Flexibility
Challenging Spirit
Sincerity

JFE Group
2010 ENVIRONMENTAL SUSTAINABILITY REPORT

挑戰
柔軟
誠実

Challenging Spirit
Flexibility
Sincerity
The JFE Group considers improving the global environment a management priority and promotes business operations in harmony with the environment. These efforts aim to create a prosperous society.

1. To reduce the environmental impact of all business operations
2. To make contributions through technologies and products
3. To make contributions through conservation of resources and energy
4. To promote communication with society
5. To promote international cooperation

Striving to “exist in harmony with the global environment” and “improve the global environment” through our business activities, as called for in the Corporate Standards of Business Conduct and Environmental Philosophy, the JFE Group is actively working to develop innovative technologies and promote international cooperation to protect the global environment.

As reflected in COP15, held in December 2009, and the passage of Japan’s Act on Promotion of Global Warming Countermeasures, public interest in, and demands regarding, actions concerning global warming continue to grow.

For its part, the JFE Group will carry on with its concerted efforts to protect the environment as it works to steadily achieve the Voluntary Action Plan reduction goals for the first commitment period for the Kyoto Protocol.

The JFE Group is striving to improve its energy efficiency, which already ranks among the best in the world, by pursuing its own energy efficiency activities and technology development, and working to develop significant new CO2 reduction technologies, for example, through its participation in the CO2 Ultimate Reduction in Steelmaking process by Innovative technology for Cool Earth 50 (COURSE50) project. Furthermore, by taking our pursuit of activities aimed at lowering environmental burden through the provision of environmentally friendly products and technologies to an even higher level, we will continue to play an important role in protecting the global environment.

Receiving feedback from our stakeholders as we improve our environmental initiatives is important for improving the quality of our environmental management. We, therefore, encourage you to send us your unbridled opinions on our environmental activities.
JFE Steel’s Activities to Prevent Global Warming
—To Realize a Low-Carbon Society—

Message from Senior Management

Hiroshi Nishizaki
Vice President
JFE Steel Corporation

JFE Steel is constantly working to fight global warming.

FY2009 was the second year of the first commitment period for the Kyoto Protocol, and the 15th Session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP15) was held in Copenhagen in December 2009. Important developments, such as discussion of the Act on Promotion of Global Warming Countermeasures in the Diet in June 2010, have also taken place in Japan. While responding to these demands, JFE Steel will strive to take serious steps toward realizing a low-carbon society in accordance with the Group’s Corporate Vision of contributing to society with the world’s most innovative technology.

Examples of specific initiatives we have implemented are given below:

- Steady implementation of the Japan Iron and Steel Federation’s (JISF’s) Voluntary Action Program
- Introduction of new processes wherever possible to reduce energy consumption and CO2 emissions
- Further development and promotion of high-performance steel to reduce society’s CO2 emissions
- Development of Ferro-Coke production process and other innovative technologies that anticipate the future

Initiatives for Achieving the Voluntary Action Program

Under our Second Medium-Term Business Plan (FY2006 – FY2008), we made approximately 100 billion yen in CO2 emission reduction and energy-efficiency investments to achieve goals stated in the JISF’s Voluntary Action Program, and have seen steady improvements as a result. We continued to make such investments in FY2009. Examples of main investments made to date include:

- Construction of a new CDQ (Commenced its operations in March 2009 at West Japan Works, Kurashiki)
- Construction of a new high-efficiency oxygen facility (West Japan Works, Kurashiki)
- Upgrade of blast furnace stoves to energy-efficient models (West Japan Works, Fukuyama and Kurashiki)

We are also taking energy saving actions on a continuous basis, such as conducting energy-saving patrols at our head office and business offices.

Progress of the JISF’s Voluntary Action Program

During FY2008, energy consumption was reduced 11.5% compared to FY1990. As a supplementary measure to achieve program goals, JISF has made emission reduction purchase agreements of 56 million tons of CO2 in total under the Kyoto Mechanisms. Of them, 40 million tons has already been registered with the UN.

*1 First commitment period for the Kyoto Protocol
The period FY2008 to FY2012. The world’s developed countries have committed to reducing greenhouse gas emissions by 5% compared to the 1990 level during this period.

*2 JISF’s Voluntary Action Program
The goal of the JISF’s Voluntary Action Program is to reduce average energy consumption during the period FY2008 to FY2012 by 10% compared to the 1990 level (based on the production of 100 million tons of crude steel). In addition, it has also established the goal of recycling 1 million tons of waste plastic, premised on the establishment of a collection system.

*3 PJ
Petajoule (10^15 joules). 1PJ is equal to the amount of energy in 25,800kℓ of crude oil.
JFE Steel’s Activities to Prevent Global Warming

**Approaches to Energy Saving and CO₂ Reduction**

As shown in the graph below, JFE Steel has been working for a long time to use energy more efficiently and reduce CO₂ emissions. Our efforts include the recovery of by-product gases generated in the process of ironmaking and steelmaking and the use of CDQ*1 and TRT*2 to recover waste heat and pressure.

**JFE Group ENVIRONMENTAL SUSTAINABILITY REPORT 2010**

**JFE Steel’s Activities to Prevent Global Warming**

**Special Feature**

In FY2009, we worked to achieve even greater reductions in CO₂ emissions, despite production cutbacks, and succeeded in lowering our unit energy consumption to 37% of what it was in FY1973. As a result, JFE Steel has achieved world-class efficiency in energy consumption.

**Comparison to FY1973**

**Consumption in Unit energy consumption in comparison to FY1973**

**Energy Consumption and Unit Energy Consumption for FY2009**

**Crude Steel Production for FY2009**

Crude steel production through the first half of FY2009 fell sharply in response to the global economic decline that began in FY2008. Second-half production, on the other hand, recovered on strong export market conditions, leaving total production for the year basically unchanged from FY2008, and 10% higher than the figure for FY1990.

**CO₂ Emissions and Unit CO₂ Emissions for FY2009**

Even though our crude steel production for FY2009 increased by 10% compared to FY1990, our energy consumption fell by 12% in total and the amount of energy we used to produce 1 ton of crude steel (unit energy consumption) dropped by 20%.

The level of energy consumption still remains lower, an 8% decrease, when compared with that of FY2005 where the production volume of crude steel was almost the same level of that of FY2009.

**Multiple awards for energy saving**

JFE Steel’s ongoing efforts with regard to energy saving have received various awards for its contributions to society. In FY2009, our technical endeavors were again acknowledged with the following awards.

- Contribution Prize of the 42nd annual Ichimura Industrial Awards for development of high-strength steel with high earthquake resistance.
- 56th Okochi Memorial Production Prize for development of nano-scale surface-treated high-performance steel sheet for automobiles.

**JFE Steel’s Super-SINTERTM selected as a Low CO₂ Kawasaki Pilot Brand**

Three JFE Group technologies, including JFE Steel’s Super-SINTERTM, were selected as Low CO₂ Kawasaki Pilot Brands by the City of Kawasaki for FY2009. This is the first year for the awarding of this designation, which recognizes technologies and products that are particularly effective in reducing CO₂ emissions and were researched, developed, and created in the City of Kawasaki.

Super-SINTERTM is a technology for infusing hydrogen-based fuel into a sintering machine, and JFE Steel was the first company in the world to succeed in applying this type of technology commercially. Our East Japan Works (Kehin) has been using Super-SINTERTM technology since January 2009.

Recognition at Kawasaki International Eco-Tech Fair 2010

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*1 CDQ (Coke Dry Quenching)
*2 TRT (Blast Furnace Top Pressure Recovery Turbine Generation)
JFE Steel’s Activities to Prevent Global Warming

Contributing to the Reduction of CO2 through Our Products

JFE Steel works with customers to help reduce CO2 emissions not only in the development, production, and supply of high-performance steel necessary to realize a low-carbon society and pursue economic interests but also in the application of that steel in end-products used by consumers.

According to figures calculated by the Institute of Energy Economics, Japan, for FY2008, Japan Iron and Steel Federation member companies, by supplying 7.97 million tons of high-performance steel, reduced CO2 emissions from the usage of products by consumers by upwards of 14.87 million tons (8.51 million tons domestically, 6.36 million tons overseas).

Transportation Division’s Energy-Saving Measures

To reduce CO2 and NOx emissions from the transportation of steel products, JFE Steel is making a “modal shift” to relatively low-environmental impact ship and rail transportation modes. In its pursuit of efficient transport, it is also taking steps like introducing the use of large specialized freighters for transporting raw materials from overseas.

JFE Steel achieved a modal shift of 95% in FY2009. The amount of CO2 emissions for deliveries was approximately 300,000 tons.

Non-Energy-Related CO2 Emissions

To remove iron ore impurities, lime and dolomite are added to BF and converters. The CO2 from the breaking down of these materials is non-energy-related CO2.

During FY2009, JFE Steel’s non-energy-related CO2 emissions were approximately 1.75 million tons.

Tour of the East Japan Works (Keihin) by METI Minister Naoshima

Minister of Economy, Trade and Industry Masayuki Naoshima and Masaki Koito, the Director of the Iron and Steel Division of the ministry’s Manufacturing Industries Bureau toured the East Japan Works (Keihin). After explaining measures the company is taking to protect the global environment and stop global warming, JFE Steel personnel escorted Mr. Naoshima and Mr. Koito on tours of areas including the waste plastic recycling plant, blast furnace, plate mill, and hot rolling mill, as they explained the steps JFE Steel is taking to reduce CO2 emissions and protect the environment.
JFE Steel has decided to construct a piloth plant as part of its effort to develop processing technology for Ferro-Coke production, which constitutes a novel approach for greatly reducing CO₂ emissions. Ferro-Coke is an innovative material that promises not only to improve the efficiency of iron ore reduction inside a blast furnace but also to deliver significant reductions in the proportion of reduction agent used, thereby minimizing CO₂ emissions and energy consumption. This construction project is being pursued by JFE Steel and three other blast furnace companies aiming to develop new, more resource-efficient iron production technologies. It is being subsidized by the New Energy and Industrial Technology Development Organization (NEDO), and the project participants hope to perfect this new technology and commercialize it as soon as possible.

**Construction of a Pilot Plant for Ferro-Coke Production Process at the East Japan Works (Keihin)**

Innovative Ironmaking Technology Using Ferro-Coke

![Flowchart](Image)

**Projects Outside Japan**

The JFE Group has used environmental preservation, energy conservation, and CO₂ reduction technologies in its R&D to contribute to international society by undertaking numerous technology transfers that fight global warming and help developing and developed countries advance economically while protecting their environments.

**International Cooperation Projects by the JFE Group**

- **Russia**
  - FS for a coal-fired power plant in Sakhalin Island (gas-fired plant; 2 others)
- **Ukraine**
  - FS for BOF gas recovery (FY2009; 3 others)
- **Poland**
  - Study on introducing high-performance industrial technology for refiner furnaces (FY2009)
- **Vietnam**
  - FT for converting a coal-fired power plant in Dak Lak (gas-fired plant; 2 others)
- **China**
  - Waste heat recovery power plants for cement factories (Shaanxi Province and 4 other locations)
  - Environmental preservation and energy conservation diagnosis of Taiyuan Iron & Steel
  - SME production from unused coke oven gas
  - Study on energy-saving measures for lime kiln (FY2010)
  - Study of energy-saving DME project in Shougang Plant on (China)
- **Pakistan**
  - FT for saving energy at Pakistan Steel Mills
- **India**
  - An energy conservation diagnosis at Steel Authority of India Limited
  - Environmental preservation and energy conservation diagnosis at Mahanadi Coal Fields Limited
  - FS for waste heat recovery at sampling cooler at Tata Iron and Steel Ltd. (8 others)
- **Bangladesh**
  - FT for installation and optimization of pipelines to reduce GHG emissions
- **Thailand**
  - Study on introduction of high performance industrial furnace for steel rolling reheat furnaces in Thailand (5 others)

- **Mexico**
  - Study on energy-saving measures by heat temperature waste heat recovery of Autopista Mexico-Washington (5 others)

- **Brazil**
  - Study on energy-saving measures by heat temperature waste heat recovery of Autopista Mexico-Washington (5 others)

**JFE Steel’s Activities to Prevent Global Warming**

JFE Steel is fighting global warming by applying world-class energy-efficiency technology in global initiatives like APP*¹ and worldsteel*² activities, and through technical exchanges with China.

In addition, the JFE Group is contributing to international society by actively pursuing the development of technology overseas.

**Environmental Technology Exchanges with China**

The Japan Iron and Steel Federation (JISF) and the China Iron and Steel Association (CISA) have been holding the Japan China Steel Industries Conference on Exchange of Advanced Technologies on Environmental Preservation and Energy Saving annually since 2005. The fifth meeting, held on April 27 and 28, 2010 in Anshan City in the Chinese province of Liaoning, featured active discussions focused on environmental protection technology.

- **Preheating of Scrap with ECOARCTM Technology**
  - Construction of the plant began in December 2009 at the East Japan Works (Keihin), with completion scheduled to take about two years.

**Introduction of Regenerative Burners for CSI’s No. 5 Reheat Furnace**

California Steel Industries (CSI), a joint venture of JFE Steel and Companhia Vale do Rio Doce of Brazil, is one of the largest steel re-rollers in the Western US. CSI completed construction on its No. 5 reheat furnace* on May 18, 2010 and has since brought it on line. This is the first large reheat furnace in the US to use regenerative burners and is 20% more efficient, in terms of specific energy consumption, than traditional reheat furnaces. A regenerative burner achieves extremely high heating efficiency by using heat from exhaust gas.

* Reheat furnace
  - Regenerative burners are used to heat steel slabs, which are then put through hot rolling mills to produce hot-rolled steel sheets.
Environmental Management System

Construction and Operation of the Environmental Management System

Under the JFE Group CSR Council, the JFE Group has set up the JFE Group Environmental Committee chaired by the President of JFE Holdings, as well as an Environmental Committee in each of the Group’s operating companies and affiliated companies. With this multi-tiered committee system, JFE has been dealing with environment-related issues, such as setting objectives for environmental protection activities, checking progress of those activities, and improving environmental performance for the whole Group.

Promotion to Receive ISO 14001

Each company in the JFE Group has been aiming to receive ISO 14001 certification in order to promote voluntary and continuous environmental activities. Four operating companies with production facilities have all received ISO 14001 certification for individual works. The JFE Group is actively conducting environmental auditing has been conducted on the basis of ISO 14001 with the aim of enhancing environmental management quality. Regarding environmental auditing on the basis of ISO 14001, inspections are made by certification authorities, while internal auditing is conducted mainly by qualified employees who not only have taken the auditor-training course offered by an external institution, but also have experience in environment-related work.

Environmental Auditing

At the JFE Group, environmental auditing has been conducted on the basis of ISO 14001 with the aim of enhancing environmental management quality. Regarding environmental auditing on the basis of ISO 14001, inspections are made by certification authorities, while internal auditing is conducted mainly by qualified employees who not only have taken the auditor-training course offered by an external institution, but also have experience in environment-related work.

Environmental Education

At the JFE, the JFE Group is actively conducting environmental education aiming to foster a corporate culture of engaging in environmental protection activities. In each operating company, environmental education is incorporated in training programs for new employees and promotions, and also includes annual programs at each level, covering environmental protection.

Communication with Society Related to the Environment

Opening of JFE Tonbo Michi

JFE Engineering and eleven other companies with business facilities in the Susehiro area of Yokohama’s Tsurumi Ward signed a joint greenification pledge made to the City of Yokohama and embarked on the Kehin no Morizukuri (Forest Building in. Kehin) project. In May 2009, JFE Engineering completed and held the opening ceremony for a public green space consisting of walking paths and a biotope, and developed with a subsidy from the City of Yokohama. Named the "JFE Tonbo Michi" (JFE Dragonfly Path) based on responses to a call for name suggestions, this green space is overseen by volunteers invited to form the Tonbo Michi Fan Club. Volunteers undertake activities like cleaning the area around the biotope’s pond, trimming grass, and observing the behavior of organisms living in the biotope to protect its biodiversity. They are also taking steps to ensure maintenance of the biotope is continued for future generations. In August 2009, the Kanto Kensetsu Kousaiakai and Ecosystem Conservation Society—Japan selected the “JFE Tonbo Michi” for inclusion in their list of 100 aquatic and green sites in the Kanto area of Japan.

Exchanges through Exhibitions

The JFE Group participates in various exhibitions on environmental themes in order to provide stakeholders with necessary information on its activities. In December 2009, we participated in Eco-Products 2009, one of Japan’s largest environmental fairs, presenting our environmental initiatives, along with our technologies/products that support entire society and life, and contribute to environmental preservation.

Information through the Internet

The JFE Group actively offers information related to the environment through the JFE Group website. Its environmental management policy, results and activities are introduced under the title of “Environmental Activities.” Moreover, JFE has been cooperating with an environmental website “ecobeing,” where general knowledge on environmental issues is presented in an easily comprehensible way. Through this linkage, the Group introduces comments of “eco people,” who are innovatively involved in environmental issues. This is one example of JFE’s efforts to promote environmental awareness activities among the general public.

JFE Holding’s environmental initiative website at: www.jfe-holdings.co.jp/en/environment
Environmental website “ecobeing” at: www.ecobeing.net
In FY2009, environment-related capital investment totaled 30.6 billion yen and expenses amounted to 90.4 billion yen. The ratio of environment-related capital investment against total capital investment is approximately 18%. As a result of activities during FY2009, the effects of energy conservation were valued at an estimated 0.8 billion yen.

**Environmental Accounting**

<table>
<thead>
<tr>
<th>Description</th>
<th>Investment</th>
<th>Expenses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management</td>
<td>Monitoring &amp; measurement of environmental influence, EMS-related activities, environmental education &amp; training, etc.</td>
<td>0.2</td>
</tr>
<tr>
<td>Prevention of global warming</td>
<td>Energy conservation, effective use of energy, etc.</td>
<td>13.6</td>
</tr>
<tr>
<td>Effective use of resources</td>
<td>Recirculation of industrial water, recycling of by-products &amp; waste generated in-house, waste management, etc.</td>
<td>11.9</td>
</tr>
<tr>
<td>Environmental protection</td>
<td>Prevention of air pollution, water pollution, soil contamination, noise, vibration, ground subsidence, etc.</td>
<td>4.4</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>Miscellaneous, etc.</td>
<td>–</td>
</tr>
<tr>
<td>Research &amp; development</td>
<td>Technology development for environmental protection, energy conservation, prevention of global warming</td>
<td>0.5</td>
</tr>
<tr>
<td>Social activities</td>
<td>Protection of nature, support for affiliation, information disclosure, exhibitions, advertising, etc.</td>
<td>–</td>
</tr>
<tr>
<td>Total</td>
<td>30.6</td>
<td>90.4</td>
</tr>
</tbody>
</table>

Environmental accounting data stated above was calculated on the basis of the following assumptions:

The effects in environmental accounting such as expected effects and risk avoidance effect are excluded from calculations.

Calculations do not include capital investments made primarily for purposes other than environmental protection, such as renovation of superannuated facilities, even if the process as a whole resulted in a net energy saving compared to the former process.

Environmental accounting data stated above was calculated on the basis of the following assumptions.

Above costs are environment-related investments and expenses at JFE's steelworks, except the item of research & development, for which the scope is extended to cover the entire Group.

* The effects in environmental accounting such as expected effects and risk avoidance effect are excluded from calculations.

* Calculations do not include capital investments made primarily for purposes other than environmental protection, such as renovation of superannuated facilities, even if the process as a whole resulted in a net energy saving compared to the former process.
<table>
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<tr>
<th>Group Companies</th>
<th>FY2020 Priority Environmental Targets</th>
<th>FY2020 Results</th>
<th>FY2010 Priority Environmental Targets</th>
<th>Refer to Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>JFE Steel</td>
<td>Promote measures to prevent global warming</td>
<td>Approx. 12% reduction in energy consumption, and approx. 20% reduction in unit energy consumption compared to FY1990</td>
<td>Promote measures to prevent global warming in line with the Voluntary Action Program of the Japan Iron and Steel Federation (JISF) (Compared to FY1990, we plan to achieve a 10% decrease in energy consumption for the period from FY2008 to FY2012)</td>
<td>ERI1-10</td>
</tr>
<tr>
<td></td>
<td>Continuously strive to reduce environmental risks</td>
<td>Comply with laws and regulations, Promote voluntary environmental conservation activities</td>
<td>Continuously strive to reduce environmental risks</td>
<td>ERI1-20, ERG1-0</td>
</tr>
<tr>
<td></td>
<td>Promote byproduct recycling</td>
<td>Build new wastewater treatment facilities in order to comply with stricter restrictions on nitrogen in Chiba region</td>
<td>Promote byproduct recycling</td>
<td>ERG1-0</td>
</tr>
<tr>
<td></td>
<td>Improve waste control</td>
<td>Promote measures to prevent global warming in the facility management business, Promote energy-saving activities in the condominium development business</td>
<td>Promote voluntary environmental conservation activities</td>
<td>ERG1-7-18, ER21</td>
</tr>
<tr>
<td>JFE Engineering</td>
<td>Promote energy-saving activities in production divisions</td>
<td>Shimizu Works: a reduction of 23% compared to FY1997 (electric power consumption per unit weight processed)</td>
<td>Shimizu Works: reduction of 5% compared to FY1997 (electric power consumption per unit weight processed)</td>
<td>ER23-4, ER24</td>
</tr>
<tr>
<td></td>
<td>Promote byproduct recycling</td>
<td>Continue development of recycling technology for dust and sludge and implementation of actual equipment</td>
<td>Committed operation of dust recycling facilities (Fukamachi)</td>
<td>ER23-4, ER24</td>
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<td></td>
<td>Promote reduction of construction site waste</td>
<td>Recycling rate of 86.2%</td>
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<td></td>
<td>Promote measures to prevent global warming</td>
<td>Target a 10% reduction in electric power consumption in basic unit within FY2010 compared to the level of FY1990 (scope: new shipbuilding shipyards)</td>
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<td>Target a 5% reduction in energy consumption in basic unit compared to the previous year (scope: group-wide level)</td>
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<td>Reduce waste emissions</td>
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<td></td>
<td>Take measures to regulate VOC emissions</td>
<td>Achieved a group-wide waste recycling rate of 84.7%, a slight decline from the previous year</td>
<td>Promote voluntary environmental conservation activities</td>
<td>ER23-4, ER24</td>
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<td></td>
<td>Monitor the chemical substances restricted under PRTR</td>
<td>Shimizu Works: reduction of 5% compared to FY1997</td>
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<td>ER23-4, ER24</td>
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<td>Universal</td>
<td>Promote energy-saving activities in production divisions</td>
<td>Toshiba Works: reduction of 3% compared to FY1997 (Total CO2 emission of 3 works: 16,344 t-CO2)</td>
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<td>Shipbuilding</td>
<td>Promote byproduct recycling</td>
<td>Continue development of recycling technology for dust and sludge and implementation of actual equipment</td>
<td>Committed operation of dust recycling facilities (Fukamachi)</td>
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<td>Promote voluntary environmental conservation activities</td>
<td>ER23-4, ER24</td>
</tr>
<tr>
<td></td>
<td>Monitor the chemical substances restricted under PRTR</td>
<td>Shimizu Works: a reduction of 5% compared to FY1997</td>
<td>Shimizu Works: a reduction of 5% compared to FY1997</td>
<td>ER23-4, ER24</td>
</tr>
<tr>
<td></td>
<td>Promote energy-saving activities in production divisions</td>
<td>Toshiba Works: reduction of 3% compared to FY1997 (Total CO2 emission of 3 works: 16,344 t-CO2)</td>
<td>Toshiba Works: reduction of 3% compared to FY1997 (Total CO2 emission of 3 works: 16,344 t-CO2)</td>
<td>ER23-4, ER24</td>
</tr>
<tr>
<td>JFE V</td>
<td>Promote energy-saving activities in the condominium development business</td>
<td>Acquire Housing Performance Evaluation Reports, Anti-degradation of structural frames measure grade: Grade 3 Energy efficiency grade: Grade 3</td>
<td>Acquire Housing Performance Evaluation Reports, Anti-degradation of structural frames measure grade: Grade 3 Energy efficiency grade: Grade 3</td>
<td>ER23-4, ER24</td>
</tr>
<tr>
<td>Urban Development</td>
<td>Promote measures to prevent global warming in the facility management business</td>
<td>Reduce waste emissions in the facility management business</td>
<td>Reduce waste emissions in the facility management business</td>
<td>ER23-4, ER24</td>
</tr>
<tr>
<td></td>
<td>Promote measures to prevent global warming in the facility management business</td>
<td>Improve the recycling rate of targeted commercial and business waste</td>
<td>Improve the recycling rate of targeted commercial and business waste</td>
<td>ER23-4, ER24</td>
</tr>
<tr>
<td></td>
<td>Promote measures to prevent global warming in the facility management business</td>
<td>Promo value for energy-saving equipment</td>
<td>Promo value for energy-saving equipment</td>
<td>ER23-4, ER24</td>
</tr>
<tr>
<td></td>
<td>Promote measures to prevent global warming in the facility management business</td>
<td>Promote measures to prevent global warming in the facility management business</td>
<td>Promote measures to prevent global warming in the facility management business</td>
<td>ER23-4, ER24</td>
</tr>
<tr>
<td></td>
<td>Promote measures to prevent global warming in the facility management business</td>
<td>Promote measures to prevent global warming in the facility management business</td>
<td>Promote measures to prevent global warming in the facility management business</td>
<td>ER23-4, ER24</td>
</tr>
<tr>
<td>Kawasaki</td>
<td>With the closure of the Tsukumojima Works, review our activity themes and implement the following</td>
<td>With the closure of the Tsukumojima Works, review our activity themes and implement the following</td>
<td>With the closure of the Tsukumojima Works, review our activity themes and implement the following</td>
<td>ER23-4, ER24</td>
</tr>
<tr>
<td>Micronics</td>
<td>With the closure of the Tsukumojima Works, review our activity themes and implement the following</td>
<td>With the closure of the Tsukumojima Works, review our activity themes and implement the following</td>
<td>With the closure of the Tsukumojima Works, review our activity themes and implement the following</td>
<td>ER23-4, ER24</td>
</tr>
</tbody>
</table>
JFE Steel Corporation has endeavored to reduce environmental loads through R&D on energy saving and environmental protection technologies and aggressive investment in facilities. As a result, our steel production processes now boast the world's highest energy efficiency and recycling rates. Far from becoming complacent with its achievements, JFE Steel still continues to conduct R&D and introduce equipment to further reduce environmental loads in each steel production process.

**Steel Production Process at JFE Steel**

- **Energy recycling in works**
  - 65%

- **Purchased energy**
  - Electricity: 41,496 GWh
  - Natural gas: 3,473,300 m^3

- **Industrial water**
  - 250 million tons

- **Recycled materials**
  - Steel scrap (BOF)
  - Toner (sintering)
  - Waste plastic (BF)
  - Steel scrap (BOF)
  - Waste plastics

- **Input**
  - Coke oven
  - Blast furnace
  - BOF, EF, CC

- **Output**
  - Iron & steel products
  - Marine & land civil engineering materials
  - Other products

**Byproducts recycling** (27.4%)

- **Recovered energy recycling**
  - Reprocess gas
  - Industrial fuel

- **Wastewater, evaporation loss** (6.8%)
  - Landfill disposal (0.2%)

**Recycling Process at the JFE Group**

- **Input**
  - Byproducts
  - Recycled materials

- **Output**
  - Chemical substances
  - CO₂ approx. 52 million tons

- **Energy supply**
  - Approx. 50,000 tons of waste plastic containers and packaging

JFE Steel helps to reduce society’s waste by taking in approximately 50,000 tons of waste plastic containers and packaging—an amount greater than that sent for disposal.
### Reducing Environmental Loads in Business Activities at JFE Steel

#### Air Quality Preservation

**Reducing Sulfur Oxide (SOx) and Nitrogen Oxide (NOx) Emissions**

In an effort to control emissions of SOx and NOx, JFE Steel is actively pursuing the installation and usage of desulfurization equipment and denitrification equipment for major emissions sources.

#### Water Quality Preservation

JFE Steel has been earnestly promoting circulation/recycling of industrial water consumed in the steel production process, with its industrial water circulation rate* maintained at as high a level as about 93%. For release into public waters, wastewater is given appropriate purification treatment so that its pollution loads can be reduced.

* Industrial water circulation rate

\[
\text{Industrial water circulation rate} = \frac{\text{Total consumption} - \text{Received industrial water}}{\text{Total consumption}}
\]

#### Environmental Surveillance

To prevent environmental abnormalities, JFE Steel constantly monitors the load on air and on water quality through a combination of methods like periodic batch analyses, continuous analyses by an automatic analyzer, and ITV-based remote monitoring.

#### Reducing Dust

Since dust is generated from various sources in the steel production process, JFE Steel has been promoting appropriate reduction measures by identifying individual sources and designing specific measures for each source.

#### Excerpts from the Report

- **Exhaust gas treatment equipment for sintering machine**: an example of the activated coke method at the West Japan Works (Fukuyama)
- **Dust prevention fence at East Japan Works (Chiba)**
- **Wastewater treatment equipment**: Example of denitrification equipment for wastewater at the East Japan Works (Chiba)
- **Remote surveillance of environmental data**: an example from East Japan Works (Keihin)
- **Automatic wastewater analyzer**: an example from East Japan Works (Chiba)

---

Reducing Sulfur Oxide (SOx) and Nitrogen Oxide (NOx) Emissions

- SOx Emissions (million Nm³)
  - 1973: 7.1
  - 1980: 6.4
  - 2005: 3.6
  - 2007: 3.7
  - 2008: 3.5

- NOx Emissions (million Nm³)
  - 1973: 6.0
  - 1980: 7.1
  - 2005: 3.6
  - 2007: 3.7
  - 2008: 3.7

---

Received Industrial Water and Circulation Rate

- **Received Industrial Water**: (million t)
  - 1995: 220
  - 2000: 214
  - 2005: 231
  - 2008: 230

- **Industrial Water Circulation Rate**
  - 1995: 93.1
  - 2000: 93.4
  - 2005: 93.6
  - 2008: 93.7

---

COD (Chemical Oxygen Demand)

- **COD (Chemical Oxygen Demand)** (t/day)
  - 1995: 3.5
  - 2000: 3.2
  - 2008: 3.7

---

Reducing Dust

Since dust is generated from various sources in the steel production process, JFE Steel has been promoting appropriate reduction measures by identifying individual sources and designing specific measures for each source.
Reducing Environmental Loads in Business Activities at JFE Steel

Effective Utilization of Byproducts

JFE Steel has been recycling byproducts (i.e., iron and steel slag*1, dust, and sludge*2) in the steel production process to make use of materials for steel manufacturing and has been promoting effective utilization of byproducts as resources. In FY2009, JFE Steel started up a dust recycling facility in the Fukuyama area as a further step to recycle site dust.

*1 Iron and steel slag: Material consisting of non-iron rock components in iron ore and iron, etc., that remains after the molten metal. Slag is mainly used as material for cement.
*2 Sludge: Mud-like substance remaining after wastewater treatment.

Appropriate Processing of PCB Waste

We practice appropriate storage of PCB waste in accordance with the law as well as disposal of such waste based on the schedule directed by the Japan Environmental Safety Corporation (JESCO).

In addition, the group company, JFE Techno-Research, finished putting together a PCB analysis system in April 2010. This system employs a simplified method for measuring minute amounts of PCB, which is based on a manual specified by the Ministry of the Environment. JFE Techno-Research offers JFE Group companies and outside entities services for accurately, economically, and rapidly testing for the presence of PCB in insulating oil used in electrical devices.

JFE Techno-Research’s simplified approach for measuring minute amounts of PCB

High resolution GCMS for measuring PCB

Example of a sample collection kit

Control/Release Reduction of Chemical Substances

JFE Steel has been promoting voluntarily release reduction program, which gives the first priority to chemical substances having higher toxicity and larger release amounts. Since FY2001, total release into air and public waters has been reduced continuously.

Release and Landfill Disposal of Chemical Substances

<table>
<thead>
<tr>
<th>Substances Reported under PRTR (FY2009) (Unit: t/year, decimals: g/TEQyr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>100</td>
</tr>
<tr>
<td>101</td>
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<tr>
<td>102</td>
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<td>127</td>
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<tr>
<td>128</td>
</tr>
<tr>
<td>129</td>
</tr>
<tr>
<td>130</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>
Reducing Environmental Loads in Business Activities

JFE Group ENVIRONMENTAL SUSTAINABILITY REPORT 2010

JFE Engineering is actively working to recycle waste generated in its business activities.

To promote recycling in its offices, it is clarifying waste separation rules and implementing recycling patrols.

And at its construction and manufacturing sites, it is continuously promoting reduction and recycling of industrial waste by means of thorough separation and revising recycling approaches.

Meanwhile, JFE Engineering’s planning and design divisions are incorporating recycled materials, using energy-efficient equipment, and taking other such steps that are friendly to the environment.

Control and Reduction of Chemical Substances

In compliance with the Pollutant Release and Transfer Register (PRTR) Law, JFE Engineering controls releases and transfer volumes of the designated chemical substances and reports those figures to the national government through local governing bodies. The company has been promoting activities to reduce controlled substances, including paints, solvents, and gasoline.
Universal Shipbuilding has built environmental management systems tailored to the functions and operations of individual shipyards in an effort to lower its environmental burden.

**Global Warming Prevention**

A breakdown of Universal Shipbuilding’s energy-origin CO2 emissions shows that 86% are associated with electricity consumption, 10% with petroleum usage, and 4% with gas usage. These figures remained unchanged over the past several years.

The company’s most pressing concern is to lower its electricity consumption, the greatest source of its energy-origin CO2 emissions. Toward that end, the production divisions are taking steps like turning off lights during lunch hours, reducing electricity consumed by welding equipment standing by for use, and replacing electrical equipment with energy-conserving options. The office divisions are promoting such activities as turning off lights during lunch hours, reducing electricity consumption, the company is also proactively engaged in activities such as turning off the engines of shipyard vehicles and trucks when idling, shutting off gas mains at the completion of work, etc. in order to reduce wastage of energy and gas.

Total electricity consumption of production and office divisions for FY2009 came to 138,030 MWh, 11,207 MWh less than in the previous year. Electricity consumption per work hour (MWh/1,000 hours) also declined on a year-to-year basis. Simultaneously with efforts to reduce electricity consumption, the company is also furthering energy conservation through the introduction of energy-saving equipment and operations, as well as by turning off the engines of shipyard vehicles and trucks when idling, shutting off gas mains at the completion of work, etc. in order to reduce wastage of energy and gas.

**Reducing Generation/Discharge of Waste**

Universal Shipbuilding is working to reduce the generation and discharge of waste.

For this purpose, the production divisions are putting out more garbage receptacles for separated waste, conducting patrols, and taking other steps to help ensure that garbage is properly separated, reused, and recycled. The office divisions are reusing wastepaper and thoroughly separating garbage in a bid to dispose of less and recycle more.

As a result of such activities, production and office divisions cut their combined discharge of waste for FY2009 to 52,880 tons, a decrease of 1,141 tons compared to the prior fiscal year.

As for recycling, results were slightly disappointing as the recycling rate declined to 84.7%, from 85.7% in the previous fiscal year.

**Control and Reduction of Chemical Substances**

In compliance with the Pollutant Release and Transfer Register (PRTR) Law, Universal Shipbuilding controls release and transfer volumes of the designated chemical substances and reports those figures to the national government through local governing bodies. The company has been promoting activities to reduce controlled substances, including paints, solvents, and gasoline. As a shipbuilder, Universal Shipbuilding pays particular attention to monitoring releases and transfers of three key substances, namely ethylbenzene, xylene, and toluene that are important for painting activities.

**Zero Fuel Leak Campaign**

Universal Shipbuilding considers fuel leaks to be a significant source of marine environmental pollution and conducts regular training to prevent accidents and minimize damage.

**Chemical Substances**

<table>
<thead>
<tr>
<th>Substance</th>
<th>FY2008</th>
<th>FY2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>1,554</td>
<td>1,190</td>
</tr>
<tr>
<td>Ethylbenzene</td>
<td>298</td>
<td>254</td>
</tr>
<tr>
<td>Xylene</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Toluene</td>
<td>70</td>
<td>64</td>
</tr>
</tbody>
</table>

**Waste Disposal Volume**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total (t)</th>
<th>Recycling rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>'09</td>
<td>1,670</td>
<td>84.7</td>
</tr>
<tr>
<td>'08</td>
<td>1,504</td>
<td>84.7</td>
</tr>
<tr>
<td>'07</td>
<td>1,119</td>
<td>84.7</td>
</tr>
<tr>
<td>'06</td>
<td>1,108</td>
<td>84.7</td>
</tr>
</tbody>
</table>

**Material Balance for FY2009**

<table>
<thead>
<tr>
<th>Input</th>
<th>Universal Shipbuilding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw materials</td>
<td></td>
</tr>
<tr>
<td>Energy</td>
<td>525,000 t</td>
</tr>
<tr>
<td>Electric power consumption</td>
<td>138,030 MWh</td>
</tr>
<tr>
<td>LPG / LNG</td>
<td>857 t</td>
</tr>
<tr>
<td>Urban gas</td>
<td>9,100 km3</td>
</tr>
<tr>
<td>Gasoline</td>
<td>11,2 kℓ</td>
</tr>
<tr>
<td>Light oil</td>
<td>1,623 kℓ</td>
</tr>
<tr>
<td>Kerosene</td>
<td>443 kℓ</td>
</tr>
<tr>
<td>A-heavy oil</td>
<td>460 kℓ</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output</th>
<th>Universal Shipbuilding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Products</td>
<td>486,400 t</td>
</tr>
<tr>
<td>Air pollutants</td>
<td>67,084 t</td>
</tr>
<tr>
<td>NOx</td>
<td>75 t</td>
</tr>
<tr>
<td>SOx</td>
<td>12 t</td>
</tr>
<tr>
<td>Waste generated</td>
<td>52,880 t</td>
</tr>
<tr>
<td>Recycling rate</td>
<td>84.7 %</td>
</tr>
</tbody>
</table>

**Power Consumption**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total (MWh)</th>
<th>(MWh/1,000 hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>'09</td>
<td>138</td>
<td>138</td>
</tr>
<tr>
<td>'08</td>
<td>142</td>
<td>142</td>
</tr>
<tr>
<td>'07</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>'06</td>
<td>157</td>
<td>157</td>
</tr>
</tbody>
</table>
Reducing Environmental Loads in Business Activities at Kawasaki Microelectronics

**Reducing Global Warming and Reducing Chemical Substance Emissions**

During FY2009, production operations at the Utsunomiya Works were gradually shut down, lowering discharges of greenhouse gases and other environmentally-harmful substances at Kawasaki Microelectronics. That testing procedures, which consume large amounts of electricity, remained in operation until the beginning of calendar year 2010, meant that CO2 emissions related to energy consumption declined only slightly. Kawasaki Microelectronics ceased usage of three Freon-substitute PFC gases that have extremely potent greenhouse effects in October 2009, lowering emissions for FY2009 to a level 30% below that for FY1995. In the area of chemical substance management, Kawasaki Microelectronics, after discontinuation of the use of toluene, was using five PRTR substances. Usage of all five of these substances was halted in October 2009.

Reducing Environmental Loads in Business Activities at JFE Urban Development

**Reducing CO2 Emissions Related to Condominiums**

The Real Estate Companies Association of Japan adopted its voluntary action plan for reducing CO2 emissions related to new condominiums in February 2009. The aim of this plan is to reduce condominium life cycle CO2 emissions—emissions related to everything from construction through demolition—to a level below that for general construction.

Condominiums sold by JFE Urban Development already boast environmental performance above what is necessary to achieve the association’s goal.

**Cutting Waste Generation and Energy Consumption at Facilities under Management**

The waste generated by the THINK (Techno Hub innovation Kawasaki) science park, the Globo shopping center, and other facilities managed by JFE Urban Development Group is all separated and measured. Steps are taken to reduce and recycle waste, as well as cut energy consumption.

CO2 Emissions at THINK

(1,000 t-CO2)

- 

<table>
<thead>
<tr>
<th>Year</th>
<th>05</th>
<th>06</th>
<th>07</th>
<th>08</th>
<th>09</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>2.5</td>
<td>2.5</td>
<td>2.6</td>
<td>2.6</td>
<td>2.7</td>
</tr>
</tbody>
</table>

**Material Balance for FY2009**

**INPUT**

| Total energy | 0.347 PJ |
| Electricity | 33.7x10^6 kWH |
| Gas | 4 t |
| Coal and oil | 550 kℓ |
| PFC purchase (CO2 equivalent) | 48x10^3 t-CO2 |
| Chemical purchase (CO2 equivalent) | 6x10^3 t-CO2 |
| Water usage (CO2 equivalent) | 178x10^3 m^3 |
| Resource input (raw material) (CO2 equivalent) | 1.29 t |

**OUTPUT**

| CO2 | 16x10^3 t-CO2 |
| PFC emissions (CO2 equivalent) | 23x10^3 t-CO2 |
| SOx | 263.8 m^3 |
| NOx | 1,351 m^3 |
| Wastewater | 15x10^3 m^3 |
| Waste generated | 1.29 t |
| Chemical emissions/transfer | 2.2 t |
| Products (CO2 equivalent) | 1.22 t |
R&D of Environmental Conservation Technology

Development of Technology for Making Lighter Automobiles: Lowering CO₂ Emissions with Lightweight, High-Tensile-Strength Steel Frames

Efforts to reduce automobile CO₂ emissions by developing electric vehicles and using high-tensile-strength steel to make lighter car bodies are underway.

JFE Steel is using computer simulation to develop technology that uses high-tensile-strength steel for creating car bodies that weigh less. As part of that effort, we worked with Keio University’s Electric Vehicle Laboratory (supervised by Prof. Hiroshi Shimizu of the University’s Faculty of Environment and Information Studies) to develop and fabricate an automobile frame with built-in components*. For use with an extremely compact electric vehicle, this frame is made out of lightweight, high-tensile-strength steel.

* "Automobile frame with built-in components" means a frame complete with batteries, motors, tires, and other components necessary for mobility.

Structural design applying computer analysis

Rigidity analysis results
Impact analysis results

Automobile frame with built-in components for extremely compact electric vehicle developed by Keio University

Development of Environmentally Friendly Steel Processing Technologies: Aiming to Cut CO₂ Emissions by 30%

JFE Steel is a participant in the COURSE50 project launched by the New Energy and Industrial Technology Development Organization (NEDO). The COURSE50 project aims to use modified coke oven gas (modified COG) to reduce iron ore and recover CO₂ from blast furnace gases, and cut CO₂ emissions by approximately 30% compared to the existing steemaking process. JFE Steel’s role in the COURSE50 project is to study the behavior of iron ore once modified COG has been introduced into the blast furnace and to develop a pressure swing adsorption method for recovering and separating CO₂ and fuel gases from blast furnace gases, ultimately reducing CO₂ emissions and putting the fuel gases to effective use. We are also developing technology for recovering heat from slag and using it to recycle the chemical absorption fluid used to recover and isolate CO₂.

COURSE50 Overview

Wire-type Waste Incinerator

Formation of stable flames

Combustion based on the use of high-temperature air combustion technology (Conceptual image)

Development of High-Efficiency Waste-to-Energy Technology: Helping to Reduce CO₂ Emissions

Waste incineration facilities can generate electricity from the heat of waste incineration, to avoid using fossil fuels altogether.

JFE Engineering is a technology leader in the field of waste power generation. We are helping to reduce CO₂ emissions by using this technology to provide society with waste incinerators that can generate electricity very efficiently.

JFE Engineering worked to improve upon its own high-temperature air combustion technology, to both minimize air used for incineration and achieve stable combustion, and develop a technology that does not require catalytic denitrification equipment, which consumes energy intensively. In return for our efforts, we succeeded to boost electricity generation efficiency by 17% compared to existing technology while keeping the NOx concentration in waste gas below 50ppm.

Energy-Saving Devices for Ships

Universal Shipbuilding equips nearly all of the ships it builds with energy-saving devices SSD (Super Stream Duct) and SURF-BULB (Swept-back Up-thrusting Rudder Fin with BULB) to reduce greenhouse gas emissions and improve operation economy. SSDs are installed in front of screws to recover the energy from vortices created when ships move forward and use that energy as thrust. SSDs also create a more organized flow of water into screws to take advantage of the work performed by the screw. SURF-BULBs are installed on rudders to reduce resistance.

Measurements have shown that installation of both devices improves propulsion efficiency by 6-13%. For a more concrete illustration, a 10% propulsion efficiency improvement for a VLCC (Very Large Crude Oil Carrier) at sea 200 days a year would reduce CO₂ emissions by approximately 6,000 tons.
JFE’s Technologies Contribute to Global Environmental Protection

Highly-lubricated automotive galvannealed (GA) steel sheets “JAZ® (JFE Advanced Zinc)”

POINT

- Offer excellent press formability
- Use no substances that would hurt the environment

JFE Steel’s highly-lubricated automotive galvannealed (GA) steel sheets, JAZ®, is a product that has improved press formability through the formation of a layer of nano-scale thickness on the surface of each galvannealed steel sheet. This product is ideal for stamping the exposed panels such as side panels, fenders, doors, wheel housings, and unexposed panels that are normally difficult at press-forming.

In addition, this new product is easy on the environment as it includes none of the environmentally harmful substances found in previous galvannealed steel sheets offering exceptional lubrication properties.

Achieved the World’s Highest Level of Energy Conversion Efficiency

Silicon Wafer for Solar Batteries

POINT

- A material used for solar batteries, critical for fighting against global warming
- Total volume shipped would generate as much electricity as one nuclear plant

JFE Steel, using electron-beam melting, high temperature plasma melting, and other sophisticated metallurgical technologies, has created the world’s most advanced solar grade (SOG) silicon*. It has also used this SOG silicon to manufacture multicrystalline silicon ingots and processed them into wafers. These wafers are used in solar cells that, at around 17%, have achieved an energy conversion ratio among the world’s highest. The volume of wafers shipped since 2001 is enough to generate 750,000kW of electricity, an amount equal to the output of one nuclear power plant.

Contributing to the Low-Environmental-Burden Transportation of Natural Gas

HIPER® Steel Pipe for pipeline

JFE Steel’s HIPER® is a UOE steel pipe product that resists wrinkling when subjected to high levels of axial and bending force. HIPER is used to build pipelines for transporting natural gas over long distances.

* UOE steel pipe is made by expanding the inside steel pipe that has been formed into “U” and “O” configurations with U and O steel pipe presses.

 Helping to Lower Environmental Burden by reducing weight

HBL®385 Structural Steel

HBL®385 structural steel applies JFE Steel's own accelerated cooling system*. Exceptionally high strength makes it possible to use less steel. HBL®385 is a high-tensile strength, high earthquake-resistant steel suited for use in mid-to-high rise buildings.

* The accelerated cooling system rapidly cools rolled steel plates with continuous water quenching.

Conserving Resources Without Using Rare Metals

JFE-TF1, Highly Heat-Resistant Stainless Steel Sheet

JFE Steel’s “JFE-TF1”, highly heat-resistant stainless steel, helps resource conservation without using molybdenum, a rare metal. JFE-TF1 is suitable for components such as automobile exhaust manifolds, which could be exposed to extremely hot temperatures. JFE-TF1, such components can be made 20% thinner and lighter than is possible with conventional steel materials.

Helping to Protect Resources by Not Using Rare Metals

High-Strength Hybrid Mo Alloy Powder

JFE Steel manufactures high-strength hybrid Mo (molybdenum) alloy powder*. That it does not use the rare metal, nickel, as is commonly done, helps to protect precious resources. JFE Steel’s high-strength hybrid Mo alloy powder is used to manufacture sintered automobile components, one of the characteristics of which is high strength.

* Alloy powder is a steel alloy powder (includes elements other than iron).

www.jfe-steel.co.jp/products/steelpipe
www.jfe-densei.co.jp/products/solar_photovoltaics
www.jfe-steel.co.jp/products/stainless/02prototype.htm
www.jfe-steel.co.jp/products/building/items/hbl385/index01.html
www.jfe-steel.co.jp/products/tetpun/youto.html
www.jfe-steel.co.jp/products/steelpipe
www.jfe-steel.co.jp/products/stainless/02prototype.htm
JFE's Technologies Contribute to Global Environmental Protection

**Infrastructure for a Low-Carbon Society**

**CYCLE TREE**
(Multi-level mechanical bicycle parking system)

Named a winner of the Fiscal 2007 Japan Society of Mechanical Engineers Excellent Product Award

- **POINT**
  - Efficiently stores bicycles in a limited amount of space
  - Advances the realization of a low-carbon society by promoting the usage of bicycles

The CYCLE TREE is a mechanical bicycle parking system that makes it possible to compactly park bicycles even in small areas such as the spaces in front of train stations, where spaces are limited due to the concentration of buildings and other structures. The abandonment of large numbers of bicycles near train stations has become a significant problem in many urban areas, and the CYCLE TREE offers a solution. By using effectively the limited space around train stations, the cutting-edge technology promotes cycling-oriented lifestyles.

**www.jfe-eng.co.jp/product/machinery/machinery5421.html**

**Clathrate Hydrate Slurry (CHS)**
Heat Storage Air Conditioning System

Named a winner of the Prime Minister’s Award at the 36th Japan Industrial Technology Awards (FY2005)

- **POINT**
  - Uses a fluid with cold storage capacity twice as that of water to realize energy savings and reduced CO2 emissions
  - Suitable for use in underground shopping malls, commercial buildings, and a wide variety of other facilities
  - Reduces CO2 emissions from air conditioning by 40% (Azalea underground shopping mall in Kawasaki)

The CHS air conditioning system uses a hydrate slurry that can store over twice the amount of cold energy as water used in conventional air conditioning systems. Having first been introduced in office buildings in FY2005, this system is now being used in underground shopping malls, large commercial buildings, factories, and a wide variety of other facilities.

**www.jfe-eng.co.jp/product/environment_energy/environment_energy1211.html**

**Heat Storage Air Conditioning System**

- **Sufficient Energy-Saving and CO2 Emission Reductions**
- **Clathrate Hydrate Slurry (CHS)**
- **Heat Storage Air Conditioning System**
- **Sewerage Sludge Digestive Gas Power Generation**
- **Geothermal Power Facilities**

**State-Of-The-Art Waste Disposal Facilities**

**Hyper Z Series**

The Hyper Z series is a line of state-of-the-art waste incineration facilities that lower environmental burden during construction, greatly reduce gas emissions, NOx concentrations, and other forms of environmental burden related to operation, and maximize electric power generation efficiency, all relative to traditional waste incineration facilities.

**www.jfe-eng.co.jp/product/environment/energy2111.html**

**Helping to Cut CO2 Emissions**

**Biomass Boiler System**

This system uses a circulating fluidized bed boiler in which air is injected to increase combustion efficiency. This system efficiently converts carbon-neutral biomass fuel into electricity and thermal energy.

**www.jfe-eng.co.jp/product/environment_energy/environment_energy1111.html**

**From Sewage to Energy**

**Sewerage Sludge Digestive Gas Power Generation**

The high-efficiency engine of this system converts digestive gases, generated from sludge digestion tanks at sewerage treatment plants, into electricity and thermal energy.

**www.jfe-eng.co.jp/product/environment/energy2246.html**

**Using the Earth’s Energy**

**Geothermal Power Facilities**

Geothermal power, which is created using high-temperature steam from below ground, is characterized by lower CO2 emissions than those associated with thermal power, wind power, and solar power. JFE Engineering has supplied the power-generating facilities for 9 of the 18 geothermal power plants in Japan and 2 overseas.

**www.jfe-eng.co.jp/product/environment_energy/environment_energy1322.html**

**www.jfe-eng.co.jp/product/environment/energy2111.html**
Reducing Fuel Costs for Ships

Hybrid Supercharger Power Supply System

**POINT**
- Can generate electricity while ships are underway and reduces fuel usage.
- Can also be installed on small ships.

Hybrid turbocharger is a turbocharger with a small, high-speed generator and is installed on marine diesel engines. Universal Shipybuilding, working with another company, developed the power supply system used on these turbochargers. Use of this power supply system while a ship is underway enables the production of electric power even without running the ship’s diesel generator, and, therefore, reduces fuel usage and cost. In addition, compared to turbo compound systems, which recovers the waste heat energy through an exhaust gas boiler to drive a steam turbine and/or partially recovers exhaust gas energy and feed it to a turbine as driving force of an electric generator, a hybrid turbocharger requires less space and, therefore, can be installed even on small ships, where it has so far been difficult to use generating systems that take advantage of engine exhaust.

Performance verification on board of this system is being subsidized by the Ministry of Land, Infrastructure, Transport and Tourism and has won the support of the Nippon Kaji Kyokai. It will be installed on bulk carriers scheduled for launch in 2011 and will be subjected to energy-efficiency tests.

* Turbocharger: Device that feeds compressed air into an engine.

Voyage Support System

“Sea-Navi®”

**POINT**
- Optimizes ship navigation to reduce fuel consumption.
- Recommends optimum routes based on the weather.
- Two-year test under actual operating conditions in progress.

Optimizing shipping routes can effectively reduce the fuel consumption, as well as by improving vessel shapes and propulsion performance. Sea-Navi®, a voyage support system that takes its name from a car navigation system, is designed for this purpose. Before leaving port, the system provides the best routing plan considering fuel consumption, punctuality, and safety. While the vessel is underway, the system can adjust the plan depending on the conditions which are always changeable, as well as displaying the results of fatigue life evaluation of the hull structure and a recommended maintenance plan.

[www.u-zosen.co.jp/giken/review02.html](http://www.u-zosen.co.jp/giken/review02.html)

Solar Power System Integration

**POINT**
- Optimizes power generation through everything from architectural design to construction and electrical work.
- Outstanding technical capabilities validated by the receipt of a New Energy Award.

Since entering the business of installing solar power systems in 1999, JFE Electrical & Control Systems has been involved in promoting the use of solar power in public and industrial settings and to date has installed systems that could generate a cumulative 8.5MW of electricity. Furthermore, mastering the capabilities of the JFE Group, JFE Electrical & Control Systems has lead the industry in the development of everything from technologies for connecting energy-efficient digital inverters and lithium-ion batteries to electric power facilities, to module installation hardware and high-durability frames.

Applying its comprehensive technical capabilities, JFE Electrical & Control Systems develops recommendations for installing solar power systems in areas where they have not previously been used and performs the gamut of construction, electrical, and maintenance work to optimize system performance. It is also helping to lower society’s environmental burden through its involvement in the field of mega solar power systems.

[JFE Container develops and installs solar power systems](http://www.jfe-densei.co.jp/business/env-energy/solar-cell)

Biogas Tank

**POINT**
- Development of various applications for core technology in high-pressure gas tanks.
- Development and successful testing of a biogas transport vehicle.

JFE Container, having received a commission from the Kyushu Bureau of Economy, Trade and Industry to identify technical leads for the development of a low-carbon society and develop related model systems, developed both a lightweight carbon tank (150ℓ, 20MPa) and a biogas transport vehicle that can carry 18 of these tanks. This vehicle was successfully used to transport gas on a test basis in Yamaga City, Kumamoto Prefecture.

JFE Container is helping to build a low-carbon society through the varied application of its core technology in high-pressure gas tanks.
Recycling Fluorescent Tubes
JFE is moving forward with the recycling of fluorescent bulbs and tubes at three recycling plants located in the cities of Yokohama, Sendai, and Fukuyama. Fluorescent bulbs and tubes have tiny amounts of mercury in them for light emission, which we safely remove, and recover along with glass, metal caps, and other parts. Recycling is performed for not only cylindrical fluorescent tubes but also for circular tubes, and other types of fluorescent lamps such as mini tubes used as backlights for liquid-crystal displays—production of which has skyrocketed in recent years.

Fluorescent bulbs and tubes are carefully packed into special-purpose cargo boxes and cardboard containers and transported to the processing plant with attention paid to every detail. Once at the plant, bulbs and tubes are sorted by size and shape and fed into the processing equipment. The fully automated equipment then cuts off the metal caps, recovers the fluorescent powder from inside the bulbs and tubes, recovers 99.9% pure mercury from the recovered fluorescent powder, and pulverizes and washes the glass. To prevent mercury vapor and fluorescent powder from escaping to the outside environment, inside of the processing equipment is kept at negative pressure relative to the external environment.

All materials are recycled. Metal caps, crushed glass, and other materials are automatically separated and recycled into raw material for new products of glass, metal, and plastics. Fluorescent powder from which mercury has been removed is processed into ground material and pulverizes and washes the glass. To prevent mercury from the recovered fluorescent powder, the processing equipment is kept at negative pressure relative to the external environment.

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Recycling Different Used Products
JFE is also involved in recycling various waste materials.

RECO Board
JFE recycles waste plastic containers and packaging as RECO Board (NF Board®, KG Panel) products.

NF Board® Concrete Forming Mold
Since they came into production in 2002, 2.2 million NF Board® (12mm thickness) have been used instead of wooden molds on construction sites. NF Board® are much more durable than conventional wooden molds and can be used approximately 20 times. They reduce CO2 emissions (about 45% lower than the conventional wooden molds), and were selected in 2009 as a Low CO2 Kawasaki Pilot Brand. In addition, by reducing the need to harvest trees, they also help to protect tropical rain forests.

Thin, Lightweight KG Panels
5.5mm KG Panels were introduced in 2008 and even thinner 4mm KG Panels, in 2010. KG Panels are presently being used, for example, to display election posters. New applications, including as cargo space liners for freight trucks, are under considerations.

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Marine Environmental Activities

Restoring Marine Environments with a Steel Byproduct

JFE is developing and expanding the use of steel manufacturing byproducts, taking advantage of their unique function in restoring coastal ecosystems, in order to protect marine environments.

Demonstrating the Restoration of Coral with Artificial Reefs and Implantation Devices

JFE Steel is working to develop technologies for restoring coral reefs that are declining throughout the world due to problems like bleaching.

Marine Blocks®, developed by JFE Steel, are made of calcium carbonate, which results from a reaction between CO₂ and the calcium portion of steel slag, and are used to make artificial reefs. Calcium carbonate is the primary material from which reefs are formed, and the tiny irregularities on the surfaces of objects made of this substance make it easy for coral to take hold and grow. In developing technologies for protecting and promoting the growth of coral larvae, JFE Steel has also used steel slag to make implantation devices with the hard surfaces coral larvae attach themselves to.

I want to help protect the global environment by informing people about Marine Blocks® and other marine environment restoration technologies made of steel byproducts.

Kumi Oyamada (Right)
Slag Business Planning & Control Department

Employee Voice

Marine Blocks® and implantation devices were used in a test at a coral reef near the Japanese island of Miyakojima. In this test, coral at the larval stage matured to spawning size, confirming that these products can be used to support a complete coral reproduction cycle.

The Tokyo University of Marine Science and Technology has begun a coral restoration project using Marine Blocks® in Indonesia.

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Seaweed serves as an important habitat as well as spawning area for sea life and plays a big part in absorbing CO₂ and emitting oxygen.

JFE Steel has proposed a project that would use Marine Blocks®, which are conducive to the growth of seaweed, to cultivate seaweed beds.

JFE Steel is working to develop technologies that will help to improve the fundamental marine productivity and bring about a low-carbon society by restoring lost seaweed beds to create thriving marine environments.

Using Seaweed Beds to Help Create Thriving Marine Environments and a Low-Carbon Society

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Ballast Water Management System Helping to Maintain Marine Ecosystems

Ships with no cargo carry ballast water (seawater) to maintain their balance. When they enter a port and take on cargo, they release the ballast water, which includes plankton and other organisms the ship took in at the port of unloading. Therefore, such releases impact marine ecosystems around the port of loading, and have become an international problem.

JFE Engineering has developed the JFE Ballast Ace, a compact, high-performance onboard ballast water management system applying the water treatment, mechanical, and shipbuilding technologies of the JFE Group. In March 2010, this system received the IMO's (International Maritime Organization) final approval for operation at 1,000m³/h, the world’s highest processing volume.

Moving ahead, JFE engineering is planning to introduce a model with a processing volume of 3,500m³/h and looking forward to helping to preserve marine ecosystems through sales of JFE Ballast Ace products.
1. Climate Change and Business Strategies
This business report definitively sets out the change in JFE Group's policy of tackling climate change. Although previous reports explained the environmentally friendly versions of its "Only One" and "Number One" technologies and products, it now shows us its intention to make these competencies more strategic, considering the trends of tightening environmental regulations in developed countries, and also the emerging markets that are being created by such developments. As a result the report explicitly details JFE's perspective on business opportunities related to climate-change issues. It seems that there has been a clear shift from treating climate change as a risk factor to incorporating it as a basic aim of business strategy, which represents a true integration of CSR into the JFE Group's core business.

Regarding JFE Engineering’s initiatives in fiscal 2010, for example, the report says: “Countries are beginning to take serious action in response to global environmental problems. Seizing on this development as a prime opportunity for taking a great leap, we are actively developing our businesses, mainly in the areas of the environment and energy.” JFE Steel actively discloses information about business related to Ferro-Coke, a technology with high potential for saving energy and resources, which four blast furnace companies are jointly promoting with aid from NEDO. It also discloses information about products for electric vehicles that are compliant with automotive CO2 emissions regulations in the European Union.

In addition, in line with the trend in recent years to assign corporate responsibility to greenhouse gases as defined by Scope 3 emissions, the report provides quantitative information about the CO2 emissions cuts when customers use JFE products.

The JFE Group also appears to be making progress in energy efficiency and CO2 emissions reduction in the phase of production. JFE Steel has reduced its energy consumption 12% since 1990 and has slashed unit-energy consumption 20%, resulting in a 13% reduction in CO2 emissions from 1990 levels and a 21% decrease in unit emissions. I look forward to seeing the JFE Group further link its business strategies to CSR management through its production technologies, which are some of the most efficient in the world.

2. Start of Social Reporting
The biggest change this year is the preparation and presentation of a social report that can be accessed via the Internet. The JFE Group has now started to include this document in the detailed version of its business report, which had consisted of only financial reporting and environmental reporting until this year. The result is an integrated annual report with full corporate responsibility reporting.

Nevertheless, there is still plenty of room for improving social reporting compared with environmental reporting. As an international business enterprise, much more material information about its workforce breakdown in terms of region and gender, as well as turnover rates, for example, should be provided. To improve social reporting, the JFE Group should indentify material information to the extent necessary to meet social expectations, and disclose information in a way that is as quantitative as possible. Considering that the business report is a primary source of information on the company, it also should disclose the rate of hiring persons with disabilities and annual changes in the number of employees taking childcare and nursing leave, which are becoming increasingly common practices in corporate responsibility reporting in Japan.

3. Adherence to the Antitrust Act
The JFE Group has reported some cases of antitrust violations almost every year. Following the implementation of six preventative measures in fiscal 2006 and then eight in fiscal 2007, the report noted that in fiscal 2009 the company introduced an additional four measures, including the inclusion of disciplinary measures in the corporate rules of employment. This suggests that the problem is very serious and that the JFE Group has been struggling to manage it. Antitrust violations occur in a corporate climate that is permissive to infringement in everyday business operations, so it requires a persistent effort to thoroughly change the thinking of employees throughout the organization to overcome such problems. The JFE Group should continue to make steadfast efforts to prevent further antitrust violations.