

## Products that Contribute to Lower CO<sub>2</sub> Emissions

Amid accelerated efforts to address global warming, demand is growing for products that help reduce CO<sub>2</sub>. Against this backdrop, KHI offers various highly efficient energy utilization products, such as cogeneration systems driven by gas turbines or gas engines, all over the world. We also actively delve into renewable energy utilization technologies, such as those for woody biomass power generation and bioethanol production.

**Web** A detailed description of our contribution to a better environment through our products is available in the Detailed Environmental Report posted on our website. <http://www.khi.co.jp/english/index.html>

### Gas Turbine & Machinery Company/ Gas Turbine Division

#### Realizing highly efficient use of energy with world-caliber technology —Developed the L30A new-model gas turbine for power generation

KHI developed the L30A, a new-model gas turbine for power generation in the 30MW-class—our largest output capacity—to drive such energy solutions as cogeneration systems. This gas turbine boasts electric generating efficiency of more than 40%—the world’s highest rate in this output class—which is made possible by raising compressor pressure, applying newly developed heat-resistant materials and improving turbine cooling technology. Also noteworthy, the L30A can achieve total energy efficiency exceeding 83% in a cogeneration system and generating efficiency above 50% in a combined cycle power plant. In terms of environmental performance, this gas turbine holds NO<sub>x</sub> emissions up to 15ppm (O<sub>2</sub> = 15%)—again, a world’s best—because it features KHI’s own DLE (Dry Low Emission) combustion system.

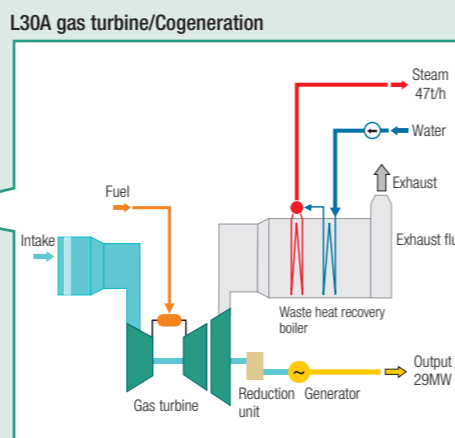
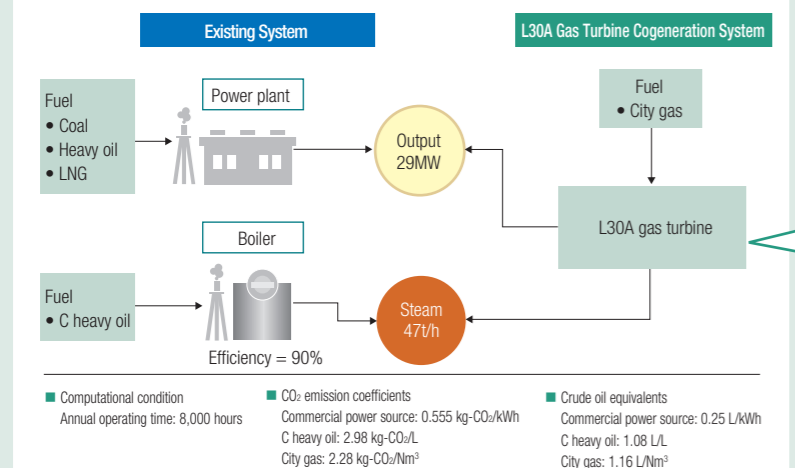
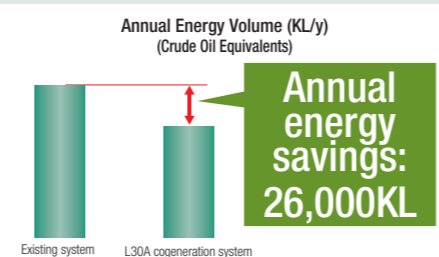
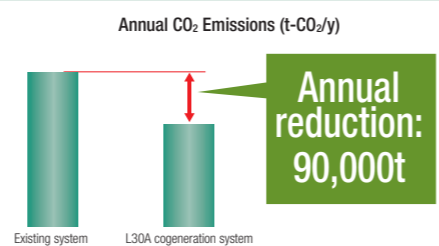
KHI reached an agreement with Daicel Chemical Industries, Ltd., to install a cogeneration system equipped with the first market-ready L30A at the latter’s Himeji Production Sector Aboshi Plant and begin a field test. The field test will serve two purposes: supply the Aboshi Plant with electricity and heat (steam) and contribute to a decrease in CO<sub>2</sub> emissions, and confirm the durability and reliability of the L30A.

The Great East Japan Earthquake was a catalyst to revisit the idea of distributed power generation, such as cogeneration systems, especially from the perspective of energy utilization efficiency and energy security. Given this reality, we will apply the technologies we have at our disposal to realize highly efficient use of energy whether at home or abroad while addressing the need for power source diversification.



L30A gas turbine

#### CO<sub>2</sub> Reduction, Energy-Saving Effect by Installing L30A Gas Turbine



## Striving for the World’s Highest Level of Quality

KHI undertakes a variety of approaches to extend high-performance, high-quality products to customers around the world. The following section highlights some examples from the Precision Machinery Company.

### Precision Machinery Company (Quality Certification Activities at the Nishi-Kobe Works)

The Precision Machinery Company manufactures hydraulic machinery and units responsible for motion control in various machines. Of the products made by this internal company, machinery for use in construction equipment, such as hydraulic shovels, have captured a large share of the market and have earned a solid reputation for quality and reliability. While small in size, our products are used at high speed and under high pressure, and their dependability under such conditions is the result of sophisticated design and processing technologies as well as persistent quality control at every stage of production. Indeed, this is an amalgamation of multiple technologies, from design through to production.

Some products made in Japan are also made abroad, at four locations, and the Company promotes diverse activities to ensure that all the machinery and components it provides are of the highest quality wherever in the world its customers may be.

#### Product Planning/Design

New products go through an exhaustive verification process by the sections involved in product development at every stage of development, in accordance with in-house design review tools. In addition, respective engineering sections jointly pursue component research with the Corporate Technology Division, which provides R&D assistance to internal companies, yielding successful results.



Design review

#### Product Evaluation

Products are evaluated under a variety of conditions at the engineering plant, which features 30 performance/durability test stands inside soundproof rooms, anechoic chambers, ultralow-temperature rooms and other facilities.



Engineering plant performance/durability test equipment

#### Parts Procurement

The internal company continuously implements activities, such as quality workshops, where participants learn by studying mistakes that have occurred in the procurement process. Participating suppliers also have a high awareness of quality, and joining them in such activities is definitely a benefit for the Precision Machinery Company.



Quality workshop with participating suppliers

#### After-Service

If a quality issue appears, it is swiftly addressed and measures are put in place to prevent a recurrence. Quality status is always presented and discussed at quality meetings, and top management supports activities transcending department borders to ensure an all-around approach to quality.



Quality meeting

#### Assembly/Inspection

Equipment and facilities, such as work support systems, are incorporated all through assembly operations to prevent human error. The same preventative measures have been implemented at production points at home and abroad.



Assembly operations using work support system

#### Parts Processing/Heat Treatment

The core parts of hydraulic machinery are made at factories in Japan where operations are tightly controlled. Human error is eliminated through automated processing, measurement, assessment and data entry.



Automated core parts inspection



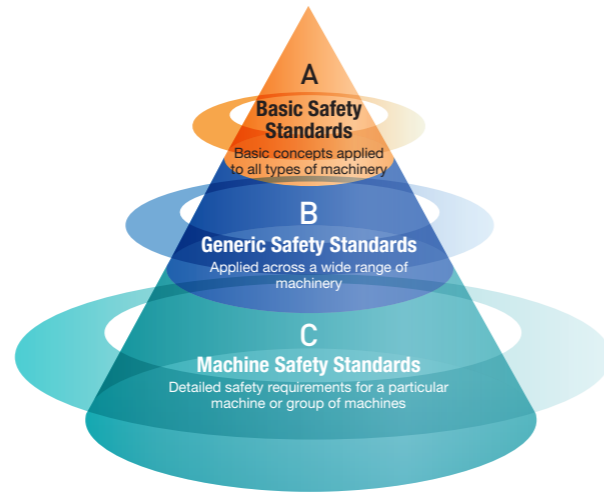
## Emphasis on Product Safety

Reassessment of internal regulations for product safety in all business segments is encouraged to ensure compliance with international standards for machinery safety. This practice serves to promote consistent risk assessment at design stages and implementation of risk reduction measures appropriate to the magnitude of the risks discovered.

Paralleling these reassessment activities, we hold information meetings on machinery safety and risk assessment seminars so that the idea of product safety is firmly planted in the minds of everyone involved in design operations and meticulously put into practice.



Risk assessment seminar



|          |                                      |   |
|----------|--------------------------------------|---|
| <b>A</b> | ISO12100                             | Safety of machinery - General principles for design - Risk assessment and risk reduction  |
| <b>B</b> | ISO13849-1<br>IEC62061<br>IEC60204-1 | Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design<br>Safety of machinery - Functional safety of electrical, electronic and programmable electronic control systems<br>Safety of machinery - Electrical equipment of machines - Part 1: General requirements |
|          | IEC61000-6-4<br>IEC61000-6-2         | Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments<br>Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments   |
| <b>C</b> | ISO10218-1                           | Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots   |

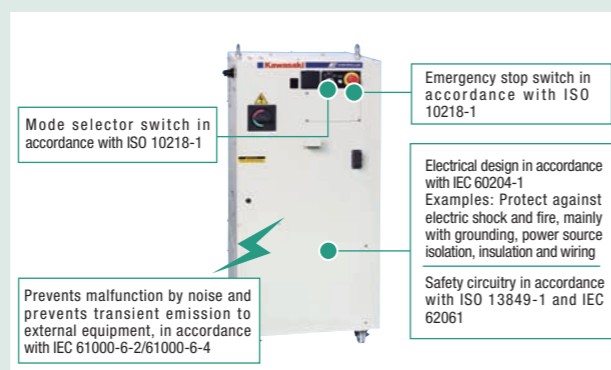
## Precision Machinery Company/ Robot Business Division

As illustrated above, international standards for machinery safety\* comprise a three-level structure: Basic Safety Standards (A), Generic Safety Standards (B) and Machine Safety Standards (C). If we take industrial robots as an example, once a design satisfies established safety criteria for Machine Safety Standards, a risk assessment is performed in accordance with Basic Safety Standards.

At this point, the following three steps are taken to reduce risk to a permissible level:

- 1 Identify hazards that occur during the robot's life cycle.
- 2 Evaluate risk stemming from each identified hazard.
- 3 Reduce risk to the permissible level.

When a control system is used to reduce risk, design reliability—that is, careful attention to safety functions and performance—based on Generic Safety Standards for control systems is essential for meeting safety performance appropriate to risk level. For example, risk can be reduced with safety devices, such as an emergency stop switch that immediately shuts down a robot, a safety switch that maintains safety during teaching—method for creating the program that industrial robots require to execute operations—and a mode selector switch that changes operating mode. To achieve safety performance in robots,



safety circuits are duplicated and highly reliable parts are used. In addition, failure mode analysis is run to verify safety performance.

We provide classes on design and risk assessment pursuant to these international standards and strive to raise awareness of safety design. We also take steps to reduce risk by reflecting on the design of existing products.

\* Machinery safety: Ensuring the safety of machine operators through the implementation of risk-reducing measures based on risk assessment

## Boosting Customer Satisfaction

The KHI Group provides an extensive base of customers in Japan and around the world with a diverse assortment of products, including transportation systems, such as ships, railway rolling stock and aircraft, and industrial equipment, such as gas turbines, engines, robots and production plants, in addition to leisure products, such as motorcycles. The ability to swiftly reflect customer requests in the products we offer is of paramount importance.

Our seven internal companies have established structures matched to respective operations. They share pertinent information within respective business segments and apply such knowledge to design and after-service activities.

In this issue of the CSR Report, the spotlight is on the customer-oriented measures taken by the Rolling Stock and Motorcycle & Engine Companies.

### Rolling Stock Company

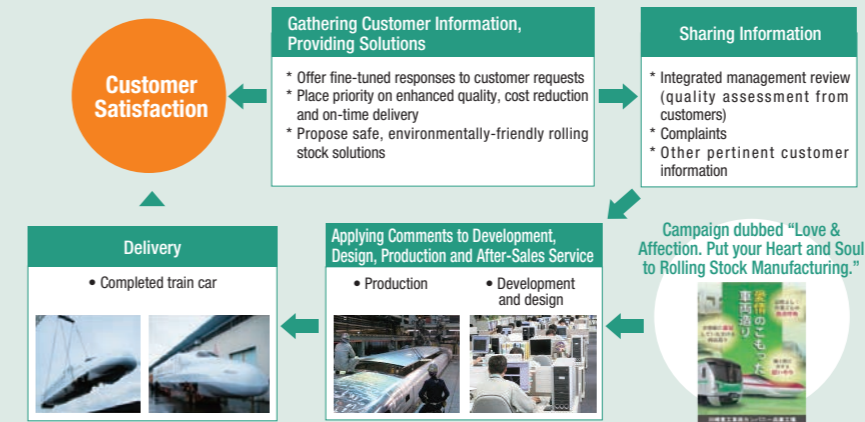
The Rolling Stock Company manufactures high-quality rolling stock that meets all sorts of transportation requirements, from Shinkansen bullet trains to express trains, commuter trains, subway trains, locomotives and new transit systems, for customers in Japan and around the world, especially in the United States and Asia.

The technological capabilities accumulated since KHI began manufacturing railway rolling stock back in 1906 have earned the company high marks from customers.



E5 Series Shinkansen for East Japan Railway Company

#### Raising Rolling Stock Customer Satisfaction



Customer Satisfaction Design Discussion Group

Questionnaire results, complaints and other comments from customers are shared internally and quickly reflected in after-sales service for delivered rolling stock and in the development of new train cars currently in production, as well as new models for the future, through a campaign dubbed "Love & Affection. Put your Heart and Soul to Rolling Stock Manufacturing." These efforts help to improve customer satisfaction levels and instill greater confidence in KHI.

### Motorcycle & Engine Company

The Motorcycle & Engine Company is the only KHI business segment that deals directly with general consumers. Back in 1953, we began making motorcycle engines, marking our entry in the motorcycle business. Since then, we have developed products geared to customer needs, establishing a high profile for the Kawasaki brand, exemplified by several historically renowned motorcycles, including the H1, Z1 and GPz900R.



Ninja ZX-10R

To ascertain an accurate picture of customer needs, we draw on the results of surveys collected from customers who have purchased our motorcycles as well as information collected from other sources, including our website. We complement these sources, mainly with comments from motorcycle magazine readers and motor show visitors, and opinions presented at dealer meetings, and share the remarks in quality assurance meetings. This helps us draft measures to boost the quality of services on delivered products and also enables us to quickly fine-tune new products for a better market reception.



JET SKI ULTRA 300X, in the JET SKI® watercraft series



All-terrain vehicle BRUTE FORCE 750 4x4i EPS



## Creating Value with Chinese Partners

Trade between Japan and China totaled \$300 billion in 2010, with exports as well as imports breaking previous records. China is indeed an important partner, supporting economic growth in Japan. Even before diplomatic ties between Japan and China resumed in 1972, KHI had a business relationship with China, mainly involving shipbuilding and rolling stock. But with the welcome mat out to establish wider presence in China, the Company opened a local office in 1979, becoming the first member of the Japanese heavy industry sector to do so. Since then, this business presence has evolved to include sales and after-sales service for customers in a wide range of industries in China as well as parts procurement from leading local manufacturers. Today, KHI has numerous bases in China for a range of operations, including manufacturing, sales and engineering.

These two pages highlight several joint ventures KHI operates to create value, in good partnership with Chinese companies.



**Q** ACK, CKM and CKE are involved in waste heat power generation systems for cement plants and other energy-saving, environment-oriented facilities. What issues characterize the market for these products and technologies in China?

**A:** Annual cement production in China hovers around 1.8 billion tons, or about half the world's aggregate production volume. An enormous amount of energy is needed to make cement and in China this requirement is met by coal. But the consumption of coal and the environmental burden that accompanies its use are social issues that China must address. Another problem is how to deal with the ever-increasing amount of garbage disposed of by city residents. Garbage is almost always still buried in China, but the number of potential landfill sites is shrinking—a situation that demands an urgent response, as does the problem of pollution, especially land and water contamination caused by hazardous substances.

**Q** How would the technologies and products of ACK, CKM and CKE remedy these problems?

**A:** First, we have energy-saving solutions for cement plants. We can provide more efficient versions of the equipment used to produce cement, typified by vertical mills and new suspension preheater kilns. Also, huge amounts of heat are released during the calcination process, and we are achieving great results with equipment that captures this heat to generate power.

The Conch Kawasaki Kiln (CKK) System, which integrates waste processing and cement manufacturing, is used to gasify waste, separate gas from incombustible materials, then apply the gas as fuel for manufacturing cement. Incombustible materials are sorted into metals and other residues. Metals are sold to metal scrap dealers and residues are used as raw materials for cement. This system obviously makes effective use of waste but it also cuts greenhouse gas emissions 50% to 60%, compared with landfill processing. Naturally, we are proud to have a product that helps China deal with its critical need to reduce waste in an environmentally friendly way, but the technology has wider relevance as an energy-saving, resource-recycling solution of global merit as well.

**Q** What is your opinion of KHI, working with you as a partner to create this kind of value?

**A:** For the CONCH Group, focused on cement manufacturing, this joint venture with KHI, an equipment maker, has facilitated cost reductions through internal manufacturing of facilities otherwise procured from outside the organization at higher costs. It has also put equipment and facilities on the product menu. Also, KHI brought to the joint venture a pool of technologies in the areas of energy conservation and environmental protection, experience in overseas operations and the management techniques of an engineering company, while the CONCH Group lent its credibility in the Chinese cement market and local procurement and operating know-how. I believe the synergistic effects derived from both corporate groups make it possible to offer excellent solutions to our clients.

**Q** Major joint ventures between Japanese and Chinese companies have promoted growth in many areas, including your corporate home of Anhui Province. Talk about these regional contributions.

**A:** Of the central provinces where the Chinese government has concentrated its support, Anhui Province is one of the most economically vibrant. As a result, a lot of effort is put into the development of human resources. Since fiscal 2009, ACK and CKM have made yearly contributions of one million yuan for scholarships to be distributed to students in Wuhu. The intention is to cultivate excellent human resources who will, as tomorrow's workforce, be active in fields that support the country, namely cement, energy and the environment.

### ACK·CKM·CKE

**Names:** Anhui Conch Kawasaki Engineering Co., Ltd. (ACK)  
Engineers energy-saving, environmentally responsive facilities  
Anhui Conch Kawasaki Energy Conservation Equipment Manufacturing Co., Ltd. (CKM)  
Develops and manufactures energy-saving, environmentally responsive facilities  
Anhui Conch Kawasaki Equipment Manufacturing Co., Ltd. (CKE)  
Designs, manufactures and sells equipment used at cement plants

**Location:** All three companies are located in Wuhu, Anhui Province

**Ratios of Capital Contribution:**  
ACK and CKM (Kawasaki Heavy Industries [50%] and Anhui Conch Venture Investment Company [50%])  
CKE (Kawasaki Heavy Industries [50%] and Anhui Conch Cement Company [50%])



ACK Center

Inside of CKM



KCPM

KCPM

### KCPM

Yang YanRong

President concurrently, chairman of Chunhui Group



**Q** KCPM began operations last year and currently makes hydraulic pumps for construction machinery. How are market conditions in China for construction machinery and hydraulic components?

**A:** China has a population of about 1.3 billion people and a land area of 9.6 million square kilometers. It may be a newly emerging market with outstanding economic growth, but many regions lag behind, and the central government must move forward in a big way on infrastructure, particularly urban-rural development, roads, railways and ports. Naturally, such extensive infrastructure projects will require an enormous amount of construction machinery.

The construction machinery industry is a sector of paramount importance to the central government and great progress was achieved during the 11th Five-Year Plan, which ran from 2006 to 2010, to strengthen this industry for China's future. Nevertheless, the manufacturing platform for key components—hydraulic pumps, motors and valves—is totally insufficient. The industry relies heavily on imported components, but supply is not always getting to the places where it is needed, creating instability in the market.

**Q** What role is KCPM expected to fulfill in this environment?

**A:** KCPM was established under Premier Wen Jiabao's directive to promote "great development of the parts manufacturing sector" with a mandate to embrace technology and management techniques from outside China and solve prevailing supply problems by facilitating domestic production of the necessary machinery components through joint ventures. Interestingly, I heard that KCPM is the first joint venture with a foreign company in the hydraulic parts sector. The company was only just established last year, but it already has the support of many construction machinery makers and actual production is rapidly expanding.

As an aside, the company currently provides 26 types of hydraulic pumps to nine construction machinery makers in China but is aiming for higher numbers, in terms of customers as well as product selection. In the eight months from May to December 2010, KCPM sold 2,659 units. The goal for 2011 is around 20,000 units.

I believe the company's role is to keep enhancing its supply capabilities and contribute to the realization of domestic production of components for construction machinery.

**Q** It was apparently an introduction from the China Construction Machinery Society that sparked cooperation between the Zhejiang Chunhui Group and KHI. What is your impression of KHI as a partner so far?

**A:** Several key conditions were necessary for KCPM to achieve success in such a short period of time. One was the synthesis of an operating platform and human resources. The Chunhui Group—KCPM's China-side parent and the company where I am chairman—brought the foundation of an experienced machinery maker in its own right with a 40-year history, and KHI provided solid technological and managerial personnel support. Another was the different approach to management. Generally, joint ventures with Japanese companies are, for better or for worse, rigidly controlled. But at KCPM, general administration has been left to the China-side, which makes employees feel more comfortable, and this has undoubtedly enabled the company to sustain product quality.

Anticipating continued demand for construction machinery in China over the long term, I hope that KHI will provide additional support, such as more product varieties to manufacture here, as leverage to capitalize on growing demand in the local market.

**Q** How do you evaluate employee health and welfare programs and employees' desire to work?

**A:** Salaries are guided by a motto of fairness, equality and openness and are adjusted annually in line with China's sharply rising consumer price index. In addition, we try to offer health and welfare benefits, such as meals and recreation, that make work life enjoyable and create an at-home kind of atmosphere for employees. We offer jobs that enable employees to demonstrate inherent skills but also present opportunities to master new techniques, and this helps to boost motivation. But I think, more than anything else, working for a rapidly growing high-tech company is in itself the biggest source of joy and pride to employees.

### KCPM

**Names:** Kawasaki Chunhui Precision Machinery (Zhejiang) Ltd. (KCPM)  
**Location:** Shangyu, Zhejiang Province  
**Ratios of Capital Contribution:** Kawasaki Heavy Industries: 54%; Zhejiang Chunhui Group: 46%  
**Business:** Manufacture and sale of hydraulic machinery components