

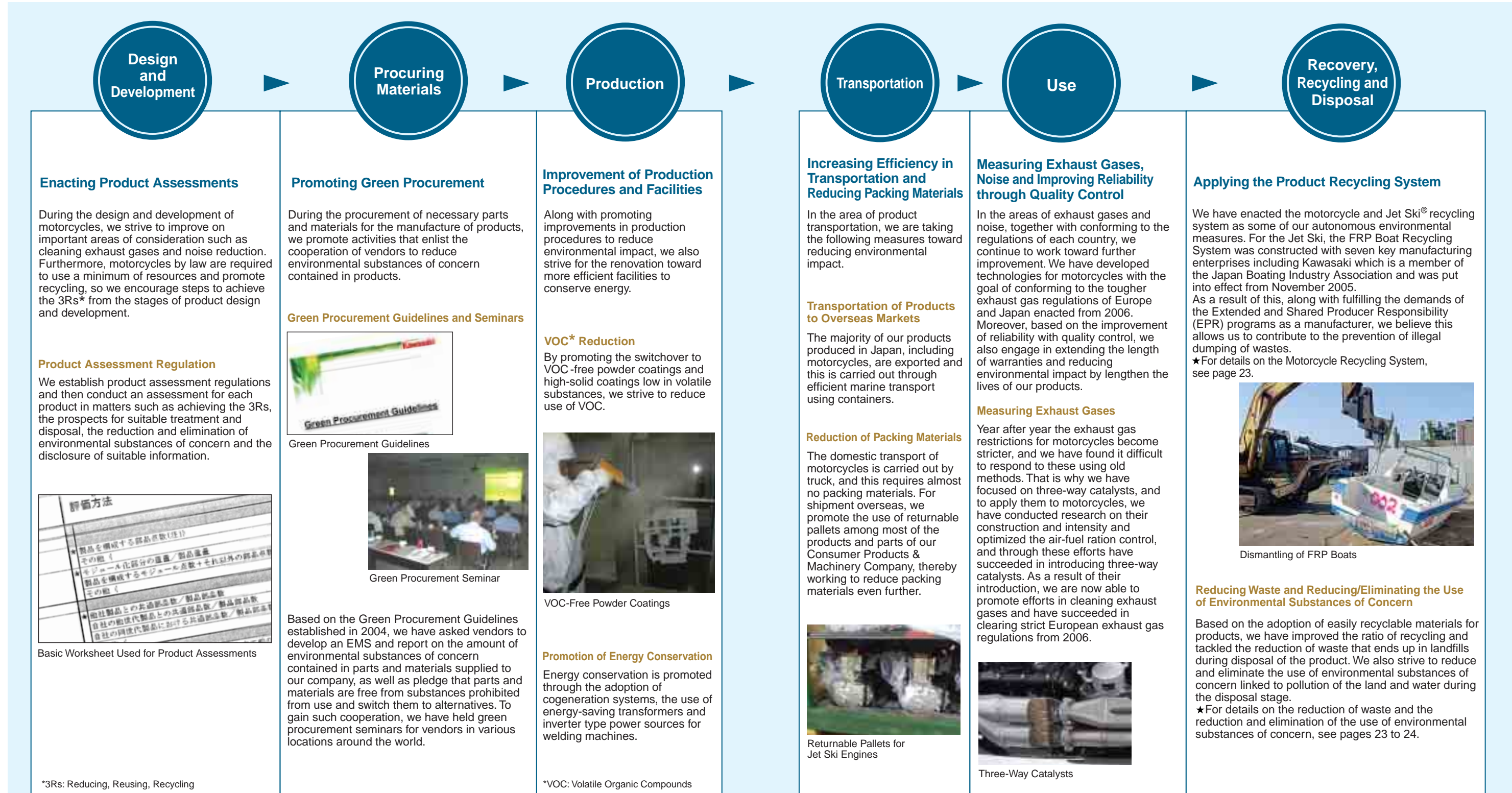
Environmentally Conscious Products

Environmentally Conscious Products

Endeavoring to Reduce the Environmental Impact throughout the Life Cycle of Products

Measures for the Consumer Products

Kawasaki considers the reduction of the environmental impact in the course of its business activities as an important issue. We have therefore undertaken steps to tackle the problem of reducing this throughout all stages of the life cycle of products from design and development to disposal. As an example of this, we introduce the activities of the Consumer Products & Machinery Company that produces motorcycles and the Jet Ski.[®]



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Measures for Motorcycles as Part of a Recycling-Based Society

The society of the future demands a shift from the present system of a society of mass production, mass consumption, and mass disposal to a recycling-based one.

To meet the requirements of such a society, Kawasaki has participated in enacting the Motorcycle Recycling System, employed 3R design, and striven to reduce environmental substances of concern.

Enacting the Motorcycle Recycling System from October 2004

In the Motorcycle Recycling System voluntarily carried out by four domestic motorcycle manufacturers including Kawasaki which is a member of the Japan Automobile Manufacturers Association, Inc., and 12 motorcycle importers, we collect scrapped motorcycles from final owners at acceptance facilities or certified collection centers, gather these up, and carry out the appropriate recycling measures at processing/recycling facilities.

Under this system, participating manufacturers calculate the future recycling costs into the price of the motorcycle, attach a

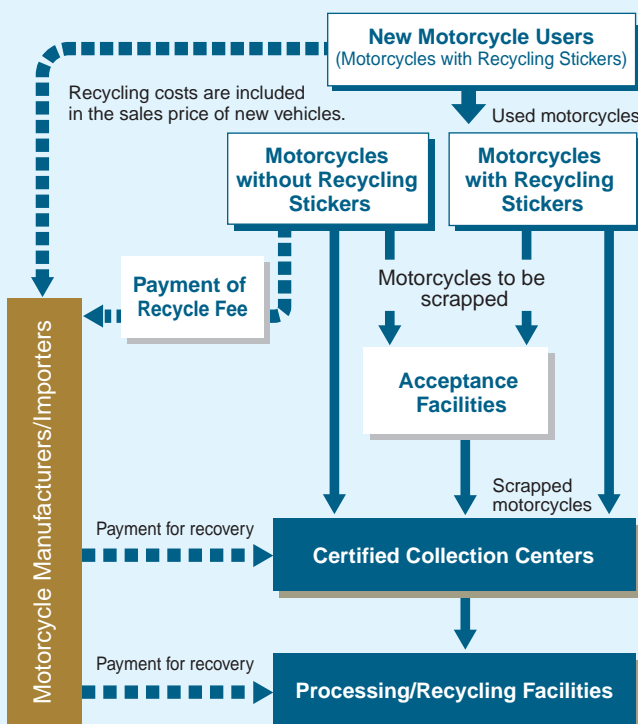
recycling sticker on the motorcycle, and sell it. But when a used motorcycle that was sold before this system started does not have this sticker attached, we require the owner of the motorcycle to incur the cost of the recycling fee.

The achieved ratio of recycling for our products from April 2005 to March 2006 reached an average of 87.2% in terms of gross weight.



Recycling Sticker for Motorcycles

Motorcycle Recycling System



Stance on 3R Design

In order to achieve a design more amenable to recycling, new models of motorcycles sold in FY2005 were manufactured to yield a ratio of recyclable materials of more than 90% relative to its gross weight.

Considering not only recycling but also the reduction of waste during disposal of the product, we adopted an aluminum monocoque frame to achieve lightweight construction for the ZZR1400 motorcycle, which began to be mass-produced from the end of FY2005. And to achieve further weight reduction, we took a second look at the body frame to achieve a slimmer construction while improving frame reinforcement.



Aluminum Monocoque Frame for the ZZR 1400 motorcycle

We have also improved the ratio of recyclable materials for products other than motorcycles such as the Jet Ski® and general-purpose gasoline engines, and design products accounting for the display of materials in parts and easy dismantling.

Working to Reduce Environmental Substances of Concern

The Consumer Products & Machinery Company has promoted the reduction and elimination of the four substances (lead, mercury, hexavalent chromium, and cadmium) that has a large environmental impact in accordance with green procurement guidelines since FY2004.

For motorcycles we completed the reduction of lead according to plan at the end of December 2005 (except for the solder of electronic boards and electric parts, as well as bearings, etc.). And for the coatings of general-purpose gasoline engines, we have begun the shift to those, which do not contain lead at the end of the FY 2005.

We have also completed the elimination of mercury in motorcycles except for the use of an infinitesimal amount in necessary parts for road safety by the end of September 2004. A trace of cadmium remains in some electric and electronic parts, but we have set targets for alternative technologies and are eliminating its use in successive models.

Hexavalent chromium is used in the surface treatment of many parts such as metal components, nuts, bolts, and the like, and poses a difficult technological problem in the development of alternative technologies, but there are prospects for alternative technologies concerning the most



Old parts
(containing hexavalent chromium)

New parts
(free from hexavalent chromium)



The ZZR1400 eliminated the use of connective parts containing hexavalent chromium.

difficult connective functions of nuts and bolts and in the new model motorcycle ZZR1400 that went into production at the end of FY2005, we have succeeded in eliminating hexavalent chromium in connective parts. In other parts as well, we have successively extended the switchover to surface treatments free from hexavalent chromium, and we plan to eliminate hexavalent chromium in all models of motorcycles during FY2006.

In the Jet Ski®, surface coatings used for rust prevention and primer treatment on aluminum parts that both contain hexavalent chromium are also scheduled to be replaced with alternative technologies—some of which have already been introduced—and we are currently formulating the time schedule for a complete changeover.

Schedule for Reduction and Elimination of Environmental Substances of Concern in Motorcycles

■ Kawasaki's Achievements ▼ Goals of Japan Automobile Manufacturers Association

	2004	2005	2006	2007
Lead	Completed reduction plan at end of December		Completed reduction plan (except for the solder of electronic boards and electric parts, as well as bearings, etc.)	
Mercury	Eliminated at end of September	Eliminated at end of September (except for the use of an infinitesimal amount in necessary parts for road safety)		
Hexavalent Chromium	In March elimination of connective parts containing hexavalent chromium in the ZZR1400.		Eliminated at end of December	Schedule of elimination in all motorcycles
Cadmium		Eliminated successively from new motorcycle	(Used trace amounts in some	Eliminated at end of December electric and electronic parts)

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Measures for All Products

Kawasaki is working positively toward the reduction of the environmental impact throughout the life cycles of each product in all product fields as well as the previously introduced consumer products.

Aircraft

As far as environmental measures for our aircraft are concerned, issues, which demand our immediate attention, are energy conservation and cleaning exhaust gas, etc.

We jointly develop and manufacture passenger aircraft with Boeing in the USA and Brazil's Embraer and also develop and manufacture various types of helicopters, such as the BK117, which was jointly developed with Eurocopter in Europe.

For the reduction of environmentally hazardous substances in

coatings, we encourage the adoption of high-solid coatings with low solvent and the development of high-solid coatings and coatings free from hexavalent chromium meeting our original specifications.

On the other hand, since our environmentally conscious technologies in aircraft engines have been highly regarded, we continue to expand our joint development and manufacture with aircraft engine manufacturers of Europe and the USA.

The Next-Generation Passenger Aircraft Boeing 787



Boeing intends to use carbon fiber composite materials in many parts of aircraft and to reduce the amount of fuel consumption through reducing overall weights. We make the most of our fabricating technologies for carbon fiber composite materials and jointly develop and manufacture the front of the fuselage.

The TRENT 1000 Jet Engine



Kawasaki has also had a hand in the development and manufacture of the new environmentally conscious aircraft engine from U.K.'s Rolls-Royce plc. This engine is planned to be installed in the Boeing 787.

Ships

Transportation by ships is one of the best means of transportation in terms of environmental impact with small fuel consumption per unit load transported. We have an established record in the development and construction of a variety of marine vessels such as LNG carriers and LPG carriers, along with container ships, bulk carriers, crude oil tankers, and many others.

As one of our measures in reducing environmental impact, we are striving to reduce fuel consumption to begin with; therefore, we are working on technological developments to optimize hull shapes, improve the shapes of ship bows, and raise the efficiency of propellers. We have also developed a Rudder Bulb System with Fins (RBS-F) that effectively converts the rotational energy of the flow behind the propeller into propulsive force and have employed this in many ships.

As a measure against marine pollution, in Very Large Crude Oil Carriers (VLCC) we employ a double-hull construction for the fuel oil tank similar to that of cargo oil tanks to prevent oil leaks in the event of accidents.

For installed engines, we have developed an electronically controlled marine diesel engine that is designed to reduce environmental impact in addition to innovatively improving operative functions.

Additionally, we have participated in the development of the Super Marine Gas Turbine which will be installed as the main engine in the next-generation coastal ships arising from the Super Eco-Ship project promoted by the Ministry of Land, Infrastructure, and Transport. This turbine has helped achieve reductions in fuel consumption by 30% and reduce pollutants such as NOx.

Environmental Considerations for the VLCC KATSURAGISAN



The fuel oil tank, as with the cargo oil tank, has a double-hull construction. It also is installed with the RBS-F as a measure to reduce energy consumption.

Electronically Controlled Marine Diesel Engine



This engine reduces fuel consumption, curtails the amount of cylinder lubrication oil, and significantly reduces the amounts of NOx as well as soot and dust in exhaust gas.

Rolling Stock

Rolling stock contributes to the prevention of global warming as a mode of transport that is high in energy efficiency and low in CO₂ emissions during operation. We produce a wide range of products such as Shinkansen trains, commuter trains, subway cars, freight cars, and locomotives.

When one looks at the environmental impact of rolling stock throughout its life cycle, the greatest impact is based on the consumption of energy during operation, and accordingly the reduction of environmental impact here becomes an important point. We therefore work toward technological cooperation with our customers and adopt technologies such as improving motor efficiency, regenerating electricity during braking,

Industrial Plants and Equipment

In field of the industrial plants and equipment, the development of energy-efficient products is crucial.

Industrial plants: We are developing fluidized bed advanced cement kiln systems to making energy-efficient cement plants.

Gas and steam turbines: We work to improve efficiency, naturally, and reduce the consumption of material resources by making these more compact, lighter, and more durable.

Industrial robots: We are promoting the production of robots that are useful to the reduction of environmental impact, such as the Friction Spot Joining (FSJ) robot.

Hydraulic pumps: In addition to undertaking efforts to make these products highly efficient, more compact, and lighter, we promote the application of bio-degradable hydraulic fluid to

Social Infrastructure

As part of our products for social infrastructure, we offer civil engineering/construction machinery and steel structures.

The shield tunneling machine, one product of civil engineering machinery, moves in the ground while excavating the required diameter tunnel, has high work efficiency and reduces environmental impact on the surrounding environment in comparison with conventional cut-and-cover tunneling method.

Furthermore, we have developed the DSR* construction method to increase performance in the reduction of environmental impact.

In construction machinery, we are engaged in the reduction of fuel consumption, cleaning exhaust gases, and reducing noise. Among these, with the adoption of the electronically controlled engine in the wheel loader, we have realized the reduction of NO_x and particulate matter in exhaust gases along with the reduction of fuel consumption.

China EMU* (Adopting Coatings free from Heavy Metals)



We promote the adoption of coatings that do not contain heavy metals (hexavalent chromium, lead, etc.) which were contained in coatings for rolling stock up till now.

reducing the weight of car bodies, and creating car shapes with little air resistance in order to achieve high energy efficiency for rolling stock.

We are also adopting various environmental measures such as promoting the use of recycled aluminum to conserve resources, the use of coatings free from heavy metals to reduce environmental impact when cars are decommissioned, and selecting materials and constructions amenable to recycling. Moreover, we work to take the local environment into consideration with low-noise car design that makes the best use of aerodynamic technologies.

*EMU: Electric Multiple Unit

eliminate environmental pollution on account of oil leaks.

Friction Spot Joining (FSJ) Robot



This machine performs spot joining of light metals like aluminum. Using frictional heat, it softens the joining spots of components and joins together. Compared to the conventional method of resistance spot welding, it reduces the consumption of electric power by more than 1/20.

As far as steel structures go, we manufacture steel bridges, steel frames used in high-rise buildings, and LNG tanks; and in the field of steel bridge construction, we employ atmospheric corrosion resisting steel components for bridge girders to expand construction methods free from chemical substances by completely eliminating the use of coatings.

Reusable Internal Parts in the Shield Tunneling Machine



A good portion of the internal shell of the shield tunneling machine which was not reused after the completion of construction until now can be extracted, and it is called the DSR construction method that allows approximately 90% of its built-in parts to be reused.

*DSR: Draw a Shield for Recycle System

Environmentally Conscious Products

Environmental Protection Products and Technologies

Along with tackling the reduction of the environmental impact throughout the life cycle of products, Kawasaki is also developing products and technologies that actively improve and preserve the environment. Through these products and technologies we aim to contribute to the realization of a sustainable society.

Energy Facilities

In an age in which humankind can no longer avoid the issue of reducing CO₂ emissions, the promotion of the highly efficient use of energy, the utilization of waste energy and the use of renewable energy are just some of the measures society will have to take.

We have developed and supplied technology like the high-efficiency combined cycle power plant (CCPP) that combines gas turbines and steam turbines, of which the latter runs on the waste heat of the gas turbine and the gas turbine cogeneration system that effectively uses the waste heat of the gas turbine.

We also are giving high priority to developing technologies that efficiently use waste energy and market products such as a waste heat recovery boiler, a cement plant waste heat power generation system that uses the waste heat recovery boiler, and a top-pressure recovery plant for blast furnaces that recover the

a top-pressure recovery plant for blast furnaces that recover the internal pressure of blast furnaces and generate electricity.

In the area of renewable energies, we also provide wind turbine generation systems, photovoltaic systems, geothermal generation systems, and woody biomass power generation systems.

As for technologies that increase the efficiency of energy utilization, we supply ice storage cooling systems that efficiently use nighttime electricity and the optimization and diagnosis of industrial energy system that optimizes the efficiency of energy utilization throughout factories.

Our lineup of technologies that hold great potential in the future include the Gigacell (see pages 9 to 10 for further details) and liquid H₂ transport and storage technology that will accommodate the coming hydrogen society of the future.

Winner of the Japan Cogeneration Center Chairman's Prize



The cogeneration system supplied to Fuji Electric Device Technology Co., Ltd., was evaluated highly for its many features such as its energy-saving technology and received the prize mentioned above.

Woody Biomass Power Generation Systems



This system converts wood chips and thinned wood, etc. into gas to generate electricity with high efficiency. These timber resources are referred to as woody biomass and are a form of renewable energy sources that is CO₂ neutral.

Air Pollution Control

During this era in which acid rain has been observed around the country and the increase of instances of air pollution from the photochemical oxidants and suspended particulate matter has been reported, air pollution control continues to be an ever-more pressing issue.

We have dedicated ourselves to producing De-NO_x/De-SO_x plant and dust collector for flue gases from boilers, etc., since the 1970s, and we have subsequently continued to improve those technologies. Additionally, we have completed low-NO_x gas turbine generation systems, low-NO_x coal-burning boilers, and low-NO_x heavy oil burning boilers from our research and development activities concerning low-NO_x combustion technologies for various conventional products.

Low-NO_x Gas Turbine Generation System



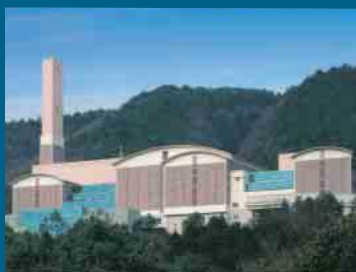
Through the adoption of catalytic combustion in gas turbine generation systems, NO_x emission is reduced below 1/10 (not in excess of 2.5 ppm) of that of conventional systems (lean premixed combustion).

Waste Treatment and Recycling

Promoting the material and thermal recycling of waste, continuing the pursuit of other activities to reduce the final disposal waste, and making hazardous substances innocuous have become leading social imperatives these days.

We have intensified the research and development of technologies for the incineration and gasification of wastes to construct high-performance refuse incineration systems (stoker-

Refuse Incineration Systems (Stoker-type Furnaces)



Achievement of even higher efficiency in power generation and greater reduction in environmental impact is made possible through the development of the advanced stoker system. Melting systems make it possible to convert ash into slag for effective use as construction material.

type furnace, fluidized bed furnace) and refuse gasification and melting systems (fluidized bed gasification and melting furnace, shaft gasification and melting furnace) and then supplied these various locations in Japan.

Further, we also supply a refuse derived fuel (RDF) production system and RDF-burning power generation system which used

in concert generate power by processing and burning domestic waste, and kraft recovery boilers.

We provide equipment that removes and thermally decomposes harmful substances like dioxins in flue gas and flying ash for refuse incineration and gasification systems.

Other related products we supply include bulky waste crushing and recycling systems, utilization systems for fly ash and coal ash, fermenting-gasification systems and composting systems for organic wastes and melt-state polymerization systems for chemical recycling of pet bottles. Moreover, we also proceed to research and develop treatment technologies for waste containing hazardous substances that are hard to decompose like PCBs and asbestos.

Kraft Recovery Boilers



Along with burning the industrial effluents (black liquor) discharged during the production of pulp in paper mills and utilizing the heat efficiently, these enable the recovery and reuse of soda used as a solvent.

Water and Soil Pollution Control

While measures to prevent the pollution of rivers, lakes and the sea have improved, they are still not sufficient. Society has now reached the point where we all must take full measures hereon out to confront the issue of soil pollution.

In the area of sewage and sludge treatment, we have proven our technologies in high performance systems, and these have been supplied various location in Japan. We also supply various membrane-type water treatment systems to purify leachates and thoroughly treat drinking water.

As facilities for effectively using sludge, we supply sludge utilization systems that convert sludge into activated charcoal, fuel, and compost.

Furthermore, we have also developed a high-efficiency, on-vehicle sludge drying system that can go round several small and medium-scale sewage treatment facilities.

For decontamination of polluted soil, we continue to research and develop cleaning technologies that can decompose pollutants such as dioxins.

Systems for Purifying Landfill Leachates



We create systems to remove organic matter and heavy metals from landfill leachates. These systems have brought about secure treatment capacities and a high level of purification for treated water.