



# MediaInfo

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

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## **One third less consumption: Industry and research work together on fuel-efficient spark- ignition engines**

**In order to meet future CO<sub>2</sub> limits, SI engine-driven vehicles must consume significantly less fuel. A new project of the Research Association for Internal Combustion Engines (FVV) is investigating how this can be achieved. The ambitious goal is to increase the efficiency of future spark-ignition engines to up to 50 per cent. At the same time, fuel consumption is to be reduced by around one third compared with today's fleet. The project is exploring new engine technologies in interaction with electrified powertrains and synthetic fuels.**

*"CO<sub>2</sub> emissions from road transport must fall significantly in the next decade. It is essential that industry and science team up to meet this challenge", says Dietmar Goericke, Managing Director of the FVV. "In addition to electrification, more efficient internal combustion engines and carbon-neutral synthetic fuels will make a decisive contribution to achieving the CO<sub>2</sub> targets. "*

**Frankfurt/M. //** The more chemical energy contained in the fuel can be converted into mechanical power, the better the efficiency and thus the fuel consumption rate of the vehicle. In the "ICE 2025+" research project financed from the FVV's own funds, four university institutes from Aachen, Braunschweig, Darmstadt and Stuttgart are investigating various measures aimed at significantly increasing engine efficiency. The aim of the project is to optimise the entire powertrain system in such a way as to achieve the lowest possible consumption in real world operation. In relation to the new WLTP cycle, this means achieving an average power efficiency of around 40 per cent, and even 50 per cent at specific operating points. New passenger car spark-ignition engines currently achieve an optimum performance of around 30 % per cent.

The researchers' methodological approach consists of combining various pre-selected technologies - such as higher compression ratios or water injection - and investigating their influence on system efficiency. In order to adapt the powertrain system to real world driving conditions, various vehicle classes as well as hybrid variants - from mild 48 volts to high-voltage hybrid powertrains - will be included in the study.

The participating researchers work closely together. The first work package, which is carried out by the Institute for Internal Combustion Engines and Powertrain Systems (vkm) at Technische Universität Darmstadt, lays the foundations for vehicle simulation.



This is important in order to be able to make exact statements about the CO<sub>2</sub> emissions of the entire vehicle under realistic operating conditions with the engine data generated in the other work packages. It is also part of the job to find an operating strategy for the electric powertrain components that enables the combustion engine to work as efficiently as possible.

The second part of the project, engine simulation, which is being carried out at the Institute for Internal Combustion Engines and Automotive Engineering (IVK) at the University of Stuttgart, consists primarily of being able to make binding statements about increases in efficiency through various combinations of technologies with the aid of rapid calculation methods. In addition, a virtual engine is "designed", which makes it possible to estimate the impact of external measures - such as exhaust heat recovery - on the engine.

Within "ICE 2025+", major measures to increase efficiency will not only be simulated, but also tested on a single-cylinder research engine. The Institute for Internal Combustion Engines (ivb) at Braunschweig Technical University is responsible for setting up and operating this test engine. The results obtained are not only used for technology evaluation but are also intended to improve existing simulation models.

The fourth work package, looks into the influence of carbon-neutral fuels on engine behaviour and is being carried out at the Chair of Internal Combustion Engines (vka) at RWTH Aachen University. Various synthetic fuels, both pure and blended, are being tested on a research engine for this purpose. In addition to assessing the potential of possible fuel alternatives in terms of efficiency and emissions, the results should also serve to improve existing simulation methods of the combustion process.

The results of the research project "ICE 2025+" will be available in spring 2020.

It remains to be seen which powertrains, energy sources and transport concepts will determine passenger and freight transport in 2050. In the short and medium term, energy-efficient hybrid vehicles and carbon-neutral fuels must make an effective contribution to climate-neutral mobility. For this reason, the FVV funds pre-competitive Industrial Collective Research (IGF) projects from its own financial resources in order to contribute to the long-term goal of "zero impact emission mobility".

Further information can be found at [www.fvv-net.de/en](http://www.fvv-net.de/en) | [research](#) | [projects](#)

## Images

Industrial Collective Research (IGF) will enable high-tech fuel-efficient internal combustion engines (ICE)



1 | Engine test bench for the research of electrified powertrains at the Center for Mobile Propulsion (CMP)  
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2 | Water injection boosts engine performance and reduces fuel consumption  
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## About FVV

FVV | The Research Association for Combustion Engines is a globally unique network of companies, research & technology performers (RTD) and funding bodies. In the context of pre-competitive Industrial Collective Research (IGF), manufacturers of automotive engines, industrial engines, fuel cells 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.

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