Scope

Kawasaki Heavy Industries Quarterly Newsletter

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About the Cover
The state-of-the-art Trent 1000 currently being developed by Rolls-Royce in the jet engine test facility at Kawasaki's Akashi Works.

KAWASAKI HEAVY INDUSTRIES, LTD.

Scope

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Trent 1000 Drives the Dream Machine

The state-of-the-art Trent 1000, developed by Rolls-Royce, was selected as the launch engine for the Boeing 787 Dreamliner, the new super-efficient passenger aircraft currently in the final development stages at Boeing Commercial Airplanes. Work on the Trent 1000 began in April 2004 and the engine received Type Certification right on schedule in August 2007, meeting the stringent standards of both the European Aviation Safety Agency (EASA) and the U.S. Federal Aviation Administration (FAA).

Kawasaki has been a key player in the development and production of the Trent 1000 right from the beginning. It participated in the engine's design and is responsible for the manufacture and assembly of the intermediate pressure compressor (IPC) module, a key engine component. Kawasaki is also responsible for carrying out some of the engine tests that make up part of the engine maturity program. These tests began in early August 2008 at Kawasaki's Akashi Works.

Trent 1000 engine in the test cell.

Trent 1000 Being Tested at Akashi Works

● Engine Test at Japan's Top Test Facility

The jet engine test facility, or test cell, at Kawasaki's Akashi Works is spacious enough to handle today's large aero engines with thrusts of up to 100,000 lbs (approximately 45 tons). The external dimensions of the reinforced concrete cell measure 89 m long, 14 m wide and 25 m high. Its environmentally friendly design incorporates a U-shaped structure that allows air to flow vertically in and out of the test cell's upper section to reduce the noise level.

An electrical system designed to operate the Trent 1000's electrical starter-generator, one of the engine's unique features, has been added to the test facility, which was initially completed in August 2000. Kawasaki also renovated the cell's hydraulic pump loading and engine control systems and built a new pre-rig shop and additional underground fuel tanks before the start of testing.

Kawasaki has been busy carrying out engine tests on the Trent 1000, which boasts a thrust of 53,000 to 75,000 lbs (approximately 24 – 34 tons). The engine used for these tests was assembled by Britain's Rolls-Royce and delivered to Kawasaki in June 2008 for engine maturity testing that started in early August. This engine test marks the first time the Trent 1000 engine has been seen in Japan.

● Making Sure It's Built to Last

Kawasaki offered a site tour of the test facility on September 3, inviting a number of major stakeholders and reporters, including representatives from Rolls-Royce, Marubeni Corporation, and All Nippon Airways (ANA). ANA is the launch customer for the Boeing 787 Dreamliner and has already signed a contract for the Trent 1000 with Rolls-Royce.

The tests being carried out at the Akashi Works constitute an important part of the engine's development program. The Trent 1000 is being put through rigorous maturity tests to ensure the engine's performance and durability prior to the 787's entry into service. Several thousand hours of engine tests are required before the engine can be employed on a commercial flight. Kawasaki had carried out 1,300 cycles of maturity tests known as "Fleet Leader Testing" by the end of November 2008. It plans to carry out testing for the next several years to simulate intensive short haul flight operations, such as ANA domestic routes, on one engine. A test cycle typically includes a sequence of flight operations from starting the engine, taxiing, to takeoff, cruising, landing and shutting the engine down. The duration of one cycle varies depending on the test.

An aircraft engine generally goes through an additional two-year development phase after EASA and FAA Certification. During this time various tests are conducted to ensure maximum reliability. Engine tests continue even after the development phase to make sure there are no problems. If any improvements are needed, they will be implemented in the production process.

Test facility control room. A four-person test crew working in two shifts runs engine tests between 7:00 a.m. to 9:00 p.m.

Test facility exterior.

Development, Design, Manufacture and Assembly of IPC Module

Taking Fuel Efficiency to New Heights

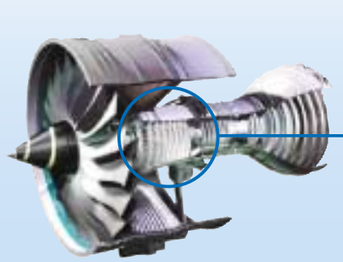
The Trent 1000 is a turbofan engine. Airflow from a turbofan engine's fan either passes through the engine's compressor or bypasses it. The ratio of air passing through the compressor to the air bypassing the engine is called the bypass ratio. A higher bypass ratio generally means enhanced energy efficiency and reduced noise levels.

The Trent 1000's bypass ratio of 11 is higher than any other bypass ratio in the industry and adds up to a quiet and energy-efficient machine. This outstanding bypass performance, along with the airplane's lightweight body, has given the 787 a remarkable 20% boost in overall energy efficiency.

Many turbofan engines have a two-spool configuration in which the high-pressure turbine drives the high-pressure compressor while the low-pressure turbine drives the fan and the low-pressure compressor. Trent engines employ a unique three-spool design that combines a high-pressure turbine and compressor, intermediate pressure turbine and compressor, and low-pressure turbine and fan. This three-spool architecture allows for aerodynamically optimal engine designs that enhance fuel economy.

Kawasaki Has Major Hand in Building IPC Module

Kawasaki has not only participated in the development of the Trent 1000 since the initial design stage, but is responsible for the manufacturing and assembly of the IPC module (Kawasaki's work share of the Trent 1000 program amounts to 8.5%). The IPC module, installed between the fan and the high-pressure compressor, is 1,240 mm long, 1,350 mm in diameter, and weighs about 600 kg. Comprised of a drum (rotor) with eight bladed discs, a casing fitted with internal stators, and other parts, the IPC module is a key component that increases the pressure of compressed air (approx. 6 atm) fed through the engine's fan to 40 atm.



Engine illustration.

IPC module.

The IPC module is installed in this section of the Trent 1000. (Photo taken at the Rolls-Royce plant in Derby, U.K.)

One-of-a-Kind Processing Equipment

The IPC module for the Trent 1000 engine is manufactured and assembled at Kawasaki's Seishin Works in Kobe. Kawasaki built this dedicated production facility in July 2006.

The IPC module is primarily composed of a titanium alloy. Although the alloy is perfect for creating lightweight products, it is a difficult material to work with. In order to make the IPC module as lightweight as possible, the titanium alloy must be as thin as possible.

Once all the materials have been processed, they are assembled into the final product at the Seishin Works. The machining work must be accurate to within 0.02 - 0.05 mm. The facility employs a number of state-of-the-art numerically controlled (NC) machines that make this kind of precision processing possible. A high-speed electrical discharge machine, the only one like it in the world, is used to make a 2 mm diagonal opening through a more than 60 mm thick component surface. The Seishin Works uses one of the world's few electron beam welding machines to weld the front-bearing housing to the front of the IPC module (near the engine fan).

Seishin Works. Manufacture and assembly are in the new dedicated facility (center in the row of three buildings on the left).

Seishin Works machining area.

The world's one and only high-speed electrical discharge machine.

One of the few electron beam welding machines in the world.

A Kawasaki robot works on precision deburring after machining.

The blade tip grinding machine grinds blades to exactly the same length.

The lathing process requires extreme accuracy.

The balancing machine detects even the slightest unbalance in the rotors.

An Assembly System Ahead of Its Time

These precision components are then assembled into an IPC module using the Trent 1000 assembly system originally developed by Kawasaki. It is a fully computerized (paperless) system for workflow and tracking. The system provides easy-to-understand assembly instructions using 3D illustrations and photos, which can be accessed online via a PC installed in each work area. All major components have been labeled with barcodes which are scanned in a fail-safing procedure designed to eliminate errors. Shop floor workers can track the workflow status of all assembly processes in real time through any of the PCs. The Trent 1000 assembly system earned high praise from Rolls-Royce as a system that's 20 years ahead of its time.

All assembly instructions include 3D images and photos via a PC.

Blades are placed in the exact location based on computer calculations.

Reaching Out Across the Globe

Development of an aircraft engine requires a huge investment and involves substantial business risks. Today, most aircraft engines are developed and manufactured through joint international programs. Engine manufacturers often sign a risk- and revenue-sharing agreement that puts them on an equal footing with their partner companies. When a company participates in a program as a risk- and revenue-sharing partner (RRSP), it bears all risks and costs of the overall program for its percentage share and receives the same percentage share of profits from sales. Kawasaki is participating in the Trent 1000 program as Rolls-Royce's RRSP. Its role in the program is a testimony to Kawasaki's superior operational and production capabilities as a global industry leader, as well as its wealth of experience and expertise in the development, production and maintenance of aircraft engines.

Kawasaki has been Rolls-Royce's RRSP on passenger aircraft engine programs for more than 20 years. A ceremony celebrating the 20th anniversary of the partnership was held in April 2008 at Kawasaki's head office in Kobe.

RRSP 20th anniversary ceremony.

Inside SWIMO, the Next-Generation Light Rail Vehicle

Rolling Smoothly with or without Overhead Wires

Electric trains are more energy efficient and generate fewer CO_2 emissions than other types of transportation systems. Next-generation light rail vehicles (LRVs) have been gaining momentum around the world, thanks to their low-floor design and low noise levels, as well as passenger- and earth-friendly features.

Kawasaki's SWIMO* is an LRV powered by the Gigacell®, Kawasaki's proprietary nickel metal-hydride battery, and can operate without overhead wires. The SWIMO test vehicle employs a three-carbody, three-bogie articulated design to enable smooth curving as well as flexibility in car combinations.

The 15 m long vehicle features floors that have been made as low as possible near the door. The aisle width is 800 mm at its narrowest section, allowing for ample wheelchair access. The SWIMO has 28 seats and can carry 62 passengers as standard capacity.

*SWIMO stands for "Smooth-WIn-Mover." It's the realization of Kawasaki's vision for a vehicle that would provide a smooth riding experience with a seamless transition to non-electrified sections, and a win-win green transportation solution via Kawasaki's innovative rail mover technology.

Five-carbody articulated unit.

Car structure
The three-carbody, three-bogie articulated tram has bogies at both ends and in the middle, allowing for smooth operation even on narrow curves. The tram layout can be changed to any configuration. A five-carbody articulated unit (20 to 30 m class), for example, can be arranged with two bogies at both ends and two bogies in the middle, as shown in the illustration.

Passenger cabin
The floor height in the cabin sections is only 360 mm. The passenger cabins at both ends have completely flat floors, providing maximum flexibility in seating arrangements.

Roof Mounting major electric devices on the roof makes SWIMO's low-floor design possible.

Charge/discharge control system
The control system, developed by Kawasaki, ensures a steady supply of power from the battery and effective use of regenerative power while controlling fluctuations in power consumption from overhead wires. On non-electrified sections the control system provides a steady supply of power from the battery when the tram is accelerating and returns regenerative power to the battery for maximum efficiency.

Braking system (regenerative brakes integrated with electronically controlled air brake system)
When braking, trains use their motor as a generator and return power to the overhead wires. This process, known as regenerative braking, is designed to enhance energy efficiency. Although power is returned to the overhead wires, transmission losses occur over long distances and if there are no other trains running nearby enough to use the regenerative power, it winds up being wasted. The SWIMO dramatically enhances energy efficiency by storing all regenerative power in its onboard Gigacell and then using it to power the motors when accelerating.

Illustration depicts the second SWIMO experimental prototype.

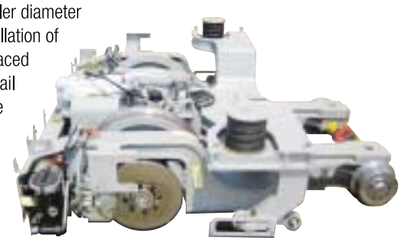
Door area
The car floors are only 330 mm off the ground at the door openings. SWIMO's 120 cm wide sliding double door is the widest LRV door in the world.

Middle bogie

Testing at Kawasaki's Harima Works.

Trial run in Sapporo during winter.

Bogies at both ends
Kawasaki has developed compact bogies designed to fit under the driving cabs at both ends of the SWIMO in order to make the cabin floor flat. While this low-floor configuration would normally result in protruding wheels (conventional LRV wheels are generally 600 mm in diameter), the SWIMO circumvents this by reducing the size of the wheels on the second axle (the one farther from the operator's cab) to a diameter of 250 mm, as shown in the picture. The smaller diameter provides enough room for the flat-floor design and installation of doors over the wheels. The larger wheels have been placed under the operator's cabin along with the motor. While rail vehicles with wheels 360 mm in diameter or smaller have a history of derailing when switching tracks, Kawasaki has come up with a breakthrough development to keep SWIMO running safely on track. Kawasaki has conducted extensive testing on its state-of-the-art smaller wheeled bogie to ensure maximum safety.



Gigacell
The Gigacell battery installed under the seats has been downsized for railway car applications and upgraded for larger output. The Gigacell is an extremely safe nickel metal-hydride battery tailored to large-scale applications. It employs a unique structure developed by Kawasaki which prevents the battery from generating excessive heat or igniting, even after quickly charging and recharging a large amount of power.

Charging time

The Gigacell can be charged in only three to five minutes after the SWIMO has traveled 10 km. That's the same amount of time it takes to turn the LRV around at a terminal.

Versatile operation
When operating in non-electrified sections, the SWIMO runs on its Gigacell batteries and returns regenerative power to the batteries when braking. Since the SWIMO is equipped with a pantograph, it charges the Gigacell while running on the power supplied from overhead wires in areas where they are available. There is no need for overhead wires when building new SWIMO lines or extending existing lines.

SWIMO blends in seamlessly with the cityscape
While overhead wires can mar the urban landscape, the SWIMO eliminates this concern and provides a more viable option for tourism planning.

New 350 kph High-Speed Train to Be Developed

Kawasaki announced in September 2008 that it would begin developing a new high-speed train, dubbed efSET*, with an eye to the global market. An entirely new initiative that is not related to its railcar development projects both at home and abroad, this makes Kawasaki the first-ever Japanese railcar maker to develop its own high-speed train for the international market. Development is expected to be complete by the end of March 2010.

The innovative efSET will achieve a service speed of 350 kph and incorporate Kawasaki's proprietary passenger comfort improvements, as well as featuring reduced environmental impact.

Kawasaki has a lengthy track record in the design and manufacture of Japan's vaunted Shinkansen bullet trains, ranging from Series 0, which came into service in 1964, up to today's state-of-the-art models. The company also supplied Series 700T trains to Taiwan High Speed Rail in 2004 and CRH2 trains to China in 2006. Based on the sound performance of those trains, Kawasaki has been able to build a strong platform in the Asian high-speed train market.

Rail travel has gained renewed prominence around the globe in recent years for its convenience and environmental friendliness. A number of countries, including the U.S., Brazil, Russia, India and Vietnam are currently constructing new networks that will add an anticipated 10,000 km of express railway tracks over the next 20 years on a global scale. Kawasaki's development of a world-class express train is expected to eclipse the plans of its European competitors.

* efSET stands for Environmentally Friendly Super-Express Train.

New Load-Haul Dump MX80 Released

Kawasaki recently released the MX80, a new load-haul dump vehicle with enhanced safety as well as environmental and operational performance.

Fitted with a new high-power diesel engine that produces fewer toxic emissions, the MX80 meets Japan's new emissions standards for off-road vehicles and is creating a better working environment in underground operations. The MX80's operator cabin comes equipped with a rollover protective structure (ROPS), a falling object protective structure (FOPS) and a climate control system that dramatically enhances operator safety and comfort. Fail-safe features include a wet negative brake that safely stops the vehicle in case of a failure in the engine or brake hydraulic systems while in operation. The new hydraulic system and increased load capacity significantly boost the MX80's operational efficiency and fuel economy. The vehicle employs the same main components as Kawasaki wheel loaders, which have a proven track record of reliability and durability, enabling Kawasaki to provide quick and dependable services.

Also known as underground mining vehicles, load haul dumps are primarily used in underground mining operations, underground development work, and large-scale tunnel construction. Built to maximize safety and mobility in confined underground working environments, these vehicles are compact with side-facing operator seats to increase the ease of forward and reverse traveling.

Demand for safer, more efficient construction machines has recently increased in pace with the growing global demand for natural resources, which is fueling underground mine development. Kawasaki launched Japan's first load haul dump, the M5N, back in 1969. Since then Kawasaki has been pioneering the development of construction machinery products with superior safety and operational performance.

New Side Thruster Plant Debuts at Harima Works

A new side thruster production plant started up in late October at Kawasaki's Harima Works. Production was moved from the Kobe Works to the larger facility to enable Kawasaki to boost output as well as operational efficiency.

Kawasaki expects the new facility to produce approximately 500 thrusters per year. That number, combined with the production volume at Kawasaki's Chinese subsidiary, Wuhan Kawasaki Marine Machinery Co., Ltd., will bring the production capacity to about 900 thrusters a year — making Kawasaki the largest side thruster manufacturer in the world. The company plans to improve price competitiveness and lead time even further with the installation of new machinery and equipment.

Side thrusters provide ships with lateral thrust and are widely utilized to maneuver various types of marine vessels, such as container ships and ferries, as they berth and unberth. The pace of side thruster production has been increasing in step with a thriving shipbuilding market that has been buoyed by the recent boom in the shipping industry.

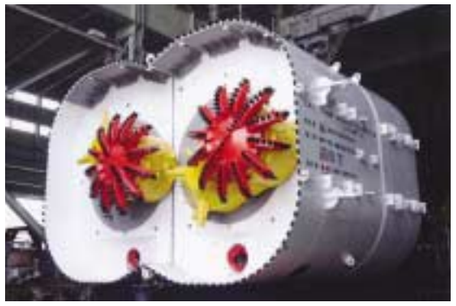
The new plant, which has been designed to respond to this growing demand, will play a pivotal role.

Kawasaki plans to build a second thruster plant at its Harima Works in order to step up production of its azimuth thruster, the Rexpeller. The additional plant will enable Kawasaki to meet the rising demand for offshore ships that has been triggered by the growing number of offshore oil field development projects.

Outline of Side Thruster Plant No. 1
- Location: 8 Niijima, Harima-cho, Kako-gun, Hyogo, Japan
- Main product: Side thrusters
- Production capacity: Approx. 500 units/year
- Total floor area: Approx. 10,000 m²

Shield Machine for Tunnel Cross-Sections Developed

In a joint development with Kajima Corporation, Kawasaki recently completed a shield machine using the APORO-Cutter* technique, a new shield tunneling method jointly developed by the two companies. The new technique can be used for constructing tunnels with virtually any cross-sectional shape, including circular, oval and horseshoe shapes. It is also suitable for tunneling through hard soil and underground obstacles.



The innovative APORO-Cutter technique uses a high-speed rotating cutter to excavate hard soil, employing a closed-face shield machine whose front end has been fitted with a rotary cutter head on a swing frame mounted to the main rotary drum (revolving drum). The cutter head quickly rotates as it turns on the revolving drum. The cutter section, comprised of a cutter head, swing frame and rotary drum, can be attached to a shield machine to excavate varying cross-sectional shapes, resulting in reduced costs and environmental burden.

The technique will be used for the first time in metropolitan Tokyo to construct an underground double-track section of the Tokyu Toyoko Line. The new shield machine will be transported to a construction site near the Toyoko Line's Shibuya Station, western Tokyo, where it will be put into operation in April 2009. Construction is scheduled to be complete in 2011.

*APORO-Cutter: All Potential Rotary Cutter

Construction Machinery Division Separates Prior to New JV with Hitachi

Kawasaki's Construction Machinery Division will be separated and become a new wholly owned subsidiary as of April, paving the way for a three-way alliance with Hitachi Construction Machinery Co., Ltd. and TCM Corporation. Hitachi will take a 34% stake in the new company via a third party allocation by the end of fiscal 2009 (April 1, 2009 - March 31, 2010) and have the option to acquire a majority stake after three years. The new joint venture is being formed to research and develop wheel loaders that will meet the new emissions standard going into effect in 2011 in Japan.

In anticipation of the Tier 4 emissions regulations, the three companies will combine their respective technologies and know-how, enabling them to strengthen the competitiveness of their wheel loader businesses. Amid the growing number of global alliances being formed in the construction machinery industry today, this agreement is also expected to enhance the companies' product competitiveness.

New Small-Medium Size R Series Robots Debut

Kawasaki released the highly anticipated new R Series robots on Oct. 1, 2008. The predecessors of the F Series robots, which featured high speeds, large torques and a wide range of motion, the R robots boast even greater speeds, higher wrist load capacities* and extended ranges. The new robots have undergone an ambitious model change and are more compact and pleasingly shaped, enhancing the atmosphere at the production site. The R Series can be utilized for an extensive range of applications, such as assembling, handling and sealing. The new E Series of robot controllers, which boost the speed and reduce the size of the D Series controllers, was released simultaneously.

The RS20N, the first robot to be released in the series, provides a maximum speed approximately 20% faster than that of the equivalent F Series robot. The maximum reach of the RS20N is the longest among its class, and a weight reduction of approximately 18% has also been achieved. The RS20N is a mid-size robot in terms of its payload capacity and range. Kawasaki will gradually roll out R Series models and E Series controllers, providing powerful, compact solutions for various payload capacities/work envelopes.

* Improved wrist torques and inertia (inertial moments) are comparable to human wrist strength. Based on these improvements, the R Series is able to reach and move a work piece located farther away.

LPG Carrier *Lotus Gas* Delivered

Kawasaki Shipbuilding Corporation delivered the *Lotus Gas*, an 80,000 m^3 LPG carrier, to LPG Horizon Panama S.A. in September 2008. The carrier, identified as Kawasaki hull No. 1620, is the 44th LPG carrier built by Kawasaki Shipbuilding and the fifth of the same model.

The 226 m long vessel employs Kawasaki's SEA-Arrow (Sharp Entrance Angle bow as an Arrow) to minimize bow wave resistance and significantly boost propulsive performance. It is equipped with four independent cargo tanks housed in the cargo hold compartments,

which are able to absorb temperature contractions for the storage of low-temperature liquefied gas. These urethane foam insulated tanks are made of special steel with low-temperature resistance characteristics, which can hold LPG at temperatures as low as -46°C. The carrier is driven by the Kawasaki-MAN B&W 7S60MC-C diesel engine, an energy-saving, ultra-long stroke, two-cycle, low-speed diesel engine. The Kawasaki rudder bulb with fins (RBS-F) has been employed to achieve maximum fuel economy.

Innovative Wind Tunnel Delivered

Kawasaki recently delivered Japan's first automotive wind tunnel equipped with a moving belt system to Fuji Heavy Industries Ltd.

The wind tunnel employs a moving belt that is situated underneath a test vehicle. The belt moves at the same speed as the wind during wind tunnel tests in order to accurately simulate actual operating conditions.

The system consists of five belts, including one beneath the vehicle body and four for the wheels, which support the vehicle's wheel load and drive the wheels in order to simulate airflow in the wheel area. The wheel belts are incorporated into a six-component balance* which is used to measure aerodynamic loads on the test vehicle.

The 65 m long, 40 m wide wind tunnel is a horizontal, closed circuit continuous flow system. Fitted with a 3/4 semi-open test section** with a 5.1 m x 3 m jet nozzle, it can generate wind speeds of up to 180 kph. It uses both outside air and cooling coils installed in the tunnel circuit to prevent an increase in the airflow temperature, which could result in errors while testing aerodynamic performance.

* Equipment for measuring the six components of aerodynamic load, i.e., three forces (lift, drag and side-force) and three moments (roll, pitch, yaw).
** A test section without a ceiling or side walls.

New Subsidiary Launches in Dubai

Operations began in November 2008 at Kawasaki's new wholly owned subsidiary in Dubai, Kawasaki Heavy Industries Middle East FZE. The new company is positioned to reach markets in the Middle East and North Africa (MENA).

Kawasaki decided to establish a Group operational base that would cover the entire MENA region with an eye to enhancing its mobility in this area, which holds huge potential for long-term growth.

The new subsidiary is located in the Dubai Airport Free Zone adjacent to Dubai International Airport. Dubai, which serves as an operational base for many foreign companies, has become the information, transportation and financial hub of the Middle East.

Kawasaki has a proven track record in shipbuilding, plant construction and industrial machinery sales in the MENA region. In addition to these existing businesses, Kawasaki plans to step up its groupwide sales activities in the region, focusing on transportation systems, gas turbines for power generation, and civil engineering machinery.

The office is located in the Dubai Airport Free Zone.

Overview of the new subsidiary:
- Name: Kawasaki Heavy Industries Middle East FZE
- Location: Dubai Airport Free Zone, UAE
- Capitalized at 1 million dirham (approx. 30 million yen)
- Major operations: marketing and sales across the entire MENA region
- No. of employees: 3

Ninja ZX-6R Among Nine New Models Unveiled at INTERMOT 2008

Kawasaki unveiled nine new models at INTERMOT 2008 in Cologne, Germany, last October. One of Europe's largest motorcycle shows, held every other year, INTERMOT provided the launch platform for the new Ninja ZX-6R, a full model change of the popular midsize supersport model. With improved chassis rigidity balance and optimized engine performance, the new model is also the first-ever commercial motorcycle to be equipped with a Big Piston Front Fork (BPF), which offers excellent damping responses. Kawasaki also presented its ER-6f and ER-6n, highly acclaimed midsize sport models that have undergone a full model change.

Also on show were the VN1700 Voyager, a full-dress V-twin engine tourer with a full load of equipment designed for long touring, and the first-ever built by a Japanese manufacturer. The VN1700 Voyager, equipped with K-ACT (Kawasaki Advanced Coactive-braking Technology), Kawasaki's first electronically controlled, combined front-rear brake system operated with an antilock braking system (ABS), pursues a high level of passenger comfort for long-distance rides. Kawasaki also presented the VN1700 Classic and the VN1700 Classic Tourer, which adds touring features to the VN1700 Classic.

Kawasaki also exhibited its KLX 250, a 250 cc dual-purpose model (for both paved/unpaved roads), and the KX450F and KX250F, exclusively designed for motocross races based on Kawasaki's expertise in racing technologies.

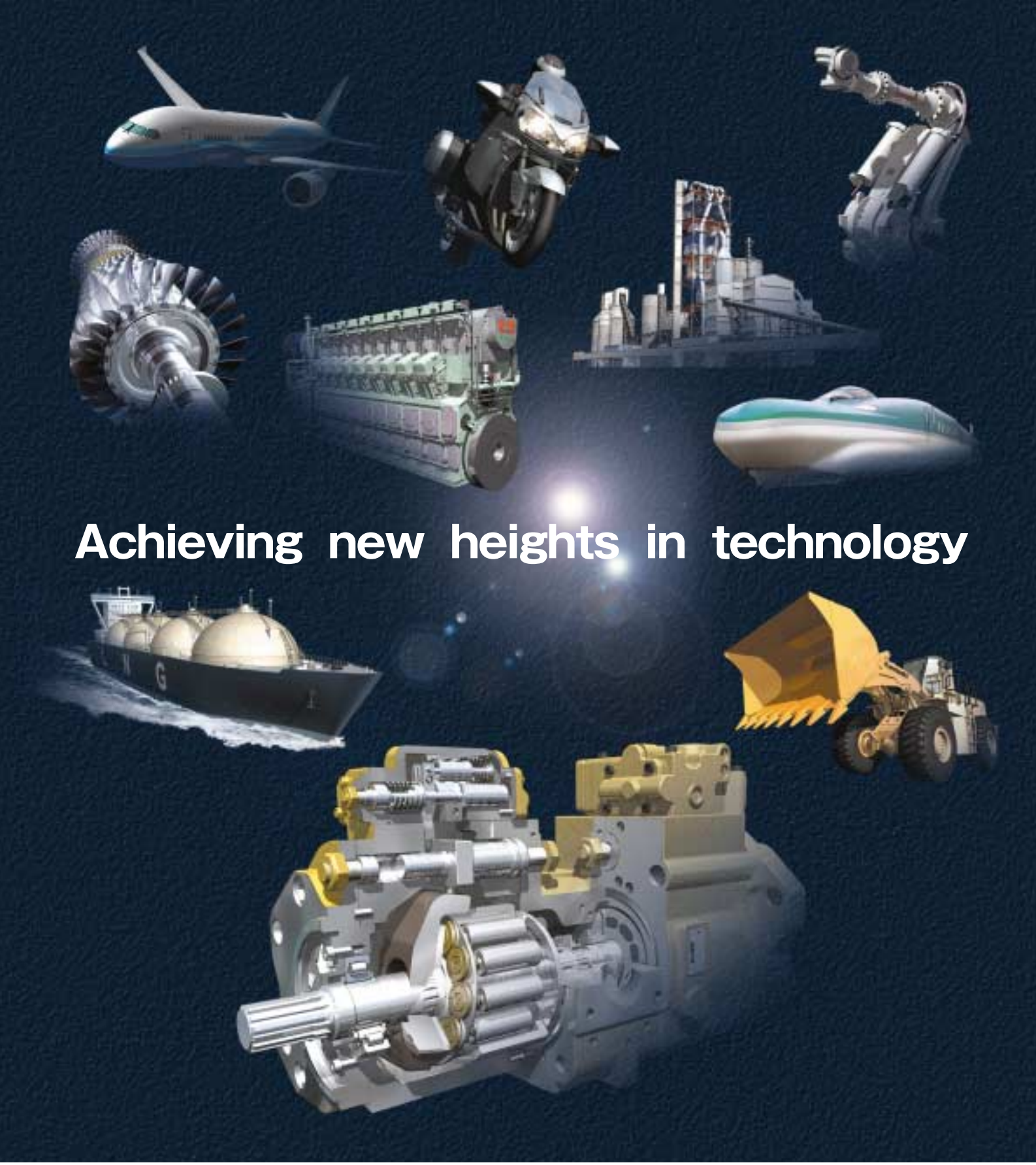
Main models exhibited

ER-6f

Ninja ZX-6R

ER-6n

VN1700 Voyager



Kawasaki Precision Machinery (KPM) develops cutting-edge technologies to meet the evolving needs for enhanced performance of hydraulic pumps, components and systems.
As a core member of the Kawasaki Group, KPM is contributing to the future of the earth's environment.

KPM Kawasaki Precision Machinery Ltd.

www.khi.co.jp/kpm/

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