Scope

Kawasaki Heavy Industries Quarterly Newsletter

April 2008
NO.75

Kawasaki

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in this issue...

About the Cover

The dual mode vehicle (DMV) currently in trial-operation in Hokkaido. Its front tires are lifted to run via rail.

KAWASAKI HEAVY INDUSTRIES, LTD.

Scope

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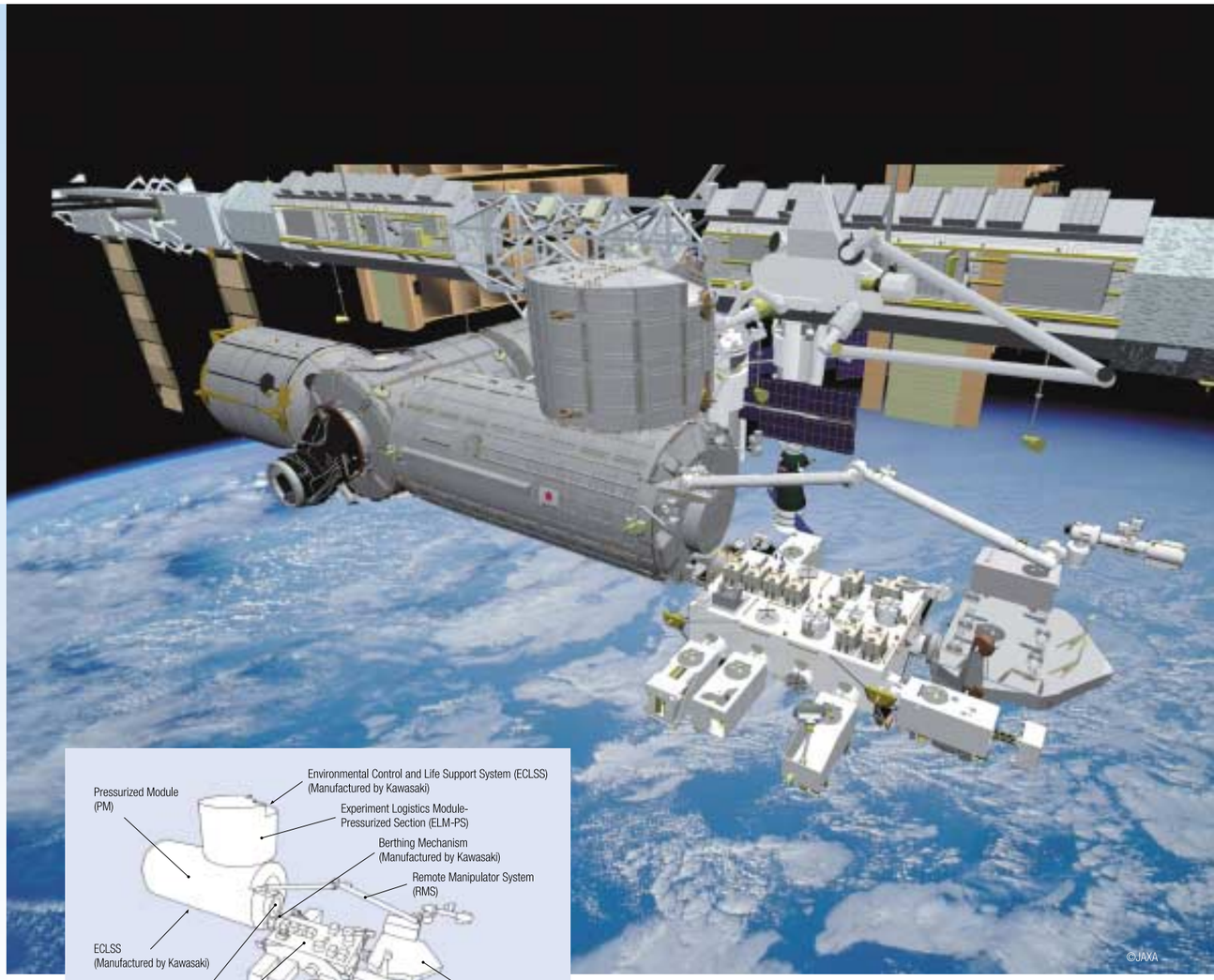
Building Hope: Assembling the JEM, Japan's First Manned Space Facility

Working on assembling the Japanese Experiment Module (JEM) known as Kibo, meaning hope in Japanese, finally began on the International Space Station (ISS) in March this year. Joint international efforts are currently in full-swing to construct the ISS, the largest space facility in human history.

Kibo components are scheduled to be transported to the ISS for assembly on three separate U.S. Space shuttle flights this year and next.

Astronauts Takao Doi and Akihiko Hoshide are taking turns boarding the space shuttle flights in March and May, to work on Kibo assembly at the ISS. Koichi Wakata will depart for the ISS late this year, and spend several months preparing for the final assembly of the Kibo module while working on a series of space experiments and ISS operations. He will be the first Japanese to stay aboard the ISS for an extended period of time.

Japan is set to make a great leap forward in space development during 2008. This issue of Frontline will explore the ISS and the Kibo module while looking at the role Kawasaki has played in the development of Kibo.



Japanese Experiment Module Kibo.

Built for the Long Haul with Space for Four

This is the design configuration of the Japanese Experimental Module Kibo developed and operated by Japan on the ISS. Kibo is Japan's first human space facility designed for long-term space missions.

Space crewmembers operating the ISS maintain communication with ground controllers. Kibo ground control operations are based at the Kibo Mission Control Center located within the Japan Aerospace Exploration Agency (JAXA) Tsukuba Space Center in Tsukuba City, Ibaraki Prefecture. The Mission Control Center serves as a command hub for Kibo operations in cooperation with NASA, which is responsible for overall ISS operations.

Pressurized Module

The Pressurized Module (PM) is the main facility where astronauts conduct experiments. It is about the size of a large bus. Inside the PM are 10 experiment racks as well as computers and other devices that provide communications, air conditioning, heat and power control functions to support Kibo operations and space experiments. The PM provides a shirt-sleeve environment in which two astronauts can work on experiments just as if they were working on the ground. Currently preparations are being made to conduct life science experiments, develop new materials and perform fluid dynamics experiments utilizing the microgravity environment. Although all of these experiments and research activities have been developed by universities and research laboratories, there is an expanding horizon of new and unique possibilities for privately funded pharmaceutical research and development, as well as advertising, educational, cultural and artistic applications utilizing space facilities.

Full-scale replica of Kibo's PM at JAXA Tsukuba Space Center. Stepping inside the module, with its rows of experiment racks on both sides, allows visitors to imagine what it's like to perform experiments in space.

Experiment Logistics Module-Pressurized Section

The Experiment Logistics Module-Pressurized Section (ELM-PS) serves as a storage area that houses materials for experiments and supplies. It is connected to the PM.

Exposed Facility

The Exposed Facility (EF) is a unique platform or "back porch" that is continuously exposed to the space environment. Astronomical observations as well as advanced space technology and other various "in-space" experiments are conducted in this vacuum of space that offers a vast field of view. Kibo is the only ISS facility with a large-scale exposed facility. Astronauts exchange experiment payloads or hardware using the Remote Manipulator System (RMS). Hardware is exchanged between the PM and the EF through the PM airlock.

Experiment Logistics Module-Exposed Section

The Experiment Logistics Module-Exposed Section (ELM-ES) is a pallet that can hold three EF experiment payloads. Payloads will be transported to the ISS via the space shuttle.

Remote Manipulator System

Astronauts operate the RMS's robotic arms from inside the PM. The arms are used to exchange experiment payloads located on the EF.

Kibo and Kawasaki

Kawasaki played a key role in the development of Kibo. It leveraged its advanced technological capabilities in mechatronics and other diverse fields to design and build the airlock, berthing mechanism and Environmental Control and Life Support System (ECLSS).

Airlock

An airlock is a unique device used to transfer experiment payloads between the PM and the space environment (EF). It is about 1.5 meters in diameter and 2 meters long. The airlock is made of an aluminum alloy (partially stainless steel) and is equipped with inner and outer hatches, a slide table inside the structure and a pressure control system outside the structure. Vacuum grease is used to lubricate hatch hinges since lubrication oils used on the ground are not suitable.

When transferring a payload through the airlock, it is first placed inside the airlock (on the slide table), the inner hatch is then closed, and 1 atm of air is released from the airlock (this air is reused since it is so precious). The outer hatch is then opened and the slide table is extended to the EF. Once moved to the exposed environment, the payload is picked up from the slide table by operating the RMS. The released air is returned to the airlock once the operation is completed.

Airlock.

Testing slide table operation.

Inspecting the airlock.

Environmental Control and Life Support System

The ECLSS includes the Temperature and Humidity Control (THC) assembly for the PM and the air circulation fan for the ELM-PS.

Due to the absence of convection in space, air in the pressurized cabin must be circulated while removing heat and moisture generated by humans and hardware in order to maintain the cabin air temperature, humidity and composition at appropriate levels. These systems are designed to capture and collect the water that is discharged with air under microgravity conditions and to minimize noise and vibration levels.

THC assembly. Two THC assemblies are installed in the PM.

Berthing Mechanism

Kibo's unique berthing mechanism joins the PM and EF. Once the four latches pull the two modules close together, they are held together in place with four electric bolts. The two modules' electric, optical fiber and liquid connectors (18 in total with some dual systems) are then firmly secured.

Berthing mechanism. It is equipped with functions to automatically align the two modules, ensuring that all connectors are securely joined in the space environment.

Hope to Soar This Year

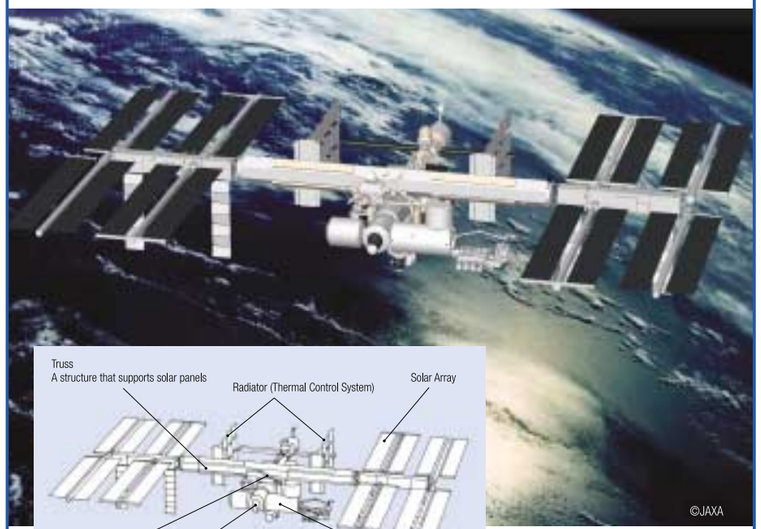
***First shuttle flight in March 2008:** Takao Doi boarded the space shuttle along with the ELM-PS.

***Second shuttle flight scheduled for May 2008:** Akihiko Hoshide will travel along with the PM and the RMS.

***Third shuttle flight scheduled for March 2009:** the ELM-ES and the EF will be transported to the ISS where Koichi Wakata is onboard. Then Wakata, who will stay on the ISS for several months, will return home to Earth on this shuttle flight mission.

Final inspection and maintenance of Kibo.

ISS: Taking Human Space Activities to New Heights Assembly Now 75% Complete and Set to Finish in 2010



International Space Station.

The ISS, now being assembled in space at an altitude of about 400 km from the Earth's surface, is a research facility that utilizes the special characteristics of the space environment to conduct various experiments and studies as well as astronomical observations that are difficult to perform on the ground. The ISS is a joint project among 15 countries—the United States, Russia, Japan, several European countries (including Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden, Switzerland and the United Kingdom) as well as Canada. It is the largest space project in human history. Assembly of the ISS, which began in 1998, requires some 50 space flights by space shuttle and Russian launch vehicles to transport various station components for assembly. Once a space shuttle arrives at the ISS, the components are taken out of the shuttle's payload bay with the shuttle's robotic arms. The components are then attached to the ISS through the operation of the ISS Remote Manipulator System and extravehicular activities. So far more than 35 assembly missions have been launched to transport ISS components. Now 75% complete, the station can accommodate a crew of three astronauts who continually operate the ISS to maintain a permanent human presence in space.

Once completed, the ISS will measure 108 meters across and 73 meters long, equivalent to the size of a soccer field, and will have a mass of some 420 tons. Six astronauts will reside aboard the ISS starting early next year. The ISS is scheduled for completion in 2010.

The ISS circles the Earth at a speed of 28,000 kph, or 90 minutes per orbit, and can be seen from the Earth with the naked eye.

See JAXA Web site for more information:
http://iss.jaxa.jp/en/

The Secret Behind the DMV's Road to Rail Transformation

Rail mode

Road mode

Innovations Transforming Transportation

Everyone is talking about the dual mode vehicle (DMV) developed jointly by Hokkaido Railway Company and Kawasaki's subsidiary, Nichijo Manufacturing Co., Ltd. It's a dream vehicle that can run on both train tracks and paved roads, and is currently undergoing trial operations by the Hokkaido Railway Company.

The idea behind building a DMV was to take a commercially available microbus and turn it into a bus that could run on railway tracks. Just like a conventional microbus, it uses its front and rear tires (inner and outer) on the road. Once it switches to rails, its retractable front and rear wheels are lowered, the front end lifts up and the front tires are locked. Load is applied to the rear inner tires and rear wheels, and a microbus engine drives the rear tires. This unique idea to build a road-to-rail microbus that runs only on its own engine power was the key factor leading to the successful development of the world's first DMV system.

Made Possible by Nichijo Manufacturing's Advanced Hydraulic Technologies

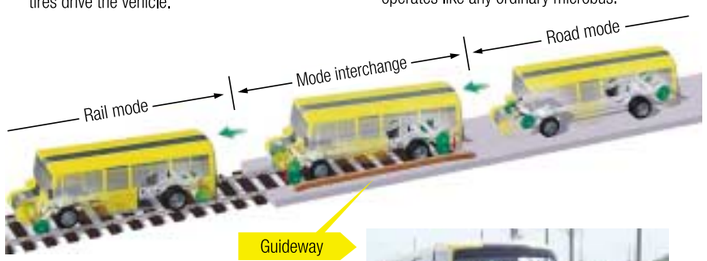
Another feature of the DMV is the remarkably short time required for switching between the two transportation modes. The vehicle switches from railroad to road mode in just 10 to 15 seconds. Since the vehicle runs on existing rails and roads, this eliminates the need for any major infrastructure development before implementation. The microbus-based DMV system also offers a cost reduction benefit. Purchasing costs are estimated to be about one-sixth, while maintenance and power costs are about a quarter of the amount required for conventional rolling stock. The DMV is drawing considerable attention from municipalities across Japan as a possible solution for local railway operators facing financial difficulties.

In the joint DMV development project, Nichijo Manufacturing employed its advanced hydraulic technologies to develop the mechanisms for retracting and extending the steel wheels and automatically controlling the load distribution to the rear tires and rear steel guide wheels during rail operation.

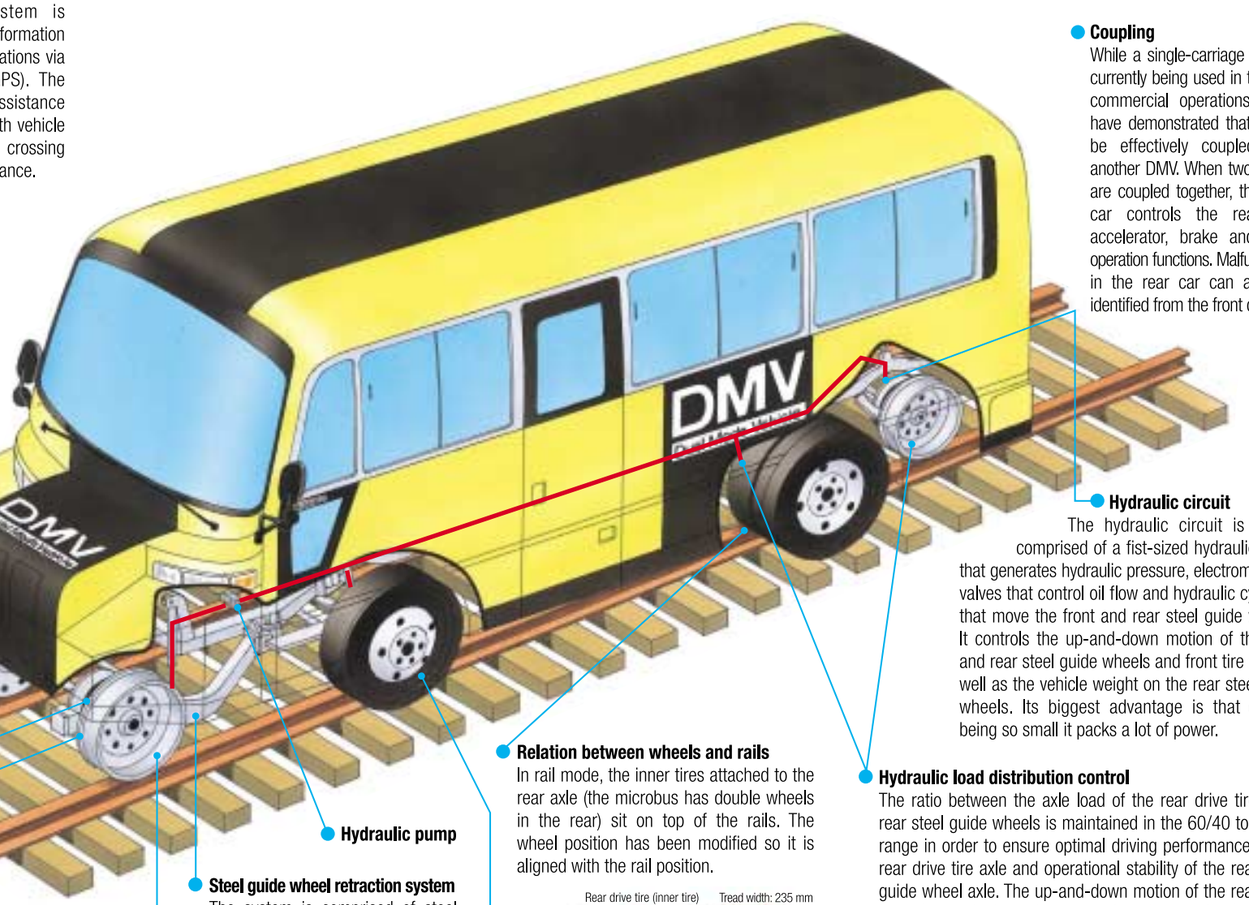
Mode Interchange System (Guideway Tire Guide System)

Rail mode
Front and rear steel wheels hug the rails to prevent derailing, while the rear tires drive the vehicle.

Road mode
With its front and rear steel wheels retracted into the vehicle body, the vehicle operates like any ordinary microbus.

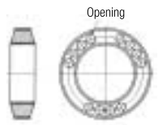


Mode switch
The vehicle slowly moves between the rubber tire guideways (which have been installed at a distance equal to the width of the vehicle) and onto the rails. The retractable steel wheels mounted at the front and rear of the vehicle then extend. The front end of the vehicle lifts and the front tires lock in place. (The whole process takes 10 to 15 seconds.)



GPS-equipped operation monitoring and driver assistance systems
An operation monitoring system is employed to send DMV location information to the traffic control center and stations via a Global Positioning System (GPS). The DMV also employs a driver assistance system that provides the driver with vehicle rail location information, railroad crossing warnings and road navigation guidance.

Mechanism and function of rubber springs
Rubber springs are made of inner and outer steel cylinders and rubber. The rubber hardness is adjusted by the openings in the rubber section. They work like coil springs used in railway cars, providing shock absorbing and steering functions during rail mode operations.



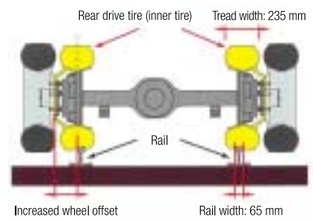
Steel guide wheel shape
In order to prevent derailing, the guide wheel flanges have been given a wider angle and more height than conventional train wheel flanges.

Hydraulic pump

Steel guide wheel retraction system
The system is comprised of steel guide wheels, an axle, rubber springs, an axle box and arm. Wheels are retracted or extended by raising or lowering the arm with the hydraulic cylinder mounted on the body.

Brake switch
Since the front tires are elevated (don't touch the rails) during rail mode, the brake circuit for the front tire axle is switched to the brake circuit for the front steel guide wheels by operating a manual lever.

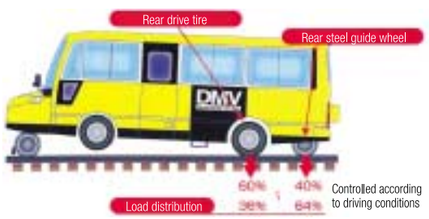
Relation between wheels and rails
In rail mode, the inner tires attached to the rear axle (the microbus has double wheels in the rear) sit on top of the rails. The wheel position has been modified so it is aligned with the rail position.



Coupling
While a single-carriage train is currently being used in the trial commercial operations, tests have demonstrated that it can be effectively coupled with another DMV. When two DMVs are coupled together, the front car controls the rear car accelerator, brake and door operation functions. Malfunctions in the rear car can also be identified from the front car.

Hydraulic circuit
The hydraulic circuit is mainly comprised of a fist-sized hydraulic pump that generates hydraulic pressure, electromagnetic valves that control oil flow and hydraulic cylinders that move the front and rear steel guide wheels. It controls the up-and-down motion of the front and rear steel guide wheels and front tire axle, as well as the vehicle weight on the rear steel guide wheels. Its biggest advantage is that despite being so small it packs a lot of power.

Hydraulic load distribution control
The ratio between the axle load of the rear drive tires and rear steel guide wheels is maintained in the 60/40 to 36/64 range in order to ensure optimal driving performance of the rear drive tire axle and operational stability of the rear steel guide wheel axle. The up-and-down motion of the rear drive tire axle is detected with sensors to determine the load, and hydraulic pressure on the rear guide wheel axle is automatically adjusted to the proper level.



Testing of Wind Power Stabilization System Starts

Kawasaki, Fuji Electric Systems Co., Ltd., Shin-Kobe Electric Machinery Co., Ltd. and Nissan Diesel Motor Co., Ltd. had jointly started testing of a stabilization system for wind power generation. Following the installation and completion of preliminary inspections and on-site testing procedures, testing began in August at the Nishime wind farm in Akita Prefecture operated by Wind-power Co., Ltd.

Wind power output varies depending on wind speed and direction. A wind power stabilization system controls fluctuations in voltage and frequency caused by changes in output. These fluctuations have been a major barrier blocking the widespread implementation of wind power generation. The stabilization system cancels the frequency fluctuations that affect the power network system in order to deliver a stable power supply.

The jointly developed wind power stabilization system is the world's first hybrid system employing secondary batteries (lead-acid or nickel hydride batteries) and electric double-layer capacitors. This hybrid structure allows for compensation to fluctuations in frequencies ranging from a few seconds to several tens of minutes at the optimal system capacity, while prolonging the life of the system.

The system is being tested at the fully operational wind power station with an aim to improving the performance, developing technologies needed for the optimal use of secondary batteries and electric double-layer capacitors, and gaining the know-how to operate it in commercial applications.

The system stabilizes power output through either individual or hybrid operation of lead-acid secondary batteries (manufactured by Shin-Kobe Electric Machinery), nickel hydride batteries (manufactured by Kawasaki) and electric double-layer capacitors (manufactured by Nissan Diesel). It consists of a bidirectional inverter equipped with a system controller for nickel hydride batteries (manufactured by Kawasaki), system controllers for lead-acid batteries and electric double-layer capacitors and a bidirectional inverter (manufactured by Fuji Electric Systems) and other components.

Optimal operation control methods are examined and evaluated during the testing. Test data will be accumulated with an eye to reducing the size of the power stabilization system and prolonging the life of the batteries.

Kawasaki's Gigacell® large-capacity nickel metal hydride battery is currently being customized for use in the system, which will expand the potential for wind power stabilization. The Gigacell offers all the advantages of nickel metal hydride batteries, including quick and efficient charge/discharge capabilities as well as operational ease at ambient temperatures. It can also be easily manufactured in large-capacity sizes and has a long life.

Wind power stabilization requires charging or discharging a large amount of power when there is a sudden surge in power output. The Gigacell is expected to perform that operation with much smaller capacities in comparison with other types of batteries. Kawasaki successfully demonstrated the Gigacell's smoothing effect on wind power output fluctuations in a test conducted jointly with the Ashikaga Institute of Technology in 2006.

Kawasaki has been making R&D efforts to improve storage batteries with the goal of expanding the use of renewable energy sources such as wind power generation under the New Energy and Industrial Technology Development Organization (NEDO) project for the Development of an Electric Energy Storage System for Grid-Connection with New Energy Resources. Kawasaki is also working to expand applications of the Gigacell to include power sources for large-size transportation vehicles such as rolling stock and regenerative electric power recovery.

Order for Offshore Natural Gas Compression Module for India

Kawasaki had recently received an order for a natural gas compressor package driven by a gas turbine, and engineering services for an offshore gas compression module from Larsen & Toubro Limited (L&T) in India. The module will be installed off Mumbai (Bombay) and operated by the Oil and Natural Gas Corporation Limited (ONGC).

The compression module is a compact facility comprising a compressor, driver, gas cooler, scrubber, valves, controllers and other equipment that compresses natural gas at sea and transports it to land via underwater pipelines. This modular concept enables optimum installation in the limited space on offshore platforms.

The module ordered this time will be assembled at L&T's fabrication yard in Hazira, India, before being shipped to Mumbai in early 2009. This marks the 50th order for Kawasaki's compression module, 34 units of which have been ordered from India.

First Order from Korea for Power Generation Systems Driven by L20A Gas Turbines

In October, Kawasaki Machine Systems, Ltd. received an order for two GPB180D (17 MW per unit) gas turbine power generation systems, featuring Kawasaki's proprietary L20A gas turbines, from Hanwha Engineering & Construction Corp., Korea. This first L20A order from Korea brings Kawasaki's total number of L20A orders to 14.

The power generation systems, driven by the high-efficiency L20A gas turbines, will be employed as the main component of the GwangMyung Community Energy System (CES) project. Samchully Co., Ltd., one of Korea's leading gas suppliers, will lead the project and supply electricity and hot water to a planned 2,000,000 m^2 multiuse residential/commercial development in GwangMyung City, west of Seoul.

The combined cycle power plant for the project comprises these two GPB180D gas turbine power generation systems, two heat recovery steam generators, and a variable extraction and backpressure steam turbine power generator. Extracted and exhaust steam from the steam turbine is supplied to the heat exchanger to produce hot water. The optimum combination of two GPB180Ds and other equipment allows flexible control of power and hot water generation corresponding to seasonal and hourly demand fluctuations. A maximum 45 MW of power and 95 Gcal/hour hot water heat can be supplied.

Kawasaki will supply the two GPB180Ds systems and Hanwha Engineering will handle the project engineering, procurement of other equipment and construction, to complete the project in 2009.

Debut Order Received for New 177,000 m^3 LNG Carrier

In November, Kawasaki Shipbuilding concluded a contract for a 177,000 m^3 LNG carrier with Tokyo LNG Tanker Co., Ltd. (wholly owned by Tokyo Gas Co., Ltd.) and Nippon Yusen Kabushiki Kaisha (NYK Line). Kawasaki Shipbuilding will build the carrier at its Sakaide Shipyard. Delivery is scheduled in 2011.

The ship, featuring Moss spherical tanks with 177,000 m^3 capacity, was developed by Kawasaki Shipbuilding leveraging the LNG transport expertise of shipowners. Since the ship has inherited the features of Kawasaki's 147,000 m^3 LNG carrier (carrying capacity 145,000 m^3), including high propulsive performance and a conventional hull size, it is able to enter the world's primary LNG terminals although it can carry significantly more LNG with the larger cargo tanks.

For the first time, the ship will be equipped with another new Kawasaki development: an advanced reheat steam turbine plant in the main engine. Dubbed the Kawasaki URA Plant, the turbine plant employs a reheating cycle to return the steam used in the high pressure turbine to the boiler, where it is reheated and sent into the intermediate pressure turbine. As a result, high thermal efficiency is achieved and fuel consumption improves by 15% compared to a conventional steam turbine plant.

Power Plant with Green Gas Engine to Begin Operation

In December, Kawasaki completed a demonstration power plant driven by its proprietary Green Gas Engine. Kawasaki plans to verify the reliability of the engine through long-term operations at the plant. Its grid-connected operation began in December, 2007, too.

The demonstration plant was built at Joetsu Energy Service (Joetsu City, Niigata Prefecture), an affiliate of Japan Energy Network. The plant will be operated with existing power plants of Joestu Energy Service.

The plant employs the largest of the Green Gas Engines, the KG-18, which is a gas-fueled, V-type, 18-cylinder engine with output of 7,800 kW.

The Green Gas Engine achieves the world's highest electric generation efficiency, at 48.5%, together with extremely low NOx emissions of 160 ppm at 0% O_2, therefore demonstrating high cost performance and excellent environmental performance. It is applicable to a wide range of markets, with four models available: 12, 14, 16 or 18 cylinders, offering outputs from 5 to 7.8 MW.

Milestone Delivery of Japan's Largest-Class LNG Tank Trailer

Kawasaki had delivered its first LNG tank trailer, with a carrying capacity of 14 tons, to Niyac Corporation. The trailer will be used for the transporting of LNG by Osaka Gas Co., Ltd. and Liquid Gas Co., Ltd.

The tank trailer features proprietary vacuum multilayer insulation technology with layers of insulation in a vacuum around the tanks to prevent heat conduction. This reduces the trailer's weight, allowing it to carry approximately 14 tons of LNG and to have a pressurized vaporizer. Incorporating the vaporizer has improved the trailer's capabilities to send out LNG, enabling higher operational efficiency to be attained.

Demand for LNG, with its low CO_2 emissions, is expected to grow and overland transport to satellite stations is expanding. Kawasaki's large tank trailer will contribute to a reduction in transport frequencies, which will significantly boost transportation efficiency and lower the environmental burden.

In April 2006, Kawasaki moved the production site of tank trailers and tank trucks from its Kakogawa Works to its Harima Works, where various tanks are produced using the production technology for large cryogenic tanks.

Construction of New Production Facility for Boeing 787 Dreamliner Begins

In February, Kawasaki began construction of another facility devoted to increased production of the Boeing 787 Dreamliner, located on the south side of its Nagoya Works 1. The existing Dreamliner facility, completed in July 2006, has already started production on the aircraft, a co-development program with the Boeing Company. Since orders for the 787 Dreamliner are increasing, Kawasaki is constructing the new facility to meet the program requirements.

The facility will comprise approximately 38,000 m^2 total floor space, and will be 189 m in length, 207 m in width and 19.3 m in height. Kawasaki is taking part in the development and production work of the Dreamliner's forward fuselage, the main landing gear wheel well, and the wing fixed trailing edge. In the new facility, the forward fuselage will be manufactured using similar state-of-the-art production equipment as that in the existing facility.

The 787 Dreamliner is a 200- to 300-seat medium-size commercial airplane with a high level of operational efficiency, incorporating a number of innovative design improvements. Cutting-edge manufacturing technology has been adopted for the aircraft, which features a world's-first composite one-piece fuselage structure. This requires a significantly different production process from that used for existing planes.

Development of the 787 Dreamliner is currently in the final stage, with an anticipated entry into service in early 2009. Kawasaki delivered its initial forward fuselage from the existing facility in early 2007 and will continue production as scheduled until the new facility is available. By enhancing its Dreamliner production capabilities, Kawasaki demonstrates its commitment to the Boeing 787 Dreamliner program and the development of commercial airplane business.

Overview of the New Facility
1. **Address:** 3-20-3 Kusunoki, Yatomi city, Aich prefecture, Japan
2. **Total Floor Space:** 38,244 m^2 (Length=189 m, Width=207 m, Height=19.3 m)
3. **Employees:** Approx. 350
4. **Main Equipment :**
   1) Automatic Fiber-Placement Machine (Co-cures the composite fuselage)
   2) Panel-Fastening Machine (Drills and fills the composite fuselage)
   3) Trim and Drill Machine (Drills and trims the composite fuselage)
   4) Ultrasonic Inspection Equipment
   5) Autoclave

Test Succeeds in Reusing Regenerative Energy of Railway Storage Battery System

Kawasaki successfully completed a verification test in November on the reuse of energy from regenerating braking, using a land storage battery system with the Gigacell®, its proprietary nickel metal-hydride battery.

The Gigacell-driven system was tested at substations of the Osaka subway, with the cooperation of the Osaka Municipal Transportation Bureau and Kotsu Service Co., Ltd., Kawasaki verified that energy generated by a train's braking could be stored and reused to compensate for the voltage fall-offs that occur during startup, operation and congested rush hours. This advance is expected to contribute to energy savings and a reduction in the environmental burden of train lines, as it will prevent a syndrome called "regeneration cancellation." It will thus allow the entire railway system to operate on less energy, reducing the contracted electricity volumes with power companies and lowering the costs associated with opening new substations.

Kawasaki also conducted tests on emergency operations during power outages and confirmed that the battery system enabled trains to reach the nearest station at a lower speed without compromising on air conditioning or lighting.

The battery system for railways was developed by Kawasaki using the Gigacell, which is tailored to large-scale applications, with quick charge/discharge capabilities. These features allow the Gigacell to be connected to overhead lines directly without a control system and minimize the power loss during charging/discharging. Because it is only 5.4 m^3 in volume, four units can be installed in parallel in substations. For enhanced safety in case of emergencies, the battery system is also equipped with high-speed DC circuit breakers on both the negative and positive terminals to disconnect the system from overhead lines and prevent short-circuiting.

Kawasaki Racers Team Up for 2008 MotoGP Victory

When new regulations changing the displacement limit for 4-stroke MotoGP machines from 990 cc to 800 cc went into effect one year ago, motorcycle manufacturers shifted into high gear to win the world's fastest motorcycle road race. Kawasaki established Kawasaki Motors Racing B.V. in the Netherlands in 2007 to ensure synergy among all relevant Kawasaki departments.

The wholly-owned subsidiary is responsible for managing the Kawasaki Racing Team's MotoGP activities. Kawasaki significantly enhanced machine performance to help the team earn its superb second-place triumph in the Grand Prix of Japan at Motegi during the latter half of the season.

Led by Racing Director Ichiro Yoda, the Kawasaki Racing Team is once again poised for victory in the 18 grueling races that make up the 2008 MotoGP championship. Joining the team this season is John Hopkins, whose track performance has taken off over the last year (fourth in the 2007 championship), along with Anthony West, who has garnered high marks for his steady victories. The racers will be backed by the power of the Ninja ZX-RR following performance enhancements over the winter. Setting their sights high, the Kawasaki Racing Team is aiming for at least a third-place showing this season—so fans can anticipate a winning performance in the world's premier motorcycle road race championships.

∗Visit http://www.kawasaki-motogp.com/ for updates.


J. Hopkins

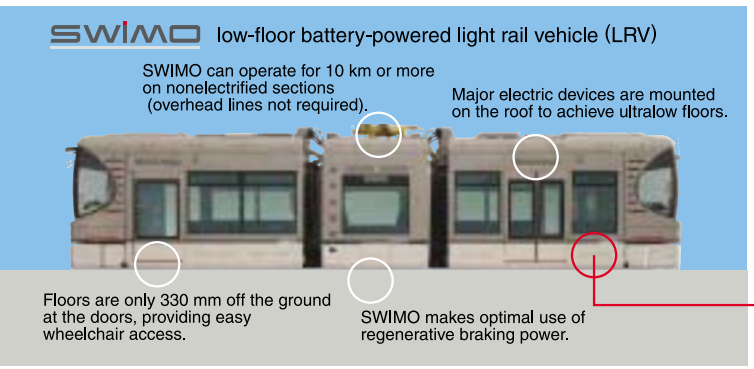

A. West


Ninja ZX-RR

Green Technology Takes to the Road

Kawasaki's environmental technology is right on track with SWIMO,® a next-generation low-floor battery-powered light rail vehicle (LRV). SWIMO is super energy efficient, barrier-free and doesn't require overhead lines. Coming soon to a street near you.

Kawasaki calls it SWIMO (Smooth-WIn-MOver) since our goal was to realize (WIN) a vehicle (MOVER) with smooth (SMOOTH) passenger boarding and exiting and smooth entry into nonelectrified sections.



LRVs are in the spotlight around the world as a low-impact solution to urban transport systems. SWIMO demonstrates Kawasaki's commitment to people-friendly, earth-friendly technologies, and features our latest pioneering rolling stock and battery innovations. With an extremely low floor that meets the barrier-free needs of all passengers, the SWIMO is powered by the Gigacell battery—which stores power generated by its regenerative braking system for significant energy savings—and thus does not require overhead lines. Kawasaki continues to leverage its environmental technologies and exper–tise to create eco-friendly products across a range of applications.

Gigacell® Kawasaki's proprietary Gigacell, a nickel metal-hydride battery with quick charge/discharge capabilities, powers the SWIMO. The battery is also used to stabilize power output from energy sources such as wind and solar power generation systems, and is easy to recycle.

www.khi.co.jp

Kawasaki