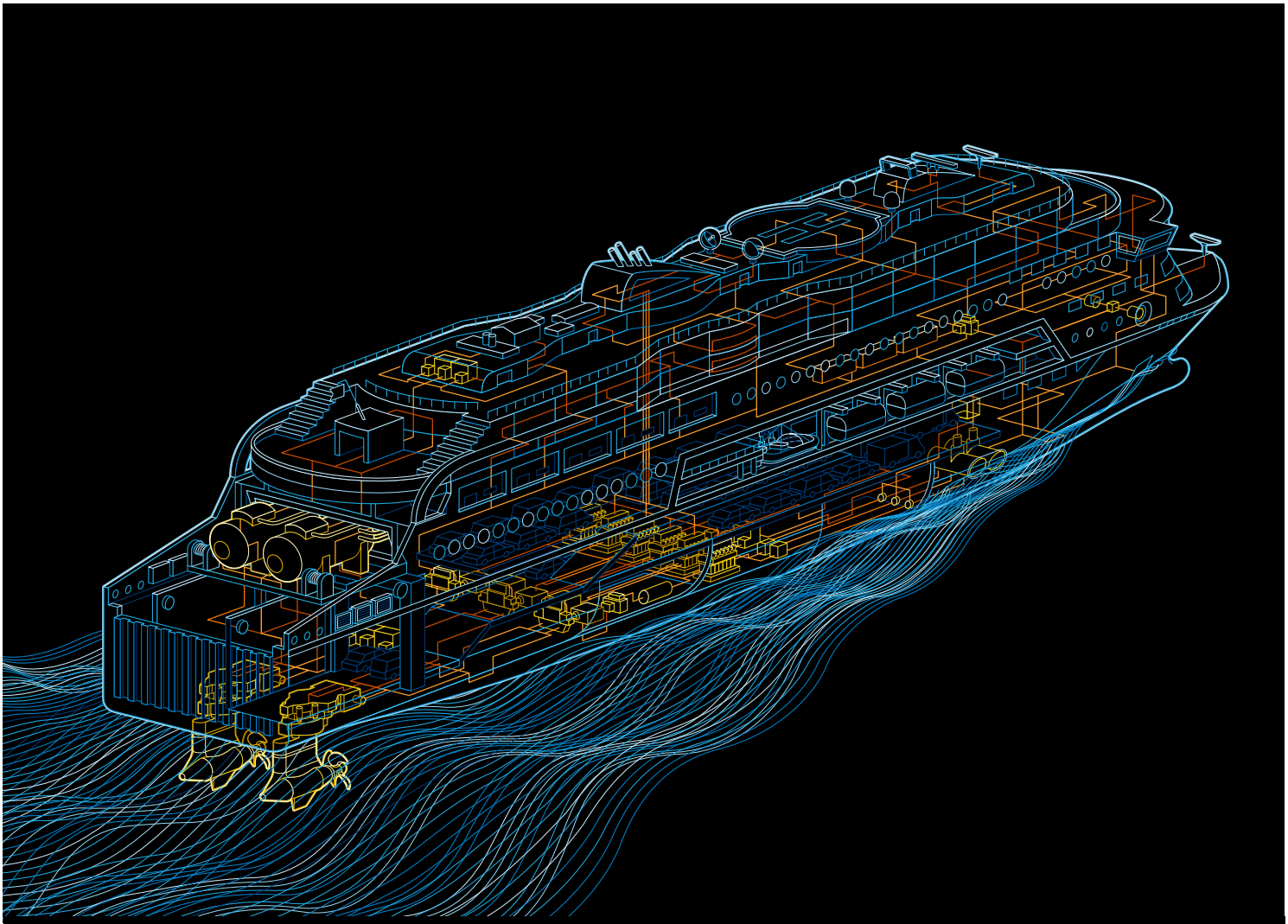


Total Passenger Vessel Solutions
For powering productivity and profitability

Power and productivity
for a better world™

The marine industry needs reliable and energy efficient solutions that power productivity and increase profitability…

The marine industry keeps the global business moving – around 90 percent of global trade by volume is transported by sea. At the same time, the marine industry's carbon emissions have grown to more than 3 percent of total global emissions – equaling that of a major national economy. Fuel is also a significant cost factor and, depending on the type of vessel, can account for as much as 50% of the vessel's overall costs. The aggregated fuel bill of the shipping industry amounts to more than $200 billion annually. Global and regional environmental regulations are also challenging ship owners and operators to make energy efficiency their top priority. At the same time, increasing competition and an uncertain long-term market outlook cause choppy seas in the marine industry.

Reaching wider horizons with ABB's total solutions

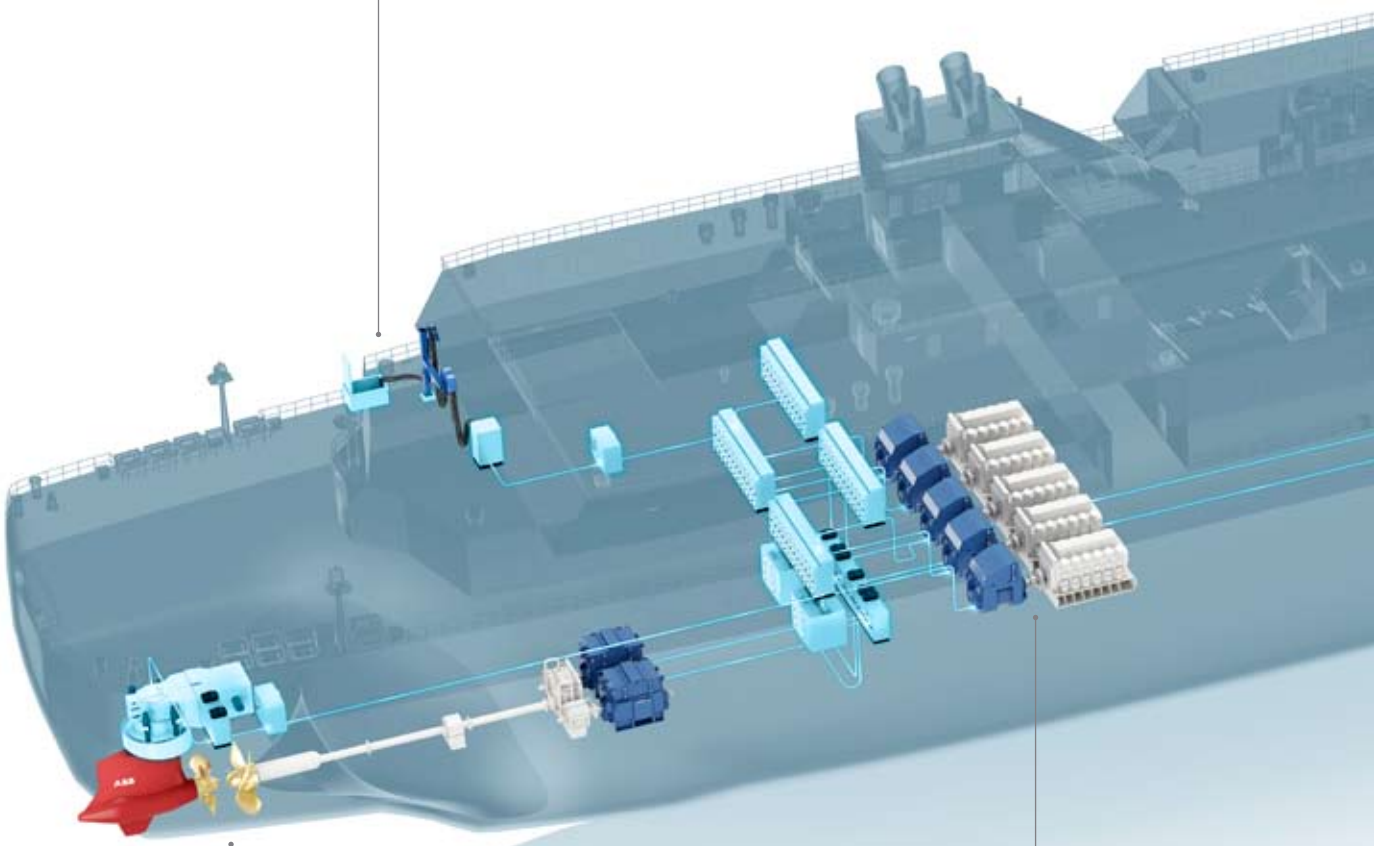
ABB's cutting edge solutions and leading marine industry know-how power you to stay ahead of your business and make sure your vessels comply with future regulations. Our energy efficient solutions help our customers reduce fuel and operational costs and increase profitability, while securing continuity, safety and reliability of operation at the same time. By cutting emissions and relying on a multitude of energy sources, our solutions also prepare your fleet for future emission thresholds and fluctuations in the fuel market.

With our marine expertise and vision of the trends shaping the marine industry, we are steering you to wider horizons.

Powering passenger vessels from individual ships to entire fleets

ABB is a leading and trusted provider of integrated electric power and propulsion as well as automation and advisory solutions for passenger vessels.

Turnkey solutions for improvement
ABB's Shore-to-ship power is an effective turnkey solution for improving reliability and energy efficiency.



Total propulsion efficiency
Azipod® CRP (Contra-Rotating Propulsion) enhances propulsion efficiency with two contra-rotating propellers.

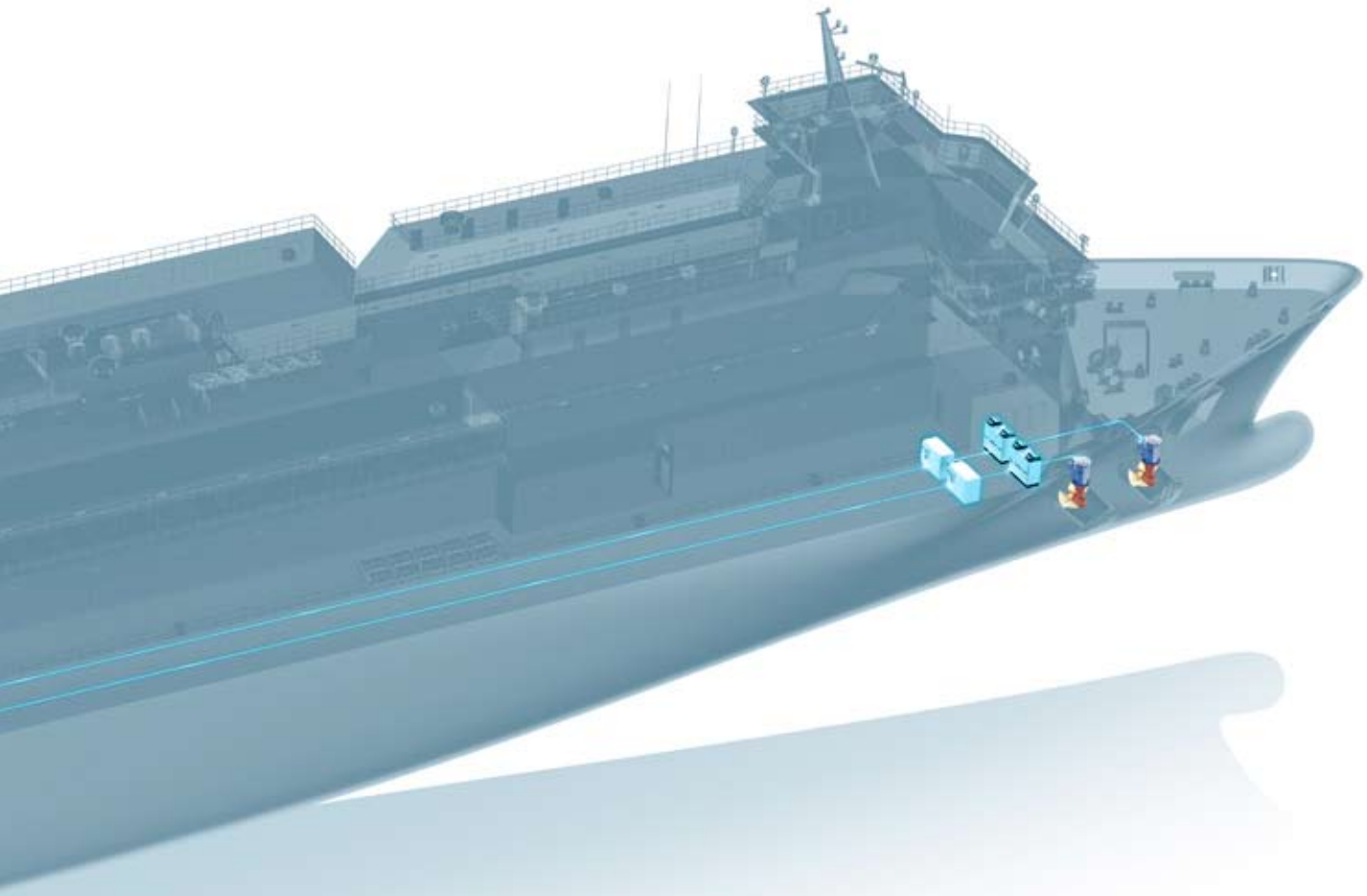
ABB's Power Plant for better efficiency
Conventional diesel power plant can be complemented with new energy sources (e.g. high-power and energy dense batteries) for better efficiency.

An integrated ABB solution – power, propulsion, automation and advisory systems – can cut fuel costs by up to 20%.

The marine industry is in need of integrated power and automation more than ever with higher demands for emission reduction and fuel efficiency. Integrated automation solutions will be the key for reaching more energy- and cost-efficient as well as more profitable vessel operations.

ABB is a leading and trusted provider of electric power and propulsion as well as automation and advisory solutions for passenger vessels. We offer innovative, reliable, safe and environmentally efficient marine solutions and world-class services that increase vessel uptime, reduce life-cycle operational costs and increase profitability for our customers. Our solutions aim to create a first rate passenger experience enabling ship owners to provide passenger value while gaining business benefits.

By being a global partner for our customers with strategically located Marine Service Centers throughout the world, ABB provides lifecycle service and support globally wherever your business takes you.



Lower vessel's energy consumption
Controlling heating, ventilation and air conditioning with Variable Frequency Drive improves energy efficiency and reduces maintenance costs.

Our experts with industry leading know-how together with flexible and customer-oriented operations enable sustainable and cost-efficient marine solutions.

Success stories

Viking Grace – the world's first LNG powered cruise ferry

Among the most important criteria in the planning of Viking Line's new cruise ferry *Viking Grace* was to meet – and exceed – the sulphur emission directives coming into force in Northern Europe in 2015. Therefore, the obvious choice was to use LNG prime movers. ABB was contracted to deliver the entire electrical power and propulsion system, ensuring safe maneuvering despite the somewhat slower ramp-up capabilities of the LNG engine as opposed to an engine powered by heavy fuel oil.

Viking Grace was completed by STX Finland and brought into service in the spring of 2013. ABB also provided a Priority Support service contract together with Remote Diagnostic Services (RDS). This brings long term value driven by increased operational reliability due to quicker response. RDS offers secure remote system analysis and troubleshooting. With RDS, ABB engineers monitor trends and detect abnormal behavior of the equipment at the earliest possible stage, allowing for immediate corrective action which in turn minimizes breakdowns.

ABB's scope of supply for Viking Grace:

- 4 x 7,400 kW Main Generators
- 6.6 kV UniGear Main Switchboard
- 2 x 10,500 kW Synchronous Drive Propulsion
- Propulsion Control System
- Propulsion and Distribution Transformers
- Bow Thruster and AC Motors
- EMMA™ Advisory Suite (Energy Measuring, Monitoring and Automation) Pilot installation
- Priority Support service contract together with Remote Diagnostic Services.

Success stories

© Meyer Werft

Azipod® propulsion system powers Norwegian Breakaway cruise ship

Norwegian Cruise Line's *Norwegian Breakaway* is the largest ship to homeport all year round in New York. The ship is around 20% more fuel-efficient than those of the past per passenger transported. ABB equipped *Norwegian Breakaway* with a complete electric system, including two 17.5 MW Azipod XO propulsion units. This gives the ship a top speed of 22.5 knots and a cruising speed of 21.5 knots. Azipod propulsion units together with a new Azipod Dynamic Optimizing system enhance the steering and turning angles, leading to fuel savings and reduction in emissions. ABB also provided the same solutions to Breakaway's sister ship *Norwegian Getaway,* which set sail in January 2014. Both ships were built at Meyer Werft shipyard.

ABB's scope of supply for Norwegian Breakaway:

- 2 x 17,5 MW Azipod® XO propulsion units
- Integrated power plant and propulsion system delivery including generators, switchboards, and propulsion system
- Service agreement for Azipod® propulsion units

Success stories

ABB provided the world's first CRP Azipod® propulsion for Japan's fastest ferries, cutting fuel costs in the process

In 2004, ABB delivered the CRP (Contra-Rotating Propulsion) Azipod propulsion systems for two RoPax Ferries built by Mitsubishi Heavy Industries (MHI) for Shin Nihonkai Ferry Co. in Japan. With a maximum speed of 32 knots, the two 224.5-meter LOA single-skeg ferries, *Akashia* and *Hamanasu,* are currently the largest and fastest ferries in Japan. Comparing the bunker consumption on the same route of two earlier fast ferries in the SNF fleet, *Akashia* and *Hamanasu* consume 20% less fuel, with a corresponding reduction in emissions. The propulsion system also enhances maneuverability in adverse weather conditions and harbor operations. In 2010 MHI awarded ABB the contract to provide similar CRP propulsion systems for two additional fast RoPax ferry newbuilds for Shin Nihonkai.

ABB's scope of supply for Akashia and Hamanasu:

- 17,600 kW CRP Azipod® XC propulsion unit in a contra-rotating mode aft of the mechanically driven main propeller
- 27,000 kW, 6.6 kV Power Generation and Distribution
- Propulsion Power and Control System

Success stories

Superyacht Picchiotti Grace E utilizes the propulsion technology of a large cruise ship

Grace E, the largest Picchiotti motor yacht of the Vitruvius® series delivered in 2014 by the Perini Navi Group represents the pinnacle of modern yacht design. Equipped with electric Azipod® CO propulsion from ABB, the 73-meter vessel will achieve the perfect balance between high performance and smooth, environmental operations. The Azipod runs silently and gives high maneuverability with exceptional fuel efficiency. The fuel saving is reflected in an extended range, and lowered lifecycle cost and emissions. Utilizing ABB's Power Plant system, the yacht's range at 12 knots is an outstanding 7,500 nautical miles.

Grace E's Power Plant consists of six high-speed diesel engines. During all operating situations, a power management system ensures that the correct combination of gensets power the yacht at their optimum performance. Optimum performance of a diesel engine means low fuel consumption, extended voyage range, low pollution and longer maintenance intervals. In the event of a malfunction in one genset, the power plant system automatically brings another one online. As a result, the yacht sails on safely without interruption.

ABB's scope of supply for Grace E:

- 2 x 1,6 MW Azipod® CO propulsion units
- ABB's power plant system

Electric power and propulsion solutions
Powering your marine business

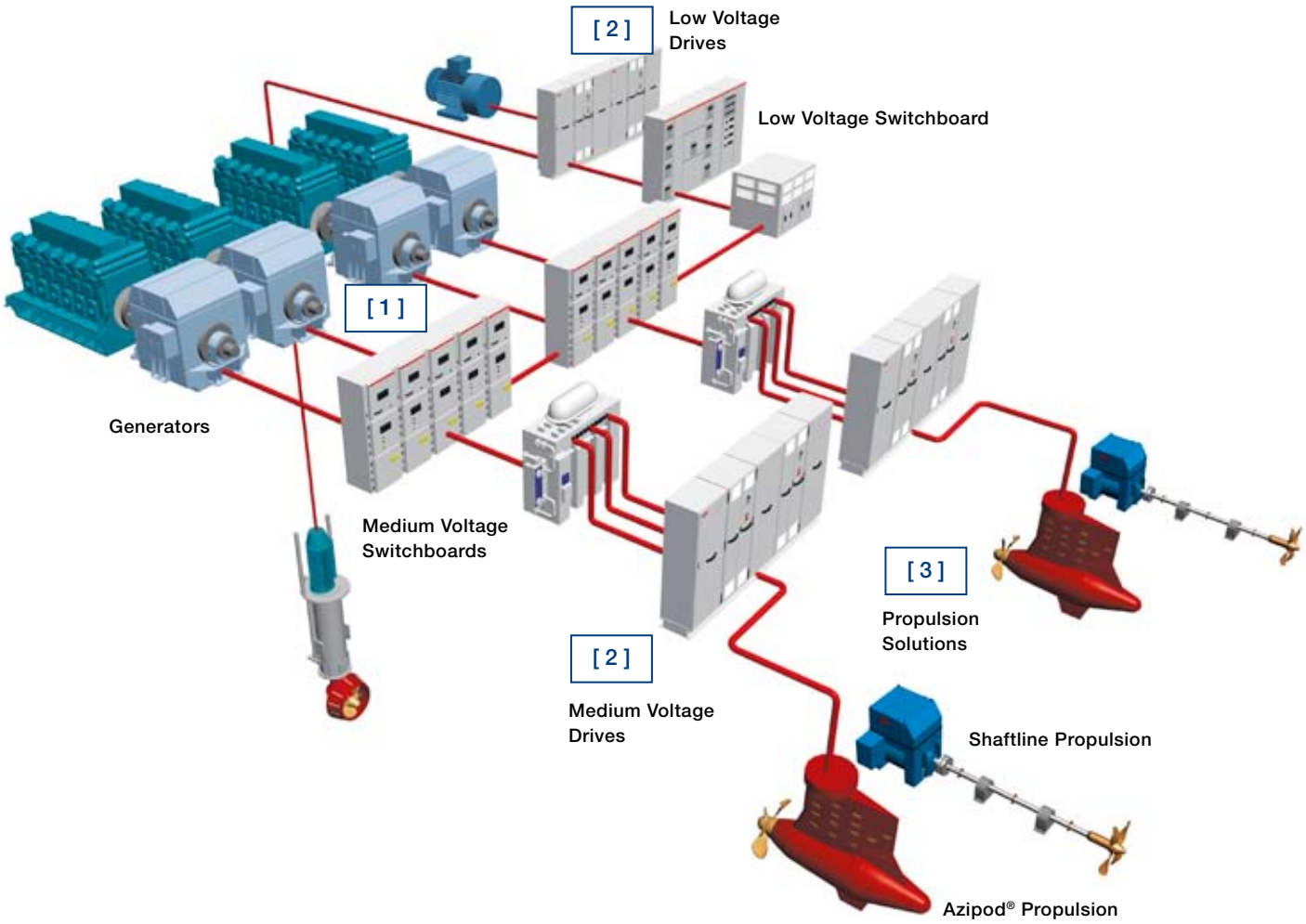


ABB offers a full range of innovative and efficient electric power and propulsion solutions for ferries, cruise ships and yachts.

Our integrated electric power and propulsion solutions include electric propulsion, power generation and distribution, distribution transformers, air conditioning and thruster motors, as well as an integrated control system.

The future is in electric propulsion

The ever-increasing demands for safety, reliability, operational economy and environmental efficiency are the driving forces for increasing use of electric power and propulsion in different vessel types. ABB is the leading manufacturer of electric propulsion systems in the world with more than 75 years of close cooperation with shipbuilders, operators, class societies and designers.

[1] ABB's Power Plant – Better integration for energy efficiency

Higher performance demands, better overall reliability and safety of vessels have resulted in an increased focus on the total concept of the vessel. ABB's Power Plant concept is the solution encompassing the whole power plant including the generators and switchboard, the propulsion system, and the control systems. ABB's Power Plant contributes to better energy efficiency, reduced exhaust emissions and lower maintenance costs.

[2] Drive Systems

ABB is the world's largest producer of electric motors and variable speed drive systems. Our vast marine experience

combined with the latest drive innovations result in innovative drives with world-class performance and reliability resulting in lower operational costs. ABB medium voltage drives, with their modularity, energy efficiency and superior performance, are the perfect solution for modern marine requirements in the power range up to 28,000 kW. ABB low voltage variable speed drives offer powerful and accurate performance for any application in the power range up to 5,600 kW.

[3] Different propulsion solutions according to your needs

ABB offers both Azipod® electric podded propulsion and shaftline propulsion solutions. ABB is the world's leading provider of electric propulsion solutions with high efficiency and reliability. Our synchronous and asynchronous motors are ideal for a wide range of passenger vessel types. Reliability and high efficiency result in considerable cost savings over the lifetime of the motor.

ABB's Onboard DC Grid

ABB's Onboard DC Grid provides a highly efficient and flexible power distribution and electric propulsion system. For example, for LNG powered ferries, ABB's Onboard DC Grid is well-suited for integrating the LNG power plant with the propulsion, resulting in higher efficiency.

For the ship owner or operator, ABB's Onboard DC grid means:

- Up to 20% fuel savings
- Equipment weight savings up to 30%
- Being ready for new energy sources or energy storage
- Increased space for payload
- Less maintenance of generator sets
- Improved dynamic response and maneuverability

Hybrid power plants enabled by batteries

There is a growing demand for higher power plant efficiency, reduced fuel consumption and lower emission levels. The marine industry is increasingly moving towards hybrid power plants enabled by high-power and energy-dense batteries as an energy source for energy efficiency. In certain areas, short-haul ferries are able to operate powered entirely by batteries.

Benefits of batteries for the ship owner or operator:

- Reduced fuel consumption and emissions
- Reduction in the machinery maintenance cost
- Lower noise and vibrations
- Safer operations
- Increased power plant availability

Electric propulsion offers several unique advantages compared to conventional mechanical solutions:

Environmental benefits from lower fuel consumption and emissions
Safety and reliability with improved maneuverability
High performance in rough conditions
Better passenger experience due to reduced vibration and noise
Standardized and proven technology
Adaptive to changes in the primary energy source
Increased payload through efficient modularization and flexibility

Total solutions for TUI Cruises

TUI Cruises' two new builds, Mein Shiff 3 and 4, include ABB's complete electrical propulsion system with automation and advisory solutions.

Azipod® propulsion
The ultimate electric propulsion solution

Azipod® propulsion is designed to reduce ship's lifecycle costs and emissions and to increase ship profitability.

Azipod propulsion is ABB's state-of-the-art azimuthing electric podded propulsion system, combining both vessel propulsion and steering in a single unit. The Azipod propulsion concept is the foundation for ultimate energy-efficiency since it is not dependent on a specific type of energy production.

The many benefits of Azipod propulsion

Reduced fuel consumption and increased energy efficiency
Azipod propulsion reduces fuel consumption and CO_2 emissions. A pulling type propeller and the elimination of appendages which traditionally disturb the water flow result in an even propeller wake. This reduces the propulsion fuel consumption typically by 10–12% compared to modern shaftline propulsion.

Azipod CRP (Contra-Rotating Propulsion) further improves the propulsion efficiency. This is achieved by the Azipod propulsion unit and shaftline propellers facing, with the propellers rotating in opposite directions. Azipod CRP is the optimum solution for fast ferries, where more than 20% fuel savings have been achieved compared to a conventional propulsion system.

Improved safety
Safety is essentially important for passenger vessels. Azipod propulsion improves vessel maneuverability to a totally new level. Excellent ship control and short stopping distance means improved passenger and crew safety.

Better passenger comfort
An efficient propeller wake brings cavitation and propeller induced pressure pulses to a minimum. Thus, noise and vibration onboard are reduced, and passenger and crew comfort improves.

Excellent maneuverability
Ship maneuverability is essential in heavy weather and restricted harbors. The Azipod propulsion system provides fast and precise ship motion control. The Azipod propulsion system's better maneuvering results in faster operations and reduced cruising speeds, meaning lower fuel costs.

Azipod propulsion solutions for different needs

Azipod CO – For medium power range from about 800 kW up to 4,500 kW.

Azipod XO – For higher power up to more than 20 MW.

Azipod® and beyond
Reaching wider horizons with ABB's total solutions

Azipod® propulsion has powered all Roayl Caribbean International's new vessels since 1999

Royal Caribbean Cruise Lines and ABB have a long cooperation in propulsion solutions. The Azipod propulsion system is in use or has been ordered for a total of 23 RCCL vessels. ABB's first deliveries of the Azipod propulsion solution were for RCI's five Voyager class vessels, the first of which started operation in 1999. Since then, Azipod propulsion has been RCI's only choice for propulsion solutions. In addition, Azipod propulsion system has been selected for five RCCL's Celebrity Cruises' vessels.

Allure of the Seas utilizes Azipod® propulsion.

Automation and software solutions
Making steel intelligent for safer and more efficient vessels

ABB's automation and software solutions help our customers meet the challenges of high fuel costs, stricter environmental and safety regulations, shortage of qualified crew and an ever-tighter competitive environment.

These automation and software solutions enable ship owners to reduce investment and operational costs, optimize vessel performance, increase overall safety, improve energy efficiency and enhance onboard equipment reliability and availability.

Extended Automation – system integration for powering performance, profitability and energy efficiency

ABB's marine automation solutions are based on our world's leading industrial automation platform System 800xA, which extends the reach of traditional automation systems. With the System 800xA platform, we offer systems and services to meet any marine automation needs. It enables a fully integrated ship with proven solutions, high degree of redundancy and unique features securing maximized vessel availability. System 800xA provides full system-wide access to controls, information and diagnostics from any workstation in the vessel. Integrated with ABB's Advisory solution, it enables the operator to achieve significant benefits in energy efficiency and helps in securing some of the most important assets in the vessel – electric propulsion and power systems.

EMMA™ Advisory Suite for minimizing energy consumption

EMMA Advisory Suite is a decision-support solution that minimizes the overall energy costs for individual vessels and whole fleets. EMMA Advisory Suite continuously analyzes the vessel's energy performance from real-time energy, fuel and process data, and uses this data to provide improvement guidance for the crew. Typical examples are dynamic trim, speed and power plant optimization.

OCTOPUS Advisory Suite – Optimum performance even in the harshest weather conditions

OCTOPUS is an industry-leading solution for motion monitoring, forecasting and decision-support. It improves passenger comfort, availability, route planning and safety as well as energy efficiency of different vessel types during weather-sensitive operations. World-leading shipping companies have used OCTOPUS over a decade for route planning and optimization of speed, heading and fuel consumption in every weather condition.

Fleet Control for fleet-wide performance optimization

Fleet Control is a modern cloud-based fleet management service. It enables the ship company's head office technical experts and decision makers to efficiently benchmark, set performance goals and manage fleet-wide energy optimization. Fleet Control includes, for example, tools for trim planning, hull and propeller condition monitoring and advanced key performance indicator (KPI) trending.

EMMA™ Advisory Suite continuously analyzes vessel's energy performance providing improvement guidance.

OCTOPUS Advisory Suite provides continuous motion monitoring, forecasting and decision-support in weather-sensitive operations.

Modernizations
Make the most of your vessel's lifecycle

ABB offers modernization solutions, such as extensions, upgrades and retrofits, that help our customers overcome challenges related to obsolescence, performance and regulatory standards.

Upgrading existing systems and equipment with the most modern components will optimize a vessel's operational performance and extend its life-cycle. Modernizations are also a more economical choice compared to the cost of full renewal.

ABB is a full system provider for retrofit solutions, from the proposal and design, through manufacturing and testing, up to installation and commissioning.

Examples of our Modernization Services:

Variable Frequency Drive for cooling systems
Variable Frequency Drive for cooling systems is a simple and efficient way to achieve major annual savings of 40–60% on average in fuel consumption on various onboard pump and fan applications. Benefits also include improved reliability and passenger comfort.

Variable Frequency Drive to control HVAC systems
In passenger vessels, heating, ventilation and air conditioning (HVAC) are the second-largest consumer of energy after propulsion. Controlling pumps and fans in HVAC processes with Variable Frequency Drive (VFD) provides substantial savings in energy consumption and reduced maintenance costs as well as improved air quality. Installing VFD's on chilled water pumps and on the evaporator cooling side brings 30–40% savings on average to total power consumption with a typical payback time of less than one year.

Variable Speed Shaft Generator (PTO/PTI)
Variable speed shaft generator is an economical and environment-friendly solution providing advantages such as increased energy efficiency, improved operational efficiency, lower noise levels and flexibility in operating modes. With a Variable speed shaft generator it is possible to utilize the shaft generator at a wide range of main engine RPM's, enabling operational flexibility. With Controllable Pitch Propeller (CPP), Variable speed shaft generator reduces propeller losses significantly on partial propeller loading conditions. In addition to new builds, VFD for shaft generator is also available as a retrofit for existing shaft generators.

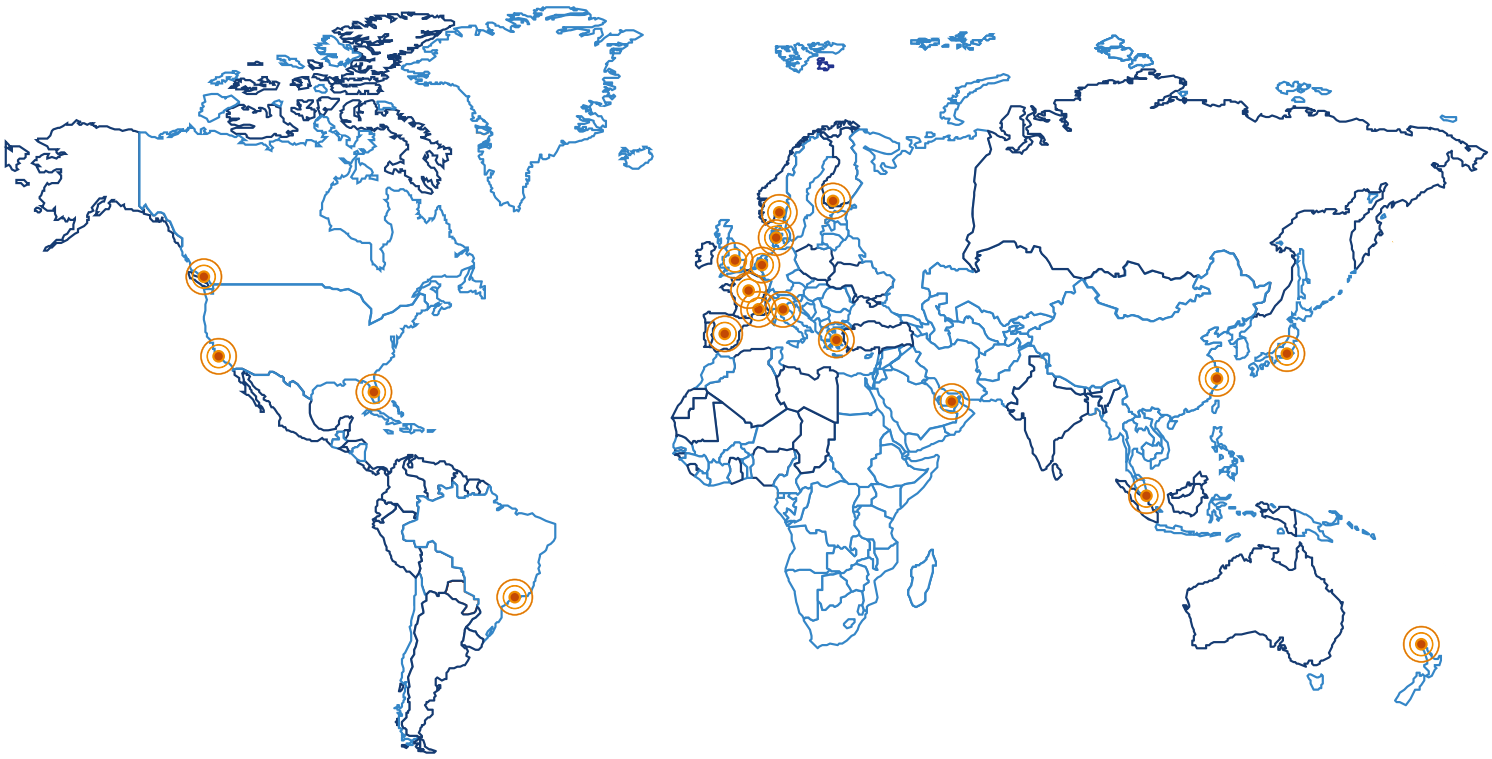
Shore-to-Ship Power
ABB's Shore-to-ship power is a practical and effective turnkey solution for improving reliability and energy efficiency and reducing maintenance costs by decreasing pollutants, noise and vibrations of the vessel. The solution also enables vessels to comply with the environmental requirements set by regulatory authorities.

Switchboard, Protection Relay and Circuit Breaker Upgrades
Switchboard, protection relay and circuit breaker upgrades are cost-efficient alternatives to a complete switchgear replacement. ABB's service experts conduct site audits on existing installations to assess the condition of the equipment, recommend the proper solution and support the right investment decision.

Upgrades for Carnival Sunshine

ABB delivered a propulsion drive and control upgrade for the Carnival Sunshine cruise ship in 2013. Due to the upgrade, the propulsion drives and controller technology were moved into the active life-cycle phase. This phase supports the customer in preventive maintenance, spare parts, technical support, on-site support and system training.

Marine Services
Global presence with local approach



ABB’s Marine Services support our customers anywhere on the globe with world-class service solutions, remote and on-site support and training for any vessel with ABB equipment onboard.

ABB’s Marine Services is present at the main cruise and ferry hubs worldwide. The global reach of our service network ensures that the services are available wherever and whenever they are needed.

Site surveys and preventive maintenance programs
ABB’s Marine Services can carry out a site survey to give a summary of the status of systems and equipment, and recommend actions. This ensures availability of necessary resources and parts for equipment updates, resulting in maximum operating performance. For instance, site survey has been well received as a planning support for upcoming dry docking. ABB’s condition monitoring is a valuable solution for carrying out monitoring on a regular basis while the equipment is running. Regular long term monitoring identifies trends that enable overhaul to be planned ahead at the customer’s convenience and allow a predictable maintenance budget for an individual vessel or an entire fleet.

ABB Service Contract
Flexibility according to your business needs

ABB Service Contract is a flexible solution that can be designed business-specifically based on individual customer and vessel needs providing maximum benefits for operations and competitiveness. It also enables more predictable maintenance budget planning. Thanks to its modular and customizable structure, the service contract easily adapts to your specific requirements and evolves with your business. Optional services further tailor the services.

Priority Support

Priority Support is a perfect fit for customers seeking a cost-efficient service solution and requiring dedicated account management and rapid response in the event of an equipment failure. The contract is a valuable addition to support the customer's self-maintenance strategy. Priority Support Agreement guarantees mobilization time within 8 hours.

Preventive Service

Preventive Service includes preventive maintenance aimed at increased reliability and extended equipment life through scheduled maintenance procedures. Long term scope of preventive maintenance minimizes the risk of unexpected repairs and costly off-hire.

Performance Optimization

Performance Optimization is a preferred solution for customers to whom disruptions of operations have a drastic business impact. Performance Optimization offers a first-class service, highest level of equipment availability, and support in asset management amounting to minimal operational risks related to equipment maintenance and technical issues.

Optional Services
Even more value to your business

Global 24/7 Technical Support – It is all about quick response time

Our Global 24/7 Technical Support hotline provides a single point of contact for vessels operating all over the world. Our case management system offers solutions for a wide range of support needs in any part of the world with target response time. You have access to highly qualified engineers, who assist you in a wide range of operational and maintenance issues.

Remote Diagnostic Services (RDS) – Expert knowledge available instantly

Our Remote Diagnostic Services makes expert knowledge available as quickly as possible and reduces the need for on-site visits. With RDS, our engineers at the Global 24/7 Technical Support Center have instant access to vessel and equipment data and all ABB resources necessary to resolve any technical incident. This reduces the need for on-site service visits and improves system performance, uptime and overall vessel profitability.

With our services, we help you to:
Reduce downtime
Increase safety
Ensure maximum passenger experience by preventing equipment failure
Be on schedule by quickly responding to any technical incident
Increase operational and energy efficiency through training and preventive maintenance programs
Minimize fuel consumption and meet strict environmental regulations with energy efficiency modernizations and upgrades
Predict maintenance budgets through condition monitoring

Long-term energy efficiency improvements for Carnival Corporation

In 2012, ABB provided Carnival Corporation with a long-term service contract to maintain and upgrade ABB's Azipod® propulsion equipment over the next 15 years for 20 ships in their fleet. The long-term Azipod propulsion system maintenance agreement improves the already high energy efficiency of Azipod propulsion units by by 2.5–4 percent, cutting costs by as much as $1 million a year per ship. The service contract covers technology and energy efficiency upgrades for all Azipod propulsion systems and propulsion condition monitoring for all ships, as well as other system equipment maintenance.

The 293.5 meter Carnival Miracle set sail in 2004.

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