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# Touching Bases in China

## Visiting Kawasaki's Production Bases for Vessels, Marine Machinery and Hydraulic Equipment, plus Business Support Offices in Shanghai

Kawasaki is moving full steam ahead to expand its operations across the globe. A major part of that expansion strategy includes further inroads into China and other key markets in Asia, where the company has set up more production and sales bases than ever.

With the Beijing 2008 Olympic Games to be held this August and the Shanghai World Expo just two years away, China

has moved front and center in the international spotlight. Kawasaki has been successfully doing business in China since 1979, where it has ridden a growing wave of economic expansion.

Kawasaki operates within a wide range of fields in China, with offices covering nearly every corner of this vast country. In this issue of *Frontline* we touch base with three Kawasaki businesses—a shipbuilding company, a marine machinery manufacturer and a hydraulic equipment manufacturer located along the Yangtze River—that are performing better than anyone could have ever imagined.



About the Cover

Cross-section of the bow of a 10,000 TEU container ship being constructed at NACKS' first shipbuilding dock.

KAWASAKI HEAVY INDUSTRIES, LTD.

Scope

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# Second Shipbuilding Dock Launched

## Nantong COSCO KHI Ship Engineering Co., Ltd. (NACKS)



NACKS office building.

This bustling urban center with a population of 7.8 million sits on the northern banks of the Yangtze River in southern Jiangsu Province.

It's here where you will find the head office and shipyard of Nantong COSCO KHI Ship Engineering Co., Ltd. (NACKS). The entire facility occupies a piece of property that measures a whopping 1,020,000 m<sup>2</sup> right on the edge of the Yangtze River.

NACKS was established in 1995 as a joint venture between Kawasaki Shipbuilding Corporation (then Kawasaki Heavy Industries, Ltd.) and China Ocean Shipping (Group) Company (COSCO). It is not only the first joint venture in the Chinese shipbuilding industry but a major player in the field, with a massive shipyard. Kawasaki and COSCO have worked together to combine Kawasaki's world-class ship design know-how and cutting-edge construction technologies with COSCO's superior ship operating capabilities to make NACKS even bigger.

### ● From Shanghai across the Yangtze to NACKS in Nantong

Stretching over 6,300 km, the Yangtze River is the longest river in China and the third longest river in the world. If you start at Shanghai, situated at the mouth of the Yangtze, and travel about 110 km north along this lingering waterway you will come to the city of Nantong.

### ● Building 50 Ships with a Single Dock

NACKS delivered its very first ship, the *Fenghai*, a bulk carrier with a deadweight capacity of

47,980 tons, to COSCO back in 1999. Since then, NACKS has built about 50 vessels, including bulk carriers, container ships, very large crude oil carriers (VLCCs), and pure car carriers with a capacity of 5,000 vehicles.

Remarkably, NACKS has achieved this amazing feat of production with just a single shipbuilding dock. NACKS boasts a superior operational efficiency that is probably the highest in China, making it a shining star within the industry. The key to the company's success lies with its outstanding team of 200 design and development engineers, which has taken shape with the support of Kawasaki Shipbuilding. The company can proudly boast never encountering a single hitch in building any of the 50 vessels. This is a major accomplishment due in no small part to the relationship of trust forged between the company's Japanese and Chinese corporate parents.

NACKS' first shipbuilding dock is 350 m long, 68 m wide and 12.8 m deep. It is equipped with five cranes including two 300 ton gantry cranes. On the premises of the NACKS shipyard are a cutting shop with the capacity to process up to 21,600 tons of steel per month, an assembly shop designed for assembling block units that weigh up to 200 tons, a painting shop with a daily output capacity of up to 6,000 m<sup>2</sup>, as well as an outfitting shop capable of fabricating 8,600 pipes per month. NACKS' outfitting quay is 540 m long and equipped with two cranes.

### ● 500 m x 80 m Second Dock

A second shipbuilding dock has recently been added to the shipyard. This dock was constructed



Outfitting quay to be expanded from 540 m to 920 m in the second expansion phase.



Coating a ship with paint. The coating process, which prolongs the life of a ship, meets the new, stricter international standard.

Construction of a 10,000 TEU container ship in NACKS' first dock reaches its peak.



Second shipbuilding dock started operation in May.

as part of NACKS' second expansion phase. At 500 m long, 80 m wide and 12.8 m deep, the new dock is much larger than the first dock. It also boasts five cranes including two 800 ton gantry cranes.

The second dock's larger cranes and

increased capacity make short work of handling larger blocks and dramatically cut the time needed to complete a shipbuilding project. Where it takes about three months to assemble a 10,000 TEU container ship on the first dock, the job can be finished in only two months on

the second dock.

In addition to the construction of the second dock, other shipbuilding facilities have also been enhanced. The capacity of the cutting shop was increased by about 1.8 times, while the capacity of the assembly shop was doubled. The painting shop is now equipped to do 1.5 times as much work as before and the outfitting quay is being extended from 540 m to 920 m.

● **Second Dock to Launch Cutting-Edge Ships**

The second dock started operations on May 8 to keep pace with China's fast-growing shipping market. NACKS now plans to place more emphasis on personnel development to boost its design and development capabilities. Using its proprietary design techniques, the company hopes to design new ship models that are not available in the Chinese market, such as 300,000 ton VLCCs, and pure car carriers with a capacity of 6,200 vehicles, 300,000 ton class VLOCs, and 205,000 ton bulk carriers. This plan of course includes enhancing overall



Large block units are assembled in the assembly shop.

quality and customer services as well.

NACKS also plans to move forward with establishing a construction system for liquefied natural gas (LNG) carriers, which require extremely sophisticated technological capabilities. It has already completed technical validation on the membrane design for an LNG carrier.

● **Building a Solid Foundation of Expertise**

The main power fueling NACKS' phenomenal growth is its people. They are the driving force



Block units are assembled into a ship on the dock.

that keeps the company moving forward. NACKS currently employs 2,650 people for its clerical, engineering and shop-floor positions (including external and temporary workers). Only a mere sixteen employees dispatched from COSCO and nine from Kawasaki Shipbuilding are included in this workforce total.

NACKS sends mainly its production employees, including design engineers and assembly workers, to Kawasaki Shipbuilding's Sakaide Works for one year of training. A total of 670 employees have already taken part in the training program, with another 20 employees



Festive launching ceremony for a newly built ship.

scheduled to participate in the program this year. This training program serves as the foundation that supports NACKS operations.

● **Emerging Global Shipbuilding Leader**

The completion of the second shipbuilding dock has rapidly accelerated the growth of NACKS. The company is likely to become one of the top shipbuilding companies in China by 2010, if not the No.1 shipbuilder. By all accounts, NACKS is playing a vital role in shaping the future of the global shipbuilding industry.

# Second Factory to Go Online in Fall

## Kawasaki Precision Machinery (China) Ltd. (KPMC)

Company flags whipping in the wind on a sunny spring day in Suzhou.



KPMC's head office and factory.

● **Facilities and Technologies Meet Highest Standard**

Winding our way down the Yangtze we come to Lake Taihu in the province of Jiangsu. Situated on the lake's tranquil shores is Suzhou, a city hailed as the "Venice of the Orient" for its charming ambience and network of canals that crisscross the timeless urban landscape.

Tucked away in an industrial park in suburban Suzhou we find Kawasaki Precision Machinery (China) Ltd. (KPMC). This company with 40 employees was established as a wholly-owned Chinese subsidiary of Kawasaki Precision Machinery Ltd. As the world's leading manufacturer of hydraulic pumps for excavators, it has garnered the lion's share of the global market. KPMC's core product is its

hydraulic pump for 20 ton class excavators. Since the first system was completed in June 2006, the company has been operating at full capacity.

KPMC's mission is to supply products that measure up to those produced in Japan. To fulfill that mission the company employs the exact same kind of production facilities and technologies as KPM. A consistent level of quality is ensured by regular visits from KPM engineers to KPMC every month.

KPMC currently produces 12,000 hydraulic pumps and 1,000 hydraulic motors annually. Most of these products are supplied to Chinese companies such as Liugong and Sany Heavy Industry, while the balance is supplied to Japanese and Korean companies.

● **Forecast is Sunny**

The KPMC factory takes main components imported from Japan (KPM) and puts them into finished products through a series of processes that include finishing/cleaning, assembly, testing, and coating.



KPMC's core product, hydraulic pumps for 20 ton class excavators, ready to be shipped.



Assembly line workers carefully and quickly put components together.

Locally hired employees are trained by experienced Japanese engineers. The factory employs a "poka-yoke" method to make its assembly process failsafe. The error-prevention system, designed to achieve greater efficiency and quality, shows every step in the assembly process on a display monitor as new products continually roll off the assembly line and into the shipping area.

China's commitment to develop its infrastructure has fueled a booming construction machinery market in which there is no let-up in

sight. KPMC intends to open a second production facility to keep up with the growing market demand. It has already acquired a factory building near its current location that will be ready for mass production in September.

Once operations at the second plant kick off, the annual production volume of hydraulic pumps will increase to somewhere between 15,000 and 16,000, while the annual production volume of hydraulic motors will increase to 10,000. KPMC sees the outlook for the future as being bright all the way up until 2015.

# Production Volume Triples in Five Years

Wuhan Kawasaki Marine Machinery Co., Ltd. (WKM)

● **Working Hard to Produce 380 Units This Year**

Just an hour and a half away from Shanghai by airplane is the city of Wuhan in Hubei Province. Home to some 8 million people, it is located along the upper reaches of the Yangtze River, about 1,200 km from the river's mouth. The river cuts across the entire city, dividing it into

three sections: Wuchang, Hanyang and Hankou. The Wuhan Yangtze River Bridge is the first highway-railway bridge (1,670 m long) to span the Yangtze River.

The city is also home to Wuhan Kawasaki Marine Machinery Co., Ltd. (WKM), a major manufacturer of side thrusters. The company was founded in 1995 as a joint venture between



Semifinished side thruster.



Getting ready to mount a propeller onto a side thruster.



WKM factory buildings. In the foreground is the assembly/testing shop.



WKM factory buildings. Pictured in front is the assembly/testing shop.

Kawasaki and the Wuhan Marine Machinery Plant, China's leading marine machinery manufacturer, affiliated with what was then the China State Shipbuilding Corporation.

WKM has been riding a tide of good fortune as the Chinese shipbuilding market continues to swell and push demand for vessels with side thrusters—like container ships, chemical tankers and various workboats—higher and higher. A side thruster is a propulsion device (generally a screw propeller) installed in a tunnel built into the bow or the stern of a ship below the waterline. It is used mainly for turning or maneuvering the vessel sideways.

WKM's production volume for side thrusters tripled between 2002 and 2007, with the cumulative volume reaching 1,000 units in June

2006. The company aims to produce 380 units this year. The production volume for 2007 totaled 305, including 159 units supplied domestically.

● **Quality First Commitment Earns Customer Trust**

WKM's sales have been buoyed not only by China's thriving shipbuilding industry but also by a commitment to quality that has earned it an excellent reputation in the marketplace. WKM provides its new employees with intensive training to ensure consistent quality. If any problem occurs, the company carries out a thorough investigation and analysis and then takes appropriate action. It is company policy to solve any problem occurring after delivery of a product onsite within 24 hours. WKM does everything possible and offers the best solution to keep its customers satisfied. This *quality first* commitment has created tremendous customer confidence in its products.

WKM's factory consists of welding, machining and assembly/testing shops that are functionally positioned adjacent to each other. The company runs an extremely tight ship, with facilities that are always kept immaculately clean.

The machining shop is equipped with state-of-the-art machining tools including NC (numerically-controlled) machining centers. All 196 of its employees are working hard to achieve this year's goal of producing 380 thruster units.

Many of its employees are state-certified crane operators, welders or other licensed trade professionals. Women make up a significant portion of WKM's workforce. The ceiling cranes that continuously move back and forth across the factory ceiling are operated by an all-female work crew.

● **Fully Booked until 2009**

Side thrusters are being increasingly used in tankers and bulk carriers as well as other vessels. WKM has received orders from ship owners as far away as Singapore and Malaysia. The company is fully booked until 2009, but with orders continuing to pour in, it is planning to boost production.

## Exciting News from Shanghai

● **Shanghai Liaison Offices Centralized**

Kawasaki operates various businesses in China in addition to the three companies featured in this article. Six of the trading companies and liaison offices supporting these operations, which had been scattered throughout Shanghai, have now been relocated to the 10th floor of the Chong Hing Finance Center, one of Shanghai's newest high-rise buildings.

These offices include Kawasaki Heavy Industries Consulting & Service (Shanghai) Company, Ltd., providing consultation and sales/business expansion support services to Kawasaki group companies; the Kawajyu Shoji Co., Ltd. Shanghai Representative Office, conducting research and liaison work; the Kawasaki Hydromechanics Corporation Shanghai Representative Office, performing hydraulic press-related research and liaison work; the Kawasaki Machine Systems, Ltd. Shanghai Representative Office, engaged in research and liaison work related to gas turbine power generation systems; the Kawasaki Precision Machinery (China) Ltd. Shanghai Branch Office, selling hydraulic equipment; and Kawasaki Heavy Industries Machinery Trading (Shanghai) Co., Ltd., which provides Kawasaki Plant Systems products as well as design consulting and after-sales services to the Chinese market.

● **Synergy in Teamwork Boosts Kawasaki's Brand Power**

Now that these six companies are operating in close proximity, they can more easily share information and interact with each other, resulting not only in greater synergy but also better risk management. When information make its way to the right place, it can open doors to new opportunities. This is the unique power that comes from leveraging the strengths of the entire Kawasaki Group.

The new location will provide a foundation upon which the six companies can work together, and build strong relationships between the Kawasaki brand and customers in Shanghai as well as the rest of China. The impressive view of Shanghai's sprawling People's Park from the new 10th floor location provides an inspiring backdrop for the six offices as they work side by side under the Kawasaki logo.



Main reception area of the business support center in Shanghai housing Kawasaki's six trading companies and liaison offices.

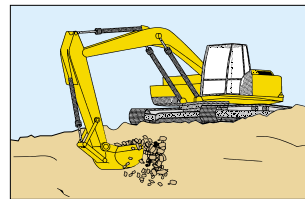


Inside the office of Kawasaki Heavy Industries Consulting & Service (Shanghai) Company, Ltd.

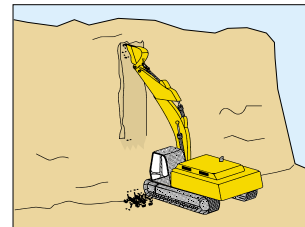
# In-Depth Look at the Hydraulic Systems That Move Excavators

## Every Movement Driven by Hydraulic Power

Hydraulic excavators used on construction sites are powerful and versatile machines. They are used for digging, loading soil onto dump trucks, grading, landscaping, demolition, and more. The power to do all this work as well as drive the vehicle depends on hydraulic pressure. Small but powerful hydraulic equipment lies at the core of a hydraulic excavator.



Digging and loading



Slope excavation and grading

Japan produces more than 60% of the hydraulic excavators sold on the global market. Kawasaki Precision Machinery (KPM)'s hydraulic systems are used not only in hydraulic excavators made in Japan but also in those produced for overseas markets, where they have earned high marks for their superior quality and performance.

## Superior Maneuverability

The boom, arm and bucket of a hydraulic excavator move with the same seemingly effortless motion as a person's arm and hand. The vehicle itself can start and stop on a dime without any hesitation. These smooth precision movements are all made possible by hydraulic systems that enable the operator to completely control the excavator bucket and other parts as if they were an extension of his/her body. The operator transmits his/her intentions to the control valves via hydraulic cylinders. The control valve is a router that adjusts the amount of oil sent by the engine-driven hydraulic pump. It supplies the exact amount of oil to the cylinders that the operator desires, depending on how he/she wants to move the bucket or the arm. The pressure of the oil then drives the bucket cylinder and arm cylinder that actuate the bucket and arm.

The means for transmitting an operator's intentions are improving everyday with rapid technological advancements in everything from the remote control of hydraulic pilot valves to microcomputer control of sensors, to the direct electrical manipulation of control valves. A pioneer in this field, KPM has been working at the frontiers of technology to deliver products that are on the cutting edge of research and development.

**Arm cylinder**  
The arm cylinder moves the arm in relation to the amount of oil (pressure) distributed via the control valve.

**Arm**

**KMX15**



**Control valve**

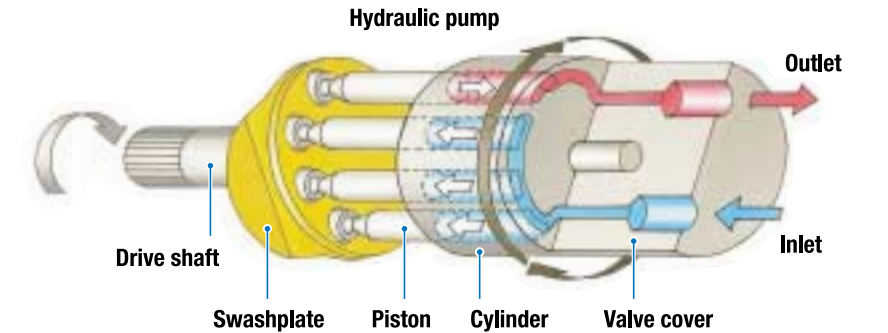
The control valve works like an extension of the operator's body to deliver the exact amount of oil from the hydraulic pump as desired. It is an ultra-precision device that requires highly advanced machining technology. The degree of accuracy required can be as precise as 0.005 to 0.001 mm.

**Boom cylinder**  
The boom cylinder moves the boom in relation to the amount of oil (pressure) distributed by the control valve.

**Boom**

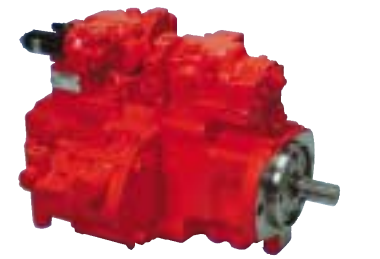
**Bucket cylinder**  
The bucket cylinder actuates the bucket in response to the amount of oil (pressure) distributed by the control valve.

**Bucket**



**Hydraulic pump**

Powered by the engine, the hydraulic pump supplies oil to the hydraulic motors and cylinders via the control valves to transmit the energy (energy of flow and pressure) of the fluid (oil).



K3V/K5V/K7V series

**M2X/M5X series**



**Motor**

The hydraulically powered motor turns the upper section of the hydraulic excavator.



**PVD8P**

**Remote-control pilot valve (for driving)**  
This remote-control pilot valve is used to convey the operator's intention when moving the excavator either forward or backward.

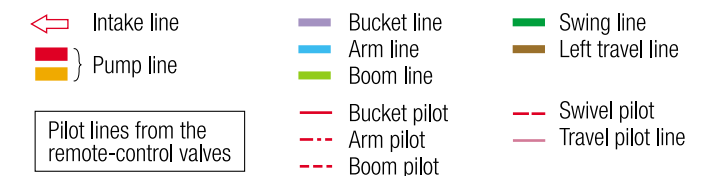


**PV48K**

**Remote-control pilot valve (for operating)**

The remote-control pilot valve is a device used for accurately conveying the operator's intention to the hydraulic system. Each excavator is equipped with two four-way remote-control pilot valves. Since each valve can control up to two movements, a total of four movements can be carried out simultaneously. Thanks to KPM's proprietary design mechanism, the system requires less input force, delivers a quick response and provides stable performance.

**Speed motor**  
Hydraulically powered, the speed motor moves the hydraulic excavator backward and forward.



## KPM to Expand Main Factory for Hydraulic Pumps

In April, Kawasaki Precision Machinery, Ltd. (KPM) began building a new facility to manufacture hydraulic pumps for construction machinery at its main factory in Kobe in order to meet increasing demand in



the global market. The company also began reorganizing its main factory to enhance production capacity for various hydraulic products. The new facility, with a total investment of approximately 8 billion yen, is scheduled to begin production in April 2009 and go into full operation in June 2009.

In light of anticipated demand for new types of hydraulic pumps, KPM will move its production line for these pumps to the new facility. It plans to install additional production equipment in the new facility in order to establish an integrated manufacturing system that will encompass everything from machining to assembly and operation. KPM will concentrate production lines for control valves along with new production equipment in the space that will become available in the existing facility after moving the production

line for hydraulic pumps to the new facility. It also plans to install production equipment for hydraulic motors and core parts in their respective production facilities in order to increase the main factory's overall production efficiency and KPM's hydraulic product manufacturing capacity. ::

### Overview of the New Facility

Address: 234 Matsumoto, Hasetani-cho, Nishi-ku, Kobe, Japan  
 Products: hydraulic pumps  
 Production capacity: 48,000 units/year (as of June 2009)  
 Total floor area: approximately 10,000 m<sup>2</sup> (bi-level structure)  
 No. of employees: 100 (projected as of June 2009)

## EarthTechnica Becomes Kawasaki Subsidiary

On April 1, Kawasaki bought all of Kobe Steel, Ltd.'s shares in EarthTechnica Co., Ltd. EarthTechnica was originally a 50/50 joint venture between Kawasaki and Kobe Steel, two Japanese crushing equipment industry leaders. It began operations in July 2003 after the two crushing equipment businesses agreed to merge their marketing and design divisions. The two companies transferred their manufacturing operations to EarthTechnica in April 2005.

Since the merger of the Kawasaki and Kobe Steel divisions, EarthTechnica has worked on strengthening its operational foundation. It has been implementing measures aimed at integrating the operations of the two former divisions in order to enhance its sales networks and product lines, develop new products with

its combined technological capabilities and increase efficiency by streamlining production lines to eliminate overlapping products. EarthTechnica has also strengthened and expanded operations in the area of resource recycling and environmental engineering, which is expected to take off in the near future.

Working under the Global K medium-term business plan adopted in September 2006, Kawasaki has implemented a group-wide initiative to develop energy and environmental engineering into a business that will serve as a new pillar for the group. Kawasaki proposed this recent deal with Kobe Steel in line with this plan.

EarthTechnica will play a key role in Kawasaki's energy and environmental engineering business. Kawasaki will actively

invest its management resources in the marketing, technical and financial operations of EarthTechnica to further strengthen and expand its environmental engineering business. Kawasaki will also work to effectively restructure EarthTechnica's sales, engineering, development and manufacturing operations with an eye to boosting its bottom line and strengthening its operational foundations. ::

### About EarthTechnica

President: Shuichi Nose  
 Major operations: design, manufacture and sale of crushing plants and resource recycling equipment  
 Paid-in capital: 1.2 billion yen

## Korea's First Offshore Gas Compression Module Shipped

In April, Kawasaki shipped an offshore gas compression module from its Kobe Works for the Donghae-1 Gas Platform Modification Project being conducted by the Korea National Oil Corporation (KNOC).

The compression module is a compact facility comprising compressors, a driver, gas cooler, scrubber, valves, controllers and other equipment used to compress natural gas at an offshore platform and transport it to land via underwater pipelines. This modular concept enables optimum installation in the limited space on offshore platforms.

Since the module is built to be lifted from a single point and has been test-run before shipment, only minimal installation and preparatory operations are required.

Even though it is equipped with two compressors, the module boasts a low gross weight of less than 700 tons and meets strict weight restrictions for installation on the existing Donghae-1 offshore gas platform, located near the coast of Ulsan, Korea.

Kawasaki has a proven track record in this business field, having manufactured and delivered 48 modules, mainly to India and

Malaysia. This latest shipment is to become Korea's first gas compression module and is a testament to Kawasaki's expertise. ::



## Motor-Driven Centrifugal Compressor Units Delivered to Saudi Arabia

In March, Kawasaki completed the final delivery of six motor-driven centrifugal compressor packages from its Kobe Works to Saudi Arabia.

The order was received in January 2007 from Aramco Overseas Company B.V., a subsidiary of Saudi Arabian Oil Company. One of the centrifugal compressor packages went to the Nuayyim ASL Crude Increment -100 MBCD project to install in a grassroots facility to process an additional 100 MBCD of crude oil from the Nuayyim field and downstream facilities. Another package went to the Hawtah Stabilizer Upgrade Project to

provide additional crude degassing facilities, which is processing Arab Super Light (ASL) crude from both the Hawtah and Nuayyim fields in Saudi Arabia for the Saudi Arabian Oil Company.

The motor-driven compressor packages are used to compress natural gas and are installed in the Nuayyim Gas and Oil Separation Plant and the Hawtah Stabilizer Unit.

Kawasaki has supplied a total of 231 compressor units worldwide, including 37 to the Middle East. The company will continue efforts to increase sales of compressors and compression systems to the area. ::



## First M7A-03D Gas Turbine Power Generation System for Germany

Kawasaki's German subsidiary, Kawasaki Gas Turbine Europe GmbH, recently received its first order for the GPB80D gas turbine power generation system powered by Kawasaki's 7,000 kW class M7A-03D gas turbine. The order was placed for a Munksjö Paper GmbH production plant in Unterkochen, Germany.

Munksjö Paper will work jointly with a public utilities company, Stadtwerke Aalen, to build a cogeneration system comprised of a gas turbine power generation system and a heat recovery boiler in its production plant in

Unterkochen. The cogeneration system is expected to cut carbon dioxide emissions by 30%, or 30,000 tons annually, making the energy supply system for the plant environmentally friendly. Exhaust gas from the gas turbine power generation system will be recovered by a heat recovery boiler and supply steam to the plant's production lines, resulting in an overall efficiency rate of 86%. The GPB80D gas turbine power generation system is scheduled to begin operating this September.

Development of the system, driven by

Kawasaki's new M7A-03D gas turbine, was based on the GPB60D and GPB70D gas turbines, which have earned a high reputation in the market. The GPB80D has achieved higher performance compared with the GPB70D by approximately 10% in terms of output and 2.9 points in terms of thermal efficiency. ::

## Order received for TRT Generating System in Brazil

Kawasaki recently received an order for a top pressure recovery turbine (TRT) generating system with a capacity of 22,020 kW from the Brazilian steel company Companhia Siderúrgica Nacional (CSN). The system is scheduled for completion in the second quarter of 2009.

The TRT generating system is driven by the exhaust gas pressure generated from the steelworks' blast furnace and converted into electricity using a turbine. In addition to energy savings, noise is reduced when gas passes through the turbine. Because of the system's environmentally friendly features, TRT generating systems have been adopted for all large blast furnaces in Japan.

Kawasaki's TRT generating system is unique in that it doesn't rely on a conventional governing valve to control the blast furnace's top pressure, instead employing the turbine's

variable stator blades. This method does not control the gas flow rate from the blast furnace by adjusting the valves, but adopts a method that continuously adjusts the angle of the blades. This enables efficient, low-noise generation with minimal energy loss, even when the gas flow rate and pressure from the blast furnace change.

In Brazil, demand for power has recently risen considerably, leading steel plants to introduce their own power sources for electricity supplies. The order for a TRT generating system from CSN reflects this shift in Brazil's socioeconomic status.

Kawasaki has already sold 41 TRT generating systems around the world, demonstrating its high reputation. In Brazil, the systems have been delivered to CST (capacity: 20,000 kW), Gerdau Açominas (11,340 kW) and Usiminas (18,800 kW). ::

## New Director Appointed

On June 25, Executive Officer Mitsutoshi Takao was elected as a new director at the General Meeting of Shareholders and appointed senior vice president at a Board of Directors meeting held after the meeting. ::



Mitsutoshi Takao  
 Senior Vice President  
 Senior Manager  
 Finance & Accounting  
 Department

# Another Product that Makes Us Proud

## Kawasaki Green Gas Engines World Leader in Electrical Efficiency and Environmental Performance

Global warming, acid rain, soil pollution: We can no longer turn a blind eye to what's happening to our environment. Our motto - *Kawasaki, working as one for the good of the planet* - sums up everything we are doing to help. The Kawasaki Green Gas Engine features the world's highest electrical efficiency, 48.5%, and the lowest NOx emissions level, 160 ppm at 0% O<sub>2</sub>. When recovered waste heat is used, total efficiency reaches 85.3%. While you may not be able to see the results with your eyes, you can breathe easy knowing that Kawasaki Green Gas Engines are protecting the Earth for future generations.

**KAWASAKI HEAVY INDUSTRIES, LTD.** <http://www.khi.co.jp>

**Kawasaki Green Gas Engines**  
Electric Output: 5,000 to 7,800 kW  
Electrical Efficiency: 48.5 %  
Total Efficiency: 85.3 %  
NOx Emissions: 0.7 g/kWh (160 ppm at 0 % O<sub>2</sub>)  
Engine Models: KG-12, KG-14, KG-16 and KG-18  
No. of Cylinders: 12, 14, 16 or 18 cylinders

