



Improving energy efficiency with Azipod® electric propulsion and onboard DC systems

Nearly 80 percent of global trade by volume is transported by sea, and the boom in international trade over the past decade has pushed the industry's carbon emissions to more than 3 percent of global emissions - comparable to a major national economy. Two solutions pioneered by ABB can improve the energy efficiency of marine vessels.



An Azipod® propulsion system.

One is the Azipod® propulsion system, electrically driven propellers mounted on a steerable pod, and the other a new concept for the distribution of electricity on board using direct current (DC) instead of the traditional alternative current (AC).

Over the years the Azipod system has not only gained a reputation for its high maneuverability, quick response and smooth, quiet operation, but also for its higher efficiency and lower emissions. Arguably the Azipod system is the most environmental friendly propulsion system available today.

Huge savings in fuel oil of as much as 55,000 liters per week have been made by ships fitted with ABB's Azipod system, when compared with sister ships travelling the same routes using conventional propulsion systems. It even provides between 10 to 15 percent higher efficiency than conventional electric shaft line systems.

The pod fits to the ship's hull and rotates freely along its vertical axis, which means that thrust can be delivered in any direction, avoiding the need for a rudder, transverse thrusters at the stern, and long shaft lines inside the hull. The superior maneuverability of the vessel brings with it improvements in operational safety.

In order to transfer the Azipod's energy savings to the large cargo vessel segment, ABB is developing a completely new propulsion concept. It consists of a fixed, non-turning, electrically driven pod placed just behind the vessel's fixed-pitch, direct-drive propeller, with a separate rudder for steering at its rear. The new contra-rotating system, called Rudderpod™ CRP, is expected to provide an improved propulsion efficiency of some 7 percent. In high powered container vessels this means a huge fuel saving and reduction in exhaust gases.

These advantages make electric podded propulsion an attractive proposition to ship operators and have recently spurred ABB to take electric propulsion one step further on ships by developing a more efficient direct current (DC) electrical system, known as ABB's onboard DC system, to replace the traditional alternating current (AC) power distribution systems currently available on ships.

The system is part of a DC revival in power solutions that uses modern technology to overcome the earlier limitations of DC systems, which now not only makes DC a contender, but a superior system since it avoids the inefficiencies inherent with AC power distribution systems currently



found on board ships. The DC system will provide highly efficient power distribution and electric propulsion for a wide range of vessels from offshore support ships, to ferries and passenger vessels, and even container ships.

It is designed initially for ships with low-voltage onboard power systems, with the view to reducing fuel consumption and emissions by up to 20 percent. In traditional electrical propulsion vessels, multiple DC connections are made from the AC circuit to thrusters and propulsion drives, which account for more than 80 percent of electrical power consumption.



ABB's onboard DC system represents a step forward in optimized propulsion by connecting all DC links and distributing the power through one main DC circuit. It is designed for ships with low-voltage onboard power systems, such as offshore support vessels, tug boats, ferries and yachts, and can reduce fuel consumption and emissions by up to 20 percent.

ABB's onboard DC system connects directly to all DC links and distributes power through a single 1,000V DC circuit, which eliminates the need for large AC switchboards and heavy-duty transformers. This results in space and weight savings of up to 30 percent, allowing ships to carry more cargo. The placement of electrical equipment is also more flexible, allowing the electrical system to be designed around the vessel functions rather than the other way around. One of the biggest advantages of a DC power system is that the ship's engines no longer have to run at a fixed speed, which means the engine's speed can be adjusted to optimize fuel consumption still further. This improves a ship's operational efficiency by up to 10 percent compared with traditional AC powered systems.

In addition, ABB's onboard DC system will enable supplementary DC energy sources such as solar panels, fuel cells, super-capacitors or batteries to be plugged into the ship's DC electrical system directly, creating further fuel savings. ABB believes that hybrid power systems will play an increasing part in the next generation of ship designs, with batteries or other energy storage devices being employed to provide short bursts of higher power when required.

“Our aim is to install the first DC system onboard a ship by mid-2012,” said Jostein Bogen project leader for ABB's onboard DC systems. “This will be a major step forward in the development of even more flexible, energy efficient ships with superior performance.”