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

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More power. Less cost.

FVV starts research on advanced fuel cells for 2025

FVV | The Research Association for Combustion Engines is committed to the further development of the fuel cell. The aim is to make emission-free long-range and freight mobility affordable. A new planning group led by Dr Merten Jung (BMW) has started work and is now launching the first research projects.

Frankfurt/Main. A holiday trip to the south with a fully occupied car. A long-distance truck with a total weight of 40 tonnes. Not all requirements for the mobility of persons and goods are to be fulfilled in the foreseeable future by battery-electric vehicles. The fuel cell, provided it is operated with regenerative hydrogen, however, is a worthwhile element of a roadmap for zero-emission mobility. Fast recharging, high energy densities and ranges which are independent of the ambient temperature, speak for fuel cells to power onboard electric systems. However, the cost of automotive fuel cells is currently still very high. This is exactly the point which will be now addressed by the precompetitive industrial collective research activities coordinated by the new FVV planning group. »With application-oriented research, we want to contribute significantly to lowering costs without jeopardising the fuel cell's practicality for everyday use« explains Dr Merten Jung, who heads the planning group since its official launch. He sees significant potential for optimisation in a reduction of platinum content, in the assembly of components and in improved simulation models. The first project ideas, now approved by the FVV Executive Board, are intended to facilitate research projects with precisely this objective.

The noble metal platinum plays an important role in the low-temperature fuel cell used in automotive applications. It enables the catalytic chemical reactions at the electrodes, ie the decomposition of the hydrogen and the reaction with the oxygen. State-of-the-art aging behaviour, power density and efficiency, even with a low platinum content, also depend on the medium in which the chemical reactions occur. Thus, it is necessary to diffuse the filtered and humidified external air as consistently as possible on the catalyst surface, thereby avoiding the formation of so-called »hot spots« which can reduce the service life. The hydrogen supplied should also have a high degree of purity. However, it is still largely unexplored how the materials used in the hydrogen path may contribute to the contamination of the catalytic surfaces. Therefore, the further development of hydrogen as well as air supply systems plays an important role in this new FVV research field. »Through intensive research, it will be possible in some ten years to build hydrogen fuel cell propulsion systems that do not contain much more platinum than a today's diesel catalytic converter« says Dr Jung.

Further potential for cost reduction can be found in the mechanical and control engineering optimisation of the numerous individual components, which enable a perfect functioning of the fuel cell. For example, the air is compressed by a compressor - however, unlike the internal combustion engine, the exhaust gas energy alone is not high enough to drive the compressor because of the low temperatures. Therefore, an electrically driven compressor is generally used. How these compressors can be trimmed to the highest power density for the automotive application is another example of the future FVV research agenda, which traditionally not only concentrates on reciprocating internal combustion engines but also on turbomachinery. »To evaluate innovative design concepts for components, it is important to be able to carry out virtual tests at an early stage of development« explains Dr Jung. Therefore, FVV plans to devote part of its fuel cell research programme to the development of new freely available simulation models.

»With our new research focus on fuel cells, we are enabling small and medium-sized companies to enter the value chain of fuel cell production« says FVV Managing Director Dietmar Goericke. »Particularly in the mobile age, it is important to strengthen the business models of the medium-sized mechanical engineering industry in Germany.«

Images



1 | Hydrogen fuel cell stack assembly
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2 | Cell components
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3 | Refuelling of hydrogen fuel tank
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4 | Hydrogen fuel cell drive system
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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. 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 420 million euros in 1,200 research projects since it was founded in 1956.

More information at www.fvv-net.de