

PRESSE RELEASE

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On the road towards nitrogen oxide reduction: CatVap® technology is ready for series development

Researchers at the Fraunhofer Institute for Solar Energy Systems ISE have developed a new technology, CatVap®, for reducing emissions from internal combustion engines by fuel preparation. The technology is fuel-flexible and can be used not only with normal diesel fuel but also with sustainable fuels such as e-fuels and biofuels. It is currently being intensively tested on the road for use in commercial vehicles. From 28 February to 1 March 2023, the technology will be on display at the Albonair GmbH booth at the 10th International Engine Congress in Baden-Baden. Together with ambitious truck manufacturers, Fraunhofer ISE and Albonair GmbH now want to develop the technology for series-production and market it.

The fuel preparation technology CatVap® (CATalytic eVAPoration process) is a technology developed and patented by Fraunhofer ISE, which can be installed directly between the engine and the exhaust gas aftertreatment system. With CatVap® the exhaust system is heated very rapidly. This makes it possible to significantly reduce pollutant emissions – especially nitrogen oxides – regardless of the driving cycle. If the interaction between the engine and the heating technology is optimized, a reduction in emissions comparable to Euro VI commercial vehicles can be achieved without any increase in fuel consumption. CatVap® can also be used without modifications when e-fuels and biofuels such as hydrogenated vegetable oils (HVO) are used. With these fuels, greenhouse gas emissions such as carbon dioxide (CO₂) as well as harmful secondary emissions can be significantly reduced throughout the entire well-to-wheel chain.

Further development with industry partners

The researchers at Fraunhofer ISE are currently working on product development with Albonair GmbH, an internationally active company with expertise in exhaust gas aftertreatment. Albonair employees equipped a medium-duty truck with a CatVap® system to enable exhaust gas purification even in low-load operation. The system is attached to the exhaust system of the engine on a truck with a gross vehicle weight of 12 tons and showed complete nitrogen oxide reduction in various demanding test drives. Freezing weather conditions, bumpy roads, and city traffic were all taken into account during these runs. “For example, if vehicles with internal combustion engines are driven at very low speeds and correspondingly low exhaust gas temperatures, today’s Euro VI exhaust gas purification system cannot completely reduce the toxic nitrogen oxide emissions. By equipping the exhaust gas aftertreatment system with CatVap®, only twenty seconds of

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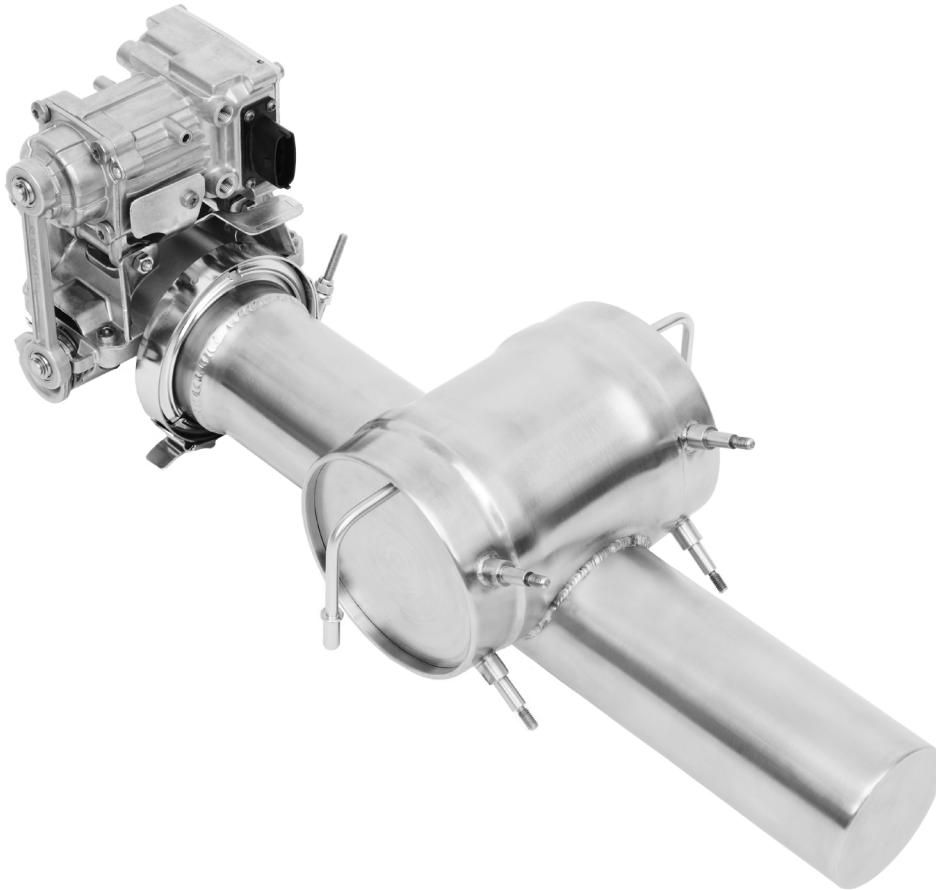
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electrical heating are required in a cold start to activate the CatVap® process, which then exceeds the performance of conventional electrical heating by a factor of more than 20. With the heated exhaust system, all secondary pollutant emissions, such as nitrogen oxide, soot, and unburned fuel components, can be almost completely removed,” explains Florian Rümmele, who is responsible for the technology at ISE. In addition, the two partners have developed fully automated software for control and data acquisition. The current hardware and software can be used for applications with combustion engines in the medium and heavy-duty truck segment as well as for off-road vehicles or in ships. In addition to Albonair GmbH, Thomas Magnete GmbH contributed to further development of the project: the automotive supplier was intensively involved in the development work during this process and supplied important components for the overall system.

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Preparing for serial production

CatVap® now has a high potential to reduce secondary emissions in accordance with the Euro emissions standard planned for 2027, without additional measures. “With the combination of sustainable fuels and the CatVap® heating technology – taking everything into account, including energy supply and use in the vehicle – it will be possible to achieve almost emission-free internal combustion engine mobility. This is why we are developing innovative synthesis routes for sustainable fuels in addition to the fuel preparation technology CatVap®,” states Robert Szolak, head of the Sustainable Synthesis Products department at Fraunhofer ISE. “We are working on market introduction concepts for such fuels, which typically start from fuel blends. This necessitates the use of robust technologies such as CatVap® that can work with these fuel blends,” says Szolak, explaining the background to the technology, which he played a key role in developing. Together with ambitious truck manufacturers, Fraunhofer ISE and Albonair GmbH now want to develop and market products ready for series production.



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This CatVap® complete system is available for various commercial vehicle sizes and their exhaust pipe diameters and demonstrated effective pollutant reduction in a wide range of test cycles. The exhibit can be seen at the Albonair GmbH booth at the 10th International Engine Congress in Baden-Baden.

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