Scope

Kawasaki Heavy Industries Quarterly Newsletter

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Kawasaki

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in this issue...

About the Cover
The front car of the pre-mass-production Series E6 Shinkansen. Please see In Focus, page 8 for more details.

KAWASAKI HEAVY INDUSTRIES, LTD.
Scope
Editor-in-Chief: Kosei Nishino
Public Relations Department
World Trade Center Bldg., 4-1
Hamamatsu-cho 2-chome, Minato-ku
Tokyo 105-6116, Japan
Phone: 81-3-3435-2132
Fax: 81-3-3432-4759
URL: http://www.khi.co.jp

Newly Developed LNG Carriers Launched

177,000 m^3 LNG Carrier Has 20% More Cargo Capacity

Kawasaki's Sakaide Works is a hive of activity as construction of a state-of-the-art LNG (liquefied natural gas) carrier proceeds on schedule. When complete, the new LNG carrier will be 177,000 m^3 with a cargo capacity of 175,000 m^3.* This gigantic vessel was recently developed by Kawasaki with technical input on LNG transport from its co-owners, Tokyo LNG Tanker Co., Ltd., a wholly owned subsidiary of Tokyo Gas Co., Ltd. and Nippon Yusen Kaisha.

The new LNG carrier incorporates all the same outstanding features found in Kawasaki's standard 147,000 m^3 LNG carriers with a cargo capacity of 145,000 m^3. Despite its massive size, the vessel packs superior propulsion performance plus the ability to enter major LNG terminals around the world. On top of that, it is equipped with spherical tanks that increase cargo capacity and represent a range of advances in LNG transport. The main engine employs Kawasaki's state-of-the-art reheat turbine plant, dubbed Kawasaki URA. It's the first time the cutting-edge system has been used, and it will increase fuel efficiency by about 15% over engines equipped with conventional steam turbine plants. The launch of the new line of vessels signals a bright new era for Kawasaki Shipbuilding Corporation, which remerged with Kawasaki Heavy Industries, Ltd. on October 1 and was rechristened as the Ship & Offshore Structure Company, an internal company of KHI.

* This volume roughly translates to the amount of LNG consumed each year by general Japanese households in a city with a population of 200,000 to 250,000 people.

Supersize 300 m x 52 m Vessel

The 177,000 m^3 LNG carrier currently being built at the Sakaide Works in Japan's Kagawa Prefecture is a behemoth measuring 300 m long and 52 m wide. The new vessel is about 20% larger than Kawasaki's standard 147,000 m^3 carriers (of which 12 have been built).

Since most LNG terminals are designed for LNG carriers ranging from 125,000 m^3 to 145,000 m^3, bigger doesn't always mean better. In fact, building a larger vessel just to increase cargo capacity might prevent entry into many ports around the world that just can't accommodate a larger vessel. That's why Kawasaki conducted an in-depth study of existing LNG terminals prior to designing the new model, assuring that it would be able to enter as many LNG terminals as possible.

In the end Kawasaki decided that the new vessel would be 300 m long with a design draft (distance from the surface of the water to the hull bottom) of 11.5 m. The new configuration has set the mold for future Kawasaki LNG carriers. The vessel's air draft (distance from the waterline to the highest point on the vessel) is tailored to meet the requirements imposed by France's Port of Montoir, a major European LNG terminal. While Kawasaki's new vessel really ups the ante for cargo well beyond the capacity of conventional 147,000 m^3 LNG carriers, measuring 289.5 x 49 m, it's actually only 10.5 m longer and 3 m wider.

Image of 177,000 m^3 LNG carrier

The newly developed Kawasaki URA Turbine Plant makes the vessel super energy efficient.

The Kawasaki URA Turbine Plant installed inside the vessel's engine room.

Kawasaki's proprietary semi-duct system with contra fins and rudder bulb with fins enhance propeller efficiency.

Pioneering Developments in Tank Construction

The spherical tanks, each measuring 44.05 m in diameter, are slightly larger than conventional tanks, which have a diameter of 41.42 m. All four of the vessel's tanks will have equal diameters and capacities. Using the same size tanks simplifies everything, from the cargo equipment needed to maintenance and operations.

Each spherical tank is composed of about 150 aluminum alloy panels. Kawasaki employs a special automatic welding process to join these approximately 40 mm-thick panels so they form a perfect sphere. Not only is aluminum highly resistant to low temperatures, but when configured into a sphere, the surface contracts uniformly. These characteristics make for a very stable structure and ensure the kind of reliability and safety required for containers carrying LNG at a constant cryogenic temperature of approximately -160°C.

The more spherical the shape, the sturdier the tank will be. Making a perfect sphere is an exacting process that involves forming precisely measured curves on each aluminum alloy panel. Final touch-up work performed by skilled workers is done by both press machine and hand. Years of experience, combined with advanced processing technology, have enabled Kawasaki to make this innovative design a reality.

The spherical tanks are produced at a dedicated facility located on the premises of the Sakaide Works. Each tank is comprised of three parts which are referred to as the northern and southern hemispheres and the equatorial ring due to the structure's close resemblance to a globe. To install the tanks on a vessel, Kawasaki used to first install the southern hemisphere and then cap it off with the equatorial ring and the northern hemisphere. Then in 2003, a new technique was adopted that enabled the integration of both hemispheres and the equatorial ring in the dedicated facility before installing it onto a vessel as one complete unit. The Sakaide Works is one of the few shipyards in the world specializing in this technique.

Balancing 1,100 t in the Air

The Sakaide Works boasts two Goliath cranes with a lift capacity of 800 t, the largest class in Japan. These gigantic cranes lift the third spherical tank, weighing roughly 1,100 t, and move it steadily toward the huge cylindrical cargo tank support (skirt). A worker on deck remains in constant communication with the crane operator to guide the tank to the exact location where it will be installed. Working with a margin of error that is nearly zero, the workers carefully maneuver the tank into position and then slowly lower it until it touches down on the surface.

The Sakaide Works has been able to significantly improve the quality of the spherical tanks it manufactures thanks to the innovative technique enabling workers to combine all three parts of the tank and finish it in the shop. Sakaide is also leveraging its advanced processing technology to produce and install skirts with pinpoint accuracy. It is this superior accuracy and production quality that makes it possible to install the spherical tanks onto a vessel as one complete unit.

Insulated by Unique Technology

The spherical tank is positioned on the skirt, which is welded directly to the hull of the LNG carrier, and then a steel cover is installed over the tank's northern hemisphere. Once welding and other hot-work operations are finished, the tank is then thermally insulated.

After this process, the tank is completely covered with the Kawasaki Panel System, Kawasaki's proprietary thermal insulation panels. The panels feature a double-layer structure using phenolic resin and polyurethane foams, coated with a thin aluminum film. Thanks to the panels' excellent insulation performance, the daily boil-off rate (or vaporization) is kept to 0.1% of the entire cargo load.

Moving Full Steam Ahead

Once the third spherical tank is installed, the bridge is lifted with cranes and installed at the vessel's stern. The bridge and pre-erection blocks are being constructed dockside. It's here that assembly blocks produced in the block assembly shop are pieced together to form larger blocks.

The shop needs to fabricate about 300 assembly blocks in order to make an LNG carrier with a capacity of 177,000 m^3. These blocks are then transported to the dockside assembly area and put together to form about 95 pre-erection blocks. The larger blocks are finished ultra precisely, making them accurate to within a few millimeters. This efficient construction method has cut the time required for dockside operations to about three months.

Kawasaki says that while the initial production run of its first 177,000 m^3 LNG carrier is taking more time than normally required, it should take less time for the second one.

New Reheat Turbine Plant

In addition to the unique hull design, enabling the vessel to enter most LNG terminals around the world even with about 20% more cargo space than conventional LNG carriers, the new 177,000 m^3 carrier boasts dramatically increased fuel efficiency. The secret behind this is the innovative Kawasaki URA Turbine Plant, which serves as the main power plant. The new LNG carrier is the first ship to be equipped with this advanced reheat turbine plant.

Most LNG carriers use a conventional steam turbine plant due to their high reliability and ease with which they utilize the boil-off gas from the cargo tanks. In recent years, new propulsion systems, such as electric propulsion driven by a dual-fuel diesel engine, have been introduced as more fuel-efficient alternatives to conventional steam turbine plants. Since the jury is still out on these new systems while they undergo technical evaluation, many shipowners would rather see improvements made to existing steam turbine plants.

Kawasaki had these shipowners' wishes in mind when it developed the URA Turbine Plant. The innovative system integrates the latest in materials, controls, electronics, power electronics and analytical technologies into Kawasaki's reheat turbine plant. It also incorporates lessons learned from its predecessor, the Kawasaki UR Turbine Plant, which is used in a number of Kawasaki-built VLCCs (200,000 DWT class very-large crude oil carriers). The 177,000 m^3 LNG carrier is the first vessel to be equipped with this new reheat turbine plant, delivering top-notch efficiency and reliability.

Overall Energy Efficiency Up 20%

Most LNG carriers are powered by a steam turbine. The boil-off gas from the cargo tanks is burned in a boiler to generate steam that powers the turbine. The boiler employs a cofiring system that can be used with fuel oil as well, when necessary. In a conventional steam turbine plant, steam sent from the boiler drives the high-pressure turbine before being sent on to drive the low-pressure turbine.

A reheat turbine plant employs a reheating cycle that returns the steam used in the high-pressure turbine to the boiler, where waste gas is used for reheating before it's directed on to the intermediate pressure turbine. The steam used to drive the intermediate pressure turbine is then sent on to power the low-pressure turbine. Kawasaki's reheat turbine plant also incorporates a number of improvements to the turbines, nozzles and blades in addition to its use of high-temperature/high-pressure steam. All these features contribute to the enhanced fuel efficiency, which is about 15% higher than conventional steam turbine plants.

Installing a reheat turbine plant in a small engine room is a difficult task since it requires the installation of more pipes as well as more processing steps. Kawasaki overcame this hurdle by leveraging its outstanding processing technology, which is used to fabricate components in precise configurations, and its superior construction technology to install the pipes.

In addition to the reheat turbine plant, the new LNG carrier also features an optimized hull shape (bow and stern), energy-saving components like Kawasaki's proprietary semi-duct system with contra fins, as well as a rudder bulb with fins that enhance propeller efficiency, all on top of improved propulsion performance due to reduced propeller rotation speed. These outstanding features add up to an astonishing improvement in overall fuel efficiency for the vessel, which consumes about 20% less energy per unit of cargo than conventional LNG carriers.

The 177,000 m^3 LNG carrier was launched in late June and is currently being outfitted with equipment. The vessel is scheduled to undergo fine-tuning, equipment testing and test runs to be conducted by Kawasaki. It is slated for delivery in 2011.

The information contained in this article is current as of June 7, 2010.

The spherical tank is slowly lowered into the skirt.

A view from the center of the skirt.

The tank is steadily lowered. The bottom of the skirt comes into view.

The tank is about to reach the bottom.

The tank is now in place.

Design of the Trent 1000 Passenger Jet Turbofan Engine

Cutting-Edge Processing and Assembly Technology for Production at Seishin Works

The Trent 1000's IPC module is manufactured and assembled in a dedicated facility, at Kawasaki's Seishin Works in Kobe. The facility houses the world's only high-speed electrical discharge holing machine and one of the world's few electron-beam welding machines. Parts that will eventually be assembled are manufactured with super precision using these cutting-edge machines.


IPC rotor

Making Air Travel More Comfortable: The Boeing 787 Dreamliner


Photo courtesy of ANA

From large windows, soft lighting and clean air to cabin humidity and air pressure similar those on the ground, the Boeing 787 Dreamliner is a next-generation passenger liner that promises to make air travel more comfortable. It is constructed of state-of-the-art composite materials that reduce the plane's overall weight and is driven by the fuel-efficient Trent 1000 engine. In fact, the 787 will reduce fuel requirements by 20% relative to comparably sized aircraft. Kawasaki has been a partner in the 787's global development from the beginning, undertaking development and manufacture of important components such as the forward fuselage, main landing gear wheel well and fixed trailing edge of main wing.

The Choice for the Boeing 787 Dreamliner

Developed by Rolls-Royce in collaboration with its partner firms around the world, the Trent 1000 is the state-of-the-art jet engine chosen for the Boeing 787 Dreamliner, the highly anticipated, next-generation passenger jet now under global development.

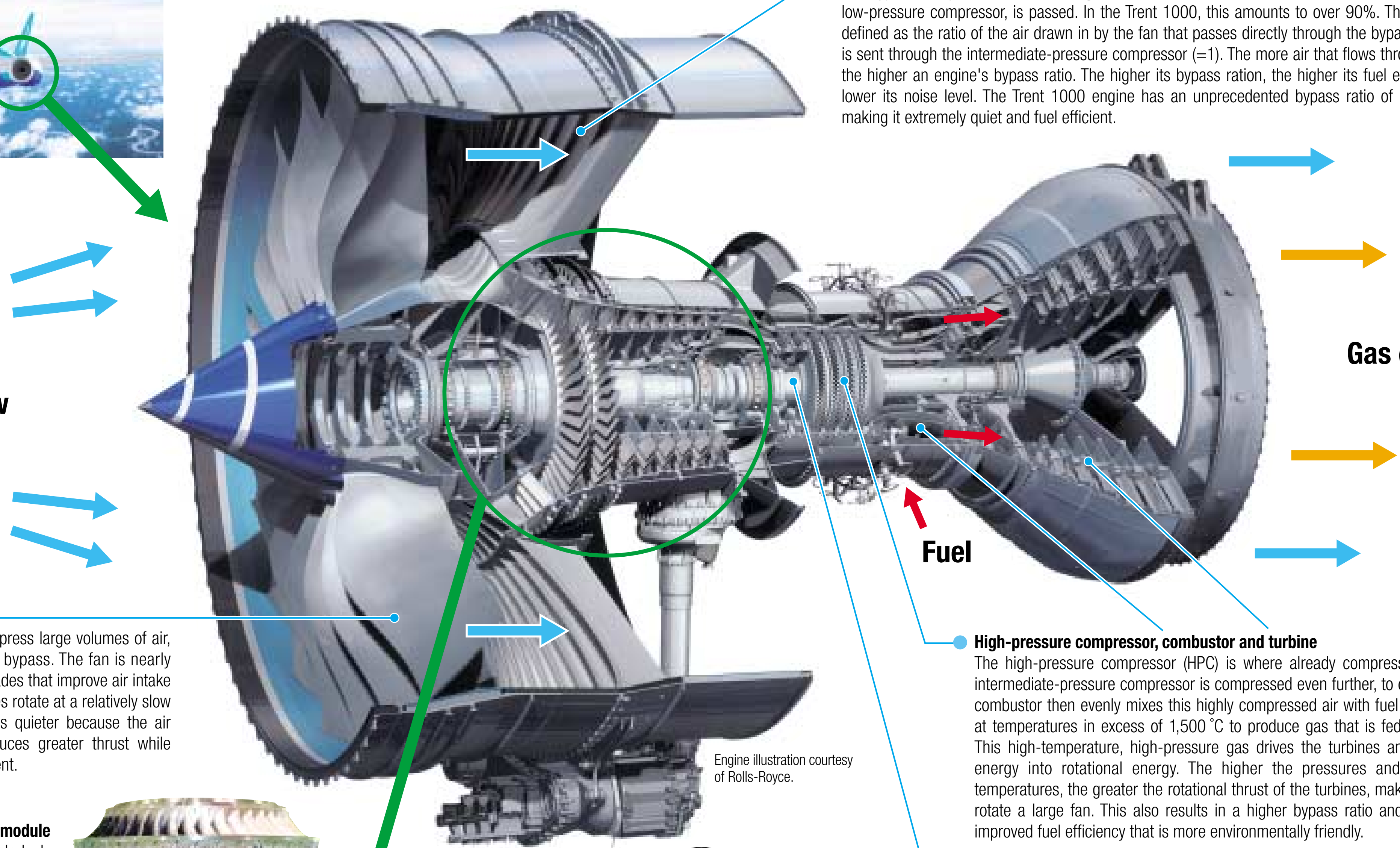
Jet engines are reaction engines, which discharge exhaust streams to generate thrust and move the aircraft forward. Jet propulsion is created by igniting the air that has been ducted through the engine's forward fan and compressed. In recent years, the majority of jet engines are high bypass turbofan in which most of the compressed air is channeled through the space between the engine's core and exterior, called the bypass, and mixed with combustion gas from the exhaust nozzle to produce a relatively slow jet stream. The result is far more efficient thrust and far less noise.

Partnering from the Early Stages of Design

Kawasaki has been involved in the development of the Trent 1000 as a Rolls-Royce partner from the early stages of the engine's design. Not only has it designed, manufactured and assembled the engine's crucial intermediate pressure compressor (IPC) module, but it also oversees a portion of the engine's operational testing as part of the development program.

The IPC module is a compressor installed between the engine's fan and high-pressure compressor. It serves to increase the pressure of ducted air from approximately 1.5 atm to approximately 10 atm.


Boeing 787 Dreamliner



Engine illustration courtesy of Rolls-Royce.

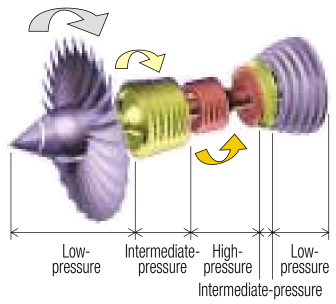
Bypass
The bypass, or space between the engine's core and exterior, is where most of the air from the fan, or low-pressure compressor, is passed. In the Trent 1000, this amounts to over 90%. The bypass ratio is defined as the ratio of the air drawn in by the fan that passes directly through the bypass to the air that is sent through the intermediate-pressure compressor (=1). The more air that flows through the bypass, the higher an engine's bypass ratio. The higher its bypass ration, the higher its fuel efficiency and the lower its noise level. The Trent 1000 engine has an unprecedented bypass ratio of up to 11 (11:1), making it extremely quiet and fuel efficient.

This is the location of the IPC module in the Trent 1000. Photo taken at Rolls-Royce's Derby plant.

Fan
The fan's spinning blades take in and compress large volumes of air, forcing it on to the rear compressors and bypass. The fan is nearly 3 m in diameter, with specially designed blades that improve air intake and compression efficiency. The large blades rotate at a relatively slow rate of 3000 rpm, meaning that the jet is quieter because the air moves at a slower speed. The fan produces greater thrust while burning less fuel, making it more fuel efficient.

Intermediate-pressure compressor (IPC) module
Designed, manufactured and assembled by Kawasaki, the IPC module is 1,240 mm long, 350 mm in diameter, and weighs approximately 600 kg. It is made almost entirely of titanium, a very strong, lightweight material that does not rust. The integrated drum (rotor) has eight disks of rotating, or rotor, blades, while the interior of the casing has fixed, or stationary, blades. This is where air compressed by the fan (approx. 1.5 atm) is further compressed to about 10 atm.

Contra-Rotation
The IPC/IPC turbine and HPC/HPC turbine are contra-rotating. This helps them work more efficiently by maintaining a straight airflow.



High-pressure compressor, combustor and turbine
The high-pressure compressor (HPC) is where already compressed air from the intermediate-pressure compressor is compressed even further, to over 40 atm. The combustor then evenly mixes this highly compressed air with fuel and combusts it at temperatures in excess of 1,500 ˚C to produce gas that is fed to the turbines. This high-temperature, high-pressure gas drives the turbines and converts their energy into rotational energy. The higher the pressures and the hotter the temperatures, the greater the rotational thrust of the turbines, making it possible to rotate a large fan. This also results in a higher bypass ratio and an engine with improved fuel efficiency that is more environmentally friendly.

Three-shaft architecture
The Trent 1000 employs Rolls-Royce's distinctive three-shaft architecture, in which three separate shafts, one each for the low-pressure turbine, the intermediate-pressure turbine and the high-pressure turbine that rotate the fan, the intermediate-pressure compressor (IPC) and the HPC, respectively, are joined together. With a turbine for each compressor, the engine makes efficient use of energy.

* A three-shaft architecture enables greater fuel efficiency since rotational velocities for the fan, IPC and HPC are configured individually for optimum efficiency.

A Distinctive Aerodynamic Nose and Bold Crimson-Red Top

The pre-mass-production Series E6 Shinkansen. Four of the cars were completed by Kawasaki at its Hyogo Works.

Four Pre-Mass-Production Series E6 Cars Go to JR East for the Akita Shinkansen Line

Cars Manufactured at Hyogo Works, Including Front Car

Construction of the seven-car pre-massproduction Series E6 for the Akita Shinkansen Line is now complete. With its distinctive 13 m long nose and its *hiun* white body, crimson-red top and silver striping, the train is the very image of "high speed."

The Akita Shinkansen runs on the dedicated high-speed Tohoku Shinkansen Line between Tokyo and Morioka, and continues to Akita on a conventional local line. Because it runs on both the high-speed line and the conventional line, the train is referred to as a "through-operation type Shinkansen."

The Tohoku Shinkansen Line has been extended from Hachinohe to Shin Aomori, with service to begin on December 4 of this year. The Series E5, called Hayabusa, will debut on the line in spring 2011 and will operate at a maximum speed of 320 kph beginning in spring 2013. Because the Akita Shinkansen runs on the same track as the Tohoku Shinkansen's Series E5, development of the new Series E6 was undertaken so it could also operate at a maximum speed of 320 kph.

Four of the seven pre-mass-production cars, including the front car, were manufactured by Kawasaki at its Hyogo Works in Kobe.

Manufacturing the front car. The aerodynamic curves of the car's elongated nose are mostly crafted by hand.

The front car is painted and dried at Kawasaki's new paint facility inside the Hyogo Works, which was completed in December 2009.

In addition to its bold color, the front car has distinctive headlights.

The calm, relaxing atmosphere of the first-class Green Car cabin.

The regular-class cabin, inspired by ears of rice at harvest.

Designed for barrier-free accessibility.

Soon to Run at 320 kph, the Highest Speed in Japan

When it is introduced on the Akita Shinkansen Line at the end of 2012, the Series E6 will initially operate on the leg between Tokyo and Morioka at a maximum speed of 300 km/h. At the end of 2013, it will begin operating at 320 kph, which will be the highest maximum speed in Japan.

The Series E6's elongated nose is shaped to reduce the noise, or tunnel boom, that high-speed trains create upon entering and exiting tunnels.

Because the Series E6 will continue running on the Tohoku Shinkansen's track, the shape of its nose and performance levels are modeled on the Series E5. But because it will also run on conventional track, its cars are narrower than normal Shinkansen cars and shorter in order to accommodate turns on conventional track that are tighter than on Shinkansen track.

While the Series E3 that currently runs on the Akita Shinkansen Line is a six-car set, the Series E6 has been extended to seven cars to match the Series E5's configuration, as well as maintaining the environmental performance, passenger accessibility and capacity levels of the E3.

Newly Developed Heater to Melt Snow During Winter

Like the Series E5, all E6 cars feature active suspension and body tilt control to increase passenger comfort during operation, and are equipped with full wrap-around inter-car fairings to reduce aerodynamic noise.

Kawasaki has manufactured many through-operation type Shinkansen, such as the Series E3, that run on both Shinkansen and conventional track in snow country. The E6 is a reflection of this accumulated experience and technology. Take, for instance, its handling of snow: In the winter the Akita Shinkansen inevitably must travel through deep snow. Coming off the wheels, this snow sticks to the undercarriage and can hinder the train's operation. Kawasaki's solution was to develop a heater that attaches to the undercarriage and melts the snow.

The train is also designed for accessibility and includes multipurpose rooms and large-size Western toilets that can accommodate electric wheelchairs. For security, there are emergency alarms in passenger cabins and restrooms, as well as security cameras in the vestibule areas. Except in the passenger cabins, the train's environmentally friendly lighting uses LEDs to reduce energy consumption.

A Bold but Refined Exterior, Designed by Kawasaki

The Series E6's design is unlike that of previous Shinkansen trains, since Kawasaki was given responsibility for the first time for the exterior and interior designs. This also marks the first time a single manufacturer has been responsible for a Shinkansen's design. The design section of Kawasaki's Rolling Stock Company has had direct and indirect responsibility for the design of numerous trains, and that helped it create the bold but refined look of the crimson-top E6. It also collaborated on the train with world-renowned automotive designer Ken Okuyama, best known for his work with Pininfarina, GM and Porsche.

Based on the idea of finely appointed and bespoke surroundings, the rain's interior is spacious and comfortable. According to the design team, the regular-class cabin was inspired by the traditional rice culture of Akita, and passengers are to feel as if they are passing through a rice paddy at harvest. The space is meant to be uplifting and to remind them of nature's bounty. Meanwhile, the first-class Green Car is a calm, relaxing space perfect for a restful journey.

The regular-class cabin seats were manufactured and delivered by Kawasaki Rolling Stock Component Co., Ltd., which is the Kawasaki Group company responsible for seating design and manufacture.

The Series E6 train will next undergo a series of trial runs to test its performance.

The pre-mass-production cars travelled by barge from Kawasaki's Hyogo Works to the Port of Kobe, where they were loaded onto a ship that carried them to the Port of Sendai, and then received by the JR East Depot in Miyagi Prefecture.

WMATA Orders Series 7000 Rail Cars

Kawasaki Rail Car, Inc. (KRC) in Yonkers, New York, has received an order for 428 subway cars (Series 7000) from the Washington Metropolitan Area Transit Authority (WMATA), which operates the third largest number of subway cars in America. The $880 million contract covers the manufacture, outfitting, assembly and testing of the subway cars at KMM's Lincoln Plant (Nebraska), with delivery scheduled between 2013 and 2016.

The contract includes an option for up to an additional 320 cars which, if all 748 cars are manufactured, could be worth $1.48 billion and run until 2018 — one of the biggest orders Kawasaki has won. The Series 7000 will replace the existing Series 1000 and 400 subway cars after delivery of the optional cars, by which time more than half of WMATA's transit cars will have been manufactured by Kawasaki.

The Series 7000 cars are being introduced as part of a new phase of customer service, and will be used in the expansion project to Dulles International Airport, replacing some of the oldest rail cars in the existing fleet, and helping ease congestion. The first stainless steel cars in use by WMATA, the Series 7000 also increases passenger capacity over existing designs by eliminating one operator compartment every two cars. State-of-the-art systems that are unavailable in the existing fleet, including monitors for displaying digital content, CCTV cameras and a communications network, are also incorporated into the design.

To date, Kawasaki has received orders for over 3,000 rail cars from a number of major US transit authorities, including New York City Transit. A proven track record in North America for delivery schedule, technical adequacy, high reliability and after-sales servicing have all contributed to the ongoing success.

The outlook for the US rail market looks bright as the American Recovery and Reinvestment Act of 2009 (ARRA) enables transit authorities across the country to build or upgrade inter-state railways. Orders for transit cars are expected to increase in the foreseeable future, and Kawasaki's orders are expected to expand both in the US and around the world.

WMATA Series 7000 Specifications
Car Type: Heavy Rail Married Pair Consist (Min: 2 cars / Max: 8 cars)
Dimensions: 23 m (L) x 3.1 m (W) x 3.3 m (H)
Carbody Material: Stainless Steel

New K Plant WHRPG System Goes to Germany

Kawasaki Plant Systems, Ltd. (K Plant), current Plant & Infrastructure Company was recently awarded a contract to supply a waste heat recovery power generation (WHRPG) system to Suedbayerische Portland Zementwerk Gebr. Wiesboeck & Co. GmbH's Rohrdorf Cement Plant. This will be the first system of its kind in Europe and will have a power generation capacity of about 6,800 kW. The plant is scheduled to go into operation in April 2012.

The project will be implemented by a consortium consisting of K Plant and Germany's largest electric machinery company, Siemens. K Plant will provide the overall plant design and engineering, waste heat recovery boilers, basic engineering for equipment to be procured by the client and technical advisory services for erection/commissioning. Siemens will provide the steam turbine and generator as well as electrical and instrumentation equipment based on plant engineering to be done by K Plant. Rohrdorf Cement Plant is responsible for building, steel construction, piping and connection with existing equipment. All possible heat sources at the plant were analyzed and evaluated in close cooperation with Rohrdorf Cement, and as a result, an innovative and very high-efficiency WHRPG has been developed.

The system is designed to recover waste heat from the calcining process with waste heat boilers and to generate electricity via a steam turbine. This energy-saving system can meet about 30% of the in-house power consumption needs of a cement plant while reducing CO_2 emissions by about 40,000 tons per year. The system has been installed at most large-size cement plants in Japan.

Since its first installation at a Japanese cement plant in the 1980's, K Plant has been a global leader in WHRPG systems, delivering more than 130 units to date with a total power generation capacity of more than 1,600 MW, and a total reduction in CO_2 emissions of more than 1,100 million tons per year. This latest contract is a testimony to K Plant's proven track record and technical capabilities.

Germany and the rest of Europe are turning their attention to energy-saving, environmentally friendly systems as a way to cope with global warming and strict environmental regulations. Interest in installing WHRPG systems at cement plants is expected to grow rapidly. This project is being supported by Germany's Federal Ministry for the Environment within the framework of its environmental innovation program.

Minebull Demining Vehicle Hard at Work in Afghanistan

The Minebull, Kawasaki's UN-certified antipersonnel landmine clearance vehicle, has cleared over 530,000 m² minefields as of June 30.

Kawasaki sold the Minebull to the Mine Clearance Planning Agency (MCPA), a non-governmental Afghan relief organization backed by the Japanese Foreign Ministry's Grant Assistance for Grass-roots Human Security Project, in July 2007. MCPA underwent a 50-day field assessment of demining operations as well as evaluation of logistical support and overall operational capability to obtain accreditation by the United Nations Mine Action Coordination Centre of Afghanistan (MACCA). MCPA started testing the Minebull's reliability in April 2009 and during the eight-month operation period, the Minebull cleared a total area of over 400,000 m².

Upon completion of testing, the Minebull was officially certified for use in MACCA's operations on December 16, 2009. Humanitarian demining operations were resumed in April 2010 by MCPA's Mechanical Demining Unit (MDU) after being suspended for the winter. The MDU successfully cleared an additional area of 130,000 m² by the end of June as scheduled, despite unusually high rainfall.

The MCPA has reported that a mechanical demining unit equipped with the Minebull cleared an area about 4.6 times larger than that cleared by a manual demining unit composed of over a dozen people. It has applied for the Grant Assistance for Grass-roots Human Security Project through the Japanese Embassy in Afghanistan to continue mechanical demining operations. Operations are set to resume soon.

Committed to international cooperation, Kawasaki continues to support MCPA's humanitarian demining project.

Acceptance certificate for Kawasaki Minebull.

Ninja ZX-10R, Four New Models Exhibited at INTERMOT 2010

Kawasaki exhibted five new models for the European market at INTERMOT 2010, held in Cologne, Germany from October 6 to 10.

The revamped Ninja ZX-10R, a large-displacement supersport model, was one of the highlights. Featuring a newly designed engine, frame and suspension systems for dramatically enhanced circuit riding performance, the all-new Ninja ZX-10R comes loaded with superior riding performance advances. These cutting-edge rider-support technologies include the S-KTRC*, Kawasaki's new traction control system, engineered specifically for racing, as well as the KIBS**, an antilock braking system designed specially for supersport motorcycles.

Kawasaki also exhibited the Z1000SX, a new model with all the great features of a supersport bike, like excellent riding performance and an aggressive full fairing plus practical features for easy riding.

Also on display were the Z750R, Kawasaki's new sport model. Featuring high-grade suspension and braking systems for enhanced sport handling, the Z750R is an upgraded version of the Z750, a medium displacement sport model that's a favorite in the European market. Kawasaki also introduced the W800, a sport model equipped with an air-cooled twin engine that offers all the classic beauty of a vintage motorcycle and a riding experience to match.

Another major attraction at the show was the VN1700 VOYAGER CUSTOM This new cruiser model is a wide and low bagger-style bike featuring a large front cowl fitted with a short wind deflector and classic saddlebags. Outfitted with a package of state-of-the-art cruising features, the VN1700 VOYAGER CUSTOM delivers more cruising comfort than ever.

* S-KTRC: Sport-Kawasaki TRaction Control
** KIBS: Kawasaki Intelligent anti-lock Brake System

Ninja ZX-10R

Z1000SX

Kawasaki

Kawasaki Gallery

Heizo Kanayama's World

Oirase Rapids (Near Hyakuryobashi), 1945-56, 31.2 x 40.8 cm, oil on panel. From the collection of Kawasaki Heavy Industries, Ltd.

Beautiful Colors that Capture the Essential Beauty of Oirase

Shusaku Sagara, **Assistant Curator, Hyogo Prefectural Museum of Art**

Flowing toward the Pacific Ocean from Lake Towada, on the prefectural border between Aomori and Akita, the Oirase River is known for the Oirase Rapids at its upper reaches. Many people are drawn to its scenic beauty, and to the many falls that dot the rapids and its tributaries.

Heizo Kanayama is said to have first visited Lake Towada and Oirase in June of 1944. From 1946 onward, amid postwar turmoil, he began to visit the area nearly every October, when the autumn foliage was most colorful. He produced many works of art on these visits.

This painting, with its mastery of perspective in a view facing upstream, captures the clear waters of the rapids during autumn near Hyakuryobashi, located a short distance downstream from Nenokuchi at the head of the Oirase River. Evident here is what poet Minoru Tobimatsu has characterized as "beautiful colors and a magnificent grasp of the essential, with minimal detail and free of explanation." Indeed, one cannot say enough about Kanayama's unified movement of both brush and water.

Heizo Kanayama and Kawasaki

Heizo Kanayama (1883 -1964) went to Europe in 1912, after graduating at the top of his class from the Tokyo University of the Arts. He won the second prize at the Ministry of Education Art Exhibition in 1916, and went on to create many masterpieces in which nature is a recurring theme. Kanayama left an indelible imprint on the history of modern art in Japan.

The Shipyard, exhibited at the Ministry of Education Art Exhibition in 1917 (and featured in *Scope 83*), is the work that first brought Kawasaki and Kanayama together. Toward the end of Kanayama's life, Kawasaki agreed to the artist's request to permanently house 138 pieces of his artwork. Kawasaki has since donated a major portion of this collection to the Hyogo Prefectural Museum of Art.