JAPAN IS ALWAYS HERE FOR YOUR VOYAGE
So many eco ships are available on the market from various countries. But, they all look the same.

A ship that demonstrates high energy efficiency during official sea trials suffers significant reduction in speed when actually operating in open seas.

Ideas for improving fuel efficiency seem to have been exhausted and we cannot expect any further improvement.

Will technologies be developed in time to meet ever-tighter regulations on SOx and NOx emissions from ships?

The age of LNG fuel

The Ballast Water Management Convention is coming into effect. Will equipment and services be able to comply with its requirements?

Needs to operate a vessel to carry very unique cargoes.

Anxiety to buy ships built by no familiar yards.

Shipbuilders just build and sell ships. They do not provide support for problems that occur after they delivered the ship.

Ship-related “Big-data” and “IoT” (Internet of Things)

The quality of ships is uneven and depends on individual shipyards.

We want to build new ferries or passenger ships to which people are showing keen interests.

Serious shortage of patrol vessels and aging of coastal ships, but no domestic shipyards.

Wants to order new vessels, but financing is an issue.

*marked technologies were developed with the support of ClassNK as part of the ClassNK Joint R&D for Industry Program in this brochure.
So many eco ships are available on the market from various countries. But, they all look the same.

Eco ships built in Japan achieved best-in-class energy efficiencies in all vessel categories.

Energy saving is by no means a new technical theme for Japanese shipbuilders. Over the last 40 years Japanese maritime industries has devoted much of technical resources to research and development related to energy savings. The eco ships Japanese shipbuilders offer today are all underpinned by proven technologies including hull forms with high propulsion efficiency, optimum match between the hull, main engine and other equipment, and proprietary energy-saving devices.

Water flow around the stern of a ship is key to improving fuel efficiency. Propulsion efficiency can be improved through the combined use of low-vibration energy-saving propellers such as the SG Propeller produced by Kamome Propeller Co., Ltd. and proprietary fins developed by shipbuilders.

Sumitomo Heavy Industries Marine & Engineering Co., Ltd., which specializes in middle sized tankers, is well known to develop the design meeting the latest market requirement on the basis of their extensive market researches. In addition to optimal hull form with high propulsive performance, the Estrella is equipped with several Sumitomo patented energy saving devices such as high propulsive efficiency NBS propeller based, an energy-saving SILD duct, and a specially shaped HLES rudder to reduce fuel consumption.

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Solution

Estrella: Aframax tanker

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Millau Bridge: 14,000 TEU container vessel

The size of container vessels is recently becoming large, and Japan’s competitive advantage lies in energy efficiency in this field. The new 14,000 TEU container vessel developed by Imabari Shipbuilding Co., Ltd. incorporates cutting-edge energy-saving technologies, reducing fuel consumption (per TEU-mile) by approximately 35% compared with conventional 8,100 TEU container ships. A newly developed bow cover is mounted on the upper part of the bow to reduce wind pressure resistance.

Beatrice: Chemical tanker

Asakawa Shipbuilding Co., Ltd. has over 30 years’ experience in building stainless steel chemical tankers. Its chemical tankers boast excellent fuel economy by combining optimal hull form with the “Friend Fin” an energy-saving device jointly developed with MHI Marine Engineering, Ltd.

Lowlands Nello: 82,000 DWT bulk carrier

Sanyos Shipbuilding Corporation has proved itself a specialist in eco ships for more than a decade. Five years ago, it developed the world’s first 80,000 DWT bulk carrier with daily fuel consumption of less than 30 tons. CO₂ emissions were reduced to 20% below the Energy Efficiency Design Index (EEDI) standard. Sanyos has continued to upgrade this model by improving the hull form.

Super-low-friction antifouling paint

As well as preventing the growth of subaquatic organisms, antifouling paints help to improve the propulsive performance of ships. Japanese marine paint manufacturers are committed to the development of super-low-friction technologies. Examples of the latest energy-saving antifouling paints include Seafo Nexo Z from Chugoku Marine Paints, Ltd. and “A-LF-Sea from Nippon Paint Marine Coatings Co., Ltd.

Propellers and fins

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**Bow shape**

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**Monitoring**

In cooperation with ship owners, Oshima Shipbuilding Co., Ltd. installs a device on the ships it build that monitors the actual fuel consumption of the vessels. This device collects operational data during actual service of the ships which are utilized in the development of energy-saving technologies.

**Tank simulations**

The Actual Sea Model Basin at the National Maritime Research Institute has the world’s most powerful wave generator. It can artificially generate various wave and wind conditions and is utilized to develop energy-saving equipment taking added resistance in waves into consideration.

**EEDI WEATHER**

A chemical tanker built by Nishinoh Shipbuilding Co., Ltd. was the first in the world to achieve Energy Efficiency Design Index (EEDI) Weather certification, which takes performance in actual weather conditions into account.

**Air lubrication technology**

Japanese shipbuilders were the first to put air lubrication technology to practical use. This technology reduces frictional resistance on a ship’s hull by creating a flowing layer of air bubbles between the seawater and the hull. It has already been introduced on multiple ship-types.

**Carbon Fiber**

Materials technology is an area of strength for Japan. The world’s first carbon fiber reinforced plastic (CFRP) propellers developed by Nakashima Propeller Co., Ltd. reduced weight by approximately 40% compared to conventional metal propellers. This weight-reduction allowed to produce a larger propeller diameter and accordingly contributed to a reduction of about 9% in the horsepower required by a ship. Shipbuilders are also studying the application of CFRP to vessels.

**Aerodynamics**

Japanese shipbuilders are focusing on wind pressure resistance; they are working to develop structures that ease frontal wind flow over accommodation and the bow to reduce wind pressure resistance.
Will technologies be developed in time to meet ever-tighter regulations on SOx and NOx emissions from ships?

Based on IMO regulations, from January 2016 onwards, Tier III NOx control (requiring 80% reduction of NOx emissions compared to Tier I control) will apply to new ships which will sail in existing NOx emission control areas.

Since January 2015, the sulfur content of marine fuel has been restricted to no more than 0.1% in emission control areas. By 2020 or 2025, a control level of no more than 0.5% will apply worldwide. The maritime industry urgently needs to respond to tightening emission controls. Japanese equipment manufacturers and shipbuilders were among the first to engage in research and development to reduce emissions by combining existing strengths in basic internal combustion engine technologies with the comprehensive technological capabilities of related industries. They have a full lineup of emission reduction measures to meet various requests from ship owners.

**Solution**

Japan already has a full lineup of new technologies to meet new standards and regulations.

**Hybrid SOx scrubber**

Mitsubishi Kakoki Kaisha, Ltd., Japan’s market leader in oil purifiers, and Mitsubishi Heavy Industries, Ltd., which has a wealth of expertise in engineering, have jointly developed a “Hybrid SOx Scrubber System” that efficiently removes SOx from engine exhaust gas. With this System onboard, a ship is able to navigate, burning conventional Heavy Fuel Oil, in areas subject to both 0.1% and 0.5% sulfur content requirements.

**SOx scrubber**

Fuji Electric Co., Ltd. has developed a compact SOx scrubber approximately 50% smaller than conventional scrubbers. Onboard test of 1MW class scrubber for power generator has been completed and onboard test for 10MW class scrubber for main engine will be carried out.

**Water emulsion fuel**

When using low-sulfur fuel oil (marine gas oil; MGO) to comply with SOx standards, it is necessary to consider the low viscosity and low lubricating properties of such oil. Ushio Reinetsu Co., Ltd. sells cooling systems that achieve the necessary viscosity and lubrication.

**EGR**

Mitsubishi Heavy Industries Marine Machinery & Engine Co., Ltd. and Mitsubishi Kakoki Kaisha, Ltd. have jointly developed a low-pressure exhaust gas recirculation (EGR) system as a key technology to comply with IMO Tier III. This is a next-generation environmental NOx regulation. The EGR system is now undergoing validation tests on actual ships. This technology significantly reduces NOx emissions by recirculating exhaust gas from downstream of the main engine turbocharger and leading into turbocharger suction. This is the world’s first trial applying the system for a marine engine. Exhaust gases are being collected from actual ships to prepare for market introduction.

**MGO cooling system**

The design of engine rooms and surrounding areas will have to be completely altered to meet all new regulatory standards including new emission control standards, the Ballast Water Management Convention, and the IMO Noise Code. Leveraging their engineering capabilities, Japanese shipbuilders are working to efficiently arrange multiple equipment items within limited spaces, without reducing cargo space.
Liquefied natural gas (LNG) is expected to be widely used as an environmentally friendly fuel that can significantly reduce CO₂, NOₓ, and SOₓ emissions compared to fuel oil. While adoption of LNG fuel is progressing in Northern Europe, especially for ferries, the lack of onshore infrastructure to support LNG fuel supply has hindered its introduction in Japan. Therefore, an LNG-fueled tugboat was developed as the first vessel to receive LNG directly from a tanker truck.

NYK Group's “Sakigake” emerged from a concerted effort by various Japanese companies. A marine dual-fuel engine produced by Niigata Power Systems Co., Ltd., the "6L28AHX-DF", was adopted as the main engine. This gas engine was specially developed to power the rapid load increases and wide output ranges which are requirements specific to tugboats. Volans Co., Ltd., a company specializing in marine combustion equipment, developed the boil-off gas treatment device. Air Water Plant & Engineering Inc. built an "LNG supply unit in cooperation with Keihin Dock Co., Ltd. In this way, a group of domestic Japanese companies demonstrated their ability to build an LNG-fueled ship on their own. The name Sakigake means "pioneer" in Japanese, symbolizing our wish to pioneer a new age of LNG fuel.

Japan is the world’s largest importer of LNG. Naturally, it has a wealth of technical knowledge and insight related to the handling of LNG on ships. Japanese companies have been actively engaged in R&D in anticipation of the coming age of LNG fuel.

MAN Diesel & Turbo’s electronically controlled gas injection system ME-GI, which is becoming increasingly widely adopted across the world, incorporates the outcomes of R&D that Mitsui Engineering & Shipbuilding Co., Ltd. has been carrying out since the 1990s. The Winterthur Gas & Diesel Ltd. X-DF series (premixed lean combustion and low-speed two-stroke dual-fuel engine) was also developed in collaboration with two Japanese companies, Diesel United, Ltd. and IHI Corporation.

All essential technologies and equipment required for building a gas-fueled ship have already been developed and are ready for use. Mitsubishi Heavy Industries, Ltd. (MHI) develops high-pressure gas supply units to feed natural gas to the gas-fueled marine engine, based on the technology acquired through LNG carrier building for long term. In the system named "MHI-GEMS", a hydraulic motor driven reciprocating pump pressurizes LNG before heating it and feed the ambient-temperature gas to the engine. The system is characterized by compactness and low power consumption. This system is already commercially available for various type of LNG as fuel ship, and is being provided together with LNG tank equipment. Meanwhile, Mitsui Engineering & Shipbuilding Co., Ltd. is developing high-pressure compressors for fuel gas supply systems (FGSS), positioning itself as the only manufacturer in the world capable of supplying ME-GI and an FGSS compressor together.

LNG fuel tanks and supply units are also available. Japan Marine United Corporation has developed a supply system by utilizing its proprietary SPB® (Self-supporting, Prismatic Shape, IMO type B) for the fuel tank. It has obtained an agreement to provide an LNG fuel propulsion system for an "LNG-ready" mega container vessel. Someos Shipbuilding Corporation has also started to market LNG fuel supply systems, utilizing shipbuilding technologies and pressure tank expertise gained through LPG tank construction.

Specific projects to build LNG-fueled merchant ships are also taking shape. Kawasaki Heavy Industries, Ltd. has received an order from United European Car Carriers to build the world’s first LNG-fueled car carriers. The two vessels are now being built at Nantong COSCO KHI Ship Engineering Co., Ltd. in China and are scheduled for completion in late 2016. Oshima Shipybuilding Co., Ltd. has developed an LNG-fueled bulk carrier and obtained approval in principle (AIP) from DNV GL.

The Japanese maritime industries are taking a large step forward in the age of LNG fuel.
The challenge of eliminating the need for ballast

Japanese shipbuilders and manufacturers supply all kinds of equipment and services to help meet Convention requirements, including ballast water treatment systems, retrofitting of equipment, and associated engineering services.

Amid rising concerns about the impact of ballast water transfer on ecosystems, the Ballast Water Management Convention is expected to come into force soon. Japanese shipbuilders and manufacturers are ready to provide not only ballast water management systems (BWMS), but also engineering services and installation work required for the retrofitting of such systems to existing ships.

Retrofitting BWMS into the limited space available on existing ships will require considerable work. Japanese shipbuilders and manufacturers were early adopters of 3D laser scanner technology used to accurately scan the dimensions and shapes of ship components for 3D modeling. This enables quick, smooth completion of the whole process from engineering to installation.

Sanwa Dock Co., Ltd., a repair dockyard, has a wealth of experience in supplying engineering and retrofitting services utilizing 3D laser scanners.

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The MIURA CO., LTD. ’s HK BWMS combines Miura’s original filter with UV irradiation to sterilize ballast water. Miura also provides maintenance services through its own global network.

New ship types are being developed to reduce the amount of ballast water required. Namura Shipbuilding Co., Ltd. has developed the *VLCC Minimal Ballast Water Ship, which reduces ballast water volume by approximately 65% compared to conventional models and has obtained AIP from ClassNK. The design is characterized by the inclined bottom of the midship section. It can reduce the required treatment capacity of BWTS to less than half the current level as well as helping to reduce fuel consumption and GHG emissions by 12% on average.

The JFE BallastAce system developed by JFE Engineering Corporation uses filtration and chemical injection technology that is highly effective in removing marine organisms. First installed in 2010, the system has been adopted by a growing number of ships.
**Issue 6**

Needs to operate a vessel to carry very unique cargoes.

Japanese shipbuilders engage in transportation projects from the planning phase to build specialized vessels that meet customers’ needs.

Using advanced engineering capabilities and through repeated and thorough consulting with ship and/or cargo owners, Japanese shipbuilders can offer one-off vessels designed to meet the specific needs of customers.

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**150 meter-long rails**

Kawasaki Heavy Industries, Ltd. (KHI) plans to build the world’s first “Liquefied hydrogen carrier by 2020. It will be equipped with a vacuum-insulated and pressure-accumulated cryogenic cargo containment system. KHI envisions transporting liquefied hydrogen produced from Australian brown coal to Japan.

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**Liquefied hydrogen**

Photo: KAWASAKI HEAVY INDUSTRIES LTD

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**Iron sand**

Taharoa Destiny is a 175,000 DWT iron sand carrier built by Mitsubishi Heavy Industries, Ltd. It transports iron sand slurry from northern New Zealand to China and Japan. Due to the geographical features of the bay from which it is shipped, the iron sand needs to be mixed with water to form a slurry before being pumped into the vessel. This is currently the only loading system in the world designed to load iron sand slurry.

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**Iron sand**

Photo: SHIN KURUSHIMA DOCKYARD CO., LTD

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**Pacific Spike**, built by Shin Kurushima Dockyard Co., Ltd., is the first ship in the world designed specifically to carry long steel rails. To accommodate the world’s longest rails, the vessel has a single, bulkhead-free cargo hold that stretches approximately 155 meters along the center of the ship and is equipped with a special system for loading and unloading the steel rails. This project set a new record for the longest cargo ever transported by sea, and was achieved through the development of a dedicated ship in collaboration with the cargo owner and the ship operator.

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**Pacific Spike**

Photo: SHIN KURUSHIMA DOCKYARD CO., LTD

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**Mitsui’s 56**

When the Mitsui Engineering & Shipbuilding Co., Ltd. 56,000 DWT bulk carrier was first launched in 2003, it was the world’s largest Handymax bulk carrier. Nearly 200 vessels have been built in the series. The design currently under construction, dubbed the “neo 56BC,” is a next-generation vessel with enhanced energy-saving performance.

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**Mitsui’s 56**

Photo: MITSUI HEAVY INDUSTRIES LTD

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**KAMSARMAX**

“KAMSARMAX” which is a well-known name to call 80,000 DWT bulk carriers in the shipping market, were originally developed by Tsuneishi Shipbuilding Co., Ltd. Tsuneishi Shipbuilding has built more than 200 of these vessels, and the total is expected to reach 300 vessels within a few years.

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**KAMSARMAX**

Photo: TSUNEISHI SHIPBUILDING CO., LTD

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**Imabari 28BC**

Imabari Shipbuilding Co., Ltd. has built over 200 of its 28,000 DWT bulk carriers to date. The basic specifications have not changed since the first vessel was delivered 22 years ago. The user-friendly design of the 28BC has been highly acclaimed, making it an exceptionally long-selling vessel.

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**Imabari 28BC**

Photo: IMABARI SHIPBUILDING CO., LTD
Shipbuilders just build and sell ships. They do not provide support for problems that occur after they delivered the ship.

Solution

Japanese shipbuilders don’t just build ships, but also undertake repair work and provide support throughout the life of the vessel.

A key characteristic of Japanese shipbuilders is that they not only build new ships, but also carry out repair work. Many Japanese shipbuilders have a specialized division or subsidiary dedicated to providing lifecycle support. We act as “ship doctors” to ensure that the vessels we bring into the world will continue operating safely into the future.

Issue

The Hakodate Dock Co., Ltd., which is celebrating its 120th anniversary in 2016, has a large repair dock in northern Japan. It can repair ships up to 230,000 DWT at its dock facing the Tsugaru Strait, an important junction for maritime traffic around Japan.

Tokyo Bay is the busiest water of marine traffic in Japan. The Yokohama Dockyard & Machinery Works of Mitsubishi Heavy Industries, Ltd. conducts repair and conversion works in this area. It has one of the largest repair facilities in Japan, including three dry docks, not only playing the role of a “Family Doctor” for the ships built at its own yards, and also various types of vessels ranging from merchant ships to special vessels.

Marine equipment manufacturers are also enhancing their after-sales service.

In the field of marine products, after-sales service is a critical element that determines the competitiveness of the manufacturer. Japanese marine equipment manufacturers are expanding their service networks worldwide to enhance their after-sales service. Rather than simply waiting for repair requests from ship owners, they proactively provide preventive maintenance and other services.

Photo: THE HAKODATE DOCK CO., LTD.

Photo: MITSUBISHI HEAVY INDUSTRIES, LTD.
SHIP-RELATED “BIG-DATA” AND “IoT (INTERNET OF THINGS)”

All kinds of data from ships across the world are aggregated at onshore data centers. Marine transportation operators use this information for optimal operation and deployment of their fleets. Onboard, the data can be used to predict failures in shipboard equipment, shipbuilders and marine equipment manufacturers use such data for product development. The Japan Ship Technology Research Association (JSTRA) has created an image of how big data will be fully utilized in the maritime industry in the future. This is the “internet of ships,” where all shipboard equipment is connected to onshore networks and vast streams of data collected from ships at sea can be utilized. A number of research and development projects are under way in Japan involving collaboration across the entire maritime industry, including shipping companies, shipbuilders, marine equipment manufacturers, and a classification society.

In order to develop a strategic roadmap for the effective utilization of big data, JSTRA cooperated with industry players to classify the wide range of ship-related data into clearly defined categories, such as data for improving safety, improving economic efficiency, reducing environmental load, and reducing workload on seafarers. The roadmap outlines specific technology development to take place over the short term (to 2020), medium term (to 2030), and long term (to 2050).

Onboard data collection (now)

Onboard data collection (future)

A project to build data infrastructure is also under way, the Smart Ship Application Platform Project (SSAP Project), a two-year collaborative effort to build the Smart Ship Application Platform 2 Project (SSAP2 Project), has been carried out over the past two years from 2013 with the participation of equipment manufacturers and ship operators. Various types of information are currently collected from ships, including data from nautical instruments, engines, and hulls as well as meteorological and hydrographic data, but such information is not managed in an integrated manner. To enable the integration of information from different types of equipment, the project built a prototype infrastructure for onboard and onshore information and conducted verification tests onboard and at onshore data centers. These tests confirmed the utility of information integration. The test results also provided reference material for the drafting of ISO standards for ship-related data. Following the first project, the Smart Ship Application Platform 2 Project (SSAP2 Project) was launched in 2015. Participation has been expanded to 42 companies including observers. The target of this new project is the utilization of big data. Data used to be retained by individual marine operators, but the project aims to enable sharing of big data among different players in the industry to further enhance the safety and economic efficiency of marine transportation.

Systems utilizing big data for such purposes as the safe operation of ships, improving fuel efficiency, and maintenance are already being put to practical use in some areas. ClassNK and various marine equipment manufacturers have jointly developed the systems, CLASSNK CMAXS LC-A and CLASSNK CMAXS eGICSX, to analyze condition-based monitoring data collected from flow, pressure and temperature sensors installed on all engines in the engine room. Information collected from these sensors is stored in a data logger and processed through an algorithm to manage equipment condition and to accurately detect any abnormalities. Conventionally, equipment condition was monitored separately by the manufacturers of each piece of equipment. By contrast, these new systems were developed through cooperation among the manufacturers of other equipment such as engines and power generators.

The condition-based monitoring data are aggregated in a cloud database, the construction of which was managed by ClassNK. Marine equipment manufacturers can monitor information through this system, and at the same time the shipping company can also manage equipment condition. ClassNK plans to enhance system functionality to enable condition-based monitoring of the whole engine room in the future, with a view to further streamline class surveys. ClassNK also aims to increase the number of participating companies and expand the range of equipment covered by the system to enhance benefits for shipping companies that introduce it.

The database is currently being used to classify the wide range of ship-related data into clearly-defined categories, such as data for improving safety, improving economic efficiency, reducing environmental load, and reducing workload on seafarers. The database is currently using the Ship Data Center which Class-NK established for wider use in the maritime industry. Class-NK hopes to collect various types of big data through the Ship Data Center in the future and to offer the data collection platform as infrastructure, operating as a third-party database administrator.

Infrastructure is rapidly being developed as information technology progresses, and Japan is steadily approaching the age of the "internet of ships."
In order to enhance quality, Japanese shipbuilders are taking an industry-wide approach to upgrading skills.

**Enhancing worker skills** is an important theme to all shipbuilders. In Japan, shipyards locating closely often hold joint training sessions for new employees as well as industry-wide skill competitions. Japanese shipbuilders are collaborating to ensure and enhance the quality of the “Made in Japan” brand.

**Solution**

For more than 10 years, local shipbuilders including SMEs have collaborated with partner companies in cities with numerous shipyards, like In-no-shima, Imabari, Yokohama, and Usuki, to hold joint training sessions for new employees as a supplement to their own in-house training programs.

Headed by Onomichi Dockyard Co., Ltd. and Kyokuyo Shipyard Corporation, shipbuilders hold a unique skills competition. The numbers of participating shipyards and skill events are increasing year by year. Imabari City, which has a high concentration of shipyard, has also launched an industry skills competition for young engineers. These competitions not only motivate workers to upgrade their skills, but also provide them with opportunities to learn new skills from each other.

**Ferries and passenger ships built in Japan are environmentally friendly “eco-ships” with unique appearance and quiet operation.**

Since Japan is an archipelago, a large number of ferries and passenger ships operate here, and Japanese shipbuilders have a wealth of ferry-building experience. Advanced features such as energy-saving technologies are incorporated into ferry designs.

**vibes one**

vibes one is an electric passenger ship made of aluminum alloy, built by Tsuneishi Facilities & Craft Co., Ltd. It has an electric propulsion system and runs entirely on energy provided by plug-in lithium ion batteries, making it virtually free of noise and vibration. It has a characteristic appearance and an observation room below deck where passengers can view the beautiful coral on the seabed.

**Taiko**

Taiko is a passenger and car ferry built by Usuki Shipyard Co., Ltd. It follows in the wake of its predecessor with a hybrid catamaran-hull stern, a unique design developed by Usuki Shipyard, and has also achieved improvements in propulsion performance. The bow of the ship is beautifully shaped for improved seakindliness.

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**Double-ended ferry**

A new ferry now being built by Naikai Zosen Corporation will be double-ended, with an interchangeable bow and stern both equipped with maneuvering equipment and propellers. It is a single-engine, twin-shaft ship with a controllable pitch propeller made of CFRP (Carbon Fiber Reinforced Plastics), featuring high performance in terms of quietness and operability. After completion scheduled for 2016, it will carry passengers to Aki-no-Miyajima, a World Heritage Site in Japan.
Japan exports newly-built patrol vessels and coastal ships. We have a proven track record of contribution through ODA.

Japan provides patrol vessels and coastal ships to various countries through official development assistance (ODA) programs as part of its efforts to strengthen cooperation in maritime services. Japanese shipbuilders are experienced in designing and building vessels tailored to local circumstances and conditions.

**Ferries for Myanmar**

In Myanmar’s largest city of Yangon, 30,000 commuters cross the Yangon River every day on a ferry service linking the city center to residential areas on the other side of the river. To replace decrepit ferryboats, Japan has provided three newly-built vessels for no charge. The three twin-engine, twin-shaft passenger ferries were built by Nakatani Shipbuilding Co., Ltd.

**Multi-purpose vessels for the Philippines**

Based on maritime cooperation between the governments of Japan and the Philippines, Japan Marine United Corporation is now building ten 40-meter multi-purpose vessels for the Philippine Coast Guard. They will be delivered to the Philippines until 2018, and utilized in such activities as disaster relief and protection of the marine environment as well as surveillance and control of illegal fishing.

**Patrol Vessels for Djibouti**

In order to secure maritime safety and security in the Gulf of Aden and offshore of Somalia, where people are suffering from frequent piracy incidents, Japan provided two 20m Type Patrol Vessels as grant aid to Djibouti Coast Guard of the Republic of Djibouti to enhance its ability. The Vessels were constructed and delivered by Sumidagawa Shipyard Co., Ltd. in 2015.

**Japan offers a solid support system for project financing through public organizations as well as private financial institutions.**

The impact of the credit crunch following the financial crisis has made shipbuilding finance increasingly difficult throughout the world. Against this backdrop, the Japan Bank for International Cooperation (JBIC) stepped up its financing of shipbuilding projects for export. It has expanded its export financing scheme, which used to be limited to exports to developing countries, to include exports to developed countries as well. Nippon Export and Investment Insurance (NEXI) also supports numerous vessel export projects through the international trade insurance system.

**JOIN**

The Japan Overseas Infrastructure Investment Corporation for Transport & Urban Development (JOIN) was established in 2014 as an infrastructure investment fund to provide financing to overseas transportation and urban development projects with the aim of promoting the export of Japanese infrastructure to overseas markets. Projects for ship-based transportation of passengers and cargo, floating production storage and offloading (FPSO) and floating storage and regasification unit (FSRU) vessels for marine resource development, and offshore supply vessels will be eligible for JOIN funding. This funding can also be utilized in combination with JBIC loans.

**JBIC**

In 2014 Pacific Basin Shipping Limited, a major Hong Kong-based ship operator, obtained funding for the purchase of 18 bulk carriers under the buyer’s credit and local buyer’s credit schemes with a credit line of USD 175 million. An increasing number of major ship owners are utilizing JBIC financing when building ships in Japanese shipyards. These financing schemes cover diverse vessel types, including not only bulk carriers, but also roll-on/roll-off carriers, passenger ships, LNG carriers, geophysical survey vessels, ore carriers, and anchor handling tug supply (AHTS) vessels.

**New Infrastructure Fund “JOIN”**

The financing environment for shipbuilding is continuously changing amid dramatic fluctuations in global financial conditions. Public institutions in Japan offer solid support with the aim of promoting large-scale export projects. A wide variety of financial tools is available to support those who wish to purchase ships and other products or services.

The impact of the credit crunch following the financial crisis has made shipbuilding finance increasingly difficult throughout the world. Against this backdrop, the Japan Bank for International Cooperation (JBIC) stepped up its financing of shipbuilding projects for export. It has expanded its export financing scheme, which used to be limited to exports to developing countries, to include exports to developed countries as well. Nippon Export and Investment Insurance (NEXI) also supports numerous vessel export projects through the international trade insurance system.

**JOIN**

The Japan Overseas Infrastructure Investment Corporation for Transport & Urban Development (JOIN) was established in 2014 as an infrastructure investment fund to provide financing to overseas transportation and urban development projects with the aim of promoting the export of Japanese infrastructure to overseas markets. Projects for ship-based transportation of passengers and cargo, floating production storage and offloading (FPSO) and floating storage and regasification unit (FSRU) vessels for marine resource development, and offshore supply vessels will be eligible for JOIN funding. This funding can also be utilized in combination with JBIC loans.

**JBIC**

In 2014 Pacific Basin Shipping Limited, a major Hong Kong-based ship operator, obtained funding for the purchase of 18 bulk carriers under the buyer’s credit and local buyer’s credit schemes with a credit line of USD 175 million. An increasing number of major ship owners are utilizing JBIC financing when building ships in Japanese shipyards. These financing schemes cover diverse vessel types, including not only bulk carriers, but also roll-on/roll-off carriers, passenger ships, LNG carriers, geophysical survey vessels, ore carriers, and anchor handling tug supply (AHTS) vessels.

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