

Customer Application #21

Testing and Optimizing Fuel Cell Stack

Ecogenium e. V. was founded in 2020 by and for students of RWTH Aachen University and FH Aachen University of Applied Sciences and offers a platform where those interested in the topic of hydrogen can exchange ideas, network and gain practical experience. In this context, Ecogenium is developing a fuel cell vehicle to compete in the Shell Eco-marathon in the Urban Concept category.

The vehicles in the Urban Concept category look like a passenger car and must have four wheels and a small luggage compartment. In the competition, the aim is to cover a distance of 16 km in 40 minutes using as little fuel as possible.

The vehicle developed has a 3 kW PEM fuel cell stack that generates a voltage of between 13 V and 23 V from hydrogen and atmospheric oxygen, depending on the power output. At maximum power, currents of more than 200 A flow.

To test and optimize the operating strategy of the stack, an electronic load (sink) with a correspondingly small resistance is required to realize the high currents at the low voltages.

Test With Electronic Load PLI4806

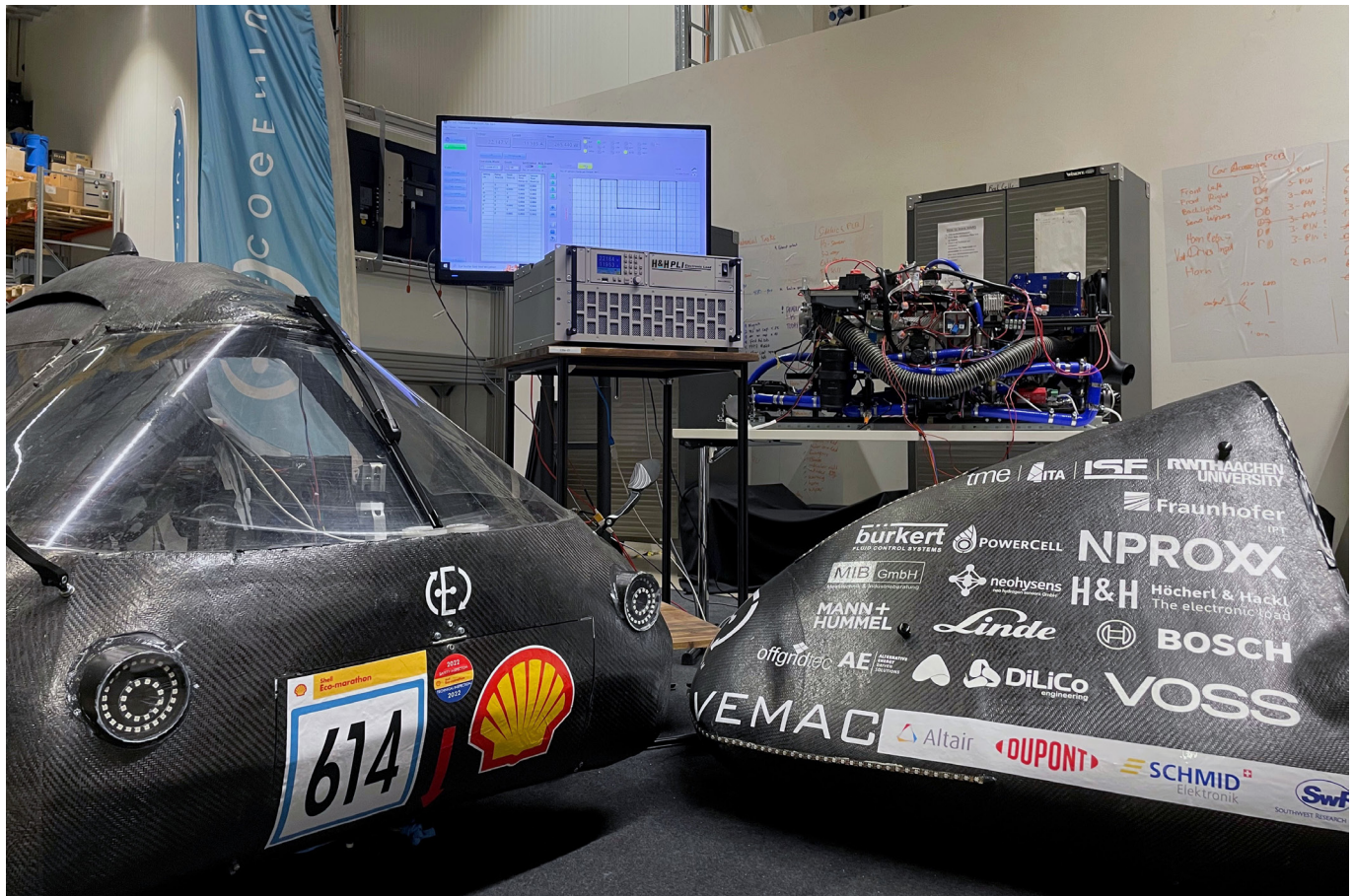
Höcherl & Hackl GmbH provides Ecogenium e.V. with the electronic load PLI 4806, which meets the high requirements.

The fuel cell stack is loaded with the sink in constant current mode. This allows parameters to be varied for efficiency optimization under constant conditions.

The currents can be set from the control panel or from a computer using the free software tool that can be downloaded from the H&H website.

In addition, cycles of ramps and stages can be intuitively assembled and run using the software. Measured values for current and voltage are also recorded at 10 Hz and exported as csv files. In the future, the students want to control the sink via its digital interface in order to simulate a moving vehicle.





The vehicle requires different voltage levels; for example, the control unit is operated at 12 V, while the engine controllers are operated at 53 V. To be able to supply all devices with the fuel cell, DC/DC converters are used. The PLI4806 is also used for load testing and efficiency determination of the DC/DC converters. With its input voltage range up to 60 V, all necessary voltages are covered.

