ABB, Sintef to Test Hydrogen Fuel Cells

Shailaja A. Lakshmi November 2, 2018

Pic: ABB

Norwegian Sintef Ocean and ABB Marine will use two 30kW hydrogen fuel cells, set up in laboratory to model the operation and control of a complete marine power system in a megawatt-scale propulsion plant.

"ABB and Sintef Ocean are undertaking groundbreaking research to test the viability of fuel cells as an energy source for main ship propulsion. The new research project seeks to provide the answers required for fuel cell technology to be delivered at the scale needed to power commercial and passenger ships," said a press release.

The testing methodology, to be developed at Sintef Ocean’s Trondheim-based laboratory, will use two 30kW fuel cells, set up to model the operation and control of a complete marine power system in a megawatt-scale propulsion plant.

ABB’s own software together with Sintef Oceans vessel simulator capabilities will imitate and play back different load profiles and diesel/battery/fuel cell combinations, and tested in a scaled down laboratory environment.

The trials will explore more than the technicalities of scaling-up and optimized fuel cell/battery combinations alone.

“Sintef is contributing the hydrogen supply and infrastructure, while having a test lab gives ABB and Sintef Ocean the opportunity to increase in-house competence for integration, control and safety of fuel cell technology in marine applications,” says Anders Valland, research manager for maritime energy systems at Sintef Ocean. "Sintef has extensive capabilities with regard to fuel cell technology, maritime energy systems, electric power systems and power electronics, which gives us an edge in developing innovative solutions."

“Fuel cell technology is maturing quickly. These trials are expected to provide the platform for fuel cells to build on, so that they can take a position in the maritime sector that is competitive with fossil fuels,” says Jostein Bogen, product manager for energy storage and fuel cells at ABB Marine & Ports. “Finding unknowns and coping with them in a controlled environment, rather than risking surprises on board ship will be central to these trials.”

Another key objective will be establishing how to enhance the control of fuel cell plant in combination with energy storage, and how to optimize efficiency, reliability and the lifetime of fuel cell stacks.

“We will be seeking the decisive and practical solutions to develop fuel cell technology for main propulsion,” says Kristoffer Dønnestad, R&D engineer, ABB Marine & Ports, Trondheim. “Research will focus not only on fuel flow and fuel handling, but on what a hydrogen ship bunkering infrastructure might look like.”

The laboratory in Trondheim has been a key research resource for ABB, providing a focus for research into the fine details of its design innovations and helping to bring its most advanced maritime technologies to market, including ABB Onboard DC GridTM.

Using hydrogen as fuel, the proton exchange membrane fuel cells (PEM) separates electrons and protons, with protons passing through and electrons used as electrical output. Hydrogen is converted directly to electricity and heat without combustion. PEM fuel cells operate at a lower temperature, are lighter and more compact than their solid oxide counterparts.

ABB is a front-runner in sustainable marine e-mobility covering electric vehicle power, protection, control and installation. It has also had close involvement in ferry projects deploying battery power over short distances or for hybrid power plants to optimize ship efficiency. Battery power will certainly be key to meeting Norway’s target for zero ship emissions in the Fjords from 2026, according to Bogen.

Certainly, Bogen believes that deep-sea shipping will not have to wait until 2050 for the combustion-free generation of electricity, heat and clean water. “With the use of renewables to produce hydrogen for fuel cells and stored energy for batteries, the entire chain can be clean,” he says.