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Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg (ZSW)

Standort Ulm:
Helmholtzstr. 8, 89081 Ulm

100-kw Car Fuel Cells Undergo Endurance Test

ZSW logs 5,600 km a week in a test bench

As fuel cell powered passenger car rollout picks up momentum, the need for tests is growing worldwide, and so is the demand for independent testing facilities. The purpose of these tests is to assess fuel cells' electrical performance under the kind of a dynamic load that cars cycle through day in and day out. The Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW) recently achieved a remarkable result with a special kind of endurance test. The institute, which boasts Europe's largest fuel cell and battery testing infrastructure, logged more than 5,600 kilometers equivalent per week using a continuously operating 100-kilowatt fuel cell stack. A set of harmonized, dynamic test cycles measured the fuel cell's nonstop performance in a test bench and also furnished key information about hydrogen consumption.

Visitors attending MobilityTec 2015, a special exhibit at the Hanover Fair on April 13 through 17, can learn more about this from ZSW experts in hall 27 at stand H85 (Baden-Württemberg Pavilion).

Cars powered by fuel cells being more and more deployed in the field. This year vehicles from Korea and Japan will hit the German market, first a Hyundai model in May followed by a Toyota model in September. The hydrogen dispensing infrastructure is also improving. In 2011, 215 hydrogen fueling stations were in operation worldwide. Today there are 20 stations in the greater Hamburg, Berlin and Stuttgart regions, and the number of dispensers is expected to increase to 50 nationwide by the end of 2015.

Fuel cells have to meet some key requirements for automotive applications. They must hold up for ten years under dynamic operating conditions, their safety has to be substantiated with certified tests, and they have to be proven efficient with the lowest possible hydrogen consumption. To this end, an automotive fuel cell stack that delivers 100 kilowatts of electrical power was subjected to a dynamic load cycling trial using a load profile agreed upon by representatives of European industry and research organizations. The test was carried out on a test bench at the Ulm-based fuel cell test center. Engineers call these test sequences 'fuel cell dynamic load cycles,' or FC-DLC for short.

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These dynamic load cycles simulate on-road use pf passenger vehicles. The institute ran 73 a day, each taking 20 minutes, for a total of 512 load cycles per week in the test bench. One cycle is equal to around 11 kilometers (km) travel distance, so the stack logged 803 km per day or the equivalent of 5,621 km per week without any issues.

Hydrogen consumption underpeak load came to 7.8 kilograms per hour, equivalent to 1,450 standard liters per minute. This is a considerable quantity, and it attests to the ZSW fuel cell test center's performance capability.

"Such comparative measurements are difficult to take on the road because the result depends too heavily on the driving style and climatic conditions," says Professor Werner Tillmetz, a member of ZSW's board of directors and head of the Electrochemical Energy Technologies division. "Very reproducible conditions can be configured for extended periods and very large amounts of hydrogen can be reliably provided in our test bays."

The Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW) is one of the leading institutes for applied research in the fields of photovoltaic energy, renewable fuels, battery technology, fuel cells and energy systems analysis. The three ZSW sites at Stuttgart, Ulm and Widderstall are currently staffed with around 230 scientists, engineers and technicians supported by 70 research and student assistants.

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A fact sheet on ZSW is available from: Solar Consulting GmbH