THIESEL 2002
2nd INTERNATIONAL CONFERENCE ON THERMO- AND FLUID DYNAMIC PROCESSES IN DIESEL ENGINES
10th – 13th SEPTEMBER 2002
VALENCIA, SPAIN

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Conference Coordinator

Dr. Xandra MARGOT/ CMT-Motores Térmicos - Universidad Politécnica de Valencia

Introduction

The 2nd international conference on Thermo – and Fluid Dynamic Processes in Diesel Engines, THIESEL 2002, organised by the institute CMT-Motores Térmicos of the Universidad Politécnica de Valencia, was held in Valencia, Spain on 10th – 13th September 2002. About 200 experts from all over the world, including Europe, USA, Japan and Korea, participated in or attended the conference. Industry and academia were equally represented, thus favouring the exchange of ideas and views and widening and consolidating the links between the two communities.

During the conference, all aspects related to thermal and fluid dynamic processes in Diesel engines have been addressed, from basic studies aimed at a better understanding of the physical processes underlying Diesel engine operation, to real day-to-day problems associated with engine development. In the general adopted scope, areas ranging from the use, in basic

combustion research, of sophisticated tools such as advanced experimental diagnosis, complex analysis and simulation, to that of more robust design tools in current industrial practice have been covered.

Conference objectives

New and advanced technologies in the fields of fuel injection and combustion, air management and exhaust after-treatment have to be further developed if Light and Heavy Duty Diesel engines are to transport us into an environmentally friendly future. As regulations impose increasingly restrictive emission and low fuel consumption levels, engine developers face the challenging task of complying with them, while responding to the customers' requirements of high specific power, driveability and comfort. Hence the importance of promoting and consolidating research in this area, using all possible means. In particular, it is important to compile and exchange new ideas as well as promote collaboration between the diverse disciplines and groups from the academic and industrial communities involved in Diesel engine design. This has been the main objective of the international conference on Thermo–and Fluid Dynamic Processes in Diesel Engines, THIESEL 2002.

Summary of the conference contents

To our knowledge, the international conference THIESEL on 'Thermo – and Fluid Dynamic Processes in Diesel Engines' is the only European conference specifically dedicated to topics on the research and development of Diesel engines. Other major conferences in the automotive sector have a wider scope of related subjects.

THIESEL 2002 has attracted about 180 experts in the Diesel automotive sector from all over the world, including Europe, USA, Japan and Korea. The interest created by this conference shows that it responds to a real need to compile and exchange scientific information that is vital to respond to the current challenges imposed by the restrictive emissions legislation.

During the three day conference, a total of 44 papers, previously selected through a formal reviewing process, were presented in 12 sessions. Six of them were invited keynote lectures on a variety of topics related to Diesel engines R & D. Dr. Bernd Mahr of Robert Bosch presented a lecture on the future and potential of the injection systems that enable fuel injection at high pressure (up to 2000 bar) in a flexible manner, adapted to the speed and load operation conditions of the engine (multiple injection, pre and post injection ,…).

Dr. Klaus-Peter Schindler from Volkswagen gave his point of view about the advantages offered by the light duty Diesel engines in terms of compliance to present and future environmental norms.

The lectures by Prof. Klaus Binder from Daimler Chrysler and M. Patrice Marez from PSA Peugeot Citröen discussed the development of new techniques and strategies to reduce emissions of Diesel engines in heavy duty vehicles and private cars respectively: use of EGR and turbo-charging, flexible injection systems, exhaust gases after-treatment technology, electronic control, etc…

Prof. Rolf Reitz from the University of Wisconsin-Madison presented the latest results relative to the use of computational fluid dynamics (CFD) for the optimisation of Diesel engine processes. The significant progress made in multidimensional modelling added to the improved computing power means this tool can be used efficiently to study the influence of diverse parameters on the combustion process.

Finally, Prof. Hiro Hiroyasu from the University of Kinki (Japan) gave a lecture on the optical techniques used to measure and visualise the injection jets and combustion in Diesel engines.

Papers presented during the conference were firstly selected for their scientific interest, but the Organising Committee took care to obtain a good balance between papers about fundamental University research and papers about applied research for industry developments. About a third

of the papers came from Industry, including four out of the six invited lecturers, and the rest were from Research Centres and Universities.

Among the topics addressed during the conference there were presentations on experimental and theoretical work related to the following themes:

- Diesel engines and environment
- Air management processes
- Diesel sprays
- Combustion and pollutant formation
- Control strategies of emissions
- Noise generation and reduction
- Engine modelling
- Diagnosis experimental techniques
- New fuels

Three sessions were dedicated to themes related to Diesel injection and sprays. The progress obtained in recent years in injection technology has brought about an increase of Diesel engine performance. This is related to the optimisation of the injection, which is paramount to obtain an efficient Diesel combustion. Papers presented during the conference aimed at providing a better understanding of the Diesel spray characteristics (break-up, evaporation, penetration,…) and modelling in function of the operating conditions and the nozzle geometry.

The optimisation of Diesel combustion in order to reduce pollutant emissions is intimately related to the above topic and it was discussed during three further sessions. Since the electronic control of the injection allows unprecedented flexibility, the influence of different injection conditions (multiple injection, injection pressure, turbulence, …) on the NO_x and particulate emissions was discussed in detail. Other important aspects were also discussed, such as the use of EGR and DPF for emissions reduction, combustion noise, etc…. In addition, one of these sessions was entirely dedicated to Homogeneous Charge Combustion Ignition (HCCI). Also to do with emissions reduction is the topic of alternative fuels, which was talked about in a separate session.

Two sessions addressed the latest progress in Diesel engine modelling, from one-dimensional cycle modelling and empirical modelling for pollutant formation to more complex two and three-dimensional analyses for heat transfer, spray development, in-cylinder flow and IC engine optimisation.

Papers related to the latest advances in experimental measurement and diagnosis techniques were presented in two other sessions. They included LIEF visualisation of sprays, analysis techniques for particulate measurement and EGR measurements.

Finally, the air management processes in Diesel engines were addressed in another session with subjects as varied as turbo-charging modelling, pipe flows and exhaust gas after-treatment.

THIESEL 2002 has gathered papers on most aspects related to the Diesel engine thermal and fluid dynamics processes. Recent advances have been discussed and future trends identified. Academia and Industry have been equally present and the exchange of information and ideas has flowed between both in a hopefully very positive and efficient way. In this, the conference has attained its objectives. It is also certain that new solutions have to be further explored in order to ensure that the Diesel engine complies with the strict international emissions regulations of the future, whilst at the same time still offering the expected high specific power with minimum consumption. THIESEL 2004, planned for September 2004, will, no doubt, see more progress in this area.

THIESEL Conferences Publications

THIESEL 2002

The THIESEL 2002 Conference Proceedings are available in printed and CD Rom versions for 40€. If interested, please contact secrecon@mot.upv.es.

The Conference Proceedings are also indexed in the Global Mobility Database of the Society of Automotive Engineers (SAE). Photocopies of papers may be obtained through them.

In addition, a book containing a selection of papers from the conference is in preparation and will be edited by Springer Verlag.

THIESEL 2000

The Conference Proceedings book of the THIESEL 2000 International Conference on 'Thermo- and Fluid Dynamic Processes in Diesel Engines'(held in Valencia, Spain in September 2000) is also available for 30 €.

THIESEL 2000 papers are also indexed in the SAE's Global Mobility Database.

Also available directly from the scientific editor Springer Verlag:

'Thermo- and Fluid Dynamic Processes in Diesel Engines , selected papers from the THIESEL 2000 Conference held in Valencia, Spain, September 13 – 15, 2000'. Eds. J. H Whitelaw, F. Payri, J .M. Desantes. Springer Verlag (2002), ISBN 3-540-42665-5