasizes practical applications of existing technologies, from design and maintenance, to operating and troubleshooting of energy systems and equipment Features concise yet complete entries, making it easy for users to find the required information quickly, without the need to search through long articles

Our knowledge of mass transfer processes has been extended and applied to various fields of science and engineering including industrial processes in recent years. Since mass transfer is primordial phenomenon, it plays a key role in the scientific researches and fields of mechanical, energy, environmental, materials, bio, and chemical engineering. In this book, energetic authors especially provide advances in scientific findings and technologies, and develop new theoretical models concerning mass transfer for sustainable energy and environment. This book brings valuable references for research engineers working in the variety of mass transfer sciences and related fields. Since the constitutive topics cover the advances in broad research areas, the topics will be mutually stimulus and informative not only to research engineers, but also to university professors and students.

Ron DiPippo, Professor Emeritus at the University of Massachusetts Dartmouth, is a world-regarded geothermal expert. This single resource covers all aspects of the utilization of geothermal energy for power generation from fundamental scientific and engineering principles. The thermodynamic basis for the design of geothermal power plants is at the heart of the book and readers are clearly guided on the process of designing and analysing the key types of geothermal energy conversion systems. Its practical emphasis is enhanced by the use of case studies from real plants that increase the reader's understanding of geothermal energy conversion and provide a unique compilation of hard-to-obtain data and experience. An important new chapter covers Environmental Impact and Abatement Technologies, including gaseous and solid emissions; water, noise and thermal pollutions; land usage; disturbance of natural hydrothermal manifestations, habitats and vegetation; minimisation of CO₂ emissions and environmental impact assessment. The book is illustrated with over 240 photographs and drawings. Nine chapters include practice problems, with solutions, which enable the book to be used as a course text. Also includes a definitive worldwide compilation of every geothermal power plant that has operated, unit by unit, plus a concise primer on the applicable thermodynamics. * Engineering principles are at the heart of the book, with complete coverage of the thermodynamic basis for the design of geothermal power systems * Practical applications are backed up by an extensive selection of case studies that show how geothermal energy conversion systems have been designed, applied and exploited in practice * World renowned geothermal expert DiPippo has including a new chapter on Environmental Impact and Abatement Technology in this new edition

Small and micro combined heat and power (CHP) systems are a form of cogeneration technology suitable for domestic and community buildings, commercial establishments and industrial facilities, as well as local heat networks. One of the benefits of using cogeneration plant is a vastly improved energy efficiency: in some cases achieving up to 80–90% systems efficiency, whereas small-scale electricity production is typically at well below 40% efficiency, using the same amount of fuel. This higher efficiency affords users greater energy security and increased long-term sustainability of energy resources, while lower overall emissions levels also contribute to an improved environmental performance. Small and micro combined heat and power (CHP) systems provides a systematic and comprehensive review of the technological and practical developments of small and micro CHP systems. Part one opens with reviews of small and micro CHP systems and their techno-economic and performance assessment, as well as their integration into distributed energy systems and their increasing utilisation of biomass fuels. Part two focuses on the development of different types of CHP technology, including internal combustion and reciprocating engines, gas turbines and microturbines, Stirling engines, organic Rankine cycle process and fuel cell systems. Heat-activated cooling (i.e. trigeneration) technologies and energy storage systems, of importance to the regional/seasonal viability of this technology round out this section. Finally, part three covers the range of applications of small and micro CHP systems, from residential buildings and district heating, to commercial buildings and industrial applications, as well as reviewing the market deployment of this important technology. With its distinguished editor and international team of expert contributors, Small and micro combined heat and power (CHP) systems is an essential reference work for anyone involved or interested in the design, development, installation and optimisation of small and micro CHP systems. Reviews small- and micro-CHP systems and their techno-economic and performance assessment Explores integration into distributed energy systems and their increasing utilisation of biomass fuels Focuses on the development of different types of CHP technology, including internal combustion and reciprocating engines

The disproportionate use of fossil fuels has turned into a serious environmental issue. Thus, we are encountering one of the biggest challenges of the twenty-first century, satisfying the energy demand with respect to the environment.

Thermoelectricity is an emerging technology, which contributes to reducing the impact of the use of traditional technologies, harvesting the waste heat, and eliminating the use of refrigerants. The book Bringing Thermoelectricity into Reality covers the current thermoelectric investigations: the study of novel thermoelectric materials, the development of computational models, the design of proper assemblies, and the optimization of thermal designs, as well as novel thermoelectric generators, coolers, and heating applications. This book looks for the definitive thermoelectric applications applied to everyday life.

The concept of appropriate technology has been addressed for electricity production in remote areas of developing countries through the solar ORC technology. The selection of working fluids plays an important role in ORC system. R245fa and R134a are recommended for power generation. In addition, R245fa works well for the heat source temperature of the range 100-120 C whereas R134a below 100 C. Vacuum type solar collector is used for obtaining the hot water which can produce the temperature of 120 C. The commercial scroll expander that adopt magnetic coupling

has been used in the experiment. The experimental investigation of the small-scale ORC showed acceptable characteristics for the temperature of the 120 C that uses R245fa working fluid. The system efficiency is 8.5 % with the power output of 1.4 kW. From the economic point of view the solar ORC system cannot recover its investment until 19 years of installation and operation currently without any subsidies. The concept in this book is helpful for solar ORC developers, manufacturers, energy planners, rural practitioners, different aid and donor agencies for adopting the sustainable energy system technology."

CAMD or Computer Aided Molecular Design refers to the design of molecules with desirable properties. That is, through CAMD, one determines molecules that match a specified set of (target) properties. CAMD as a technique has a very large potential as in principle, all kinds of chemical, bio-chemical and material products can be designed through this technique. This book mainly deals with macroscopic properties and therefore does not cover molecular design of large, complex chemicals such as drugs. While books have been written on computer aided molecular design relating to drugs and large complex chemicals, a book on systematic formulation of CAMD problems and solutions, with emphasis on theory and practice, which helps one to learn, understand and apply the technique is currently unavailable. · This title brings together the theoretical aspects related to Computer Aided Molecular Design, the different techniques that have been developed and the different applications that have been reported. · Contributing authors are among the leading researchers and users of CAMD · First book available giving a systematic formulation of CAMD problems and solutions Authored by authoritative experts in the field, this long-awaited book provides multidisciplinary insights into the technological, economic, design, and optimization aspects of organic Rankine cycle (ORC) systems. Following an introduction presenting the fundamentals of Rankine cycles and thermodynamics, subsequent chapters discuss ORC technology, including the selection of working fluid, the expansion machines and pumps, and the applications of ORC. A chapter on modeling, optimizing and controlling ORC systems is also included. The book concludes with a look at future technological advances. For newcomers to this hot topic as well as experts in industry already working with the technology, from organic chemistry via simulation and modeling to power plant engineers.

The development of engine waste heat recovery (WHR) technologies attracts ever increasing interests due to the rising strict policy requirements and environmental concerns. Organic Rankine Cycle (ORC) can convert low medium grade heat into electrical or mechanical power and has been widely recognized as the most promising heat-driven technologies. A typical internal combustion engine (ICE) converts around 30% of the overall fuel energy into effective mechanical power and the rest of fuel energy is dumped through the engine exhaust system and cooling system. Integrating a well-designed ORC system to ICE can effectively improve the overall energy efficiency and reduce emissions with around 2-5 years payback period through fuel saving. This book chapter is meant to provide an overview of the technical development and application of ORC technology to recover wasted thermal energy from the ICE with a particular focus on vehicle applications.

This paper describes research and development currently underway to place the evaporator of an Organic Rankine Cycle (ORC) system directly in the path of a hot exhaust stream produced by a gas turbine engine. The main goal of this research effort is to improve cycle efficiency and cost by eliminating the usual secondary heat transfer loop. The project's technical objective is to eliminate the pumps, heat exchangers and all other added cost and complexity of the secondary loop by developing an evaporator that resides in the waste heat stream, yet virtually eliminates the risk of a working fluid leakage into the gaseous exhaust stream. The research team comprised of Idaho National Laboratory and General Electric Company engineers leverages previous research in advanced ORC technology to develop a new direct evaporator design that will reduce the ORC system cost by up to 15%, enabling the rapid adoption of ORCs for waste heat recovery.

This book comprises five chapters on developed research activities on organic Rankine cycles. The first section aims to provide researchers with proper modelling (Chapter 1) and experimental (Chapter 2) tools to calculate and empirically validate thermophysical properties of ORC working fluids. The second section introduces some theoretical and experimental studies of organic Rankine cycles for waste heat recovery applications: a review of different supercritical ORC (Chapter 3), ORC for waste heat recovery from fossil-fired power plants (Chapter 4), the experimental detailed characterization of a small-scale ORC of 3 kW operating with either pure fluids or mixtures (Chapter 5).

Topics on CO₂ sequestration and reduction in greenhouse gas emissions from process engineering and materials for clean energy are covered. Papers addressing sustainable technologies in extractive metallurgy, materials processing and manufacturing industries with reduced energy consumption and CO₂ emission are also included, as well as industrial energy efficient technologies including innovative ore beneficiation, smelting technologies, recycling and waste heat recovery. The book also carries contributions from all areas of non-nuclear and non-traditional energy sources, including renewable energy sources such as solar, wind, biomass, etc. The book also emphasizes novel mineral beneficiation, processing, and extraction techniques leading to waste minimization of critical rare-earth materials used in energy systems (e.g., magnets, display and lighting devices). Papers from the following symposia are presented in the book: Energy Technologies and Carbon Dioxide Management High-temperature Systems for Energy Conversion and Storage

Compared to the conventional Rankine cycle using water, the ORC can create efficient expansion at low power, avoid superheater and offer higher thermal efficiency in low temperature application. Small-scale ORCs from several kWe to a few hundred kWe offer great potential for meeting the residential demand on heat and power, and are of growing interest in scientific and technical fields. However, one critical problem is the decreased device efficiency and cost-effectiveness that arises when the ORC is scaled down. In this thesis, the ORC is combined with low concentration-ratio solar collectors. The background, research trend, merits and importance of the solar ORC are described. To reduce the thermodynamic irreversibility and the cost of the system, three innovative solutions are proposed: solar ORC without heat transfer fluid (HTF), which employs two-stage collectors and heat storage units; hybrid solar power generation based on ORC and amorphous silicon cells; osmosis-driven solar ORC. Heat collection, storage and power conversion are optimized. The design, construction and test of a prototype are conducted, demonstrating the feasibility of the ORC for small-scale cogeneration. Special attention is paid to the variable operation and parameter design with respect to the condensation temperature.

The main scope of this study is to emphasize exergy efficiency in all fields of industry. The chapters collected in the book are contributed by invited researchers with a long-standing experience in different research areas. I hope that the material presented here is understandable to a

wide audience, not only energy engineers but also scientists from various disciplines. The book contains seven chapters in three sections: (1) "General Information about Exergy," (2) "Exergy Applications," and (3) "Thermoeconomic Analysis." This book provides detailed and up-to-date evaluations in different areas written by academics with experience in their fields. It is anticipated that this book will make a scientific contribution to exergy workers, researchers, academics, PhD students, and other scientists in both the present and the future.

This book examines internal combustion engine technology and applications of biodiesel fuel. It includes seven chapters in two sections. The first section examines engine downsizing, fuel spray, and economic comparison. The second section deals with applications of biodiesel fuel in compression-ignition and spark-ignition engines. The information contained herein is useful for scientists and students looking to broaden their knowledge of internal combustion engine technologies and applications of biodiesel fuel.

Organic Rankine Cycle Technology for Heat RecoveryBoD – Books on Demand

14th International Conference on Turbochargers and Turbocharging addresses current and novel turbocharging system choices and components with a renewed emphasis to address the challenges posed by emission regulations and market trends. The contributions focus on the development of air management solutions and waste heat recovery ideas to support thermal propulsion systems leading to high thermal efficiency and low exhaust emissions. These can be in the form of internal combustion engines or other propulsion technologies (eg. Fuel cell) in both direct drive and hybridised configuration. 14th International Conference on Turbochargers and Turbocharging also provides a particular focus on turbochargers, superchargers, waste heat recovery turbines and related air managements components in both electrical and mechanical forms.

This book on organic Rankine cycle technology presents nine chapters on research activities covering the wide range of current issues on the organic Rankine cycle. The first section deals with working fluid selection and component design. The second section is related to dynamic modeling, starting from internal combustion engines to industrial power plants. The third section discusses industrial applications of waste heat recovery, including internal combustion engines, LNG, and waste water. A comprehensive analysis of the technology and application of organic Rankine cycle systems is beyond the aim of the book. However, the content of this volume can be useful for scientists and students to broaden their knowledge of technologies and applications of organic Rankine cycle systems.

The rising trend in the global energy demand poses new challenges to humankind. The energy and mechanical engineering sectors are called to develop new and more environmentally friendly solutions to harvest residual energy from primary production processes. The Organic Rankine Cycle (ORC) is an emerging energy system for power production and waste heat recovery. In the near future, this technology can play an increasing role within the energy generation sectors and can help achieve the carbon footprint reduction targets of many industrial processes and human activities. This Special Issue focuses on selected research and application cases of ORC-based waste heat recovery solutions. Topics included in this publication cover the following aspects: performance modeling and optimization of ORC systems based on pure and zeotropic mixture working fluids; applications of waste heat recovery via ORC to gas turbines and reciprocating engines; optimal sizing and operation of ORC under combined heat and power and district heating application; the potential of ORC on board ships and related issues; life cycle analysis for biomass application; ORC integration with supercritical CO₂ cycle; and the proper design of the main ORC components, including fluid dynamics issues. The current state of the art is considered and some cutting-edge ORC technology research activities are examined in this book.

Organic Rankine Cycle (ORC) Power Systems: Technologies and Applications provides a systematic and detailed description of organic Rankine cycle technologies and the way they are increasingly of interest for cost-effective sustainable energy generation. Popular applications include cogeneration from biomass and electricity generation from geothermal reservoirs and concentrating solar power installations, as well as waste heat recovery from gas turbines, internal combustion engines and medium- and low-temperature industrial processes. With hundreds of ORC power systems already in operation and the market growing at a fast pace, this is an active and engaging area of scientific research and technical development. The book is structured in three main parts: (i) Introduction to ORC Power Systems, Design and Optimization, (ii) ORC Plant Components, and (iii) Fields of Application. Provides a thorough introduction to ORC power systems Contains detailed chapters on ORC plant components Includes a section focusing on ORC design and optimization Reviews key applications of ORC technologies, including cogeneration from biomass, electricity generation from geothermal reservoirs and concentrating solar power installations, waste heat recovery from gas turbines, internal combustion engines and medium- and low-temperature industrial processes Various chapters are authored by well-known specialists from Academia and ORC manufacturers

Maritime Technology and Engineering 3 is a collection of papers presented at the 3rd International Conference on Maritime Technology and Engineering (MARTECH 2016, Lisbon, Portugal, 4-6 July 2016). The MARTECH Conferences series evolved from biannual national conferences in Portugal, thus reflecting the internationalization of the maritime sector. The keynote lectures and the papers, making up nearly 150 contributions, came from an international group of authors focused on different subjects in a variety of fields: Maritime Transportation, Energy Efficiency, Ships in Ports, Ship Hydrodynamics, Ship Structures, Ship Design, Ship Machinery, Shipyard Technology, safety & Reliability, Fisheries, Oil & Gas, Marine Environment, Renewable Energy and Coastal Structures. Maritime Technology and Engineering 3 will appeal to academics, engineers and professionals interested or involved in these fields.

Energy conversion technology has always been a main focus for researchers in order to meet the increasing demand as well as securing a clean, consistent and reliable energy supply. The constantly rising fuel price is another good reason to develop alternative systems such as wind turbines, hydropower, photovoltaic systems and other renewable energy solutions. This book contains a collection of selected research works in the areas of electric energy generation, renewable energy sources, hybrid system, electromechanical energy conversion, electric machines, power electronic converters and inverters, energy storage, smart grid and traditional energy conversion systems. The book intends to provide academic and industry professionals working in the field of energy conversion and related applications with an update in energy conversion technology, particularly from the applied perspective.

Advances in Carbon Management Technologies comprises 43 chapters contributed by experts from all over the world. Volume 1 of the book, containing 23 chapters, discusses the status of technologies capable of yielding substantial reduction of carbon dioxide emissions from major combustion sources. Such technologies include renewable energy sources that can replace fossil fuels and technologies to capture CO₂ after fossil fuel combustion or directly from the atmosphere, with subsequent permanent long-term storage. The introductory chapter emphasizes the gravity of the issues related to greenhouse gas emissionglobal temperature correlation, the state of the art of key technologies and the necessary emission reductions needed to meet international warming targets. Section 1 deals with global challenges associated with key fossil fuel mitigation technologies, including removing CO₂ from the atmosphere, and emission measurements. Section 2 presents technological choices for coal, petroleum, and natural gas for the purpose of reducing carbon footprints associated with the utilization of such fuels. Section 3 deals with promising contributions of alternatives to fossil fuels, such as hydropower, nuclear, solar photovoltaics, and wind. Chapters 19 of this book is freely available as a downloadable Open Access PDF under a Creative Commons Attribution-Non Commercial-No Derivatives 4.0 license. The links can be found on the book's Routledge web page at <https://www.routledge.com//9780367198428>

Solar Cooling Technologies presents a detailed study of the potential technologies for coupling solar energy and cooling systems. Unifies all the various power based solar techniques into one book, investigates tri-generation schemes for maximization of cooling efficiency, especially for small scale applications and offers direct comparison of all possible technologies of solar cooling Includes detailed numerical investigations for potential cooling applications

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