



Corporate Profile, CSR Report 2011

Message from the Top Management

We are promoting stronger CSR management by implementing thorough compliance measures and enhancing risk management.

Our heartfelt condolences go out to all those who lost their lives in the March 11 Great East Japan Earthquake, and we extend our deepest sympathies for those who survived the disaster and their family members. We will devote our utmost efforts to restoring the facilities and equipment we have delivered.

Recovery of business performance

Fiscal 2011 is the final year of our 9th Mid-Term Management Plan (fiscal 2009-2011). With the highest priority on restoring stakeholders' confidence in us, we have endeavored to recover our business performance as soon as possible to enhance our corporate value. Clarifying the position of each of our businesses inside the Group, we continue to work to secure profits and enhance competitiveness of core businesses, to rebuild businesses undergoing restructuring, and to support the sustainability of continuing businesses and early withdrawal from businesses we have decided to abandon. We have also made efforts to increase profits and strengthen our financial base through continued implementation of enhanced risk/cost management and reduction of fixed costs and investments/loans throughout the Group. Through these efforts, our consolidated ordinary income, our key management target index, reached the target value set at the beginning of fiscal 2009 and even exceeded the target in fiscal 2010, indicating the positive effects of our efforts on the steady recovery of our business performance.

Deployment of businesses

In the domestic waste treatment plant business, we have won five bids out of ten submissions made for renewal of waste treatment plants since fiscal 2009, when the current Mid-Term Management Plan commenced. With the percentage of winning bids increasing, a target of this mid-term management plan, we have gained the largest share during this period. Moreover, measures to improve cost management of plants under construction have shown substantial progress, contributing greatly to their securing profits. In the waste treatment plant overhaul sector (periodic overhaul of waste treatment facilities,) benefits from the merger with the Takuma Plant, one of our group companies, have been gradually seen.

In the domestic energy plant business, while the market remains stagnant due to slow recovery in capital investments in the private sector, we have steadily received orders in the field of special fuels, one of our strengths, including chicken and cow manure-mixed combustion, bagasse biomass fuel, and RPF (recycled plastic fuel). In the overseas energy plant business, despite harsh competition with overseas makers in India and elsewhere, we received orders for construction of new plants in Thailand and Cambodia, and are planning measures to receive more orders.

Completion and handover of the Lakeside Plant in the U.K.* was a milestone event in our business in Europe. I attended the plant's opening ceremony last October in the presence of the Duke of Edinburgh, where I was thanked by the plant's owner. I hereby express my sincere appreciation to all those who were involved in the construction of this plant.

As explained above, our 9th Mid-Term Management Plan has been mostly progressing as scheduled. I believe this is because of the united efforts of all the executives and employees of our group, who share the sense of crisis, work together toward the same direction under the basic policies of the Mid-Term Management Plan, and steadily have implemented the planned activities. Since this is the final fiscal year of the Plan, we will further promote these efforts to achieve the Plan's final goals.

(* See page 25 of this Report.)

Final year of the 9th Mid-Term Management Plan

The first goal for fiscal 2011, the final year of the 9th Mid-Term Management Plan, is to achieve the Plan's final numerical target of "5 billion yen or more consolidated ordinary income." To ensure this target is achieved, all executives and employees will do whatever they can during this year with strong determination to absolutely achieve the target.

Many plants that have been under construction are scheduled to be completed during this fiscal year. With a large number of new orders received, the amount of work in all of the design, construction, procurement and quality control sections has been substantially increasing. Each section will make utmost efforts toward handing over plants that can satisfy our customers, by ensuring thorough progress control through constant proactive moves.

This April, Takuma incorporated the plant department of one of its group companies, Sun Plant Co., Ltd. This enabled integration of our construction functions in eastern Japan. By maximizing the effects of the integration in the construction and overhaul sectors, we are determined to construct more sophisticated facilities.

Core businesses and business foundation

Another goal for this fiscal year is to further expand our core businesses and make our business foundation robust.

As described above, we have steadily been receiving new orders in the waste treatment plant business. This increase in orders. I believe, is a positive result of the successful functioning of the flow of accurately grasping customers' needs and reflecting them in proposals while reducing costs, through integrated efforts of sales and engineering, and with Takuma Technos, our group company.

For cost reduction, while competitive cost-setting techniques are being established due to advances in measures to reduce LCC (Life Cycle Costs), stronger customer trust in our company because of the increased number of orders makes it easier for us to gain support for further cost reduction efforts. I think we have entered a virtuous cycle, where the efforts we have made so far have strengthened competitiveness, resulting in winning more orders. An increase in orders received then leads to reduced costs, which further strengthens competitiveness, leading to winning more orders. To further expand our businesses, we must constantly win orders and maintain competitiveness. The number of orders received during fiscal 2011 is expected to increase substantially.

Projects for major improvement of waste treatment plants are expected to be launched. By winning orders for these projects, we will make our business foundation robust and take a step forward toward further business expansion.

Global situation surrounding Takuma

The United Nations Climate Change Conference held in Cancún, Mexico (COP 16) in November 2010 ended with the adoption of the Cancun Agreements, which includes establishment of the Green Climate Fund to help developing countries cope with global warming, although most issues facing difficulty reaching agreement, such as the reduction of greenhouse gas emissions targeting all nations, were carried over to the next conference.

According to the IPCC 4th Assessment Report, to achieve a target of reducing the temperature rise since the Industrial Revolution to 2 degrees to prevent serious impact from global warming, the amount of greenhouse gas emissions must be cut in half by 2050.

The Great East Japan Earthquake significantly damaged our trust in nuclear power. Now that construction of new nuclear power stations, which was believed to be an effective means of reducing CO₂ emissions, is virtually impossible, power generation from waste incineration and power generation from biomass incineration, two of our major business fields, are likely to draw much attention in the medium-to-long term.

Feed-in Tariffs, a mechanism for purchasing renewable energies at fixed price rates, are scheduled to be introduced soon and later likely applied to other renewable energies such as woody biomass. Moreover, for two years the Ministry of the Environment has supported high-efficiency waste incineration power generation to promote CO₂ reduction by providing subsidies of 50% of the construction costs. These are all favorable signs for our businesses.

Thus, needless to say, our businesses must properly respond to the demands of the present age in and outside Japan, thereby significantly contributing to conservation of the environment and establishment of a recycling-oriented society. I believe it is our social responsibility to enhance and maintain sustainability around the world through development in the fields of environment and energy.

Thorough legal compliance

Ensuring compliance is a basic activity necessary to build a healthy corporate culture. Basing our actions mainly on the Takuma Group Ethics Charter and Takuma Group Code of Conduct, we have steadily implemented various promotional/educational activities to enhance understanding of corporate ethics, including relevant laws and in-house regulations.

Specifically, the Compliance & CSR Promotion Organization Task Force is held four times a year to ensure compliance at each worksite and plant.

Contacts with our competitors are strictly controlled in accordance with the Regulations Concerning Management of the Pledge of the Anti-Monopoly Act Compliance.

Moreover, in 2006 Takuma joined the United Nations Global Compact (see below), and is working to fight corruption as its Principle 10, "Anti-Corruption," calls for.

With the aim of becoming a company that is trusted by all stakeholders, all executives and other employees of Takuma will further strive to ensure compliance and improve corporate ethics.

Enhancing risk management

Risk management, I believe, are activities to assess and prevent the risks a company faces. It is crucial for a company to build and maintain an effective risk management system in accordance with the company's risk management regulations.

In fiscal 2008, we established a system in which risks in all of our businesses are determined and countermeasures planned at the beginning of each year, with the



The ten principals of the UN Global Compact

<Human Rights>

Principle 1: Businesses should support and respect the protection of internationally proclaimed human rights; and

Principle 2: make sure they are not complicit in human rights abuses.

<Labor Standards>

Principle 3: Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining:

Principle 4: the elimination of all forms of forced and compulsory labor;

Principle 5: the effective abolition of child labor; and

Principle 6: the elimination of discrimination in respect of employment and occupation.



On November 10, 2006, the Takuma Group joined the United Nations Global Compact, pledging to adhere to universal principles covering human right, labor right, the environment and anti-Corruption. The Global Compact is a voluntary corporate citizenship initiative proposed by U.N. Secretary-General Kofi Annan in 1999 at the world Economic Forum. Our company practices a social contribution through the active conduct of business in support of the ten principles.



measures' results then reported at the end of the year. This system has enabled different departments to share common goals and to steadily implement measures to introduce into management an appropriate PDCA cycle to reduce risks.

Moreover, we drew up risk management regulations focusing exclusively on DBO projects**, with the aim of winning orders for DBO projects, from which profits are promised. The effects of our efforts are beginning to be seen

No orders can be won without adequate risk management. Making the best use of our experience, we will continue making efforts to further enhance risk management.

(** See page 15 of this Report.)

In conclusion

The efforts we have devoted to date are beginning to show specific results. Without being just satisfied with these results, however, all of our executives and other employees will spend this final year of the Plan continuously making united efforts to achieve the final goals and further development toward a bright future.

For a corporation to fulfill its social responsibilities, communication with diverse stakeholders is crucial. I believe that this report will be an effective tool for this purpose. Since I want to give closer attention to your feedback in order to prepare CSR reports that are even easier to understand in the future. I would be very grateful to receive your honest opinions and advice.

June 2011 Takuma Co., Ltd.

Hajime Tejima

<Environment>

Principle 7: Businesses should support a precautionary approach to
environmental challenges;
Principle 8: undertake initiatives to promote greater environmental
responsibility; and
Principle 9: encourage the development and diffusion of
environmentally friendly technologies.
<anti-corruption></anti-corruption>
Principle 10: Businesses should work against corruption in all its forms including extortion and bribery.

Business Summary

Environmental Technologies

We contribute to society through the recovery of valuable resources and energies as well as the promotion of safe/clean waste treatment.

Pioneer in waste treatment technologies

Since completion of the first large ordinary waste treatment facility in Japan in 1963 using its unique proprietary technologies, Takuma has constructed over 340 waste treatment facilities. While pursuing the most efficient incineration, we have striven to develop optimal technologies that match various forms of waste, which change along with the times. It is no exaggeration to say that the history of waste treatment in Japan means the history of advancements in our company's waste treatment technologies.

Helping prevent global warming with proprietary technologies

Coinciding with increased promotion of the 3Rs (Reduce, Reuse and Recycle) in recent years, we work on material recycling and thermal recovery of waste (the third "R"). Since ordinary waste generated from our daily life holds high energy, generating power from such energy helps prevent global warming. We build waste treatment facilities utilizing our unique technologies for incineration, heat recovery, exhaust gas treatment and waste water treatment, and contribute to preventing global warming by reducing CO₂ emissions through environmental preservation and thermal recovery/power generation.

Variety of facilities and abundant delivery experience

The types of facilities that Takuma has delivered include: "high efficiency waste treatment plant," which performs high-efficiency power generation by forming high temperature/high pressure steam; "pyrolysis gasification and melting plant," which incinerates pyrolysis gas and carbon generated through thermal decomposition of waste at high temperature to form slag, while generating electricity; "ash melting plant," which melts ash left after incineration of waste to form slag to be used as a road material; "recycling plant," which collects iron, aluminum and glass from waste; and "biogas power generation plant," which extracts methane gas from hard-to-burn wastes such as kitchen waste to generate power.

In the field of industrial waste treatment, we have delivered "industrial waste treatment plants." which combine nonflammable wastes generated from business activities with wastes with high calorific value to perform safe treatment and collect energy, and "hydrogen and methane fermentation plants," which generate hydrogen and methane from food waste and use these outputs as fuels for boilers.

In the field of water treatment, we have delivered "advanced processing plants" to purify treated water at water reclamation centers (sewage plants) and, in the field of sludge treatment, "sewage sludge incinerators" to control greenhouse gas emissions during incineration. In particular, we boast the largest share in delivery of advanced processing plants in Japan.

Energy Technologies

Valuing people and the earth, we promote effective use of diverse energies.

Utilizing energy technologies to reduce CO₂

Takuma, not only being a pioneer in boilers, also has a long history of possessing, modifying and improving incineration technologies in the field of utilizing various wastes and biomass.

Energies, which serve as sources of heat and power, are used in a wide range of industries. Not only oil, coal and natural gas-based fuels, but also various carbon-neutral and renewable energies from various agricultural/forest waste, as well as heat from various plants, can all be used effectively. Our technologies that enable effective use of diverse energies contribute to securing energy sources for the future and preventing global warming by reducing CO2 emissions.

Actively promoting development of new energy technologies

In recent years, in response to the growing anti-global warming sentiment, we construct "animal manure incineration power plants" based on our new technologies, in addition to woody chip incineration power plants and RPF incineration power plants, with which we have abundant experience. Paying attention to effective use of natural gas, which generates much less CO₂ and can help prevent global warming, we also added to our product lineup gas incineration boilers and high-efficiency gas turbine power plants. We will continue to actively develop new technologies to utilize energies that are friendly to people and the earth while responding to our customers' needs.

Ordinary waste treatment plant

We support the realization of a recyclingoriented society using advanced waste treatment technologies that meet the needs of local communities.



- Pyrolysis gasification and melting plants
- •Resource recycling and collection plants

•Energy from Waste plants

- Bulky garbage crushing plants
- Incineration ash and fly ash melting plants •Waste to solid fuel conversion plants
- •Transition and intermediate processing plants
- •Raw fuel (biogas) recovery plants
- •Various types of pollution prevention equipment



TAKUMA CSR REPORT 2011

Value Technology, People, and the Earth

Supporting lifestyles and supporting the environment at Takuma, with combustion technologies are at the core of our business, we have created a variety of technologies in such areas as waste treatment and water treatment, while focusing

on people's lifestyles and the global environment.

In order to help solve environmental problems, our desire is to provide new value in the environment and energy fields, including countermeasures for global warming, which is a problem on a planetary scale, and to contribute to the realization of a recycling-oriented society.

1111

Industrial waste treatment plant

Using advanced incineration technologies, we can even treat toxic substances suitably and we are supporting the environmental protection efforts of industry.

Industrial waste treatment plants •Various types of recycling plants



Industrial waste treatment play



from industrial waste and provides heat to a plantation

General-purpose boilers

As the convergence of Takuma combustion technologies, our boilers are a reliable brand that has earned the support of a wide range of industries.

- •Once-through boilers (Eqos, Super Eqos)
- •Vacuum-type water heaters (Vacotin heater)
- Package water-tube boilers Smoke tube boilers (RE boiler)

1.1.1.1

- Heat-transfer oil boilers (thermoheater)
- Radiation heating equipment (strip heater) Various equipment for ships
- Note: These products are handled by Nippon Thermoener Co., Ltd., which is one of our group companies.



Super Faos



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Corporate Information

Company outline

Company name:	Takuma Co., Ltd.
Head office location:	2-2-33 Kinrakuji-cho, Amagasaki, Hyogo 660-0806, Japan
	TEL +81-6-6483-2609 FAX +81-6-6483-2751
Representative Director:	Hajime Tejima, President and CEO
Date established:	June 10, 1938
Capital:	13,367,457,968 yen (as of March 31, 2011)
Main business areas:	Design, construction and superintendence of a wide variety of boilers, plant machineries, pollution prevention plants, environmental equipment plants, and heating and cooling equipment and feed- water/drainage sanitation equipment and facilities Design, construction and superintendence of civil, architecture and other works

Number of employees (non-consolidated): 749 (as of March 31, 2011)

Number of employees (consolidated): 3,235 (as of March 31, 2011)

Business places: Head Office (Amagasaki City, Hyogo Prefecture) Osaka Office (Osaka City) Tokyo Office (Chuo Ward, Tokyo) Hokkaido Branch (Sapporo City) Tohoku Branch (Sendai City) Chubu Branch (Nagoya City) Hokuriku Branch (Kanazawa City) Kyushu Branch (Fukuoka City) Taipei Branch (Taiwan) London Branch (United Kingdom) Harima Factory (Takasago City, Hyogo Prefecture)

Permits and registrations

<Head Office. branch offices and other business offices>

Construction license (Minister of Land, Infrastructure, Transport and Tourism license, Special 22-6129)

Construction consultant registration (Minister of Land, Infrastructure, Transport and Tourism registration, Construction 21-9335)

First-class architect office registration (Governor of Hyogo Prefecture, 201793)

ISO 9001 quality management system certification

<Harima Factory>

ISO 9001 quality management system certification

ISO 14001 environmental management systems certification

Manufacture of thermal equipment for power generation (Ministry of Economy, Trade and Industry) Permission to manufacture boilers and pressure vessels, permission to manufacture cranes (Ministry of Health, Labor and Welfare)

Private product certification standards related to the welding of manufactured electrical goods

(thermal power) certification (Japan Power Engineering and Inspection Corporation) Certification for the manufacture of boilers and first-class pressure vessels (Nippon Kaiji Kyokai)

Manufacture of specific high-pressure gas facilities (High Pressure Gas Safety Institute of Japan)

Corporate structure



Balance sheet overview and net sales composition ratios

ISO 900⁻

JQA-1952

ISO 9001

certification

SO 140

JQA-EM0313

certification

Harima Factory

ISO 14001



Net sales composition ratios (FY 2010)

Group Company Overview

Group companies in Japan

Hokkaido Sanitary Maintenance Co., Ltd. Operation and maintenance of sewage treatment facilities

lwate-Kenpoku Clean Co., Ltd.

Campo Recycle Plaza Co., Ltd.

General and industrial waste

treatment service

service

Industrial and general waste treatment

Ecos Yonezawa

Final disposal of

industrial wastes

Co., Ltd.

Takuma Engineering Co., Ltd. Design of environmental equipment plants and energy plants

Takuma System Control Co., Ltd. Design of electrical instrumentation equipment, including environmental equipment plants and energy plants

Takuma Plant Services Co., Ltd. Maintenance of a wide variety of boilers and environmental facilities

Kankyo Sol-Tech Co., Ltd.

Analyzing and measurement for environmental related issues, including water quality, exhaust gas and soil pollution

R.B.N. Co., Ltd.

General waste, including waste home appliances and office automation equipment, and industrial waste treatment service

Energy Mate Co., Ltd.

Sale of cogeneration systems and systems for generation equipment of the same and total service for onsite energy systems for consumer use

Nagaizumi High Trust Co., Ltd. Facility upgrading, operation and maintenance for general waste final disposal sites

Fuiisawa High Trust Co., Ltd Operation and maintenance management of general waste treatment facilities

Dan-Takuma Technologies Inc.

Manufacture and sale of clean equipment, cleaning equipment, chemical filters, clean rooms, drying equipment and thermal chambers

Overseas group companies

Bioener ApS (Denmark) Servicing and maintenance of biomass power generation plants

KAB Takuma GmbH (Germany) Manufacture and sale of waste power plants and biomass power plants. principally involved with woodchips

> SIAM TAKUMA Co., Ltd. (Thailand) Sale of energy and environmental related plants, parts sale for plants of the same and after-sales service

Taiden Environtech Co., Ltd. (Taiwan) of industrial machinery and equipment

Kyoritsu Setsubi Co., Ltd.

Design, construction and superintendence of Energy from Waste plants, mechanical equipment of sewage treatment facilities, boiler plants for general industries

> Takuma Technos Hokkaido Co., Ltd. Operation and maintenance of waste treatment facilities

Tochigi High Trust Co., Ltd. Industrial waste treatment service

Biopower Katsuta Co., Ltd. Electric power selling using biomass energy from wood fuel chips

Katsuta Co., Ltd. Industrial and general waste treatment service

Ichihara New Energy Co., Ltd. Industrial waste treatment service

Nippon Thermoener Co., Ltd. Sale of a wide range of boilers and related equipment

Takuma Technos Co., Ltd.

Maintenance, management and operation of waste treatment facilities, excreta processing facilities and other facilities, as well as the design, installation and management of various types of boilers, environmental equipment and other equipment

Sun Plant Co., Ltd.

Design, construction and superintendence of air-conditioning equipment, feedwater/drainage sanitation equipment, electrical equipment and environmental sanitation equipment

Design, installation and superintendence of waste treatment facilities and a wide variety

Editorial Policy

We have prepared this document as a combined Corporate Overview and CSR Report, with both a guide to our corporation and a report on our CSR activities.

Publisher

General Affairs Department, Corporate Service Division CSR Department, Compliance & CSR Promotion Division Takuma Co., Ltd.

Data collection period

From April 1, 2010 to March 31, 2011 in principle. In addition, some activities in fiscal 2011 are included.

Coverage

Takuma Head Office, Business institutions, Harima Factory, and some group companies (Nippon Thermoener Co., Ltd., Takuma Technos Co., Ltd., Hokkaido Sanitary Maintenance Co., Ltd., Takuma Technos Hokkaido Co., Ltd., Sun Plant Co., Ltd., Takuma Engineering Co., Ltd., Takuma System Control Co., Ltd. Dan-Takuma Technologies Inc., Kvoritsu Setsubi Co., Ltd., Kankvo Sol-Tech Co., Ltd., Takuma Plant Services Co., Ltd., KAB Takuma GmbH, Bioener ApS, Taiden Environtech Co., Ltd., and SIAM Takuma Co., Ltd.)

Time of Issue:

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Corporate Governance

from accounting auditors and the Audit Department about auditing plans, the status of auditing and other issues and otherwise conduct regular information exchanges. They cooperate together as they do this and undertake auditing

Corporate Governance

In order to accelerate management decision-making and clarify where management responsibilities are placed, we have adopted an operating officer system in which we appoint operating officers who are entrusted with the responsibility to execute our business activities. The Board of Directors meets regularly once a month as a rule and whenever else it is necessary to make decisions about important issues related to business management and issues established by law, as well as to oversee the execution of the directors' duties.

Moreover, we have also established an Executive Execution Committee, which is chaired by the president/ chief operating officer, as an organization that deliberates matters that are brought up at meetings of the Board of Directors and other important issues related to the execution of our business activities. This committee communicates and provides direction about items decided by the Board of Directors and other important items

related to the execution of our business activities appropriately to the divisions that are to execute them. As of March 31, 2011, the Board of Directors was comprised of 6 members, and 14 operating officers (including some who are also directors) had also been appointed.

For corporate auditing, we have adopted an auditor system, and our Board of Auditors, which comprises of four auditors, including two auditors from outside the company, is in charge of it. Auditors attend important meetings, including those of the Board of Directors and the Executive Execution Committee, and they strive to understand and observe the status of business execution in a timely and appropriate manner. They express their opinions as necessary, and they conduct strict auditing of the business execution performed by the directors. This includes conducting self-assessments and evaluations related to the internal control system by operating officers at the end of each term. Furthermore, they receive reports



Compliance & CSR Promotion Structure

Our structure for the promotion of compliance and CSR is used to advance education about our corporate compliance and to foster common awareness about fulfilling our corporate social responsibilities among all employees.

The General Manager at each headquarters serves as the Compliance & CSR Promotion Supervisor, who verifies the state of education at the meeting held at the beginning of each fiscal year and establishes policies for the year.

In each department, a Compliance & CSR Promoter is appointed who offers educational programs four times a year to raise employees' awareness. After each educational program, Promoters submit a report, a list of attendants and answers given to test problems to the General Manager of their headquarters for approval, and then submit the approved documents to the Secretariat (CSR Department). The Secretariat analyzes the submitted documents and reports the results at the next meeting of the Compliance & CSR Promotion Organization.



of every business place, division and subsidiary company in accordance with the auditing policies, divisions of work and other stipulations established by the Board of Auditors.

Thus, we have established a system that encourages employees to constantly deepen their awareness through repeated compliance/CSR promotion educational opportunities.

As to ensuring compliance with the antimonopoly law, we have established Regulations concerning Management of the Pledge of the Anti-Monopoly Act Compliance, which require target persons to submit a handwritten pledge concerning compliance with the Anti-Monopoly Law, aiming to ensure their perpetual compliance. We have also set up regulations to control contacts with our competitors and established a system requiring submission of copies of approvals by the officers in charge and applications for approval to the CSR Department to ensure implementation of strict examination. The examination results are always reported to the management.

Risk Management Structure

In accordance with the Risk Management Policy, we have established a structure as described in the diagram below, in which all the risks of the Company are classified into project risks/DBO Project risks concerning our core business line, namely plant construction, and potential risks and/or actualized risks concerning other business activities, as well as risks concerning financial reporting.

To address the potential risks, we have established a risk management system requiring each department to submit a risk management plan at the beginning of each fiscal year and report the results of measures they have taken at the end of the year. Specifically, the CSR Department, which is in charge of risk management, examines over 500 risks of the entire Company and determines/presents the risks that each department should address, based on the risk classification list, which classifies the risks into common risks for the entire company, common risks for each job, risks unique to each department, etc. This integrated handling has helped visualize the actions taken at each department and enabled speedy management decision-making.



Internal Control

In accordance with the Companies Act, the Basic Policy for Establishment of an Internal Control System (full text is available on the Web) was adopted at the Board of Directors' meeting in May 2006. Based on this policy, we have enhanced and utilized our internal control system.

As structures to assure that our Directors and employees adhere to both laws and corporate statutes in the execution of their business duties, we have established the Takuma Group Ethics Charter and Takuma Group Code of Conduct. We review their contents whenever necessary, and we distribute them to all employees in our Compliance Manual to provide a reference for their use during the execution of their daily work. In addition, we have established an in-house reporting system in order to quickly discover legal violations and other violations related to compliance and respond to them quickly and effectively (see p.39).

As a structure to assure appropriateness of the business activities that occur in our corporate group, we have established Operational Standards for Group Management, and we are undertaking management of subsidiary companies through an approval application and reporting

Actions Taken in Response to the Great East Japan Earthquake

Reported to the

Earthquake

Response

Headquarters.

Actions Takuma has taken in accordance with the Crisis Management Code in response to the Great East Japan Earthquake are as follows:

- March 11, 2011
- Set up the Earthquake Response Headquarters.
- Headquarters at Head Office
- Chief: President
- Vice Chief: General Manager of Compliance & CSR Promotion Div.

General Manager of Corporate Service Div.

- Members: Head of each section
- Headquarters at Tokyo Branch Chief: Head of Tokyo Branch
- Members: Head of each section • Confirmed the safety of our in-house
- employees and external employees, and their family members.
- Checked with our customers the status of products we have already delivered.
- Checked the status of facilities/
- equipment under construction.
- March 14, 2011
- Notified the entire Group of the results of safety confirmation of our in-house and external employees, and their family members.

system. In addition, we send directors and auditors from our company, and supervise the execution of business activities at subsidiary companies. Moreover, we have established the Takuma Group Coordinating Committee for Compliance & CSR Promotion, and through this committee, we are striving to raise awareness and conduct education at every group company in order to make our compliance policies permeate the entire Group.

In order to assure that our system allows auditors to effectively audit, the President and CEO has regular meetings with the auditors to maintain mutual understanding. We have also established an Auditing Division as a staff department for auditors.

To ensure the appropriateness of documents and other information related to finance and accounting, we evaluate the status of enhancement and utilization of internal control concerning our financial reporting every year in accordance with the Financial Instruments and Exchange Act. We will make continuous efforts to improve our system to enhance and utilize internal control, to further increase the reliability of our financial reporting.

While trying hard to gather information on quake-hit areas, we took actions to help our customers resume operation of facilities we had delivered, and to resume construction of facilities currently under construction.

Since our product lineup includes several plants and gas turbines that utilize natural energy sources, we have established a structure to propose various systems to support recovery of the Tohoku region. We will offer them various forms of support that can satisfy local needs.

Donations

On March 14, 2011 we placed a box at the Head Office to solicit donations, a move which we then expanded to branch offices and factories, resulting in a large amount of funds raised. We also introduced a Matching Gift program for the first time, under which the Company added an amount equaling the donations made by employees, and sent the total amount to the Japanese Red Cross Society.

Our London Branch received a large amount of donations from their partner companies and their employees with a message of hope to use the money for Japan. We deeply appreciate the kindness and support of the people in the U.K.

• Providing information for the Ministry of the Environment

Through the Japan Environmental Facilities Manufacturers Association, Takuma provided information concerning disaster waste treatment, etc. for the Ministry of the Environment, and exchanged opinions on relevant matters.

Deployment of Businesses

Efforts for DBO **Projects**

Aiming to propose DBO projects that can satisfy our customers

[D: Design] [B: Build] [O: Operate]

Waste incineration technology is said to be an experience-based engineering, meaning that the accumulation of skills from experience and their utilization is important. In the business of constructing and operating waste incineration plants, the application of the DBO approach, which uses private management and technical capabilities, is sometimes said to have inconsistent results that differ according to how much expertise a private enterprise has accumulated based on its experience and record of results.

DBO Projects

Design-Build-Operate (DBO) is one project approach that is similar to the private finance initiative (PFI) project approach in that the public conducts fundraising for the construction of the facility, so the public owns the facility, and private enterprises are commissioned to conduct the design and construction. In the DBO approach, private enterprises are also commissioned to operate, maintain and manage facilities for long periods of time.



Takuma has abundant experience in delivery, operation and management of various facilities required for DBO projects.



By number

of facilities

Others



TACTICS (technology network system)

Operation Support Center

Overview of the technology information network

Head Office

At our Head Office, we have constructed a comprehensive operation support system that remotely monitors the operating conditions of facilities via the Internet



Business

place A

Rusiness

place B

Management policy for project operation

Placing the highest priority on safe operation of facilities, we operate projects in cooperation with operation management companies. We implement project operations in accordance with our Company Motto.

> Value Technology, People.

The project operator shall pursue **Stable disposal/operation Facilities trusted by local communities Consideration to the environment** to realize its basic philosophy.

Technology

People

Earth

Stable disposal/operation

Facilities trusted by local communities

- project, and realize a high level of transparency in project operations.
- through educational trainings and self-enlightenment programs.

Consideration to the environment

- rounding environment.
- oriented society.

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By facility

capacity

Company Motto

and the Earth

Management Policy

· We set "stable operation of facilities" as the matter of highest priority in this project. · Utilizing technologies based on our experience and know-how, we carry out maintenance and management of facilities that can maximize the facility capacity and minimize costs.

· Each employee should recognize that acceptance by local communities is crucial for public projects/public facilities and actively participate in activities that contribute to improving environmental awareness in the community, thereby creating facilities that value connections with local communities and working together with them.

· We promote information disclosure up to the level that fits the public nature of this

• To ensure that each employee understands the importance of fulfilling this Management Policy, we encourage our employees to acquire up-to-date knowledge and technologies

· We actively participate in activities that contribute to preserving and improving the sur-

• We play the role as a center for environmental information transmission, with the aim of helping raise the environmental awareness of local communities and realize a recycling-

Deployment of Businesses 2

Efforts to Extend the Lifespan of **Facilities**

Efforts to develop new ordinary waste treatment facilities demanded by the times

Proposing plans to extend the lifespan of waste incineration plants that meet our customers' needs

Since completion of the first continuous mechanized waste incineration plant in Japan in 1963, Takuma has constructed over 340 plants, boasting a top class share in terms of both the number of facilities and facility capacity (see p.15, Business Deployment 1). Starting even before anti-global warming approaches began to draw public attention in the field of waste treatment, Takuma has realized high-efficiency waste power generation and implemented major improvements that help prevent global warming, while also continuously promoting related research and development activities.

Ordinary waste treatment facilities have been undergoing drastic advancement through introduction of enhanced measures for environmental conservation such as measures to reduce dioxin emissions. Today, these ordinary waste treatment facilities are positioned as urban facilities that not only perform appropriate treatment of waste but also help form a recycling-oriented society by promoting reduction of waste generation and reuse, recycling and heat recovery of recyclable resources, while playing an important part in tackling global warming. The Ministry of the Environment is now promoting, in its Waste Treatment Facilities Improvement Plan, introduction of the "stock management" approach, which aims to extend the life of waste treatment facilities to reduce their life cycle costs, thereby realizing efficient updates/improvements and maintenance/management of facilities.

Therefore, it is important to encourage waste treatment facilities to introduce the concept of stock management, and to properly implement daily operation management and annual inspection/maintenance, as well as timely measures to extend facility lifespan.

Also required is not only extending lifespan but improving performance that contributes to CO₂ reduction, such as improved energy-saving and power generation capacity.

Cited from [Guidelines for preparing a plan to extend the lifespan of waste treatment facilities (waste incineration facilities), March 2010, Waste Management Division, Waste Management and Recycling Department, Ministry's Secretariat, Ministry of the Environment]



Overview of our plant service information database

We have placed divisions throughout the country that specialize in maintenance and repair. Utilizing the knowledge that we have accumulated in our own plant service information database, we are actively undertaking stock management that uses this centralized information about past servicing and facility repairs. This enables us to

conduct servicing and repair in advance before facility degradation progresses beyond established management levels. In this way, we seek to extend the lifespan of facilities, as well as realize stable and safe operation that is free from mechanical troubles.

Grants for establishment of a recycling-oriented society

ment





Topic 1

High-Efficiency Raw Fuel Recovery Facilities

New type of facility that revolutionizes the concept of waste treatment — Methane collection and high-afficiency power generation from ordinary waste



Nantan Waste Treatment Facility (image)

High-efficiency raw fuel recovery facility (image)

To replace the aging waste treatment facility owned by the cities of Yabu and Asago in Hyogo Prefecture, the new Nantan Waste Treatment Facility is being constructed, with scheduled completion in March 2013.

The biggest feature of this facility is that it functions as a high-efficiency raw fuel recovery facility holding both a biomass plant, which performs methane fermentation treatment of garbage and paper waste in combustible waste and conducts gas engine power generation; and a heat recovery plant, which incinerates residues from the biomass plant (plastics, residue from fermentation) safely and stably.

Methane gas collected from the waste will be used to conduct high-efficiency power generation using a gas engine power generator (with generation efficiency of 30% or more). This advanced facility will lead the initiative to create a low-carbon, recycling-oriented society by effectively utilizing the energy obtained from waste while helping to reduce CO₂ emissions.



Features of Takuma's dry methane fermentation technology

Our dry methane fermentation technology generates methane not only from kitchen waste but also from paper materials and plant trimmings. Therefore, compared with conventional wet methane fermentation technology, which targets only kitchen waste, sludge and excreta, a larger amount of biogas can be collected. Moreover, this technology can be applied also to plastics and other raw materials contained in combustible waste that are not suitable for fermentation, just by providing simple pretreatment. This technology is therefore highly useful for



Advantages of dry methane fermentation for combustible waste treatment

Providing safe and stable technologies

After completion, this facility will operate as the first dry methane fermentation treatment facility in Japan for urban waste. Our dry methane fermentation technique has already been demonstrated in some test facilities (biogasification technology test plant for Kyoto City) and



Biogasification technology test plant

treatment of combustible waste.

Furthermore, with this technology, which combines methane fermentation with gas engine power generation, facility scale has a much smaller impact on power generation efficiency compared with conventional steam turbine power generation, which uses steam recovered from incineration exhaust heat. Therefore, this technology enables small-scale facilities, which are unable to generate power with conventional incineration methods, to perform high-efficiency power generation.

private facilities (food waste methane gasification facility for Campo Recycle Plaza). Using this experience, we will offer safe and reliable technologies for stable operation of facilities.



Campo Recycle Plaza

Efforts for special combustion boilers

Topic **2 Recovery of Energy from RPF**

Waste plastics are unused fuels!

- Establishing a local production system for local consumption to ensure stable supply of fuels from waste for customers (case report from Hokuriku region)

Here are some voices of users of RPF-fired boilers, which are operating steadily in the Hokuriku region, to introduce this system for ensure stable supply of RPF (refuse paper & plastic fuel).



Users of RPF boilers in the Hokuriku region



Representing RPF manufacturers

We have a plant in Fukui City. RPF boilers introduced in companies located in the Hokuriku region are major targets of our RPF supply. Our customers for whom we supply RPF also supply us with raw materials (waste plastics, used paper) for RPF. As a local company, we will actively promote this flow of "local production for local consumption." We will continue to support fuel supply, while encouraging more companies to introduce Takuma's RPF-fired boilers.

RPF manufacturer **A** (Toyama Pref.)

We are promoting manual sorting to prevent foreign substances from getting into RPF.

RPF fuel trading firm; key to stable RPF supply!

Shinsho Corporation

We serve as a go-between for users of boilers and RPF manufacturers in cooperation with Takuma. We cover RPF manufacturers mainly in the Hokuriku region, as well as those in the Kansai and Tokai regions. RPF has been increasingly recognized since its JIS was established last year. Since RPF is produced from waste, we will make further efforts to improve quality control and ensure stable supply.

Hokuriku region

RPF manufacturers' group (consisting of about ten companies based in the Hokuriku region)

Eco Clean (Fukui Pref.)



Director Ishitani



RPF manufacturer **B** (Ishikawa Pref.)

It would be more convenient for both users and fuel suppliers if the fuel storage space had capacity for at least three days.



General Manager in charge of Environmental Businesses

Topic **3**

Chicken / Cow Manure Incineration Boilers

Animal manure is another unused fuel!

- Technology that changes this hard-to-dispose-of waste generated in huge amounts into fuels

In response to various domestic laws and policies, such as the Act on Special Measures for the Promotion of New Energy Usage, etc. (New Energy Law), the Special Measures Law Concerning the Use of New Energy by Electric Utilities (RPS Law), the Biomass Nippon Strategy, and the government buyout system for entire volumes of renewable energy, for which active discussions are currently under way, as well as the trend among private companies to seek higher economic rationality that arose due to the drastically soaring crude oil prices over the past few years, alternative fuels to oil have been attracting extremely high public attention.



Since the mid 1950s, Takuma has constructed as many as over 560 wood chip-fired and bagasse (waste sugarcane after juice extraction)-fired boilers inside and outside Japan. Since 2006, when the Biomass Nippon Strategy was established and biomass began drawing public attention, we have delivered 15 biomass boilers.

Among them, very few boilers in Japan use biomass from animal manure as fuel. Takuma constructed two boilers of this type out of three currently in operation.

We recently received an order for construction of a boiler of this type from Nangoku Kosan Co., Ltd., the company that introduced our boiler in 2002. This indicates that our experience in boiler operation is highly appreciated. The new boiler will be able to use cow manure as fuel in addition to chicken manure, which is used in conventional facilities.

The market for conversion to biomass and oilalternative fuels, or actions to reduce CO₂ reduction, are expanding dramatically. Takuma deals with all types of biomass including food byproducts, shochu liquor lees and sludge as well as construction wood chips, timber offcuts and plant trimmings, and has a widely varied product lineup covering biomass-fired boilers, power generation plants, biogas plants, Kompogas plants, and more. Takuma is therefore determined to establish a firm position in the biomass and oil-alternative fuel market.

Voices from users of animal manure biomass boilers

For development of regional agriculture and communities

Our company was founded in 1973 in Miyazaki Prefecture, a leading meat producing area, with the aim of making effective use of byproducts generated in meat production processes. By effectively utilizing livestock byproducts (bones, internal organs, fat, etc.) generated in association with meat production and animal excreta as feed, fertilizers and energy, we are better able to contribute to the development of regional agriculture and communities and the establishment of a recycling-oriented society.

Contributing to environmental conservation in Miyazaki Pref.

Introduction of this facility has enabled us to collect chicken manure generated throughout the prefecture and to contribute greatly to environmental conservation in Miyazaki Prefecture. Production of feed and fertilizers requires heat for drying and other processes. This boiler, which reduces the consumption of fossil fuels such as heavy oil, also helps reduce CO₂ emissions. The incineration ash generated is also effectively utilized as high-quality materials for fertilizers. We are now ordering our second boiler of this type from Takuma. We rely on their technological capabilities and support, and I hope our relationship will continue for a long time.



Flow chart of an animal manure power generation plant



VOICE

Mr. Sugita Representative Director Nangoku Kosan Co I td (Miyakonojo City, Miyazaki)



Mr. Yuge Executive Director Nangoku Kosan Co., Ltd. (Miyakonojo City, Miyazaki)

Completion of a Waste Power Plant in the U.K.

Receiving Orders for Biomass Boilers in Southeast Asia

Biomass, a source of energy that grows in the sunshine, contributes greatly to reducing CO₂ emissions. Ensuring a balance between preservation of the global environment and the development of energy-this is what Takuma's biomass boiler power generation aims for.



The Duke of Edinburgh attending the ceremony

In January 2010, Takuma completed handover of a new waste power facility, one of the largest plants in the U.K., to Lakeside Plant, the client, after four years and four months of construction work. Construction commenced in September 2005 in an area near London's Heathrow Airport, gateway to the U.K., based on an order we had received because of high appreciation for our abundant experience inside and outside Japan.

With an incineration capacity of 1,370 tons a day and power generation capacity of 36,650 kW, equal to the power consumption of approx. 50,000 households, this is the first large-scale waste power plant completed in Europe by a Japanese incinerator manufacturer.

In October 2010, to celebrate the plant's completion, a grand opening ceremony was held inside the facility, to which a large number of guests, including the Duke of Edinburgh, the Japanese Ambassador to the U.K. Ebihara and several other administrative officials, were invited. Many guests expressed their high appreciation for Takuma's technologies.

With the high technological capabilities long accumulated in businesses in Japan, Takuma contributes to local communities by offering highly reliable facilities for customers overseas, where the business environment, including the characteristics of waste and design/construction conditions, are very different from that in Japan.

Since its early days, Takuma has constructed and delivered many biomass boiler power plants, which use environment-friendly and recyclable agricultural/forest waste as alternative instead of fossil fuels, for industries in Japan and overseas, especially in Southeast Asia.

One type of biomass boiler power plant is the bagassefired boiler plant, which holds nearly 50% share in the market for the sugar production industry in Thailand. Sugar factories crush sugarcane into minute pieces and extract sugar with a compressor, and use the remaining fiber called bagasse as boiler fuel. The steam produced can be used to provide electricity needed at the factories, and then used as a heat source for refining sugar.

In response to the emergence of changes in market demands that have gradually progressed in recent years, there has been a shift in demand for bagasse-fired boilers from ones for factory use with relatively low pressure and large capacity (steam generation 200-300 tons/h, pressure 2.0-3.0 MPaG, steam temperature 300-400°C) to compact, high-efficiency boilers (steam generation 120-170 tons/h, pressure 4.0-11.0 MPaG, steam temperature 450-520°C). This is because products suited for business purposes such as selling excess electricity to external customers and supplying energy using biomass fuels under the scheme of establishing an SPC inside sugar factories are increasingly in demand.

Despite fierce competition from emerging Indian and Chinese manufacturers, Takuma has established a steady position in the region in cooperation with our group company SIAM TAKUMA Co., Ltd. Based on the excellent technologies we have accumulated through abundant experience, we provide highly reliable bagasse-fired boiler plants that match market demands and introduce new designs, as well as other biomass boiler power plants that use rice husks, corn cob residue, palm residue, forestry and woody biomass, etc. as fuels. In doing this, we can steadily contribute to society, with the aim of realizing the coexistence of environmental preservation and energy development.

Topic 4





Transporting sugarcane



Bagasse yard



Topic 5

Topic 6

Gas-Fired Boiler with Low Air Ratio Combustion by Jet-Film Flame

Nippon Thermoener Co., Ltd.



EQi-2000 3-unit installation

Super Egos EQi-2000/2500

Received the Japan Machinery Federation President's Award in the 31st Energy-Conserving Machinery Awards in 2010

■ Outline of machine

Super Eqos EQi2000/2500 are small gas-fired oncethrough boilers with improved boiler efficiency adopting a jet film combustion system developed exclusively by Takuma, capable of reducing both CO and NOx simultaneously at a low air ratio ($\lambda = 1.17$), before impossible with conventional small once-through boilers.

Model	EQi-2000	EQi-2500
Equivalent evaporation	2,000 kg/h	2,500 kg/h
External dimensions	900 × 2,700 × 2,450 mm	

■ Features of jet film combustion

A supersonic nozzle that Takuma originally developed to dust off bag filters is applied as the burner nozzle. A self-recirculation gas flow forms inside the combustion chamber by the jet blast, which mixes with thin-layer flame to lower the flame temperature and reduce thermal NOx. Meanwhile, mixing of combustion gas and air is promoted so that generation of CO can be reduced in combustion with a low air ratio.

This low air ratio combustion helps improve combustion efficiency, leading to decreased fuel consumption.



Effects on energy efficiency

By changing the air ratio from the conventional 1.3 to as ultra-low as 1.17 (exhaust gas $O_2 = 3.0\%$), boiler efficiency can be improved from 96% to over 97%, while electricity consumption of ventilators can be reduced by 22% to 45%.





Effects of introduction

Assuming an annual load factor of 50%, advantages of introducing an EQi-2000 unit compared with our conventional model are as follows:

 Annual fuel savings: 	7,000 m ³ (N)
 Annual electricity savings: 	10.000 kWh
 Annual CO₂ reduction: 	20 t - CO ₂
Annual running cost reduction:	530 000 von

Annual running cost reduction: 530,000 yer



High-Efficiency Gas Condensing Hot Water Heater

GTLH-500 (indoor type)

Super Vacotin heater GTLH-500, the world's first latent heat recovery vacuum type gas water heater, developed

Development background

Since Takuma launched the first vacuum-type water heater in the world in 1974, Vacotin heater, its product name, has become a brand name representative of vacuumtype water heaters and has been a long-selling series.

In developing the new vacuum-type water heater GTL-500, we aimed to further improve thermal efficiency, which had already reached nearly the maximum with the existing model. The new model was therefore designed to exclusively use the urban gas 13A, a clean form of energy, and incorporates modifications to the boiler structure and burner control system. As a result, thermal efficiency of 95% has been achieved in a wider load range than with the conventional model.

Based on the GTL-500, with Tokyo Gas Co., Ltd. we jointly developed the GTLH-500, the world's first latent heat recovery vacuum-type gas water heater, by adding to the GTL-500 a system to collect latent heat contained in the moisture of exhaust gas, which was unused as energy in the conventional model. The GTLH-500 has achieved thermal efficiency of 105% on a low heating value basis.

The GTL-500 and GTLH-500 were both launched for sale in April 2011 as new models substantially different from conventional water heaters.

■System features

- [GTL-500]
- Uses only urban gas 13A, achieving improved heat recovery efficiency
- → Thermal efficiency of 95%, the highest among our 581 kW output models.
- Automatically controls the burner between 20% and 100% (turndown ratio 1:5)
- \rightarrow High efficiency operation with no loss even with low loads
- Compact design similar than conventional model
- \rightarrow One-door type with a total width of 820 mm
- [GTLH-500]
- Ultrahigh efficiency of 105% (on a lower heating value basis) is achieved.

Capable of collecting latent energy contained in the moisture of exhaust gas, which before was usually not collected.

- Separate type latent heat collector is adopted. Separate delivery or late installation, and bypass operation are available.
- Exhaust gas down-flow system is adopted. Condensed water, which interferes in the process of latent heat collection, is guided to fall down by the flow of exhaust gas, to prevent thermal efficiency from declining.
- Designed to be resistant to acid condensed water All-stainless steel is used for the portions that contact with exhaust gas, and a device to neutralize condensed water is built in.

Nippon Thermoener Co., Ltd.

■ Effects on energy efficiency

Improved thermal efficiency leads directly to reduced fuel costs

Compared with the conventional model, with thermal efficiency of 90% with 3,000 hours of annual operation and 90 yen unit gas cost, the annual fuel cost can be reduced by about 800,000 yen with the GTL-500 and about 2.2 million ven with the GTLH-500. (The cost amount to be reduced varies depending on the operational situation.)





GTLH-500 (outdoor type)

Development of New Technologies

Technology to Convert Waste Oil into Light Oil

Takuma has developed a technology to produce "next-generation bio light oil" from waste oil*. Unlike existing BDFs (bio diesel fuels), this next-generation bio light oil satisfies the standard for commercial light oil. A test operation of a school bus using this fuel conducted by Tottori University of Environmental Studies demonstrated this light oil's high quality as a fuel equal to the quality level of commercial light oil.

* This technology was developed based on a study by Kaoru Fujimoto, former professor of the University of Kitakyushu.

Development background

Recently, in view of the issues of energy security and global warming, development of bio fuels (fuels from renewable energy sources derived from animals and plants, instead of crude oil, petroleum gas, natural gas and coal, as well as fuels produced from these) has been accelerating. In particular, development of bio fuels for transportation that do not compete with the food supply is strongly demanded.

One such fuel is waste oil, a promising fuel source having higher heating value than other biomass resources and existing mostly in liquid form. However, since it is

difficult to use waste oil as it is because of its high kinetic viscosity and flash point, it needs to be converted into an appropriate form of fuel oil. To do this, a technology to produce BDF based on ester exchange has been introduced, though it has problems with quality and production costs. To solve these problems, Takuma has developed a new technology to produce environmentfriendly and high quality fuel.



System features

Our next-generation bio light oil production technology is a mechanism where the ester bond in oil is broken by means of catalytic reaction under a 400°C/normal pressure conditions, and then the oil is converted into a light oil-equivalent hydrocarbon oil consisting mainly of olefin/paraffin. This method is superior to the conventional ester exchange method in that it does not require any

Development results

As part of its efforts toward practical application of this technology, Takuma, in a joint study with Tottori University of Environmental Studies launched in fiscal 2010, conducted a demonstration operation of a next-generation bio light oil production facility using waste oil collected from households, and a trial operation of a university school bus using 100% next-generation bio light oil.

In the demonstration facility operation, 65% of the energy in the waste oil was recovered for use as automobile fuel, with fuel quality satisfying the light oil standards (compulsory standard, regular standard).

In the school bus trial operation (total mileage: 2,700 km, total oil supplied: approx. 500 L), evaluation on engine conformity of the bio light oil as an automobile fuel reports that the engine exhaust has no smell of oil, like the exhaust of BDFs. Other evaluation results also indicate favorable operational performance and fuel costs equal to the commercial light oil.

Encouraged by these results, we will further deploy this technology to a wide range of biomass resources including



reagent such as methanol, does not generate any waste such as glycerin, and as ingredients can use animal oil and palm oil, both of which have high fluid points. Moreover, the next-generation bio light oil produced with this technology is a high quality fuel equivalent to commercial light oil, and can be used in cold climates since it has a low freezing point.

vegetable oil such as palm oil and animal oil such as beef fat and fish oil, and develop markets for next-generation bio light oil.

Note: These demonstration tests are financially supported by the subsidy for scientific research to promote establishing a recycling-oriented society granted by the Ministry of the Environment. This technology was developed by Takuma for practical application with approval by the Kitakyushu Foundation for the Advancement of Industry, Science and Technology.



Filling a school bus with oil



School bus used for trial operation

Development of New Technologies **2**

Gasification of Biomass, **Liquid Fuel Synthesis Technology**

Takuma has developed a technology to produce methanol from biomass. Methanol is an alcohol fuel excellent for storage, transportation and incineration. This system makes optimal use of biomass energy in various forms such as liquid fuel, electricity and heat to meet diverse needs.

Development background

Methanol, which is used extensively as a raw material in the chemical industry, is also used in the environmental field for sewage plants and bio-diesel fuel production facilities. It is also used for small fuel cells of mobile devices such as laptop PCs.

Methanol is generally produced from natural gas, a fossil fuel. By producing methanol, an important industrial material indispensable for our lives, from biomass, we are able to reduce consumption of fossil fuels and emissions of CO₂.

Takuma has promoted development of a gasification technology to efficiently produce gas fuel from biomass

and a methanol synthesis technology to effectively produce methanol from this gas fuel. As part of a project commissioned by the Ministry of the Environment to develop anti-global warming technologies, Takuma conducted a demonstration test of gasification methanol synthesis for three years from fiscal 2007 to 2009. Methanol produced in the test was actually put into practical use as a reaction aid in producing bio-diesel fuel, demonstrating the effectiveness of this technology.

System features

To produce methanol, biomass must first be transformed into gas fuel. Methanol is synthesized from carbon monoxide and hydrogen, which are the main components of this fuel gas, by means of catalytic reaction.

Other energy sources than methanol can also be obtained in this system. The portion of fuel gas not used for methanol synthesis and any unreactive gas (off-gas) are used to generate power, which can be used to cover the plant's motive needs and supply electricity to the neighborhood. Moreover, thermal energy for steam and

Development results

In the empirical test, we operated the system for a total of 2,500 hours, including one month of continuous operation, and it produced about 5,000 L of methanol stably. This demonstrated that our gasification methanol synthesis technology had reached an adequate level for practical application.

Because of these achievements, we were awarded for this technology the Japan Chemical Industry Association Technology Award 2010 and the 24th Japan Society of Energy and Resources Technology Award. We will continue making efforts to help prevent global warming and establish a sustainable society.





hot water can also be obtained from exhaust gas after power generation.

Thus, this system can be called a trigeneration plant, which produces from biomass three sources of energy: methanol, electricity, and heat.

In this system, the production volume of methanol, electricity and heat can be adjusted according to the demand for each element, enabling users to operate the plant efficiently.



nan Chemical Industry sociation Technology Award 2010



The 24th Japan Society Energy and Resources Technology Award

Development of New Technologies **3**

Two-stage Hydrogen and Methane Fermentation of Biomass

Takuma has developed a technology to efficiently collect energy using microorganisms from biomass with high moisture content such as food waste without incinerating the biomass. In this system, biomass is converted into gas fuel, which can be used as an energy source for various purposes such as heat, electricity and automobile fuel.

Development background

Production processes at a food factory require a large amount of heat. To satisfy this demand, food factories currently rely on fossil fuels, though they are facing an urgent task of reducing the use of fossil fuels. They also face the task of reducing the volume of food waste generated in production processes.

Seeing this situation, we have developed a system that efficiently collects biogas mainly from food waste by employing two-stage hydrogen-methane fermentation, to realize both waste disposal and reduced fossil fuel consumption.

This system is applied in our No. 1 Plant for processing shochu liquor lees. In shochu production, waste containing organics called shochu lees is generated in the distillation process. Conventionally, shochu lees are dumped into the ocean without being effectively utilized, while thermal energy generated using fossil fuels have been supplied to the shochu distillation process.

By applying this technology for shochu processing to collect biogas from shochu lees and use it as fuel, consumption of fossil fuels can be reduced (energy-saving effects), leading to simultaneously achieving both reduced environmental burdens and waste disposal.



System features

Decomposition by methane fermentation roughly consists of the microbial reaction processes of solubilization, hydrogen/organic acid formation, and methane formation. Each process is divided into two stages and fermentation is performed under the most appropriate conditions for each stage. This improves the entire fermentation efficiency.

This two-stage hydrogen-methane fermentation tech-

Development results

Takuma developed the hydrogen-methane fermentation system as a method of collecting energy from shochu lees, which was conventionally dumped as waste. The demonstration test plant built in 2005 has been in continuous operation since then. Because of its contribution to preserving the environment, the system was awarded the Chairperson's Prize at the Japan Society of Industrial Machinery Manufacturers' 35th Outstanding Environmental Equipment Awards, and the President's Award in the fiscal 2009 Energy-Conserving Machinery Awards by the Japan Machinery Federation for its stable operability and high energy efficiency. The system also received the fiscal 2010 Japan Institute of Energy Progress Award (Technical Division) for its remarkable contribution to the energyrelated technology field.

After five years of successful test operation, it was decided to continue operation of the system.

Capable of collecting energy from various unused wastes including not only shochu lees but also waste from



Riomass



Pretreatment equipment





nology enables a higher rate of energy collection than does conventional single-stage methane fermentation. Since solubilization and organic acid formation are actively promoted, the time required for fermentation can be reduced so that the system can be made compact. The plant design is simple with no auxiliary equipment attached since such equipment often causes trouble.

food factories with high moisture content such as okara (bean-curd refuse) and juice residue, as well as livestock excreta, sewage sludge, high-concentration effluents, etc., this system is a promising technology that establishes a recycling-oriented system and contributes substantially to reduced burdens on the environment. Our goal now is to further improve its energy recovery efficiency and reduce costs.



irnerson' Prize 35th Outstanding Environmental Equipment Awards by the Japan Society of Industrial Machinery Manufacturers



President's Award the fiscal 2009 Energy-Conserving Machinery Awards by the Japan Machinery Federation



Fiscal 2010 Japan Institute of Energy Progress Award (Technical Division)

CSR Activities for the Future

Efforts to Draw up a Road Map

We evaluated the status of the compliance/CSR activities we have promoted since 2006, in preparation to draw up a road map for CSR activities in the future.

Process of drawing up a road map

Step 1	Review the compliance/CSR activities conducted since fiscal 2006.
	We will review all the activities we have conducted concerning compliance, risk management and internal control since fiscal 2006, when the Coordinating Committee for Compliance & CSR Promotion was established. Then the current status of each activity will be evaluated internally. The evaluation method will be determined based on various CSR-related guidelines such as ISO 26000, which provides guidelines for social responsibility, while taking into consideration the relevance of such guidelines to our business activities.
Step 2	Select important tasks.
	There are many legal regulations and issues related to our business activities, for each of which relevant departments must take necessary actions. Among them, legal regulations and issues that are likely to have significant impact on the entire company should be addressed under a company-wide framework. In Step ② , based on the evaluation results in Step ① , we will select the important tasks that should be addressed under a company-wide framework.
Step 🕄	Develop a scheme to verify the level of implementation of important tasks.
	Concerning the level of implementation of the important tasks, it is necessary to gather reports on the progress status from throughout the company and then verify them. In Step (3), to verify the implementation status, we will develop a scheme to clarify 1) the method for gathering reports on progress status, and 2) the system for organizing the gathered data.
Step 4	Share verification results throughout the company.
	Concerning the results of verification of the implementation level of important tasks, it is necessary to 1) submit a report to management for approval, 2) give feedback to all departments in the company and hold discussions for improvement, and 3) arrange a meeting or other forum to share the results throughout the company. In Step (9 , we will organize a scheme for reporting/feedback for sharing the verification results.
Step G	Provide in-house education/promote permeation.
	A series of processes from selecting important tasks, verifying the level of implementation, to sharing verification results internally, must be constantly followed throughout the company. In Step (3), we will discuss in-house education/measures to promote permeation such as training seminars and workshops for ensuring company-wide deployment and permeation of the processes.

■CSR issues for the future

Concerning CSR issues for the future, we should first focus on the top priority fields to take actions for improvement. Once a PDCA cycle of actions/improvement is established, the next step is to check the priority fields and consider expansion of those fields. Actions for introducing outside views such as listening to opinions of external stakeholders should also be encouraged.

Over the long run, we will deploy extensive CSR activities to respond to social expectations, such as promoting community cooperation/development and addressing social and global issues.

Takuma Group's priority fields

- Fair business activities
- Promoting environmental managementt
- Proper labor practices

Actions for improvement for priority issues

Step	Step 2	Step 🕄	Step 4
eview activities.	Select important tasks.	Develop scheme to verify imple- mentation level.	Share verific results throu out company

Road map for CSR activities (concept image)

CSR activities are activities that should be conducted continuously over a long period of time. By creating a road map, we will take steady steps to do what we can and continuously make improvements for the future.

Long-term issues for the future

- Promoting community cooperation/development
- Addressing social issues
- Addressing global issues

Etc.

Next-stage issues

 Checking priority fields • Expanding priority issues Introducing outside views Etc.

Step 6

education.

Provide in-house

ification roughany.

Actions for next-stage issues

Advance/expand the actions

Address longterm issues for the future

CSR Report



The CSR of Takuma

We instituted the Takuma Group Ethics Charter, Takuma Group Code of Conduct, and Personal Information Protection Policy and now strive toward promotion of CSR management.

Takuma Group Ethics Charter

Takuma and the Takuma Group companies believe that it is essential for the sound development of the group that all of the directors and employees remain aware of our social responsibilities and the circumstances surrounding us as well as act in response to social ethics complying with applicable related laws and ordinances. Bearing the above in mind, we have established and will promote this ethics charter as our code of conduct, aiming to realize our management principles.

- 1. We shall strive for proactive social contribution while establishing a harmonious coexistence with the global environment as good corporate citizens.
- 2. We shall act in good faith in accordance with sound business custom, while complying with applicable laws and regulations and committing ourselves to fair, transparent and free competition, as well as conducting lawful business activities.
- 3. We shall never have any relationship with antisocial forces or organizations, which may pose a threat to the social order and security of civil society.
- 4. We shall respect fundamental human rights and never practice discrimination.
- 5. We shall strive to provide high quality products and services, based on our advanced technologies, to attain high acclaim and confidence from our customers.
- 6. We shall strive to disclose corporate information to shareholders and investors through investor relations (IR) and other activities on a timely and equitable basis.
- 7. We shall strive to protect corporate properties as well as information, while never using either for improprieties or any unjustifiable purpose other than normal business operations.

Takuma Group Code of Conduct

Harmony with society	 Coexistence with the global environment Coexistence with international society Practice of social contribution activities 	Practice of customer satisfaction
Practice of compliance with	 Free competition and fair trade Relationship with politics and public administration 	Making appropriate disclosure of information
laws and ordinances as well as sound economic activities	 6. Policies concerning business entertainment and gift-giving 7. Prohibition of involvement in anti-social activities 8. Appropriate export and import transactions 	Protection of corporate properties and information
Respect for basic human rights	 9. Prohibition of discriminatory actions 10. Respect for individuality, personal quality, and privacy 11. Safe work environment 	

stomer tisfaction	as ensuring reliability 13. Policies concerning advertising
iking propriate sclosure of ormation	 Transmission of corporate information Ensuring reliability of financial report Prohibition of insider trading
otection of rporate operties and ormation	 Management and proper use of corpor- ate properties Handling of confidential information Intellectual property protection

12. Safety of products and services as well

The History of Takuma

Image: The first "Takuma boiler" is introduced by our founder Tsunekichi TakumaTsunekichi Takuma	1912 For the energy of Japan and the world			
1930 Tsunekichi Takuma was commended as one of the ten great inventors of Japan during the Meiji and Taisho periods (1868– 1926)	1930	1938 Founded Takuma Boiler Manufacturing Co., Ltd. The company motto instituter "Service to the nation through boiler manufacturing"	Amagasaki Factor	
1949 Exported a bagasse firing boiler, which was the first product of its kind in the industry	1940	Harima Factory under	1942 Operation launch of 1949 Listed on the stock Osaka and Tokyo	the Harima Factory exchanges in
1958 Advanced into the environmental facility sectors, including waste incineration and water treatment plants	For the environment of Japan and the world			
1963 Delivered Japan's first waste incineration plant Delivered a sewerage treatment facility Japan's first waste incineration plant	1070			
1975 Bulk production of the world's first vacuum-type hot water heater, "vacotin heater"	1000	1972 Company renamed Takuma Co., Ltd.	地を ^{変更しまし} 。 禁王 タクマ TAKUMA CO. LTD 参加47年6月 ¹⁰	"We are renamed Takuma Co., Ltd. June 1, 1972" Logo to notify name change
Vacotin heater 1986 Delivered the first waste treatment facility overseas (U.S.A.)	1960			
	1990	1992 A new company motto institu Earth"	uted: "Value Technolo	ogy, People and the
2004 Established KAB Takuma GmbH in Germany, engaged in the plant construction business for waste and biomass power plants in Europe 2005 Benamed Nippon Thermoener Co. Ltd. by the marger between	2000	2004 Issued the first edition of th Instituted the "Takuma Grou 2005 Instituted the "Takuma Envi Instituted the "Personal Info	e "Environmental Re up Code of Conduct" ronmental Policy" rmation Protection I	port" Policy"
Takuma Hanyokikai Co., Ltd.—our former subsidiary, which conducted the manufacture and sale of small boilers—and Ebara Boiler Co., Ltd.	Into the age of CSR	2006 Instituted the "Compliance I Instituted the "Takuma Grou Participated in the UN Globa 2007 Issued the first edition of th 2009 CSR Awareness Survey firs	Declaration" up Ethics Charter" al Compact e "CSR Report" t conducted	oney

Compliance/CSR Activities

Compliance/CSR promotion education

Positioning fiscal 2010 as the first year of the "compliance continuation/application period," we held four seminars under the principles of 1) encouraging each person to think and act on his/her own, and 2) making the educational programs a forum for creating a better working environment.

• 1st Seminar: Compliance case study

A compliance case study seminar was held in order to deepen understanding of the matters learned and improve applicable skills by simulating events that actually occurred or are likely to occur, and then discussing the problems in such events.

Case 1 Copyrights Case 2 Abuse of dominant bargaining position Case 3 Awareness of environmental issues Case 4 Ethics for engineers

2nd seminar: Power harassment. Sexual harassment

Based on the results of the CSR Awareness Survey conducted in fiscal 2009, participants learned about power/sexual harassment. In addition to what is generally known about power/sexual harassment, the lecture also covered secondary harassment (reactions to those accusing power harassment, referring specifically to retaliation from the harasser or company, others' attitudes toward those siding with the harasser, etc.)

• Lecture on CSR from an outside management expert

On September 29, 2010, we invited Shizuo Fukada (former Japanese representative industrial expert and Chairman, ISO/SR Standardization Working Group) to give a lecture for management staff on "The CSR environment/Trends surrounding Takuma and priority issues to tackle."

CSR Awareness Survey

The CSR Awareness Survey for fiscal 2010 was conducted following the first survey in 2009, with the aim of determining the degree to which education to promote compliance/CSR had permeated the company as well as the employee levels of awareness and understanding, in order to identify indicators for future efforts. After the fiscal 2010 survey, we provided education on items that scored low throughout the company, making effective use of the survey results. We will continue to conduct this survey and utilize the results for more practical compliance/CSR promotion activities.

In-house reporting system

At Takuma, we have been operating an in-house reporting system since August 2006, with the aim of promoting compliance management by uncovering illegal or unfair acts as early as possible and undertaking corrective measures. Reporting contacts are set up at our Compliance & CSR Promotion Division and at an outside law office, as well as a dedicated contact for anonymous e-mail reporting. Our In-House Reporting Code and the Takuma Group Code of Conduct declare that informants are not to be subject to disadvantageous treatment. To assure that our in-house reporting system is properly understood and utilized, we have distributed compliance cards with information about reporting contacts to every employee, and we are making efforts to spread awareness of it through education to promote compliance and CSR.

• 3rd seminar: Takuma's CSR

-CSR through international standards: ISO 26000 The background and purpose of ISO 26000 issued in November 2010 were explained. Participants then discussed the theme "What actions should be taken in your department based on the Company Motto?," and summarized some specific actions each department could take concerning the three elements of the Company Motto, "Value Technology, People and the Earth." (See p.40)

• 4th seminar: Corporate scandals and compliance -Compliance at Takuma

Participants learned that in order to prevent corporate scandals, it is necessary to not only comply with the laws but also maintain a good working environment where employees' ethical level is high and their human rights are respected. The process of using the in-house reporting system was also explained to promote thorough understanding, and an outline of past in-house reports submitted was disclosed.











Out current Company Motto "Value Technology, People and the Earth" was established in 1992. It represents our determination to take full advantage of the strengths and talents of each employee, constantly develop the technologies that lead the industry, and by doing so, help protect the global environment. What are actions based on the Company Motto? Here are some answers to this question from our employees.

Value Technology

- · Conduct up-to-date development and pass it down to the next generation, to ensure succession of technologies.
- ble cases), to prevent recurrence of troubles.
- Ensure transparency in design for all stakeholders by presenting organized design details and backgrounds.
- . Understand that safety control, guality control, construction control and process control are all included in "technology."
- · Listen to users' opinions (satisfaction) about Takuma products and the points they think need improvement, and give feedback to the engineering departments, to reflect the opinions in future technology and product improvement.
- · Promote development of technologies related to resource saving, energy saving and recycling, while striving to reduce waste in every business field.
- as biogas generation facilities.
- formation security.

Value People

- · Respect the positions of everyone including customers, employees and business partners, and maintain a fair and honest attitude toward them.
- · Enhance communication with customers, suppliers, regional residents, employees and their family members, and help create a comfortable and safe working environment.
- · Each member of the department should help each other and engage in sales activities to satisfy the stakeholders.
- Offer user-friendly design, taking into consideration the installation environment.
- Offer health and safety-conscious design, while preventing designers from working too long.
- · Enhance safety awareness throughout the company and permeate it at each construction site, in order to establish a safety-oriented culture to prevent labor accidents.

Value the Earth

- - earth
 - cial development.

 - pate in volunteer cleaning activities, make donations, etc.
 - global warming and preserve the global environment.
 - · Promote proper disposal and reduction of industrial waste. During construction work, ensure compliance with laws concerning air and water quality, noise, vibration, etc.



· Conduct thorough examination and confirmation of technological backgrounds, establish a check system and gather information (trou-

· Play a role in expanding Takuma's advanced technologies in the market by proactively dealing with newly developed products such

• To prevent internal technical information from leaking, introduce systems to prevent information leakage and provide education on in-

• Respect the cultures of customers in foreign countries and build good relationships, in order to facilitate smooth business promotion.

 Keeping in mind that preventing global warming is a global task, actively propose products that are effective in reducing CO₂ and NOx. • Since our main products are environment-friendly (helping to protect the environment), providing our products/plants helps protect the

· Expand sales of energy-saving, recycling facilities, in order to help prevent resource depletion and contribute toward sustainable so-

· Raise environmental awareness by participating in cleaning activities (volunteer) held in line with worldwide Environment Day. • Take energy/resource-saving measures such as improving work efficiency and joining the Cool Biz or Warm Biz campaign, partici-

· Waste treatment and biomass power generation represent sustainable energies that are not dependent on fossil fuels, helping prevent

Activities That Contribute to Society

Awards received from outside organizations

• Japan Institute of Energy Progress Award

Our System for processing shochu lees to recover energy using two-stage hydrogen methane fermentation received the Japan Institute of Energy Progress Award (technical division) for fiscal 2010. This system is a promising technology capable of collecting energy from not only shochu lees but also various wastes with high moisture content that were conventionally unused as energy, such as waste from food factories, livestock excreta, and sewage sludge, and that contributes substantially to reducing burdens on the environment. (For more details of this technology, see pp.33 and 34.)



Japan Chemical Industry Association Technology Award

Our Gasification methanol synthesis from biomass technology received the Japan Chemical Industry Association Technology Award for fiscal 2010. This technology efficiently converts biomass to fuel gas, and effectively produces methanol from the gas. It is an innovative technology that helps establish energy independence and is expected to serve as a distributed energy supply system in urban areas where a large amount of waste biomass is generated and in mountainous areas where effective use of forestry residue is needed. (For more details of this technology, see pp.31 and 32.)

• Japan Machinery Federation President Award

Our Small gas-fired once-through boiler of low air ratio jet film combustion type (Super Eqos EQi 2000/2500) received the Japan Machinery Federation President Award in the 31st Energy-Conserving Machinery Awards 2010. We shared the award with Nippon Thermoener Co., Ltd., one of our group companies. This is a small gas-fired once-through boiler with reduced power consumption, developed jointly by Takuma and Nippon Thermoener, and manufactured and sold by Nippon Thermoener. (For more details of this technology, see p.27.)



The Society of Environmental Conservation Engineering is an organization consisting of researchers and engineers from various fields including waste treatment, energy and water treatment. At its 40th anniversary ceremony, Takuma was awarded for its long contribution to environmental technologies.





Takuma Technical Review

We publish our Takuma Technical Review twice per year, and introduce information related to technologies that we have developed. The most recent issue features "Efforts by the Ministry of Agriculture, Forestry and Fisheries concerning biomass," as well as reports on plant operation and introduction of new products. Please visit our website to read the abstracts.



[Takuma website > Technical Information > Technical Review] http://www.takuma.co.jp/english/gijutu/gihou.html

Exhibition

From November 15 to 17, 2010. Takuma participated in the 54th National Conference on Life and the Environment held at the Kobe International Conference Center. Many people visited our exhibition space.



Activities to solicit donations for areas hit by the Great East Japan Earthquake (See p.14)

Supporting the World Food Programme

We serve on the Board of Trustees of the Japanese branch of the World Food Programme (WFP), which is part of the UN Global Compact. It is said that nearly a billion people are suffering from hunger around the world. We have a campaign period once per year and place posters around the entrances of staff dormitories and dining halls, for example, to convey information about the global food problem to our employees. Together we undertake fundraising and make contributions to the WFP.

Blood donation campaign

We called for blood donation at the Harima Factory in December 2010 and at the Head Office on March 30, 2011 to help support the Japanese Red Cross Society. Many employees donated blood. We will hold this campaign again in fiscal 2011.

Social contribution activities by Takuma employees

• Creation of a new course for the Japan Science and Technology Agency (JST) "Web Learning System for Engineers"

-Akira Kawashimo, Technology Planning & Administration Department (Tokyo) To provide engineers with learning opportunities, the Japan Science and Technology Agency (JST) offers a Web Learning System for Engineers on the Internet. In response to a request by JST, Takuma employee Akira Kawashimo created a course called "Recycling-oriented society and resources/waste" for a new program, "Environmental ethics for sustainable society," which is now available on the Web. Kawashimo recalls, "I think I made use of and communicated knowledge I had acquired through my work for society from the viewpoint of environmental ethics.'

[JST Web Learning System for Engineers] http://weblearningplaza.jst.go.jp/ (in Japanese)

• Lecturer for "Community carbon counselor" training program -Akira Kawashimo, Technology Planning & Administration Department (Tokyo)

The Cabinet Office offers a "Community carbon counselor" training program all over Japan as a local community job creation project. In response to a request from the Carbon Management Academy, Takuma employee Akira Kawashimo gave a lecture on environmental ethics. Kawashimo says, "Environmental ethics is a profound and difficult theme. As a lecturer, I was able to organize the key factors. I hope I can keep on contributing to the local community through my daily work."

Takuma Group cleaning campaign

In line with the worldwide Environment Day, we organized a campaign to clean the neighborhoods around our offices from May to June 2010. Responding to a call for volunteers, a total of 494 employees from throughout the Group participated in the campaign. President Teshima joined the cleaning of the Head Office neighborhood. At the Harima Factory, members of "Yotteko-mura Arai," a residents' organization in Takasago City, Hyogo Pref., joined the cleaning. Sun Plant Co., Ltd. participated in a cleaning activity for the Machikado Clean Day in Chuo-ku, Tokyo. We will continue conducting cleaning activities as one way to contribute to local communities.

• Participation in the city-wide campaign, Clean Osaka 2010 On November 2, 2010, volunteers from Takuma's Techno-Consulting Dept., Osaka participated in Clean Osaka 2010, a city-wide cleaning campaign in Osaka.

Contributions to NPOs

Purchasing UNICEF Christmas cards We purchased 560 sets of UNICEF Christmas cards. Fifty

percent of the proceeds are used to fund UNICEF in their work to help children around the world.

· Donations to calendar market held by NPO, Nippon Volunteer Network Active in Disaster We donated 150 unneeded calendars. The money raised from their sale is used to support disaster victims.

Activities by the group company — Nippon Thermoener Co., Ltd. —

• Hybrid water heater "duoQ3" awarded in the Equipment/System Design Division of the Environmental/ **Equipment Design Awards**

Our hybrid water heater "duoQ3" was awarded in the 8th Environmental/Equipment Design Awards by the Association of Building Engineering and Equipment. These awards are given to excellent environmental/equipment designs with the aim of communicating widely to society the importance of the role of environmental/equipment engineering and the significance of the impact of facility equipment/system design on architectural design.





 Use of carbon offset New Year's postcards We purchased 6,345 carbon offset New Year's postcards for 2011. Compared to ordinary postcards, these have a

CO₂ offset of 17.7 tons.

- Participation in exhibitions
- Enezo 2010 Energy Solution & Thermal Storage Fair (May 26-28, 2010, INTEX Osaka)
- Energy Solution & Thermal Storage Fair '10 (July 28–30, Tokyo Big Sight)
- ENE-WAY 2010 (September 8–10, Nagoya International Exhibition Hall)
- Netsuden Plaza 2010 (November 10-12, Tokyo Big Sight)
- Tokyo International Laundry & Drycleaning Show 2010 (December 3-5, 2010, Tokyo Big Sight)







Working with Our Customers

With the motto: "manufacturing products meet customer satisfaction," Takuma implemented its certification for ISO 9001: Management Systems (Registration No.: JQA 1952, registered in 1997), promoting our activities to enhance customer satisfaction, as well as product quality, based on the quality management system. We completed the switch to ISO 9001:2000 in fiscal 2002 and to ISO 9001:2008 in fiscal 2010.

Customer satisfaction survey

We use our customer satisfaction surveys to obtain feedback from customers when we have built new plants and delivered new equipment, for example, as well as from those to whom we provide regular servicing and upgrades for existing plants. These surveys allow us to hear the unvarnished opinions of our customers about the products that we have delivered and our staff who have been responsible for working with them.

We conduct our satisfaction questionnaire surveys for these types of customers and analyze the results. If there were problems, we analyze the factors that contribute to them and undertake countermeasures to prevent them in the future. The questionnaire survey process is shown on the right as a PDCA flow.

We have used this format to conduct questionnaires since fiscal 2007. Since the second year, average scores of the evaluations we receive from the results have been continually as high as over 80.

For customers who gave a total score of 70 or below, or who gave 1 (Dissatisfied) on a 4-point scale to any of the evaluation items, we analyzed the problem factors and discussed the measures to prevent recurrence. From fiscal 2010, we decided to take the same actions for customers who gave 2 (Rather dissatisfied) to any of the evaluation items, in order to further increase customer satisfaction.



[Average evaluation scores from questionnaire surveys]

FY 2007: 73.4 points (37 plants) FY 2008: 80.2 points (18 plants) FY 2009: 83.5 points (26 plants) FY 2010: 82.3 points (16 plants)



Working with Our Shareholders

IR activities

In keeping with our Takuma Group Code of Conduct, we provide our shareholders and other investors with accurate corporate information in a timely and fair manner. As one part of this, we provide notification when we call a general meeting of stockholders, balance sheet information, timely disclosure information, marketable securities reports, annual reports in English and other business information on our website.

[Takuma website > IR information] http://www.takuma.co.jp/investor/index.html

Working with Our Suppliers

In keeping with our Takuma Group Code of Conduct, we are striving to secure safety and confidence in all our products/services, and we particularly appreciate the support of our suppliers. We believe suppliers are our important partners to achieve the goal of "manufacturing products that meet customer satisfaction" and thereby contribute to society. We make efforts to establish a healthy and stable relationship of trust that will last for a long time.

[Material Procurement Policies]

- 1. When appointing suppliers, they must be treated fairly.
- 2. Seek to discover new manufacturers.
- 3. Confidential information must be firmly controlled.
- 4. Seek to obtain new related information.
- 5. Promote green procurement.
- Comply with laws and ordinances concerning business deals.
- 7. Always have VA and VE in mind.
- 8. Strive toward self-development.

• Fair and impartial evaluation and selection

We provide open opportunities for all companies regardless of nationality, company scale or transaction histories.

We select suppliers based on our comprehensive evaluation of their reliability and safeness in terms of quality, prices, delivery, etc., as well as their technological development abilities and supply capacities.

Promotion of CSR-conscious procurement activities

Because stable transactions with good suppliers result in improved reliability of our products, we seek to establish relationships of mutual trust and promote mutual development.

In accordance with our compliance principles, we respect relevant laws and regulations as well as social norms, and strictly control and maintain any confidential information we obtain through business transactions. Moreover, we organize study meetings and compliance seminars to improve awareness and knowledge among our employees.





● VA/VE* activities

In product procurement, we promote VA/VE activities with suppliers in order to provide customers with optimum products at low cost. These days, we particularly promote VA/VE in view of each product's lifecycle.

* VA/VE: value analysis/value engineering

[Takuma website – Material Procurement] http://www.takuma.co.jp/procurement/index.html

Working with Our Employees

Approaches toward employees

Our company sets "establish a work environment allowing each employee to challenge their goals, as well as getting on with their work through appropriate assessment" as its basic policy. Specifying the following three approaches as critical items, we introduce various systems for each:



(1) Enhance the motivation of employees by ensuring transparency as well as satisfaction for assessment. Objective Management System

We utilize an Objective Management System in which work objectives are set at the beginning of the fiscal year and the degree to which they are achieved are evaluated at the end of the fiscal year. The objectives, which are based on company policies, are decided through meetings and interviews with superiors to include the work tasks that each individual is to undertake over the year and the

roles they are expected to fill. During the fiscal year, we conduct "midpoint interviews" for everyone around the same time. In addition to regular confirmation and follow-up on the progress status of objectives, these promote communication between superiors and the employees that work under them and provide opportunities to deepen mutual understanding and trust.

	Мау	October	March
Interview	Objective setting	Midpoint	Achievement
meetings		interviews	evaluations

In-house commendation

- Takuma Prize*
- Invention and idea commendations
- Qualification acquisition commendations
- Takuma Technical Review Outstanding Paper Award
- Continuous service commendations
- * The Takuma Prize is awarded to employees who have demonstrated outstanding achievements in their work as well as to employees who have demonstrated outstanding achievements in their efforts for society outside of work, including lifesaving, disaster prevention and volunteer service.



(2) Provide capacity building assistance to employees.

In order to promote the cultivation of employees abilities and their self-development, we hold technical presentation meetings for technical employees, offer TOEIC tests, and provide financial rewards and pay examination fees for employees who acquire new certifications, for example.

Technical presentation for technical employees

We set up opportunities to give technical presentations with the aims of enhancing presentation skills to promote younger engineers' technical capabilities as well as clarifying challenges and goals to enhance the technical capabilities of each one.

Open laboratory

We organize open laboratories with the aim of widely enlightening our technical development result within the company and of providing opportunities for exchange between the development team and other employees.

English education support system

In order to improve the language skills of our employees, we regularly offer TOEIC examinations on site.

- Other systems
- Support for obtaining qualifications
- Correspondence education programs
- New employee training
- General employee training
- Managers training
- Job rotation system
- Technical training sessions

(3) Improve the work environment, facilitating employees' efforts to address business tasks without anxiety.

Balancing work and private life

In order to maintain suitable working time periods, assure days off and support diverse ways of working of our employees, we have incorporated systems for discretionary work, flextime, and half-days off. In addition to various systems for supporting employees who are giving birth and raising children, we have also created a system of time off for employees who nurse other family members that exceeds the amount of time legally required.

Implementation of no overtime days

- Reduction of working after hours and on holidays
- Promotion of the use of compensatory holidays and paid time off
- Paid holidays in half-day units
- Childcare leave
- Nursing leave (we allow one year compared to the 93 days that are legally required)
- Discretionary work system
- Flextime system

• Other enhancements to workplace environments

- Measures to counter sexual/power harassment
- Work environment measurement
- Listening to opinions within the company*
- * To enhance "ideal working conditions" for employees, our company absorbs a wide range of views from employees by placing an "opinion box," as well as communication via e-mail and telephone concerning their working environments.

• Employee health management

At our Head Office, in cooperation with our corporate health insurance society and the staff of our cafeteria business, we held a wellness fair with the themes of "Obesity prevention-Creating a body that hardly gains weight" and "Proper drinking-How to drink alcohol smartly." During the fair, panels were displayed, a registered dietitian provided individual diagnoses, and special menu items were offered. In addition, our corporate health insurance society proactively conducts health management measures for all employees.

Recruitment

Graduate recruitment

We implement the periodic recruitment of new graduates every year, from the perspectives of long-range outlook and human resource cultivation. As for the recruitment for the next fiscal year, we will continue to implement fairer and more highly transparent recruitment activities via the provision of information, putting ourselves in the students' shoes.

Internship

We have an internship program, accepting university and technical college students during their school summer breaks.

[Takuma website – Recruitment info] http://www.takuma.co.jp/saiyou/index.html

Respect for human rights and the abolition of discrimination

Our company sets out its respect for basic human rights and prohibition of discriminatory acts in the Takuma Group Ethics Charter, Takuma Group Code of Conduct, and labor regulations. In addition, we also support respect for human rights, without contributing to human rights violations, elimination of forced labor/child labor and the abolition of discrimination through participation in the UN Global Compact.

[Employee health management measures]

- Improvement program for lifestylerelated diseases
- Lifestyle-related disease prevention checkups
- Mental health measures
- Health consultations
- Transmission of health information (in-house newsletter and website)

• Labor-management relations

The labor union is an organization which conducts periodic deliberations and collective negotiations in terms of annual salary, working hours and other working conditions and establishing a stable employee-employer relationship.

Recruitment of handicapped persons

Currently, 8 handicapped employees are active in the company (as of March 31, 2011). We will continue to strengthen our approaches toward improving the employment rate of handicapped people by proactively participating in job-interview sessions in the local community as well as implementing year-round recruitment.

Reemployment system for employees reached the mandatory retirement age

Since fiscal 2006, when we introduced a reemployment system for those employees having reached the mandatory retirement age and we have been providing employees who wish to work actively after retirement with the opportunities to continue playing active roles.

- Takuma Group Ethics Charter (excerpt) 4. We shall respect fundamental human rights and never practice discrimination.
- Takuma Group Code of Conduct (excerpt) [Respect for basic human rights]
- 9. Prohibition of discriminatory actions
- 10. Respect of individuality, personal quality and privacy
- 11. Safe work environment



Efforts for Occupational Health and Safety

Having made "CSR founded on our shared respect for people" our most important slogan, we have been implementing activities to ensure safety and health with the aim of preventing occupational accidents, enhancing labor health, and promoting the formation of a comfortable working environment.

Being the sixth year since we created and started operating the Takuma Construction Occupational Health and Safety Management System (TK-COHSMS), which is based on the OSHMS promoted by the Ministry of Health, Labor and Welfare, we are entering the stage in which safety and health activities promoted jointly by offices and factories should be implemented more actively and spontaneously. Under these circumstances, holding "Establishing stable leadership" as one of the priority safety and health targets for fiscal 2011, we will push forward with our goal of being a safer company by fully exercising our leadership as a master contractor and by ensuring establishment of safety control systems at each related business operator.

• Occupational safety and health activities and their results 1. Safety inspection system

We maintain a system where any construction or installation work starts only after the health and safety manager in each department inspects the safety and health plans for the construction or installation work prepared by our primary subcontractors, and then approves them.

• Fiscal 2010

Number of safety inspections done: 141

2. Education for worksite representatives (safety and health education)

We continuously provide education to increase the levels of safety awareness of our employees and affiliated contractors.

• April 2004 – March 2011

Cumulative number of trainees: 19.608 Number of trainees passing the completion exam: 7,301

3. Safety patrols

Based on our annual safety patrol plan, our Safety and Health Committee (comprising safety and health committee members and advisors) has continued safety patrols. Our safety department and construction division also conduct independent safety patrols. These safety patrols provide inspections/instructions and education, focusing on the implementation status of risk assessment based on SSA (Safe Working Procedure Step Safety Assessment) as well as any unsafe conditions and unsafe acts at worksites

• Number of safety patrols implemented in fiscal 2010 By Safety and Health Committee (members, advisors): 108 By the safety department: 322 By the construction division: 409





• Takuma's recent safety records (number of casualties and severity rate)

Our safety record for fiscal 2010 includes five people who had to miss one or more days of work due to injury, with a severity rate*, which expresses the extent of the accidents, of 0.70.

(* Severity rate: Cumulative number of lost labor days per 1,000 total actual labor hours)



FY 2006	0.37
FY 2007	0.33
FY 2008	0.41
FY 2009	0.14
FY 2010	0.61

National average severity rate in construction industry

Environmental Report

Basic Policy	Environmental	Our co follow vironn of all o
Environmental Philosophy	Takuma is committed to preserving the activities under the Company Motto: "Va	e enviro
Operational Guidelines	 All Takuma Group companies will rection of the environment and business Continuously develop activities to prlaws and ordinances, and ensure environmental standards. Promote development of improved tect Address resource conservation, energibusiness activities. Improve employee awareness and unthrough environmental education and Provide the community with information 	ognize activitie eserve f ronmen hnologi gy effici nderstar internal on on th
Enviro Objec	onmental tives	Our c

fiscal 2012.

2012.

5. Takuma will achieve a rate of green purchase, such as office supplies, by more than 60% by fiscal 2012. 6. Takuma will take all effective and possible environmental measures by controlling expenditures on the same.

Environmental **Objectives for** Group Companies

Takuma

Environmental

Objectives

In accordance with the establishment of our "Environmental Objectives," our domestic group companies established their own "Environmental Objectives" and are striving toward efforts to reduce the environmental load.

Environmental Management

The situation concerning the acquisition of ISO 14001

Our Harima Factory has acquired ISO 14001 certification and has been implementing environmental management activities, based on the environmental management system established to comply with international standards. Our group companies Nippon Thermoener Co., Ltd., Takuma Technos Co., Ltd., and Dan-Takuma Technologies Inc. have also acquired ISO 14001 certification.

ompany has established the "Basic Environmental Policy" as s; aiming to ensure employees contribute toward global ennental conservation. This basic policy applies to the activities company departments.

onment and realizing an affluent society through business hnology, people, and the earth."

the importance of maintaining a balance between preserva-

the environment that comply with applicable environmental ntal control and assessment systems conform to international

ies and products for society that preserve the environment. eiency, recycling, and minimization of waste generated by all

nding about the importance of preserving the environment promotional activities.

he activities of Takuma to preserve the environment.

ompany has established the following environmental objectives.

1. Takuma will reduce the amount of overall energy consumption by 30% compared to its level of fiscal 2001 by

2. Takuma will reduce the amount of CO₂ emissions by 30% compared to its level of fiscal 2001 by fiscal 2012. 3. Takuma will reduce the amount of waste generation by 30% compared to its level of fiscal 2001 by fiscal 2012. 4. Takuma will reduce the amount of final disposal of waste by 30% compared to its level of fiscal 2001 by fiscal

Environmental Report

Environmental Data

Objectives and achievements



Total energy consumption

The total energy consumption of fuels and electricity at our company is indicated in the graph above. The amount of energy consumed in fiscal 2010 was about the same as in fiscal 2009, achieving our objective. We will continue to promote reducing energy consumption.

•Waste generation

Our company sells recyclables and reusables from the waste generated through its business activities to scrap dealers, while outsourcing the treatment of the remainder of the waste-non-recyclables and non-reusables-to haulers, processors and final disposal dealers, in accordance with the Industrial Waste Control Manifest system.

■PRTR emissions

Although our business activities do not involve a wide variety of chemical substances on a massive scale, we use a few designated chemical substances. Consequently, we report and register such chemical substances designated as PRTR [Pollutant Release and Transfer Register], in accordance with relevant laws and ordinances, with the local government.

Dichloromethane (CAS No. 75-09-2)

Rustproofing paint on structural steel for boilers

FY	2006	2007	2008	2009	2010
Emissions (tons)	0	0.5	0	0.1	0

Greenhouse gas emissions

The greenhouse gas emissions created by our company are limited to carbon dioxide (CO₂). The amount of CO₂ emissions in fiscal 2010 was about the same as in fiscal 2009, achieving our objective as well as the target total energy consumption. We will continue striving to reduce CO₂ emissions, both at offices and factories.

•Water usage

The applications of water are cooling and rinsing factory equipment, while being used for daily life, cooling water for air-conditioners, watering plants and makeup water for ponds at the Head Office. The water used for these applications is all tap water.

At the Harima Factory, its water area is covered by the special measures law for the Seto Inland Sea environmental conservation, whereby stringent emission concentration regulations as well as total volume control are applied. The water quality is regularly checked at each registered drain outlet and the result is reported to Hyogo Prefecture.

Toluene (CAS No. 108-88-3)

Used for chemical analyses inside analytical laboratories

FY	2006	2007	2008	2009	2010
Emissions (tons)	3.4	1.1	0.4	0.1	0.03

After use, all materials are taken away by waste-solvent dealers for disposal

• Xylene (CAS No. 1330-20-7)

Rustproofing paint on structural steel for boilers

FY	2006	2007	2008	2009	2010
Emissions (tons)	1.8	1.5	0.2	1.2	1.4

I Environmental Accounting

Since fiscal 2006, we introduced and disclosed our own environmental accounting system; based on the "Environmental Accounting Guidelines 2005 issued by the Ministry of the Environment." As our business activities mainly involve environmental conservation plants and its equipment, Takuma Group employees have a significant awareness of the need for environmental conservation and we have been implementing approaches toward such issues within the Takuma Group.

Scope of data collection

•Period: April 1, 2010 - March 31, 2011

•Sites: [12 companies within the country] Takuma Co., Ltd. (Head Office, other offices including overseas sites and the Harima Factory), Takuma Technos Hokkaido Co., Ltd., Sun Plant Co., Ltd., Takuma Engineering Co., Ltd., Takuma System Control Co., Ltd., Dan-Takuma Technologies Inc., Kyoritsu Setsubi Co., Ltd., Kankyo Sol-Tech Co., Ltd., Takuma Plant Service Co., Ltd. [4 overseas subsidiaries]

KAB Takuma GmbH, Bioener ApS, Taiden Environtech Co., Ltd., SIAM TAKUMA Co., Ltd.

Environmental conservation cost

Item		Investment (thousand yen)	Costs (thousand yen)
Βι	isiness area costs		
	Pollution prevention costs	-	19,814
	Global environmental conservation costs	1,360	10,778
	Resource recycling costs	-	15,432
Ma	anagement activity costs	-	38,035
Research and development costs		26,198	815,353
Social activity costs		-	8,470
	Total	27,558	907,882

Environmental Efficiency

"As for environmental loads, there is a need for business organizations to reduce their gross volumes. However, approaches toward high economic efficiency are also required from a business management perspective. Consequently, when comprehending and evaluating environmental performance as well as approaches toward the environment implemented by business organizations, it is important to comprehend and manage an index indicating the efficiency of their approaches toward the environment, while also reflecting the economic value they produce, as well as an index indicating the total loading dose." (Environmental Performance Indicators Guideline for Organizations-Fiscal Year 2002 Version—: Ministry of the Environment)

At Takuma, we calculated our environmental efficiency in response to the demands of this age. In fiscal 2010, our environmental efficiency was almost the same compared to fiscal 2009.



Nippon Thermoener Co., Ltd., Takuma Technos Co., Ltd., Hokkaido Sanitary Maintenance Co., Ltd.,

Environmental conservation effect

Item	FY2009	FY2010			
(1) Environmental conservation effect concerning resources input for business activities					
Total energy input (GJ)	113,505	117,277			
Water resources input (m ³)	60,583	61,276			
(2) Environmental conservation effect concernin wastes created by the business activities	ıg environmen	tal loads and			
Greenhouse gas emission volume (tons-CO ₂)	4,833	4,961			
Waste generation (tons)	879	1,011			
Final disposal volume (tons)	151	119			
Total drainage volume (m ³)	63,556	61,034			
BOD emissions (tons)	3,565	3,466			
COD emissions (tons)	3,846	3,713			
T-N emissions (tons)	989	918			
T-P emissions (tons)	176	160			





Outside Expert Opinion

Comments on Takuma Corporation's CSR Report for 2011



Scott Davis Professor of Strategic CSR **Rikkyo University**

The waste processing and treatment industry in the world and in Japan is not known for its transparency. Few corporations in this industry regularly report on their CSR activities or implement systematic corporate social responsibility initiatives as part of their business management processes.

The Takuma Corporation stands out in marked contrast to this trend. The Takuma Corporation has produced a corporate social responsibility report annually since 2007 (a precursor of this series was published in 2006 as an Environmental Report) making this report for 2011 its fifth to date. This ongoing reporting achievement, combined with the fact that this reporting process is grounded upon a well organized and carefully planned CSR initiative, places the Takuma corporation firmly on the leading edge of responsible business in this industry.

A CSR Report is not just a list of past activities. It is a means for a corporation to explain its reason for existence, the processes that it implements in order to realize and achieve these principles and goals, and the processes through which it identifies and engages with the partners with which it works and serves. This review will therefore examine the strengths and weaknesses in reporting of the principles, processes and partners of the Takuma corporation as a responsible and ongoing concern.

Principles

In his message at the beginning of the report, President Tejima describes waste management and energy as being an industry developing as an ongoing process in response to changing international and domestic demands and technological challenges. President Tejima describes Takuma Corporation's strategy as being a continuous cycle of learning and innovation designed to understand the ever-changing nature of waste produced by society, develop the technology required to process it

in the most efficient and environmentally friendly way, and coordinate the many organizations, communities and corporations involved in the use and management of resources in a responsible and equitable manner.

In his report on the state of the main business, President Tejima states that the Takuma Corporation's social responsibility is to maintain and promote sustainability throughout the world by the development of environmental and energy technology. This concise conceptualization of the social responsibility of the business and management of the Takuma Corporation is critically important and sets the tone for the entire report.

Processes and Partners

The report gives a wealth of examples showing the actual processes by which the Takuma Corporation implements its principles in its daily operations. The many innovations in plant design and new technology presented in the "topics" clearly demonstrate the Takuma Corporation's commitment to contributing to society by the active development and application of new technologies as a pioneer in this industry.

The sections describing the corporate governance, compliance, and risk management systems are also well presented and explained. The risk management section is particularly interesting and could be improved by giving examples of risks in each of the three classifications that were identified in the past and explaining how they were managed. The explanation in the section on operations describing how the "corporate mission and policy" is used to ensure that plants are designed and operated in alignment with the interests and wellbeing of the stakeholder is particularly interesting.

An objective assessment of the state of the business and achievements in attaining goals for further promoting responsible business is a critical part of a positive CSR initiative. This report therefore could be further improved by providing an explanation of how the

Takuma Corporation identifies its stakeholders, engages with them in order to actively addresses their interests, and how it integrates their goals and concerns in formulating its CSR activities as a mid to long-term strategic plan.

Response to the Outside Expert Opinion



Wataru Yoshida Executive Officer General Manager Compliance & CSR Promotion Div. & Corporate Service Div.

We are deeply grateful to Professor Scott Davis for his comments on our CSR Report for 2011.

This is the fifth time that we have issued a CSR Report. Fiscal 2010, which is the focus of this report, is the second year of our 9th Mid-Term Management Plan, and fiscal 2011 is the final year of the plan.

In the comments, Professor Davis provided his views on the intentions of the President and CEO stated in the "Message from the Top Management," as well as our efforts for responsible "Deployment of Businesses," "Compliance," "Risk Management" and "Development of New Technologies."

Viewing compliance and risk management as the most important bases of our CSR activities, we introduce their structures and mechanisms in this report. CSR activities are premised on continued existence of the company, and thus compliance and risk management are indispensable. As Professor Davis indicated, we will make sure to conduct risk management and continue our efforts to explain its results in an easily understood manner in the future as we do today.

Furthermore, in the section "CSR Activities for the Future," we introduce our efforts to draw a roadmap for the years ahead. The scope of corporate social responsibility activities is broad and thus an action plan showing a clear way forward is an essential part of CSR activities. We plan to draw this roadmap, taking the next Mid-Term Manage-

In conclusion

I congratulate the Takuma Corporation on the considerable achievement represented by this report for 2011 and look forward to a more detailed explication of their goals and achievements based upon a strategic mid to long-term plan in the next report.

ment Plan into consideration, by closely examining our CSR activities and determining what the priority issues are in order to formulate a system in which the PDCA cycle for CSR activities functions well.

Our key field is mainly the environment and energy business. Today, corporate sustainable development is impossible without placing importance on the environment and energy. In his comments, Professor Davis provides both good points as well as needed improvements regarding staying committed to our main business. We will make steady efforts for continued improvement in the areas he indicated.

Amid changes in circumstances in the world and Japan from day to day, as an environment and energy company, we strive to continue publicizing our policies, principles and objectives and specific efforts to achieve them through our CSR Reports. Furthermore, not satisfied with past achievements alone, we will conduct our business activities under the company motto of "Value Technology, People and the Earth."

We will take the comments offered here to heart, and would like to use them to promote CSR management in the future and to prepare even better CSR Reports starting with the next edition. We aim to press forward in our efforts to meet the expectations of all our stakeholders, so I hope that you will offer us your continued support and cooperation.

Working with the Global Environment

Takuma's CO₂ Reduction Technologies

We convert waste/biomass into energy and reduce CO₂!

What is biomass?

Energy from garbage

Biomass is any recyclable organic material derived from a living organism, but does not include fossil fuels. For example, even though CO2 is emitted if vegetables and other household wastes are incinerated, when vegetables are grown again, they absorb CO₂, so there is no increase in CO₂ in the atmosphere. By using the heat produced by incinerating biomass to generate power, the amount of power generated using fossil fuels as fuels can be reduced, and this contributes to decreasing CO₂.

Energy from biomass

Reducing CO₂ at Energy from Waste plants and industrial waste incineration plants

Garbage is not really waste. It is an important source of energy. About 500kWh* of power can be generated from one ton of garbage. In Europe and the Americas, waste incineration plants are often called Energy-from-Waste (EfW) plants, and recovering energy from garbage has become the norm. Please stop thinking of garbage as "garbage." It is a "resource." We are seeking to be the best in the world with our technologies to convert waste into energy and reduce CO₂.

* Assumes the waste has a calorific value of 8,800kJ/kg and a power generation efficiency of 20%.



Reducing CO₂ with biomass power generation boilers A classic example of biomass power genera-

tion is in sugar refineries. At factories that make sugar, the remnants of the raw materials are produced in large quantities. Sugarcane is crushed minutely, and sugar is extracted in a compressor. The remaining fiber is called bagasse and can be used as boiler fuel. The steam produced can be used to provide electricity necessary at the plant, and then used as a heat source for refining sugar. In recent years, the amount of power generated at sugar refineries has grown greatly. There are even examples of single plants that are stably supplying electric power equivalent to 50MW.





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