



Diesel Engine Combustion Theory

Raouf Mobasher



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Modelling Diesel Combustion P. A. Lakshminarayanan, Yoghesh V. Aghav, 2010-03-03 Phenomenology of Diesel Combustion and Modeling Diesel is the most efficient combustion engine today and it plays an important role in transport of goods and passengers on land and on high seas The emissions must be controlled as stipulated by the society without sacrificing the legendary fuel economy of the diesel engines These important drivers caused innovations in diesel engineering like re entrant combustion chambers in the piston lower swirl support and high pressure injection in turn reducing the ignition delay and hence the nitric oxides The limits on emissions are being continually reduced The fore the required accuracy of the models to predict the emissions and efficiency of the engines is high The phenomenological combustion models based on physical and chemical description of the processes in the engine are practical to describe diesel engine combustion and to carry out parametric studies This is because the injection process which can be relatively well predicted has the dominant effect on mixture formation and subsequent course of combustion The need for improving these models by incorporating new developments in engine designs is explained in Chapter 2 With model based control programs used in the Electronic Control Units of the engines phenomenological models are assuming more importance now because the detailed CFD based models are too slow to be handled by the Electronic Control Units Experimental work is necessary to develop the basic understanding of the processes *Internal combustion engines, theory and design; a text book on gas-and oil* Robert Leroy Streeter, 1915 *Development of a Partially Premixed Combustion Model for a Diesel Engine Using Multiple Injection Strategies* Rene Thygesen, 2012 In order to fulfil future emissions legislations new combustion systems are to be investigated One way of improving exhaust emissions is the application of multiple injection strategies and conventional or partially premixed combustion conditions to a Diesel engine The application of numerical techniques as CFD supports and improves the quality of engine developments Unfortunately current spray and combustion models are not accurate enough to simulate multiple injection systems being in this way a topic of research The goal of this study was the development of a novel simulation method for the investigation of Diesel engines operated with multiple injection strategies and different combustion modes The first part of this work focused in improving the spray modelling The information of 3D CFD simulations of the injector nozzle was introduced in the spray simulation as boundary conditions developing coupling subroutines for this issue The atomisation modelling was also improved using validated presumed droplet size distributions Moreover to avoid the simulation of the injector nozzle for every investigated operating point a novel interpolating tool was developed in order to create spray boundary conditions based on few 3D CFD simulations of the nozzle under certain initial and boundary conditions The second part of this thesis dealt with the combustion modelling of Diesel engines For this issue a laminar flamelet approach called Representative Interactive Flamelet model RIF was selected and implemented Afterwards an

extended combustion model based on RIF was developed in order to take into account multiple injection strategies Finally this new model was validated with a wide range of operating points applying multiple injection strategies under conventional and partially premixed combustion conditions

Internal Combustion Engine in Theory and Practice, second edition, revised, Volume 2 Charles Fayette Taylor,1985-03-19 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

Engine Modeling and Simulation Avinash Kumar Agarwal,Dhananjay Kumar,Nikhil Sharma,Utkarsha Sonawane,2021-12-16 This book focuses on the simulation and modeling of internal combustion engines The contents include various aspects of diesel and gasoline engine modeling and simulation such as spray combustion ignition in cylinder phenomena emissions exhaust heat recovery It also explored engine models and analysis of cylinder bore piston stresses and temperature effects This book includes recent literature and focuses on current modeling and simulation trends for internal combustion engines Readers will gain knowledge about engine process simulation and modeling helpful for the development of efficient and emission free engines A few chapters highlight the review of state of the art models for spray combustion and emissions focusing on the theory models and their applications from an engine point of view This volume would be of interest to professionals post graduate students involved in alternative fuels IC engines engine modeling and simulation and environmental research

Diesel Engines Howard Edward Degler,1944

Optimization Methods for the Mixture Formation and Combustion Process in Diesel Engines Jost Weber,2008

Internal Combustion Engine in Theory and Practice, second edition, revised, Volume 1 Charles Fayette Taylor,1985-03-19 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

Internal Combustion Engines, Theory and Design Robert Leroy Streeter,1915

Diesel

Engines Howard Edward Degler,1939 **Internal Combustion Engines, Theory and Design** Robert Leroy Streeter,1923 **Internal-combustion Engines** Howard Edward Degler,1938 **The Diesel Engine** Lloyd Van Horn Armstrong,James Busse Hartman,1959 *Investigations of Advanced Injection and Combustion Strategies on DI Diesel Engine Performance and Emissions* Raouf Mobasheri,2012

The main driving force behind this research was the need for cleaner and more efficient engines to meet the ever increasing demands on the modern automobile s emissions In recent years different studies have been carried out to analyze the combined effects of high pressure injection boost pressure multiple injections included spray angle and combustion chamber geometry Though considerable research has shown these technologies can meet the low emission regulations the careful optimization of the engine operating conditions is still required in order to get the full benefit of the different strategies With these issues as motivation the first important objective of this study was to gain a detailed understanding of the mechanisms through which fuel injection interacts with other engine parameters and influences diesel combustion and emissions and hence to attempt to generalize the adoption of multiple injection strategies with regards to improving diesel engine performance For this purpose a modified parameter called Homogeneity Factor of in cylinder charge HF was introduced and proposed as a new measure in combustion theory to analyze the combustion characteristics and air fuel mixing process of diesel engines in more detail The second part of this research builds upon a detail investigation on the included spray cone angle concept and explores further their use in conjunction with multiple injection strategies in diesel engines In addition an investigation was performed in third phase of this research to analyze the effects of piston geometry on combustion performance and exhaust emission characteristics The results showed that employing a post injection combined with a pilot injection results in reduced soot formation from diffusion combustion and enhances the soot oxidation process during the expansion stroke resulting in decreased soot emissions while the NOx concentration is maintained in low levels It was also found that spray targeting is very effective for controlling the in cylinder mixture distributions especially when it accompanied with advanced injection strategies Moreover the results confirmed that a narrower width of piston bowl has a higher unburned fuel air mixture region and hence results in higher soot emissions but with slightly larger piston surface area the optimum operating point could be obtained

Burning a Wide Range of Fuels in Diesel Engines ,1967 Multifuel capabilities in diesel engines can reduce fuel costs while taking advantage of accessible fuel supplies Of course there are problems which accompany the use of different fuels in an engine brought about by the variations in the fuel characteristics e g viscosity compressibility and combustion e g fuel sprays ignition delay This collection of papers features 4 papers on combustion theory and 13 papers on solutions to multifuel engine problems It is augmented by a summary paper by distinguished authors in the field and a bibliography of related papers not included in PT 11

The Internal-combustion Engine in Theory and Practice: Combustion, fuels, materials, design. Bibliography (p. 637-761) Charles Fayette Taylor,1968 **Diesel engines** Howard E. Degler,1943

Internal Combustion Engineering: Science & Technology P.M. Weaving, 2012-12-06 Sir Diarmuid Downs CBE FEng FRS Engineering is about designing and making marketable artefacts The element of design is what principally distinguishes engineering from science The engineer is a creator He brings together knowledge and experience from a variety of sources to serve his ends producing goods of value to the individual and to the community An important source of information on which the engineer draws is the work of the scientist or the scientifically minded engineer The pure scientist is concerned with knowledge for its own sake and receives his greatest satisfaction if his experimental observations fit into an aesthetically satisfying theory The applied scientist or engineer is also concerned with theory but as a means to an end He tries to devise a theory which will encompass the known experimental facts both because an all embracing theory somehow serves as an extra validation of the facts and because the theory provides us with new leads to further fruitful experimental investigation I have laboured these perhaps rather obvious points because they are well exemplified in this present book The first internal combustion engines produced just over one hundred years ago were very simple the design being based on very limited experimental information The current engines are extremely complex and while the basic design of cylinder piston connecting rod and crankshaft has changed but little the overall performance in respect of specific power fuel economy pollution noise and cost has been absolutely transformed

Practical Diesel-Engine Combustion Analysis Bertrand Hsu, 2002-10-25 The diesel engine is one of the most efficient types of heat engines and is widely used as a prime mover for many applications In recent years with the aid of modern computers engine combustion modeling has made great progress However due to the complexities of the processes involved in the practical diesel engine there are still too many unknowns preventing computational prediction to have the accuracy level required by industry This book examines some basic characteristics of diesel engine combustion process and describes the commonly used tool to analyze combustion heat release analysis In addition Practical Diesel Engine Combustion Analysis describes the performance changes that might be encountered in the engine user environment with a goal of helping the reader analyze his own practical combustion problems Chapters include Combustion and Fuel Injection Processes in the Diesel Engine Heat Release and its Effect on Engine Performance Alternate Fuels Combustion Analysis and more

Numerical and Experimental Investigation of Water Introduction Into DI Diesel Engine Combustion Peter Eckert, 2008 Im vorliegenden Band 3 2008 berichtet Herr Eckert über die Ergebnisse aus Untersuchungen zur Partikel und Stickoxidminimierung bei Dieselmotoren durch Wassereinbringung Das primäre Ziel ist dabei die innermotorische Reduzierung der thermischen Stickoxidbildung Es sind unterschiedliche Methoden der Wassereinbringung in den dieselmotorischen Verbrennungsprozess möglich beispielsweise die Einspritzung von Wasser in das Ansaugsystem eine direkte Einspritzung von Wasser in den Brennraum sowie die Wassereinbringung mit Diesel Wasser Emulsionen Diese Massnahmen sind unter anderem bei Dieselmotoren die zumindest teilweise mit Schweröl betrieben werden besonders interessant da dort klassische Methoden zur Schadstoffreduktion wie z B

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