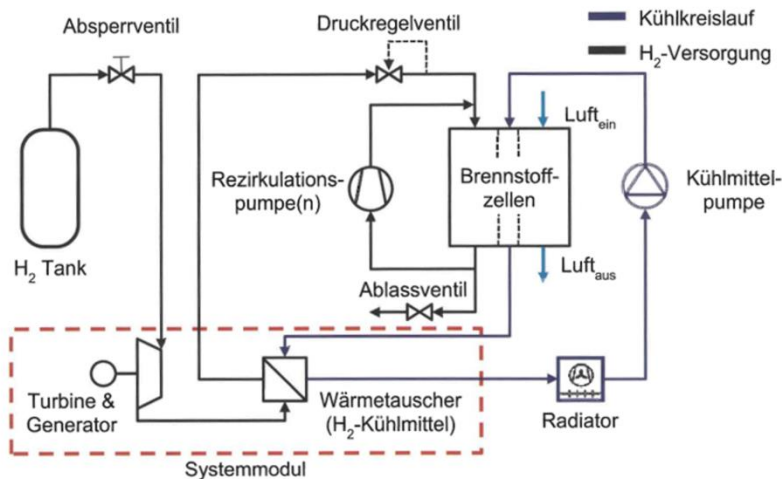


Efficient fuel cells

Exhaust gas heat increases pressure on hydrogen gas

Invention

Hydrogen is one of the hopes of the future. Fuel cells are used to convert gas into electricity used to power car engines, for example. In mobile applications such as passenger vehicles, buses, and cargo vehicles, proton-exchange membrane fuel cells are the ones primarily used.



The schematic layout of the H₂ supply and the cooling circuit of fuel cells with a high-pressure tank with an additional system module consisting of turbine, generator, and heat exchanger

Their system efficiency determines the vehicle's range. The University of Duisburg-Essen's invention can greatly increase fuel cell efficiency: Two turbines and two heat exchangers are used to generate electrical energy from compressed hydrogen gas. The heat exchanger is downstream from the turbine and can thus use the waste heat from its exhaust to heat the greatly cooled hydrogen gas and increase its pressure, greatly enhancing overall system efficiency. A combination of several turbines and heat exchangers connected in series (system module) between the hydrogen storage and the fuel cell can also be used.

Commercial Opportunities

The invention uses the pressure energy of the hydrogen and the exhaust from the fuel cells to increase the performance and efficiency of the fuel cell system. Electrical energy from wind power can be stored in hydrogen and used with increased overall efficiency for electrical supply systems. Since just a few percentage points of efficiency can be decisive for technology profitability, especially in the energy sector, the invention can have a positive effect on fuel cell technology use. In the middle term, the invention has great economic potential.

Current Status

A patent application has been submitted to the German Patent and Trade Mark Office. Initial laboratory samples that demonstrate feasibility are to be created by the end of 2022. We offer interested companies the opportunity of licensing and further developing this technology in collaboration with the inventors from the University of Duisburg-Essen. The invention is in a very early stage of development.

An invention from the University of Duisburg-Essen.

Competitive Advantages

- Enhanced efficiency
- Increased fuel cell efficiency
- Increased overall efficiency
- Process optimization

Technology Readiness Level

1 2 3 4 5 6 7 8 9

Technology concept formulated

Industries

- Fuel cell technology
- Automotive industry

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