

Case study

Supercapacitor Energy Storage System

France

Project Summary

Project: All-electric “zero emission” passenger ferry

Application: Next generation electric propulsion system

Nidec’s Role

Nidec Industrial Solutions supplied a first-of-its-kind electric propulsion system that uses supercapacitors to provide energy storage in a new 147-passenger, all-electric commuter ferry.



Scope of Supply:

Supercapacitors for starboard and port sides

Drive cabinets, including:

- Primary onshore grid protection
- Water-cooled AC/DC rectifier
- DC bus
- Water-cooled DC/DC converter
- Water-cooled DC/AC inverter for main propulsion
- Insulation permanent control
- PLC for supercapacitor management
- Air/water exchanger

HMI with dedicated wheelhouse software

Permanent magnet, air-cooled electric motors

FAT and marine certifications

Commissioning and startup

The challenge:

To design and supply an electric propulsion system for an all-electric, zero-emission passenger ferry.

A French community in need of a commuter ferry set a high bar when defining the requirements for its design. Leaders wanted a silent-running, environmentally friendly, all-electric vessel that could quickly and frequently shuttle passengers back and forth across its harbor. To power the 147-passenger vessel, they sought a battery-free energy storage solution that could be housed compactly in the hull of the vessel.

Nidec Industrial Solutions was selected to supply the innovative electric propulsion system for what would become the first electric boat in the world to operate without a battery.

The solution

Fast-charging supercapacitors from Nidec Industrial Solutions

Working with the designer, naval architects and system integrators, Nidec Industrial Solutions designed an electric propulsion system for this next-generation, first-of-its-kind vessel -- a 22.1-meter by 7.2-meter catamaran.

Instead of drawing on energy stored in onboard batteries, Nidec's system relies on 128 high-capacity supercapacitors that are distributed throughout the two hulls of the catamaran. Traditional battery recharging systems can take a half hour or more to recharge, which can place severe limitations on the number of trips a ferry can make in a day. The supercapacitors supplied by Nidec make it possible to recharge the system in just four minutes -- approximately the same amount of time it takes passengers to enter and leave the boat.

Carrying only the energy it needs for each round trip, the ferry -- equipped with two electrical azimuth thrusters -- travels at a maximum speed of 10 knots. At that rate, it takes seven minutes for the ferry to travel from one side of the harbor to the other, enabling the ferry to complete 28 roundtrips a day.

With 28 recharges per day, the boat will be recharged about 7,000 times a year -- far more than 500 to 1,000 recharge cycles that traditional lithium-ion batteries and Ni-MH batteries can support. The 15- to 20-year expected life of the supercapacitors is also considerably longer than traditional batteries

This non-polluting electric ferry emits no carbon dioxide and other greenhouse gases. Given the system's quiet operation, noise and vibration in the cabin and outside environment are also minimized.