

Customer Application #7

Solar Panel Analysis with Electronic Load

The Delta Lloyd Solar Boat Team is founded and completely run by students of the Delft University of Technology. The main goal of this team is to develop, build and race with solar powered boats.



In 2010 the team has built their first hydrofoil boat to compete in the World Cup for Solar Powered Boats. In this competition they achieved the highest speed of all competitors, 36 km/h, and finished 3rd overall.

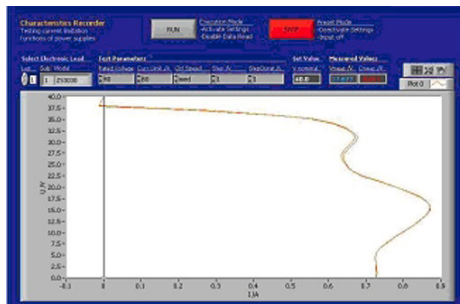
Obviously, this boat is fully electric, and for testing various components, the team has used a Höcherl & Hackl ZS3030 Electronic Load. During the development it became clear that this piece of equipment was vital for the research and tests the team had to do. The boat has 2720 high-quality Gallium-Arsenide solar cells, divided into 26 panels. Each panel was analyzed using the ZS3030 in order to find the Maximum Power Points and total power outputs. This data was used in order to match the panels for combined use in different arrays. We could even test whole arrays in order to make sure the array was working as expected.

This data was also used in order to predict the total solar power the boat would receive under different conditions and at various times.

Testing

Each array of solar panels is connected to a Maximum Power Point Tracker, (MPPT) in order to use the solar panels as efficient as possible. We connected a power supply to the input of the MPPT, and the ZS3030 was connected to the output. With this test we could check the total efficiency of our MPPTs at different convert ratios and under different load conditions. In combination with the data from the solar panel measurements, we were able to make a full simulation of the energy flows in our boat.

An especially useful feature on the ZS3030 is the 'Speed Control'. Since the MPPT controls and readjusts its output, and the ZS3030 does the same, these processes can conflict. By using the 'Speed Control', the ZS3030 could be used for this test without problems.



By race regulations, the battery capacity in our boat is limited. Usually, battery weight is the standard indication for capacity. The ZS3030 was used to do various discharge tests on different Lithium-Polymer battery cells. By comparing these tests we were able to find the exact type of battery with the best capacity/weight ratio. This way we were able to compose a battery best suited for our application. Furthermore we used the ZS3030 to measure the total capacity of our battery pack. This data was used during races when tactical decisions had to be made.

