MediaInfo

Forschungsvereinigung Verbrennungskraftmaschinen e.V.
FVV | Research Association for Combustion Engines

Petra Tutsch | Communications & Media Relations
T +49 69 6603 1457 | tutsch@fvv-net.de | www.fvv-net.de

30/05/2018

The Power of Collective Research: The FVV promotes successful IGF projects in Japan

Industrial Collective Research // Technology and ideas for tomorrow: The FVV introduces three innovative industrial collective research (IGF) projects at a technology session of the JSAE Spring Meeting in Yokohama // The future of IC engines is in the air: Professor Thomas Koch provides strategic insights into the research and evolution of synthetic fuels in Germany

Frankfurt/M., 30 May 2018. // It has now become almost a tradition that the Research Association for Combustion Engines (FVV) and its Japanese partner association, the Research Association for Automotive Internal Combustion Engines (AICE), are regularly briefing each other at their relevant national technology conferences on the state-of-the-art in engine research.

Technology and ideas for tomorrow: The FVV introduces three innovative industrial collective research (IGF) projects in Japan

This year, an FVV delegation travelled to Japan for the spring meeting of the Society of Automotive Engineers (JSAE), which took place in Yokohama from 23 to 25 May. They had the latest results from three innovative IGF research projects:

→ **Exhaust Fuel Injection - Alignment of simulation methodology and measurement techniques to predict the HC distribution at catalyst inlet**
The innovative DeNOx aftertreatment alternative to Selective Catalytic Reduction (SCR) - DiAir (Diesel deNOx System by Adsorbed Intermediate Reductants) - requires the injection of fuel into the catalyst exhaust pipe to achieve a short-term high hydrocarbon concentration - evenly distributed over the entire catalyst front. The project objective was the alignment of simulation methods and measurement techniques to predict the HC distribution in radial and axial direction at catalyst inlet. This included finding suitable measurement techniques to determine hydrocarbon concentration at catalyst inlet respectively catalyst outlet. DiAir in combination with a NOx storage catalyst has the potential to efficiently remove nitrogen oxides from the exhaust of small diesel cars. The key findings of the scientific investigation were presented by Dipl.-Ing. Verena Huth (VKA | RWTH Aachen University); the project was led by Dr. Takao Fukuma (Toyota Motor Corporation).

→ **Investigation and modelling of the influence of EGR on engine knock**
Engine knock limits the efficiency of turbocharged SI engines at high loads. The occurrence of this phenomenon can be inhibited by deploying recirculation of cooled exhaust gas (EGR) at full load. However, the development of full-load EGR combustion systems could not be performed in the 0D/1D engine simulation, as no meaningful models for the reliable prediction of the knock limit under the influence of EGR had existed. Based on the project findings, a new knock modeling approach capable of predicting the low-temperature ignition occurrence as well as reproducing its influence on the mixture's auto-ignition was developed. The results from 3D-CFD simulations accompanying the model de-velopment supported all model assumptions made. The developed knock model was successfully validated against measurement data at various boundary conditions, such as different inlet temperatures and mixture compositions as well as EGR rate and engine speed variations. It can predict the knock limit very accurately and thus contributes to an efficient development process of full-load EGR combustion systems in the 0D/1D engine simulation. The key findings of the project were presented by Professor Michael Bargende (IVK | University of Stuttgart).

→ **Systematic analysis of the soot formation of direct-injection spark-ignition engines**
Due to the increasingly stringent particulate emissions regulations for gasoline engines (Euro6b/6c) the introduction of a gasoline particulate filter (GPF) is discussed. To enable a systematic design of the filter and the development of optimal regeneration strategies, a fundamental knowledge of the SI engine particle formation is needed, especially in emission-critical states of the aggregate. The formation of particles at transient engine operation as one of the main particle source, has actually been poorly understood. Beside that future emission standards will be based on the so-called RDE (real driving emissions) test that includes a high number of transient load steps. Here the FVV project starts to answer the specific questions that need to be resolved for a comprehensive understanding of particle formation at transient SI engine operation. The key findings of the project were presented by Professor Thomas Koch (IFKM | KIT Karlsruhe).

The future of IC engines is in the air: Professor Thomas Koch provides strategic insights into the research on synthetic fuels in Germany

Professor Koch is one of the leading experts in Germany in the field of combustion analysis. His research focuses on the overall system development, including the exhaust aftertreatment and the utilisation of residual engine heat, as well as the interaction with different fuels. In this function he gave another focussed lecture in Yokohama on the current development of synthetic fuels in Germany and the related political discussion on their market introduction and reception. The lecture was received with great interest by the Japanese colleagues.

Future energy pathways for the transportation sector, which show possible options for a climate-neutral mobility in 2050, are a hot topic in Germany and Europe. The FVV will shortly present an information paper on expert knowledge from its future fuels working

group, which will outline options for action and will highlight the pre-competitive research needs for energy sources, powertrain technologies and engines.

2019 in Germany

Next year, the representatives of the Japanese automotive engine manufacturers will be guests at the FVV Autumn Conference, giving the FVV Innovation Network insights into their current research priorities.

Download at **www.fvv-net.de/en/nc/media/news/**

Images

1 | Members of the AICE & FVV Prime Movers Innovation Network in Yokohama (f.l.t.r.):
© Research Association for Combustion Engines (FVV) eV

Kenji Tsuchiya (AICE), Dr Takao Fukuma (Toyota Motor Corp), ProfessorThomas Koch (IFKM | KIT Karlsruhe), Verena Huth (VKA | RWTH Aachen), Professor Michael Bargende (IVK | Universität Stuttgart), Professor Yasuo Moriyoshi (Chiba University), Dietmar Goericke (FVV), Masanori Sugiyama (Toyota Motor Corp), Kazuo Takeuchi (Toyota Motor Corp), Professor Jin Kusaka (Waseda University)

About FVV

FVV | The Research Association for Combustion Engines is a globally unique network of companies, research & technology performers (RTD) and funding bodies. Manufacturers of automotive engines, industrial engines and turbomachinery as well as their suppliers and service providers work together with universities and other research establishments on cutting-edge technologies. The aim is to make engines and turbines cleaner, more efficient and sustainable – for the benefit of society, industry and the environment.

Combustion engines facilitate individual mobility, transportation, energy supply and industrial added value. The innovative power of the industry and its economic success

make a significant contribution to social prosperity. As a non-profit organisation, the FVV supports the development of its members - small, medium and large companies - and the promotion of young scientists through pre-competitive industrial collective research.

The FVV is a member of the German Federation of Industrial Research Associations (Arbeitsgemeinschaft industrieller Forschungsvereinigungen - AiF), the leading national organisation for applied research and development for SMEs. It has invested more than 500 million euros in 1,200 research projects since it was founded in 1956.

More information at **www.fvv-net.de/en/**