

# Environmentally Conscious Products

## Transportation-Related Products

In the rolling stock field, we manufacture a wide range of products, including Shinkansen bullet trains, express trains, commuter trains, subway trains, freight trains and locomotives. Among our environmental measures, we are enhancing energy efficiency during operation and reducing the noise of high-speed rolling stock through technological cooperation with our clients and proprietary Kawasaki's own technologies.

We also contribute to the advancement of the world's aircraft by jointly developing and manufacturing fuselages and jet engines with leading European and American enterprises.

In our shipbuilding business, starting with LNG carriers and LPG carriers, we are developing and building a variety of products, including container ships, bulk carriers and crude oil tankers. In response to the demand for increased fuel efficiency, we are working to develop technologies for optimizing hull forms and increasing the efficiency of propulsion systems.

## 1 Environmental Measures for Shinkansen Series E5, Japan's Fastest Train

In December 2010, Tohoku Shinkansen will extend service to Shin-Aomori, with the new series E5 high-speed Shinkansen debuting in March 2011. Kawasaki participated in the E5 development project led by East Japan Railway Company. We last year manufactured and delivered five of the 10 cars of the prototype train, including the driving car, and are currently manufacturing production cars. To accommodate the nation's fastest revenue service speed of 320 km/h, the driving car has a long, 15-m nose to reduce noise while going through tunnels (tunnel boom). The train also reduces body aerodynamic sound, lowers bogie noise and uses low-noise pantographs among other leading-edge noise countermeasures. We also improved energy efficiency through electricity regeneration, lighter bodies and diminished air resistance.



E5 driving car

Energy saving

Low noise

## 2 Boeing 787 Dreamliner, next-generation mid-sized airliner, had successful maiden flight

### Fuel efficiency boosted 20%

Boeing's next-generation mid-sized airliner, the Boeing 787 Dreamliner, had a successful maiden flight in December 2009. Kawasaki took part in developing and manufacturing the plane as a partner in the international collaborative development, taking charge of the forward fuselage (which uses advanced composite materials), the main landing gear wheel well and main wing fixed trailing edges. Moreover, we have been involved in the development and manufacture of the Rolls-Royce Trent 1000 fuel-efficient low-noise engine used on the aircraft. The Boeing 787 has 20% greater fuel efficiency than existing aircraft of the same class, thanks to the use of the Trent 1000 fuel-efficient engine and a significantly lighter body owing to a single-piece molded fuselage made of advanced composite materials, a first for a large aircraft.



Maiden flight of Boeing 787 Dreamliner

High fuel efficiency  
20% improvement

Low noise

## 3 Energy-Saving Technology for Large Bulk Carrier

We have developed a 180,000-DWT type bulk carrier with one of the largest capacities in a vessel allowed to enter the Port of Dunkirk in France. Fuel consumption has been reduced by improving propulsion with a two-stroke fuel-efficient main diesel engine, a high-efficiency propeller, and the latest technologies like a semi-duct system with contra fins and Kawasaki's rudder bulb with fins developed by Kawasaki to control flow around the propeller. The carrier has double-hull fuel tanks and electrical deck machinery to prevent marine pollution. As of June 2010, four such vessels have been delivered to customers since the delivery of the first, the *Cape Canary*, in November 2009.



Semi-duct system with contra fins



Large bulk carrier *Cape Canary*

High fuel efficiency

Marine pollution prevention

## Industrial Plant and Equipment

We are offering around the world a variety of products that support the foundations of industry, including, large-scale plants for cement, chemicals and nonferrous metals, and industrial equipment such as steam turbines, aerodynamic machinery and other prime movers, as well as industrial robots, hydraulic equipment, and other civil engineering machinery. The field of plant and industrial equipment constantly requires not only high performance but also lesser environmental impact, such as energy and resource conservation and more compact sizing. We continue to develop new products with advanced technologies to meet these needs.

## 4 Compact, Energy-Saving Fluidized Bed Cement Kiln System

We have developed a fluidized bed cement kiln system that is completely different from the conventional rotary kiln system used in cement production processes. The excellent combustion efficiency, high heat transfer coefficient and low radiation area are among the characteristics of a fluidized bed process, resulting in 10-25% lower heat consumption rate than conventional systems. Combustion takes place at low temperatures, reducing NOx emissions by 40% or more. And since the equipment can be set vertically, it has a footprint about 70% smaller, allowing for compact installations and lower facility costs. With no moving parts, the machinery and refractory last longer, saving resources and cutting operating and maintenance costs.



Fluidized bed cement kiln system

**Energy saving**  
(10-25% improvement)

**Resource saving**  
(compact, long life)

**Low NOx**  
(40% reduction)

## 5 Energy-Saving Control Valve/ Realizing Fuel-Efficient Excavator

We develop and manufacture pumps, motors and miscellaneous pilot valves and control valves to control actuators for excavators. Control valves comprehensively control the action of each actuator in an excavator, and the hydraulic oil main conduit and pilot conduit have a complex configuration. We successfully developed an energy-saving control valve by revising the conduit configuration and optimizing conduit form through fluid analysis, which resulted in a 20-60% decrease in pressure loss in each conduit. Cutting pressure loss in hydraulic systems like this helps excavators to run more fuel-efficiently.



Energy-saving control valve KMX15

**Energy saving**

**Resource saving**  
(compact)

## 6 KEEP-D5000 Hydraulic Press Acquires MF Eco Machine Certification

We have announced the KEEP-D5000 hydraulic press as an environmentally conscious product. This product is the first hydraulic press to earn certification under the MF Eco Machine Certification System established by the Japan Forming Machinery Association. It conserves energy by using servo valve control, which optimally controls the flow rate of hydraulic oil, cutting energy consumption by 43% when under load. Resources are also conserved, as the press itself is more compact and 26% lighter, and 50% less hydraulic oil is used. We will continue to mitigate environmental impacts and improve work environments by developing environmentally conscious products like this.



KEEP-D5000 hydraulic press

Kawasaki Hydromechanics Corporation

**Energy saving**  
(43% improvement)

**Resource saving**  
(compact, reduced hydraulic oil)