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NOx Emission Control Technologies in Stationary and Automotive Internal Combustion Engines Springer Nature

Internal combustion engines still have a potential for substantial improvements, particularly with regard to fuel efficiency and environmental compatibility. These goals can be achieved with help of control systems. *Modeling and Control of Internal Combustion Engines (ICE)* addresses these issues by offering an introduction to cost-effective model-based control system design for ICE. The primary emphasis is put on the ICE and its auxiliary devices. Mathematical models for these processes are developed in the text and selected feedforward and feedback control problems are discussed. The appendix contains a summary of the most important controller analysis and design methods, and a case study that analyzes a simplified idle-speed control

problem. The book is written for students interested in the design of classical and novel ICE control systems.

Combustion Engine Diagnosis Springer
This monograph covers different aspects related to utilization of alternative fuels in internal combustion (IC) engines with a focus on biodiesel, dimethyl ether, alcohols, biogas, etc. The focal point of this book is to present engine combustion, performance and emission characteristics of IC engines fueled by these alternative fuels. A section of this book also covers the potential strategies of utilization of these alternative fuels in an energy efficient manner to reduce the harmful pollutants emitted from IC engines. It presents the comparative analysis of different alternative fuels in a variety of engines to show the appropriate alternative fuel for specific types of engines. This book will prove useful for both researchers as well as energy experts and policy makers.

Thermodynamics, Combustion and Engines
Bloomsbury Publishing

Better Understand the Relationship between Powertrain System Design and Its Control Integration While powertrain system design and its control integration are traditionally divided into two different functional groups, a growing

trend introduces the integration of more electronics (sensors, actuators, and controls) into the powertrain system.

Modeling Engine Spray and Combustion Processes Springer

Science & Business Media
This book presents a thorough study of a single area of application - internal combustion engines. It breaks new ground by using engines as the means of explaining thermodynamics and combustion processes and it offers a constructive mix of basic engineering science with a real world application. The book is intended to provide a background for engine design, analysis and modelling.

Introduction to Modeling and Control of Internal Combustion Engine Systems

Introduction to Internal Combustion Engines
Based on previous trends, the reciprocating internal combustion engine will continue to be widely used in all sectors: transport, industry, and energy production. Therefore, its development, while complying with the limitations of pollutants as well as CO₂ emission levels and maintaining or increasing performance, will certainly continue for the next few decades. In the last three decades, a significant effort has been made to reduce pollutant emission levels. More recently, attention has been given to CO₂ emission levels too. It is widely recognized that one single technology will not completely solve the problem of CO₂ emissions in the atmosphere. Rather, the different technologies already available will have to be integrated, and new technologies developed, to obtain substantial CO₂ abatement.

Combustion Engines Development Academic Press

A systematic control of mixture formation with modern high-pressure injection systems enables us to achieve considerable improvements of the combustion process in terms of reduced fuel consumption and engine-out raw emissions. However, because of the growing number of free

parameters due to more flexible injection systems, variable valve trains, the application of different combustion concepts within different regions of the engine map, etc., the prediction of spray and mixture formation becomes increasingly complex. For this reason, the optimization of the in-cylinder processes using 3D computational fluid dynamics (CFD) becomes increasingly important. In these CFD codes, the detailed modeling of spray and mixture formation is a prerequisite for the correct calculation of the subsequent processes like ignition, combustion and formation of emissions. Although such simulation tools can be viewed as standard tools today, the predictive quality of the sub-models is constantly enhanced by a more accurate and detailed modeling of the relevant processes, and by the inclusion of new important mechanisms and effects that come along with the development of new injection systems and have not been considered so far. In this book the most widely used mathematical models for the simulation of spray and mixture formation in 3D CFD calculations are described and discussed. In order to give the reader an introduction into the complex processes, the book starts with a description of the fundamental mechanisms and categories of fuel injection, spray break-up, and mixture formation in internal combustion engines.

Internal Combustion Engine Technology and Applications of Biodiesel Fuel Academic Press
This handbook is an important and valuable source for engineers and researchers in the area of internal combustion engines pollution control. It provides an excellent updated review of available knowledge in this field and furnishes essential and useful information on air pollution constituents, mechanisms of formation, control technologies, effects of engine design, effects of operation conditions, and effects of fuel formulation and additives. The text is rich in explanatory diagrams, figures and tables, and includes a considerable number of references. An important resource for engineers and researchers in the area of internal combustion engines and pollution control. Presents an excellent updated review of the available knowledge in this area. Written

by 23 experts Provides over 700 references and more than 500 explanatory diagrams, figures and tables

Alternative Fuels and Advanced Combustion Techniques as Sustainable Solutions for Internal Combustion Engines
MIT Press

Biofuels such as ethanol, butanol, and biodiesel have more desirable physico-chemical properties than base petroleum fuels (diesel and gasoline), making them more suitable for use in internal combustion engines. The book begins with a comprehensive review of biofuels and their utilization processes and culminates in an analysis of biofuel quality and impact on engine performance and emissions characteristics, while discussing relevant engine types, combustion aspects and effect on greenhouse gases. It will facilitate scattered information on biofuels and its utilization has to be integrated as a single information source. The information provided in this book would help readers to update their basic knowledge in the area of "biofuels and its utilization in internal combustion engines and its impact Environment and Ecology". It will serve as a reference source for UG/PG/Ph.D.

Doctoral Scholars for their projects / research works and can provide valuable information to Researchers from Academic Universities and Industries. Key Features:

- Compiles exhaustive information of biofuels and their utilization in internal combustion engines.
- Explains engine performance of biofuels
- Studies impact of biofuels on greenhouse gases and ecology highlighting integrated bio-energy system.
- Discusses fuel quality of different biofuels and their suitability for internal combustion engines.
- Details effects of biofuels on

combustion and emissions characteristics. Biofueled Reciprocating Internal Combustion Engines Springer Science & Business Media

The utilization of mathematical models to numerically describe the performance of internal combustion engines is of great significance in the development of new and improved engines. Today, such simulation models can already be viewed as standard tools, and their importance is likely to increase further as available computer power is expected to increase and the predictive quality of the models is constantly enhanced. This book describes and discusses the most widely used mathematical models for in-cylinder spray and combustion processes, which are the most important subprocesses affecting engine fuel consumption and pollutant emissions. The relevant thermodynamic, fluid dynamic and chemical principles are summarized, and then the application of these principles to the in-cylinder processes is explained. Different modeling approaches for the each subprocesses are compared and discussed with respect to the governing model assumptions and simplifications. Conclusions are drawn as to which model approach is appropriate for a specific type of problem in the development process of an engine. Hence, this book may serve both as a graduate level textbook for combustion engineering students and as a reference for professionals employed in the field of combustion engine modeling. The research necessary for this book was carried out during my employment as a postdoctoral scientist at the Institute of Technical Combustion (ITV) at the University of Hannover, Germany and at the Engine Research Center (ERC) at the University of Wisconsin-Madison, USA.

Elsevier

The mechanical engineering curriculum in most universities includes at least one elective course on the subject of reciprocating piston engines. The majority of these courses today emphasize the application of thermodynamics

to engine efficiency, performance, combustion, and emissions. There are several very good textbooks that support education in these aspects of engine development. However, in most companies engaged in engine development there are far more engineers working in the areas of design and mechanical development. University studies should include opportunities that prepare engineers desiring to work in these aspects of engine development as well. My colleagues and I have undertaken the development of a series of graduate courses in engine design and mechanical development. In doing so it becomes quickly apparent that no suitable textbook exists in support of such courses. This book was written in the hopes of beginning to address the need for an engineering-based introductory text in engine design and mechanical development. It is of necessity an overview. Its focus is limited to reciprocating-piston internal-combustion engines – both diesel and spark-ignition engines. Emphasis is specifically on automobile engines, although much of the discussion applies to larger and smaller engines as well. A further intent of this book is to provide a concise reference volume on engine design and mechanical development processes for engineers serving the engine industry. It is intended to provide basic information and most of the chapters include recent references to guide more in-depth study.

Vehicular Engine Design CRC Press

Combustion Engines Development nowadays is based on simulation, not only of the transient reaction of vehicles or of the complete drivetrain, but also of the highly unsteady processes in the carburation process and the combustion chamber of an engine. Different physical and chemical approaches are described to show the potentials and limits of the models used for simulation.

The Future of Internal Combustion Engines Springer Science & Business Media

This revised edition of Taylor's classic work on

the internal-combustion engine incorporates changes and additions in engine design and control that have been brought on by the world petroleum crisis, the subsequent emphasis on fuel economy, and the legal restraints on air pollution. The fundamentals and the topical organization, however, remain the same. The analytic rather than merely descriptive treatment of actual engine cycles, the exhaustive studies of air capacity, heat flow, friction, and the effects of cylinder size, and the emphasis on application have been preserved. These are the basic qualities that have made Taylor's work indispensable to more than one generation of engineers and designers of internal-combustion engines, as well as to teachers and graduate students in the fields of power, internal-combustion engineering, and general machine design.

Handbook of Air Pollution from Internal Combustion Engines Elsevier

The numerical simulation of combustion processes in internal combustion engines, including also the formation of pollutants, has become increasingly important in the recent years, and today the simulation of those processes has already become an indispensable tool when developing new combustion concepts. While pure thermodynamic models are well-established tools that are in use for the simulation of the transient behavior of complex systems for a long time, the phenomenological models have become more important in the recent years and have also been implemented in these simulation programs. In contrast to this, the three-dimensional simulation of in-cylinder combustion, i. e. the detailed, integrated and continuous simulation of the process chain injection, mixture formation, ignition, heat release due to combustion and formation of pollutants, has been significantly improved, but there is still a number of challenging problems to solve, regarding for example the exact description of processes like the structure of turbulence during

combustion as well as the appropriate choice of the numerical grid. While chapter 2 includes a short introduction of functionality and operating modes of internal combustion engines, the basics of kinetic reactions are presented in chapter 3. In chapter 4 the physical and chemical processes taking place in the combustion chamber are described. Chapter 5 is about phenomenological multi-zone models, and in chapter 6 the formation of pollutants is described.

Mixture Formation in Internal Combustion Engines Springer

Computational Optimization of Internal Combustion Engines presents the state of the art of computational models and optimization methods for internal combustion engine development using multi-dimensional computational fluid dynamics (CFD) tools and genetic algorithms.

Strategies to reduce computational cost and mesh dependency are discussed, as well as regression analysis methods. Several case studies are presented in a section devoted to applications, including assessments of: spark-ignition engines, dual-fuel engines, heavy duty and light duty diesel engines. Through regression analysis, optimization results are used to explain complex interactions between engine design parameters, such as nozzle design, injection timing, swirl, exhaust gas recirculation, bore size, and piston bowl shape. Computational Optimization of Internal Combustion Engines demonstrates that the current multi-dimensional CFD tools are mature enough for practical development of internal combustion engines. It is written for researchers and designers in mechanical engineering and the automotive industry.

Internal Combustion Engine Fundamentals
Butterworth-Heinemann

Internal Combustion Engines covers the trends in

passenger car engine design and technology. This book is organized into seven chapters that focus on the importance of the in-cylinder fluid mechanics as the controlling parameter of combustion. After briefly dealing with a historical overview of the various phases of automotive industry, the book goes on discussing the underlying principles of operation of the gasoline, diesel, and turbocharged engines; the consequences in terms of performance, economy, and pollutant emission; and of the means available for further development and improvement. A chapter focuses on the automotive fuels of the various types of engines. Recent developments in both the experimental and computational fronts and the application of available research methods on engine design, as well as the trends in engine technology, are presented in the concluding chapters. This book is an ideal compact reference for automotive researchers and engineers and graduate engineering students.

Internal Combustion Engines Springer Science & Business Media

This book focuses on clean transport and mobility essential to the modern world. It discusses internal combustion engines (ICEs) and alternatives like battery electric vehicles (BEVs) which are growing fast. Alternatives to ICEs start from a very low base and face formidable environmental, material availability, and economic challenges to unlimited and rapid growth. Hence ICEs will continue to be the main power source for transport for decades to come and have to be continuously improved to improve transport sustainability. The book highlights the need to assess proposed changes in the existing transport system on a life cycle basis. The volume includes chapters discussing the challenges faced by ICEs as well as chapters on novel fuels and fuel/engine interactions which help in this quest to improve the efficiency of ICE and reduce exhaust pollutants. This book will be of interest to those in academia and industry alike.

Engines and Fuels for Future Transport McGraw-Hill Science Engineering

This book contains the papers of the Internal Combustion Engines: Performance fuel economy and emissions conference, in the IMechE bi-annual series, held on the 29th and 30th November 2011.

The internal combustion engine is produced in tens of millions per year for applications as the power unit of choice in transport and other sectors. It continues to meet both needs and challenges through improvements and innovations in technology and advances from the latest research.

These papers set out to meet the challenges of internal combustion engines, which are greater than ever. How can engineers reduce both CO₂ emissions and the dependence on oil-derivate fossil fuels? How will they meet the future, more stringent constraints on gaseous and particulate material emissions as set by EU, North American and Japanese regulations? How will technology developments enhance performance and shape the next generation of designs? This conference looks closely at developments for personal transport applications, though many of the drivers of change apply to light and heavy duty, on and off highway, transport and other sectors. Aimed at anyone with interests in the internal combustion engine and its challenges The papers consider key questions relating to the internal combustion engine

Gas and Oil Engines, Simply Explained Springer
NOx Emission Control Technologies in Stationary and Automotive Internal Combustion Engines:

Approaches Toward NO_x Free Automobiles presents the fundamental theory of emission formation, particularly the oxides of nitrogen (NO_x) and its chemical reactions and control techniques. The book provides a simplified framework for technical literature on NO_x reduction strategies in IC engines, highlighting thermodynamics, combustion science, automotive emissions and environmental pollution control. Sections cover the toxicity and roots of emissions for both SI and CI engines and the formation of various emissions such as CO, SO₂, HC, NO_x, soot, and PM from internal combustion engines, along with various methods of NO_x formation.

Topics cover the combustion process, engine design parameters, and the application of exhaust gas recirculation for NO_x reduction, making this book

ideal for researchers and students in automotive, mechanical, mechatronics and chemical engineering students working in the field of emission control techniques. Covers advanced and recent technologies and emerging new trends in NO_x reduction for emission control Highlights the effects of exhaust gas recirculation (EGR) on engine performance parameters Discusses emission norms such as EURO VI and Bharat stage VI in reducing global air pollution due to engine emissions
Introduction to Analytical Methods for Internal Combustion Engine Cam Mechanisms Springer
Now in its fourth edition, this textbook remains the indispensable text to guide readers through automotive or mechanical engineering, both at university and beyond. Thoroughly updated, clear, comprehensive and well-illustrated, with a wealth of worked examples and problems, its combination of theory and applied practice aids in the understanding of internal combustion engines, from thermodynamics and combustion to fluid mechanics and materials science. This textbook is aimed at third year undergraduate or postgraduate students on mechanical or automotive engineering degrees. New to this Edition: - Fully updated for changes in technology in this fast-moving area - New material on direct injection spark engines, supercharging and renewable fuels - Solutions manual online for lecturers

Internal Combustion Engines John Wiley & Sons

This book offers first a short introduction to advanced supervision, fault detection and diagnosis methods. It then describes model-based methods of fault detection and diagnosis for the main components of gasoline and diesel engines, such as the intake system, fuel supply, fuel injection, combustion process, turbocharger, exhaust system and exhaust gas aftertreatment.

Additionally, model-based fault diagnosis of electrical motors, electric, pneumatic and hydraulic actuators and fault-tolerant systems is treated. In general series production sensors are used. It includes abundant experimental results showing the

detection and diagnosis quality of implemented faults. Written for automotive engineers in practice, it is also of interest to graduate students of mechanical and electrical engineering and computer science.