





# Sea change

ABB will set the standard  
for software on ships

**KAI T. HANSEN** – In the thousands of years that humans have sailed the oceans, marine technology has gone through a number of astonishing changes. This decade will see a significant evolution with a new wave of technology that features software that utilizes all the available data from intelligent ship equipment. This technology opportunity, together with environmental concerns and high fuel prices, are some of the drivers for VICO – Vessel Information and Control – ABB's new center of excellence that provides software solutions to the marine business segment. VICO is strengthening ABB's position as a solution provider by complementing existing marine electrical solutions and propulsion products with advanced IT.

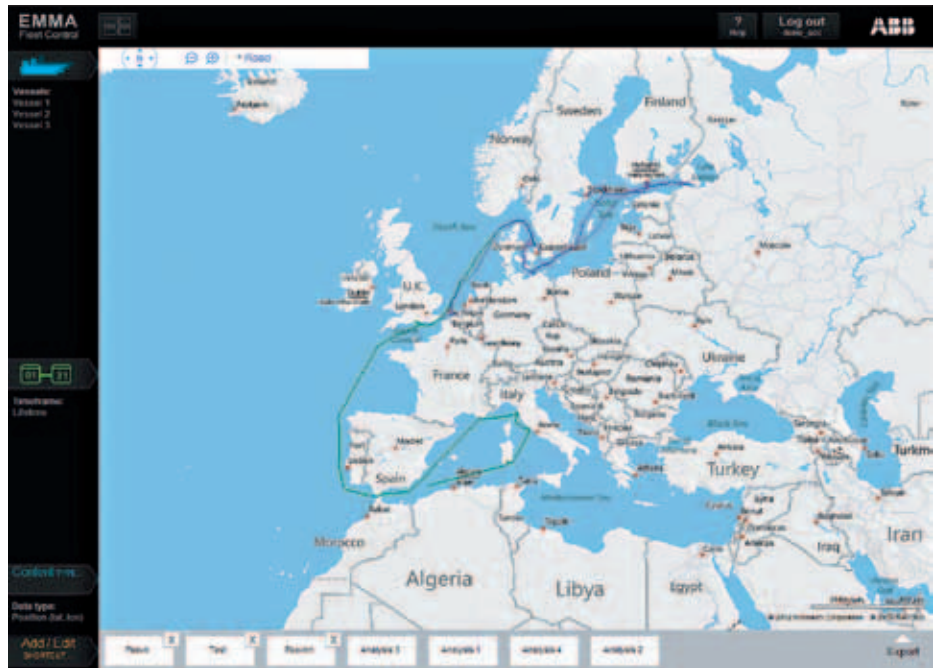
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**Title picture**

Automation and software will radically change ships over the next decade. ABB is in a unique position to provide the smart integration required for this.



## 1 Fleet control map



Around 90 percent of world trade is carried by the 70,000 or so vessels that make up the international shipping industry. In addition to these, there are a number of ships performing specialized duties, such as drill ships, research vessels and offshore supply and construction vessels. ABB's Azipod makes it a leader in the high-end electrical propulsion market, but ABB also delivers electrical systems for both diesel-electric vessels and ships with traditional propulsion. This means that a large part of the ocean-going fleet already carries mission-critical ABB equipment. In addition to these systems, ABB also delivers different control and software products that optimize propulsion and electrical system operation and facilitate maintenance and troubleshooting.

On many of the newer ships, modern drives, protection relays, motors, etc. offer rich sources of data that can be integrated with other information like speed, wind, waves and the weather forecast to optimize a vessel's operation and save energy. If the ship's computer system is not one delivered by ABB, as is often the case, this valuable resource can go unexploited.

Further, online communication via satellite is now common and vessels are able to report their technical and operational status to headquarters. This gives the ship owner the ability to elevate planning, monitoring and vessel comparison to a new level. Satellite communication can allow ABB to log on to the ship, inspect the status of equipment and help the crew when expert advice is needed. This saves traveling time and expense and increases equipment reliability → 1 – 2.

VICO will build a complete product and solution portfolio for these application

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areas, based on a smart integration of the existing products and development of new software products. These will seamlessly connect solutions from the ship's sensors all the way up to the owner's boardroom.

### The green sea

A primary benefit arising from these new products, and smart integration, is a reduction in energy usage. Fuel accounts for

between 30 and 40 percent of the cost of running a cruise ship. This increases to between 50 and 60 percent for most merchant vessels. Reducing fuel consumption by just 1 percent can mean an annual saving of \$50,000 for a midsize bulk carrier and \$300,000 a year for a large container ship.

A ship uses energy in many ways: for propulsion, lighting, heating and air conditioning. The amount of energy used for propulsion is influenced by the wind, waves, sea currents, trim and degree of hull fouling. ABB's new EMMA™ soft-

ware is now able to take these effects into account and inform a vessel's owners and operators where every last drop of ship fuel is consumed, and how efficiently it is consumed → 3 – 5.

Most importantly, this knowledge cre-

ates an awareness of a ship's energy consumption processes and enables benchmarks to be set and best practices to be targeted.

One current EMMA feature is the trim optimizer → 6. This measures the ship's trim angle and gives advice to the captain as to how he should move ballast water in order to raise or lower the bow in the

## 2 Fleet control line graph



## 3 EMMA onboard tracker – main layer – dashboard



## 4 EMMA's power overview



## 5 EMMA display – power with forecasting



water. Obtaining optimal trim is far from trivial as trim depends not only on the shape of the ship but also on the speed, waves, wind, etc. It requires a good understanding of ship dynamics as well as measurements and observations of the actual vessel in real-life situations; large waves created behind the ship, for instance, could be due to suboptimal trim. Fuel, in that case, is being used to make waves instead of progress – hardly the best use of fuel.

Other products will, for example, allow the air conditioning to take into account the outside temperature, humidity, weather forecast, etc., and thus save energy.

### Reliability at sea

Marine equipment integrity is not only a cost issue – it is also one of life or death. Redundancy and quality have always been answers to this and will remain

important, but we can now also exploit asset supervision to further increase vessel uptime.

Power blackouts on a ship are very serious as most systems, including steering, rely on a working electrical power distribution. ABB, as a vendor of both the electrical and the automation systems is in a unique position to couple these two worlds together and provide information about the electrical system directly to the chief engineer's console in an integrated way. Having immediate access to a detailed plot of the voltage as a function of time while sitting in front of the power management system user interface can simplify post-incident analysis and speed root cause identification.

Further, new ABB protection relays with IEC 61850 Internet technology enable a standardized engineering process, provide very fast communication between

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6a Suboptimal trim



6b Optimal trim

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electrical protection equipment and the control system, and deliver much more diagnostic information. ABB has successfully delivered IEC 61850 in other industries and this solution will be equally useful for marine automation solutions based on ABB's Extended Automation System 800xA platform.

#### Keeping it ship-shape

Asset management, combined with remote access, improves the way a ship is maintained and how problems are solved.

An early warning of incipient faults can be obtained by acquiring and analyzing status information from equipment. This enables equipment to be replaced or maintained in a more intelligent manner than would be the case with a rigid repair/replace schedule.

Today, ABB's new remote diagnostic system is deployed on a number of vessels and ABB service personnel can now give the ship's crew much better assistance and detailed instructions on exactly what to check, wherever the ship is located on the oceans. ABB provides periodic reports for each ship detailing the status and any incidents. This is highly valued by the customer.

Extending this further and giving access to accurate status information anywhere in a smart integrated system will give even more customer benefits in the future.

#### Full steam ahead

ABB expects the full suite of smart marine integration products to be ready

by 2015. Several are already available and they are making a big impact on marine operations. Finland-based Viking Line, for instance, has selected ABB's EMMA for a new ultra-energy-efficient passenger vessel that will have almost zero greenhouse gas emissions.

"One of the top priorities at Viking Line is to lower the emissions and fuel consumption of our fleet," said Kari Granberg, project manager at Viking Line. "We were looking for a good monitoring tool that automatically regulates power consumption and is as easy to operate as a traffic light. As a result ABB's EMMA became our first choice."

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