

Toyota fuel cell technology

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Hydrogen Fuel Cell Vehicles are zero-emissions vehicles that represent a viable solution to energy and climate change issues; hydrogen can be in fact generated by different energy sources. Toyota started the development of fuel cell technologies in 1992; after several model changes and 'limited market' introduction experience, in December 2014 Toyota launched a hydrogen fuel cell vehicle (Mirai) that in addition to a very attractive drivability features a cruising range of more than 500km, a cold-start capability at -30degC and about 3 minutes refuelling time.

The system uses in-house made components such as the fuel cell stack, the fuel cell boost converter and the high-pressure hydrogen tanks.

With a maximum power of 114 kW the Toyota fuel cell stack achieves a volumetric power density of 3.1 kW/L thanks to the design and manufacturing of a unique separator consisting of 3D fine mesh flow channels and an internal water circulation system that eliminate the use of any external humidifiers.

A new more compact, high-efficiency, high-capacity converter has been developed to boost the generated power to 650 volts, thereby downsizing the fuel cell stack and reducing the system costs.

High pressure Hydrogen vessels with a three-layer structure made of carbon fibre-reinforced plastic are used to store hydrogen at 70 MPa at a world-leading 5.7 wt% hydrogen storage capacity (mass of stored hydrogen / mass of empty tank).

Toyota is now looking at the future planning to increase the production of the fuel cell vehicle in line with the high vehicle demand and solve the next technology challenges to be able to enter a mass scale production market at the advancement of a widespread hydrogen infrastructure.