

ENGINEERING  
TOMORROW



Case study | VACON® NXP DC/DC Converter

## Solar-powered river tours protect Krka National Park

Two fully-electric, solar-powered vessels powered by Danfoss drives ensure silent, sustainable tours through the waterways of the spectacular Krka National Park in Croatia.

The national park supports 1186 species of plant life, more than 200 bird species, and 17 species of bat. Unsurprisingly, much of the land-based animal life lives in and around the waters of the Krka River, which is also home to different amphibian and reptile creatures. Famous for its seven waterfalls, tourists flock to tour the Krka River and Lake Visovac by boat.

**Zero**  
emissions





### **Silent and emission-free e-vessel powered by Danfoss**

CROATIA: To protect the pristine environment during tours, the Krka National Park commissioned two hybrid e-vessels designed for a capacity of 50 passengers each. The vessels are equipped with both solar PV panels and battery storage. When the sun shines, solar cells supply power to the propulsion. When the sun disappears, the propulsion runs on battery power. In this way the e-vessels run reliably emission-free, no matter what the weather. The fully-electric vessels operate a cycle of 8 hours on battery power and 12 hours on solar panels. Service speed is 5 knots, and maximum speed is 9 knots.

### **Optimal power conversion from solar cells to battery**

The technical challenge for this e-vessel was to achieve proper functioning between the solar PV panels and battery in the driveline system. Danfoss was able to design and deliver the ideal solution thanks to its understanding of the needs of the e-vessel, and capability in handling advanced technology.

### **MPPT software upgrade in system integrator workshop**

Danfoss cooperated with the system integrator Inmel, by providing all the necessary hardware and software for the green hybrid solution. For the first time ever, the MPPT software upgrade was uploaded to DC/DC software on site at the system integrator workshop, and successfully tested.

Danfoss provided a maximum power point tracker (MPPT) which was implemented in the DC/DC software. This enabled higher voltage on the solar panel using only the highest voltage point, resulting in more energy on the common DC bus.

Hardware components, inverters and motors, installed in this project:

- 2x Motor INU 22-5
- 2x Battery DCDC INU 140-5
- 2x Solar panel DCDC+MPPT INU 12-5
- 28 VDC switchboard supply INU 12-5
- 2x EM-PMI375-T200 12.5 kW







## Inmel d.o.o.

The system integrator partner company Inmel d.o.o. is very experienced in maritime technology, especially the latest Danfoss technology in vessel hybrid systems. Inmel produced and delivered all drive cabinets with Danfoss support as well as other crucial equipment installed on the vessel.

<http://inmel.hr/index.php>



## Dalmont

Dalmont shipyard in Kraljevica, Croatia designed and produced the modern and efficient hull. Dalmont engineers developed the hull to provide greater structural strength and a very low hull resistance, saving energy on board. The dedication and professionalism of the shipyard resulted in fast delivery of these e-vessels.

<https://dalmont.hr/en/>

