

**Environmental
Report 2003**



J F E

Contents

What is the JFE Group?	2
Toward Sustainable Growth	3



JFE toward Sustainable Society

Transition of Environmental Measures	5
JFE Technologies for Sustainable Growth	7



Environmental Management

Environmental Management System	9
Activities in 2002 / Future Objectives	10
Promoting Environmental Management	11
Environmental Accounting	13
Communication with Society	15



Reducing Environmental Loads in Business Operations

Efforts at JFE Steel	17
Efforts at JFE Engineering	27
Efforts at Kawasaki Microelectronics	28
Efforts at JFE Urban Development	28



Contributing through Products and Technologies

Contributing through Steel Products and Technologies	29
Contributing through Engineering Products and Technologies	34
Contributing through Microelectronic Products and Technologies	37



Research and Development



Building Environment-Friendly Towns

Providing Total Solutions for a Better Environment	41
Leading the Recycling-oriented Society with a Recycling Business	43



International Cooperation

Contributing to the Global Environment through International Cooperation	45
Environmental Businesses of JFE Group Companies	47
External Evaluation of JFE's Activities	49
Coexistence with Nature	50

Editorial Policy

- This "JFE Environmental Report 2003" is based on the actual performance of the JFE Group in environment-related activities during fiscal year 2002 (April 1, 2002 to March 31, 2003). Examples of activities also include some items continuing into fiscal 2003.
- Every effort has been made to maintain the continuity of the content and to improve the level of an information disclosure while promoting broader understanding of the efforts and philosophy of the JFE Group to contribute to sustainable growth with the world's most innovative technology.
- This Report has been prepared and edited in accordance with the guidelines of Japan's Ministry of the Environment (MOE), the Global Reporting Initiative (GRI), and other relevant standards.

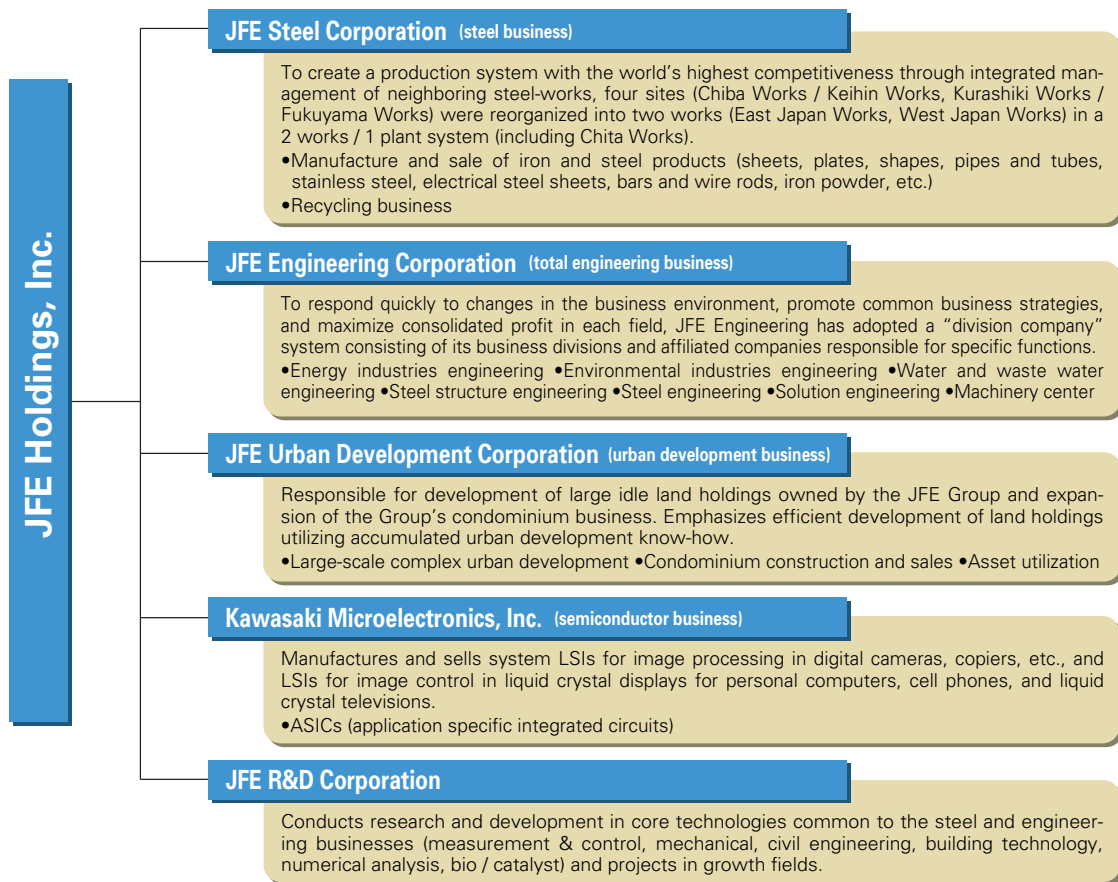
What is the JFE Group?

The JFE Group consists of five operating companies, JFE Steel Corp., JFE Engineering Corp., JFE Urban Development Corp., Kawasaki Microelectronics, Inc., and JFE R&D Corp. under a holding company, JFE Holdings, Inc.

Scale of Business Operations

	(billions of yen)		
Consolidated net sales, FY 2002	¥ 2,426.8	Stockholders' equity	¥594.5
(Breakdown) Steel	¥ 1,755.7 (72.3%)	No. of employees	54,100
Engineering	¥ 520.8 (21.5%)		(as of March 31, 2003)
Other businesses	¥ 150.3 (6.2%)		

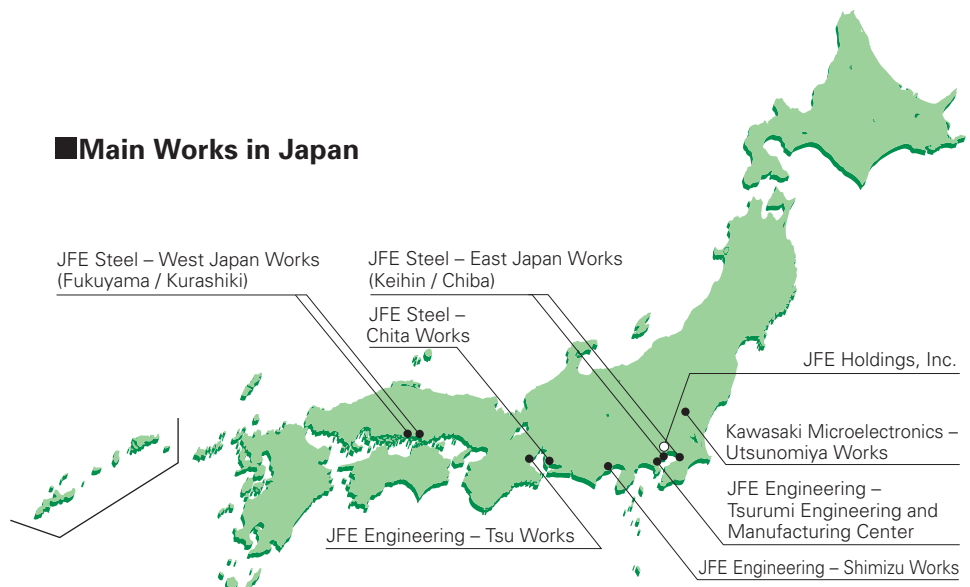
Outline of Businesses



The JFE Name

The JFE name is composed of the letter "J" for Japan, "F" for steel (as in Fe, the atomic symbol of iron) and "E" for engineering. The acronym can also be thought of as standing for "Japan Future Enterprise," i.e., a future-oriented Japanese business group centered around the core businesses of steel and engineering.

Main Works in Japan



Toward Sustainable Growth

JFE has historically placed high priority on environmental protection in all aspects, including not only protection of air and water quality, but also recycling and prevention of global warming. We are proud to be among the world's leaders in this field. With the creation of the JFE Group in 2002, we renewed our commitment to the environment by making global environmental protection a priority management task and are working to further improve our environmental performance through companywide efforts encompassing all JFE Group companies.

As a technology-oriented business group, JFE has developed many unique technologies and is continuing to apply these to environmental protection in all its business activities. At the same time, we understand that providing products and services that help create a better global environment is an important mission for a manufacturing company such as ours. In particular, we are contributing to environmental protection in the following areas.

- 1) Advanced and innovative steel ecological products
- 2) Engineering services which reduce environmental loads in society
- 3) Recycling through a synergy of steel and engineering technologies

We also believe that earning recognition as a good corporate citizen which merits the trust of society is essential for the continuing growth of JFE, and to this end, we maintain close communication with society at every level. JFE's Environmental Report 2003 is part of this effort.

As representatives of the management and employees of the JFE Group, we are confident that our continuing efforts to improve the global and regional environment will create new value in JFE, while also contributing to sustainable growth for future generations.



Kanji Emoto
Chairman and Co-CEO
JFE Holding, Inc.

Yoichi Shimogaichi
President and Co-CEO
JFE Holdings, Inc.

Corporate Vision

The JFE Group-contributing to society with the world's most innovative technology.

Environmental Philosophy

The JFE Group considers the improvement of the global environment to be of utmost importance for management, and promotes business operations in harmony with the environment to create a prosperous society.

Environmental Policy

1 To reduce of environmental influence in all business operations

JFE endeavors to reduce present and future environmental loads and promotes the development of innovative technologies for reducing environmental loads.

2 To make contributions through technologies and products

JFE contributes to the creation of a better environment through the development and supply of advanced technology, equipment, and ecological products.

3 To make contributions through conservation resources and energy

JFE contributes to the creation of a resource and energy-saving society through recycling and energy supply businesses which give priority to preservation of the global environment.

4 To promote communications with society

As a member of regional society, JFE contributes to a better environment at the regional level in cooperation with local citizens, government and administrative authorities, and other businesses.

5 To promote international cooperation

JFE contributes to environmental protection activities at the global level through active involvement in international cooperation in the form of technology transfer, etc.

JFE Technologies for Sustainable Growth

Responding to heightened social needs for energy conservation and environmental preservation, JFE supplies products and services which help prevent global warming, reduce environmental loads, and support the creation of a recycling-oriented society. These pages are a brief summary of JFE's wide-ranging environmental and energy-related technologies.

Preventing Global Warming

JFE Technologies

Building a Recycling-oriented Society

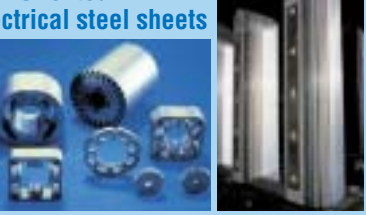
Reducing Environmental Loads

Electrical and electric power equipment

Low power loss

Low core loss electrical steel sheets

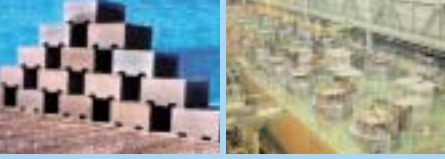
- Grain-oriented electrical steel sheets
- Non-oriented electrical steel sheets



CO₂ reduction / absorption

CO₂ reduction / absorption


- Marine Block
- Solar grade silicon (High-purity silicon for solar cells)



Energy-saving Steel manufacturing processes

Advanced energy-saving iron- and steel-making processes

- Introduction of energy-saving technologies / equipment




Energy-saving Ships

High strength plates for weight reduction

Reduced welding in shipyards


- TMCP high strength steel plates



Low environmental load Automobiles

High strength sheets for weight reduction

- High strength automotive steel sheets (HITEN)
- Tailor Welded Blank




High strength, high formability tubes for weight reduction

- HISTORY, ERW steel tubes

Clean energy


Creation and popularization of clean energy

- DME (dimethyl ether)
- Wind power generation
- LNG storage tank
- High-efficiency fuel cell power generation (SOFC)
- Solar power generation
- Natural gas hydrate





Supply of energy-saving / low environmental load equipment

- Gas engine cogeneration system
- Environment-friendly regenerative burner
- Energy-saving air conditioning system using clathrate hydrate slurry (CHS)
- Circulating fluidized bed (CFB) boiler turbine power generation



Waste detoxification and recycling

- Stoker-type waste incinerator
- Electric resistance and plasma-type ash melting furnaces
- High-temperature gasifying & direct melting furnace
- JFE THERMOSELECT gasifying & melting furnace





Eco-Town Concept

- Keihin Coastal Area Environmental City
- Soga Ecology Park
- Bingo Eco-Town


Contribution to recycling-oriented society

- Waste plastic recycling for BF feed/NF Board
- Home electric appliance recycling
- Food waste recycling




Long-life low environmental load products

- Steel-framed House





Corrosion resistance / weathering steel plates

- Weathering steel
- Rust stabilizer




Environmental load reduction technologies

- Demolition of incineration plants
- Sewage sludge methane fermentation
- Protection of soil environment
- Dam sediment removal
- Dam / river water quality preservation
- Seawater exchange-type hybrid caisson

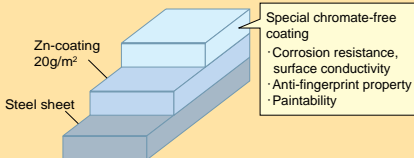
High corrosion-resistance tubular products

- Martensitic stainless steel tubes




Toxic substance-free steel sheets

- Chromate-free coated steel sheets



Low environmental load materials

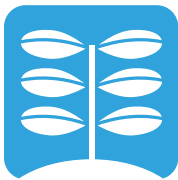
- Stainless steel sheets / tubes for automotive exhaust system



Recycling-oriented society

Long-life, low environmental load OCTGs, linepipes, bridges and offshore structures

Low environmental load Office equipment



Environmental Management

As the environment has become an issue of global concern, JFE has redoubled its efforts to solve environmental problems. As part of this, JFE has created a world-class environmental management system.

Environmental Management System (EMS)

Environmental Committees

Because the JFE Group assigns high priority to "improvement of the global environment" as a management task, it has established a JFE Environmental Committee as the highest decision-making body for environment-related problems common to the Group.

JFE is dealing with environment-related problems with a 3-tiered committee system consisting of the JFE Environmental Committee, Environmental Committees in each of the Group's five operating companies, and Affiliated Company Environmental Committees at affiliates under each of the operating companies. The JFE Environmental Committee is chaired by the President of JFE Holdings, Inc., with related Directors of JFE Holdings and Directors responsible for environmental matters at the five companies as members. Thus, the decisions of the JFE Group's top management are reflected in the Group as a whole, enabling JFE to implement unified environmental management. As a support function for the 3-tiered committee system, JFE has also established a Group Environmental Liaison Committee made up of persons responsible

for environmental matters at JFE Holdings and the five operating companies to share information in practical work related to the environment. In a similar manner, each of the operating companies decides and implements environmental measures for the individual company and holds liaison meetings with its affiliates.

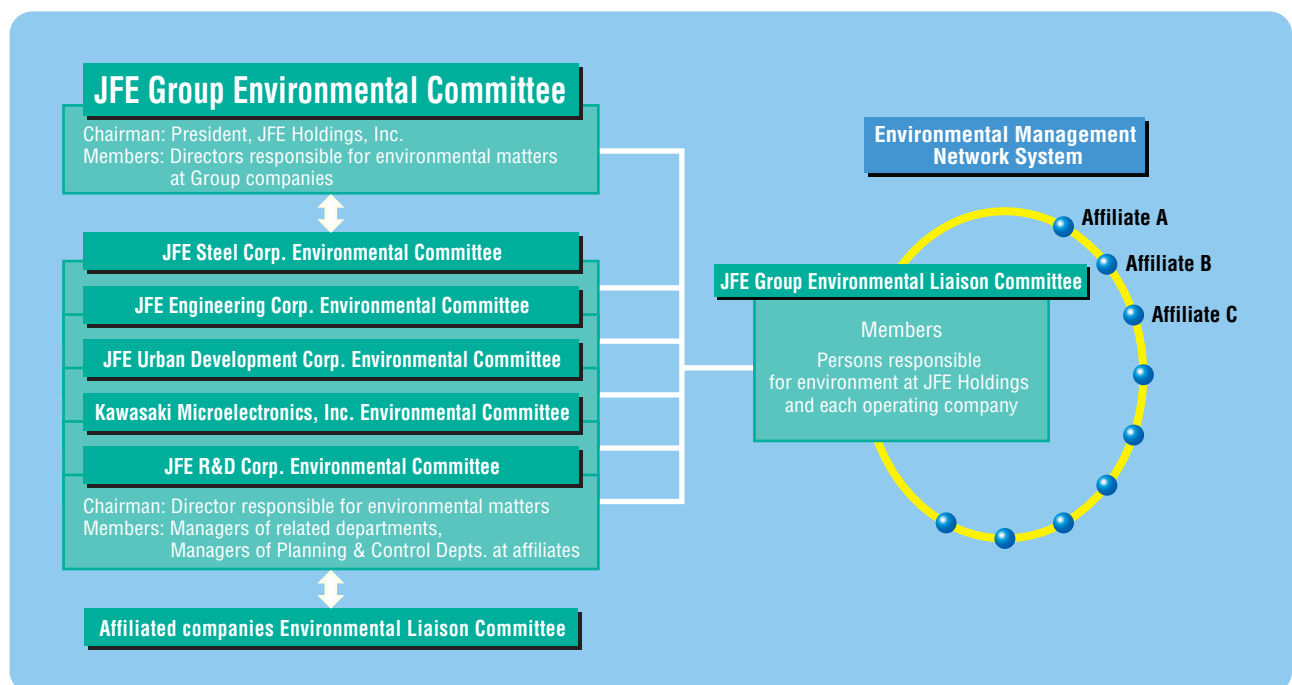


1st meeting of the JFE Environmental Committee

JFE's IT-based "Environmental Management Network System"

In parallel with the Environmental Committee system, JFE created a system which enables common use of environment-related information on the Group intranet to support more complete environmental management. Information is shared among persons in charge of the environment at

JFE Holdings, the five operating companies, and Group affiliates by transmitting news on environmental trends to the individual employee level, improving the effectiveness of environmental management in the Group as a whole.





Activities in 2002 / Future Objectives

Based on its performance to date, JFE sets new objectives for improvement of global environmental activities.

Aims of JFE Group		Future objectives	Results in FY2002
1. Environmental management and communication	(1) Expansion of environmental management	<ul style="list-style-type: none"> Strengthening of systems and improvement in level of environmental management Expansion of green procurement in Group as whole 	<ul style="list-style-type: none"> ISO14001 certification JFE Urban Recycle Corp. JFE Environmental Committee and environment-related committees in operating companies Creation of Group intranet information network Study of condition of environmental management in affiliated companies Expansion of guidelines to affiliated companies (in progress)
	(2) Communication with society	<ul style="list-style-type: none"> Strengthening of communication 	<ul style="list-style-type: none"> Disclosure of environmental information by Environmental Report and homepage Timely information by company and works magazines Participation in ecological products and waste technology trade shows Holding of "Urban Renaissance Symposium" by Environment & Energy Liaison Center Lectures at JFE Technical Culture Seminars Research support by JFE 21st Century Foundation Contribution to Kanagawa Prefecture's Kanagawa Forest Conservation Program for Water Resource Regions program by participating as Riverhead Forest Partner
	(3) International cooperation	<ul style="list-style-type: none"> Contribution to global warming countermeasures under Kyoto Mechanism (joint implementation, CDM, etc.) Communications with overseas organizations, etc. 	<ul style="list-style-type: none"> Feasibility studies for energy saving and environmental measures and implementation of model projects in China, Thailand, Malaysia, Brazil, etc. Receiving of trainees from Environmental Agency in Shenyang, China Presentation of examples of Japan's Eco-Town projects at China Council
	(4) Environmental accounting	<ul style="list-style-type: none"> Qualitative measurement and evaluation of environmental activities 	<ul style="list-style-type: none"> Publication of environmental accounting information
2. Reduction of environment loads in all business activities	(1) Prevention of global warming	<ul style="list-style-type: none"> 4.4% reduction in energy unit consumption in 2010 from 1995 baseline under steel industry's Voluntary Action Plan 	<ul style="list-style-type: none"> Progressing as planned
	(2) Promotion of recycling	<ul style="list-style-type: none"> Increase recycling ratio of byproducts of manufacturing processes Recycling of byproducts (waste) generated by society 	<ul style="list-style-type: none"> Achieved 99.5% recycling ratio in FY 2002 Increased receiving of waste plastic as blast furnace feed Received 570,000 used appliances for recycling
	(3) Promotion of environmental protection	<ul style="list-style-type: none"> Reduced use and improved control of PRTR substances Dioxin countermeasures 80% reduction in benzene by FY 2003 against 1999 baseline Reduced environmental loads by more efficient product distribution 	<ul style="list-style-type: none"> Reporting of releases / transfers in FY2002 to government and disclosure in Environmental Report Measures to strengthen flue-gas treatment equipment at sintering plants Achieved 70% reduction in benzene emissions against 1999 baseline by various reduction measures Shortened transportation distance and increased transportation lot size
3. Contribution through technologies, products, and services	(1) Environment-conscious R&D	<ul style="list-style-type: none"> Development of innovative technologies to solve global environmental problems LCA-based product development 	<ul style="list-style-type: none"> Development and expanded application of heat island mitigating paving technology Start of proof experiments for clathrate hydrate slurry (high heat-density medium) production system Development of high efficiency natural gas hydrate production technology Development of Marine Block for CO₂ absorption and coastal seaweed farm restoration
	(2) Ecological products	<ul style="list-style-type: none"> Reduction of environmental loads in society by expanded use of high performance steel products 	<ul style="list-style-type: none"> Increased sales of high performance chromate-free coated sheets Auto weight reduction by Tailor Welded Blank Development of high strength sheets for ultra-lightweight auto body Development of slow-release potassium silicate fertilizer Increased production of solar grade silicon (SOG)
	(3) Total solutions for the environment	<ul style="list-style-type: none"> Contribution to Eco-Town and recycling-oriented society Development of clean energy sources anticipating next-generation needs Contribution to society by multi-faceted environmental engineering activities 	<ul style="list-style-type: none"> Start of PET bottle recycling business Start of concrete form board (NF Board) production using recycled resin Start of 100t/day DME direct synthesis pilot plant project Start of development of large-scale DME diesel power generation system Cumulative wind power capacity reached 84,000kW (end of March 2003) First order received for waste incineration demolition Successful development of methane fermentation technology using cogeneration waste heat First order received for JFE THERMOSELECT gasifying & melting furnace Start of operation of sewage sludge circulating fluidized bed (CFB) incinerator First order received for dioxin detoxification equipment (Hi-Clean DX) for waste incineration fly ash Start of full-scale operation of siloxane (organic silicon-based polymer) removal equipment for sewage treatment plant Start of full-scale operation of high temperature gasifying & direct melting furnace Start of construction of RDF power plant

Promoting Environmental Management

Environmental Auditing

In order to implement a high-quality environmental management system, it is important to understand whether the system is operating appropriately, and whether performance is being continually improved. At JFE, in addition to external inspection by certification authorities, employees experienced in environment-related work such as environmental and energy management participate in internal auditing. Also, the training of

in-house environmental inspectors is being promoted. Teams of employees led by external experts carry out internal auditing in JFE in order to ensure transparency in inspection. Issues pointed out by internal or external auditing are used as a basis for revising and continuously improving the system, taking into account the changes in the surrounding conditions.



Auditing at steelworks by external auditors

Status of the JFE Environmental Management System

JFE aims at developing a comprehensive environmental management system based on its environmental philosophy. As such, it is promoting voluntary and continuous environmental activities by each company in the JFE Group based on ISO 14001 certification.

ISO 14001 Certification Certified in

JFE	Certified in	Certified in	Certified in
JFE Steel East Japan Works (Keihin)	May 1997	JFE Steel East Japan Works	Jul. 1998
JFE Steel West Japan Works (Kurashiki)	Oct. 1997	(Chiba including Nishinomiya district)	
Kawasaki Microelectronics	Oct. 1997	JFE Steel Chita Works	Jul. 1999
JFE Steel West Japan works (Fukuyama)	Mar. 1998	JFE Engineering	Dec. 1999

Affiliated companies	Certified in	Certified in	Certified in
NKK STEEL SHEET & STRIP	May 1997	JFE CIVIL ENGINEERING & CONSTRUCTION	May 2000
JFE WELDED PIPE MANUFACTURING	May 1997	TOYOHIRA STEEL	Sep. 2000
NKK TUBES	May 1997	JFE METAL PRODUCTS & ENGINEERING	Dec. 2000
JFE CHEMICAL	Jul. 1998	KAWASHO	Dec. 2000
KAWATETSU TRANSPORTATION & TECHNOLOGY	Jul. 1998	JFE Mie Tech. Service	Feb. 2001
KAWATETSU MINING	Jul. 1998	JFE Koken	Jun. 2001
KAWASAKI REFRACTORIES	Apr. 1999	Fuji Kako	Sep. 2001
JFE KANKYO	July.1998	Philippine Sinter Corporation	Nov. 2001
JFE MATERIAL	Feb. 2000	JFE Environmental Service	Dec. 2001
JFE Soldec	Feb. 2000	NKK BARS & SHAPES	Mar. 2002
NKK MARINE & LOGISTIC	Mar.2000	JFE URBAN RECYCLE	May 2003
JFE CONTAINER	Mar. 2000		

(Limited to the subsidiaries for the JFE group consolidation, and other applicable companies in accordance with the equity method.)

Terminology

● Environmental Management System (EMS)

Management system for minimizing the environmental impacts of business activities, under which the organization establishes an environmental policy, prepares and implements plans based on that policy, checks progress and reviews plans, and voluntarily endeavors to achieve continuous progress.



Environment Month Activities

As part of its environmental management system, JFE voluntarily conducts a program of Environment Month Activities in June of each year to raise employee awareness of the environment. This year's activities began with a message from the President of JFE Holdings and included public road cleanup operations and others, as follows.

[Public Road Cleanup Operations]
[Lectures on the environment]
[Works Environmental Patrols]
[Environmental Education under ISO14001]



Works environmental patrol

Each year, East Japan Works (Keihin) holds a contest for environmental slogans. This year, the number of entries showed a large increase, reaching 857. The following were selected as winning entries.

Prize for Excellence in Environmental Slogans

“Think before you throw – Your idea makes the difference between waste and resources.”

“Your little cooperation helps to stop warming of our precious globe.”

“Your trash is a resource too – Let's recycle!”

“Just a minute – before you throw it away!
Have a think and put the Eco-mark on your heart.”

Environmental Education

JFE conducts environmental education at all levels to deepen the understanding of each employee and encourage individual efforts to improve the environment as part of regular work. Environmental education is incorporated in training programs for new employees and promotion, and also includes annual programs at each level, covering social trends related to environmental problems, the significance of the en-

vironment to JFE and measures being taken by the company, the responsibility of individual employees, and the importance of environmental management.

Based on an annual schedule, each works conducts periodical environmental education (once/year) for general employees, employees engaged in designated work, etc. as part of its environmental management system.

To strengthen environmental education, JFE introduced an Environmental Management Network System in June 2003, creating an electronic environment in which all employees, including those at affiliated companies, can access internal and external environment-related information such as Environment Month Activities from the homepage.

Green Purchasing

JFE has created a common set of Green Purchasing Guidelines for the group, which apply not only to office supplies but also to parts and materials for production, and refers to these Guidelines when making purchasing decisions. Application is currently being expanded to affiliated companies.

In outline, the Guidelines specify:

- Adequate study of required quantities before purchase to minimize purchased amounts.
- Consideration of environmental loads over the entire life cycle of final products, in addition to price, quality, delivery schedules, etc.
- Requests for and cooperation with environmental protection efforts of suppliers on a daily basis.

Examples of green purchasing:

Recycled oil, solvent containers, packaging materials, electric/natural gas/hybrid vehicles



Introduction of hybrid car

Environmental Accounting

Over the past three decades, JFE has invested huge sums in environmental protection, including measures to prevent air and water pollution, reduce noise, treat waste, and create greenbelts. JFE has also put great effort into energy-saving investment, achieving the world's highest level of energy efficiency.

It should be noted that JFE's current environmental activities were developed in the course of fulfilling its corporate mission of creating industrial and social infrastructure, and its current environmental costs

include the large ongoing financial burden of maintaining this accumulated investment. In particular, when evaluating annual expenses and results, it is important to consider these past efforts and their continuing benefits.

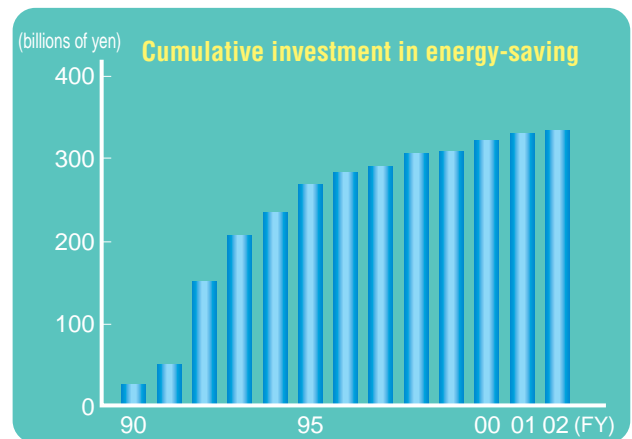
As one measure of management performance, JFE evaluates its environmental activities based on environment-related data. As an example of this, investments and expenses are included in the Environmental Report.

Investment in Energy Conservation

JFE embarked on an aggressive program of energy conservation following the first Oil Crisis in 1973. After the second Oil Crisis in 1979, it developed or introduced a wide variety of waste heat recovery equipment and invested heavily in energy-saving production processes such as continuous casting and continuous annealing. Today, JFE is maintaining its position as a world leader in energy efficiency. Cumulative investment since 1990 has now reached approximately ¥334 billion.

Representative investments in FY2001-2002

- Measures to improve power plant efficiency
- Construction of new private power plant
- Installation of energy-saving regenerative burners at plate mill reheating furnaces



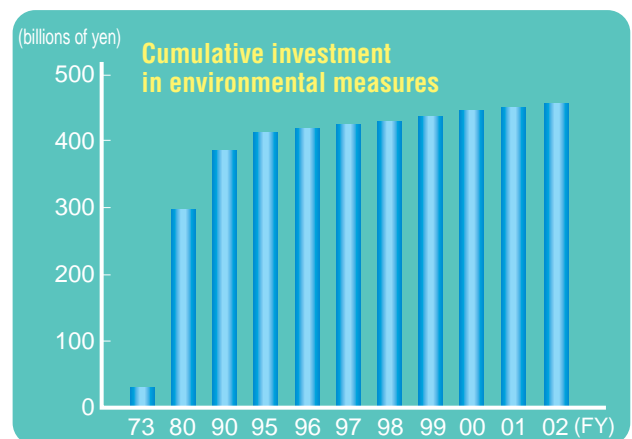
Investment in Environmental Protection

Because JFE operates steelworks in the environs of large metropolitan areas, it has made particularly strong efforts to protect the environment, including construction of desulfurization and denitrification plants as measures against SOx and NOx in the atmospheric environment and water treatment facilities to reduce COD and prevent water pollution. As a result of companywide investment in environment-related equipment, which totals approximately ¥476 billion since 1973, JFE's clean steelworks boast the world's highest levels of environmental performance.

In recent years, JFE has actively invested in measures to recycle byproducts of its steelworks and apply iron and steel making processes as infrastructure for recycling in society at large, thus leading the movement toward a recycling-oriented society.

Representative investments in FY2001-2002

- Modernization of sintering machine flue-gas treatment equipment
- Modernization of incinerator flue-gas treatment equipment
- Improvement of steelmaking shop dust collection



Main Results

The main results of environment- and energy-related capital investment and expenses are summarized on the following pages.

Energy Conservation		Environmental Protection	
Energy-saving effect	See "Success of JFE Steel's Energy Conservation Measures" (p. 20)	Environmental protection	See "Protecting the Environment" (pp. 23-24)
		Effective use of resources	See "Building a Recycling-oriented Society" (pp. 21-22)



2002 Totals

Investment in environment-related facilities was ¥9.4 billion, which accounted for approximately 10% of total capital investment for the year. Expenses were ¥70.6 billion. The primary focus of investment was environmental protection and prevention of global warming. Primary ex-

penses were environmental protection, effective use of resources, and prevention of global warming. Operation/maintenance and depreciation accounted for the majority of these expenses. Environment-related research and development expenses were ¥3.6 billion, or approx-

imately 10% of total research and development expenses.

In fiscal 2002, JFE Steel achieved a recycling rate of 99.5%. Energy-saving benefits were equivalent to ¥2.2 billion.

		Major item	Investment (billions of yen)	Expenses (billions of yen)
Environmental investment & expenses related to the JFE's own business	Management	Monitoring & measurement of environmental influence, EMS-related activities, environmental education & training, etc.		1.3
	Prevention of global warming	Energy conservation, effective use of energy, etc.	3.5	13.8
	Effective use of resources	Recirculation of industrial water, Recycling of by-products & wastes generated in-house, waste management, etc.	1.0	17.4
	Environmental protection	Prevention of air pollution, water pollution, soil contamination, noise, vibration, ground subsidence, etc.	4.8	31.7
	Miscellaneous	Fees, charges, etc.	0.1	2.1
Environmental investment & expenses related to customers and society	Research & development	Technological development for the environment, energy, prevention of global warming		3.6
	Social activities	Protection of the nature, support to forestation, information disclosure, advertisement, etc.		0.7
Total			9.4	70.6

The totals mentioned above were calculated on the following basis.

- Period: April 2002 to March 2003
- Scope: Environment-related investment and expenses at JFE's steelworks, but in the case of research and development, on a companywide basis. Calculations do not include presumed effects based on estimates or risk avoidance benefits.

(Note)

Calculations do not include investments made primarily for purposes other than environmental protection, for example, renovation of superannuated facilities, even when the process as a whole realizes a net energy saving in comparison with the former process.

Future Challenges

In maintaining and promoting environmental accounting, an accurate grasp and correct evaluation of the actual status of environmental activities are necessary. However, there are cases where existing methods are inadequate, for example, items which cannot be quantified and problems in determining the applicable scope of effects. JFE is continuing to develop more appropriate concepts and methodologies for maximizing the effectiveness of environmental accounting in environmental management.



Greenbelt at steelworks

Communication with Society

JFE believes that it is important to raise social awareness of the environment through communication. Environmental communication is also a tool for change within the JFE Group, for example, by heightening the awareness of managers and employees and deepening understanding between divisions.



Coexistence with Local Communities

JFE has concluded environmental protection agreements (pollution prevention agreements) for air and water quality, noise, waste, etc. with local governments at the prefectural and city levels in areas where it has plants. Some of these agreements apply stricter standards than those in national laws, and some also cover items not required by the national government. JFE enters into such agreements from the viewpoint of regional environmental protection, and strictly observes their terms in all cases. Under greening agreements with local governments, JFE has created greenbelts in all of its works and is active in maintaining and managing wooded areas. These efforts help preserve the local scenery and have important environmental functions in absorbing CO₂ and suppressing dust and noise.

As a good citizen in local society, JFE attaches special importance to direct contact with community residents, conducting public service cleanup activities in the area and holding sports classes and tournaments.



JFE Cup Volleyball Tournament

Opening the Works to the Public

JFE holds annual open-house events at each of its works for the enjoyment of area residents. To encourage better understanding in the surrounding community, JFE has also established Visitors' Centers in its works and opens its plants to tour groups of local elementary and middle school students and the general public. Other programs include can recycling and voluntary cleanup activities in areas where works are located.



Guided plant tour



Works festival



Links with Wider Society

Environment-related Support and Assistance

The JFE Steel 21st Century Foundation is responsible for the JFE Group's direct social contribution. Concretely, the Foundation provides support for environmental purification and has prepared English and Japanese educational resources on the Japanese steel industry's advanced environmental and energy-saving technologies, which it donates to universities in Japan and other countries as part of its effort to make Japanese technology available to the world for global environmental protection. Information on these educational resources and other activities can be found at the Foundation's homepage.

URL : <http://www.jfe-21st-cf.or.jp/>

Participation in Kanagawa Riverhead Forest Partnership

As a water consumer, JFE understands the importance of healthy water circulation between water sources and urban areas, and is therefore participating in Kanagawa Prefecture's Kanagawa Forest Conservation Program for Water Resource Regions as a Riverhead Forest Partner, contributing to the creation of riverhead forests.



Symbol of Kanagawa Forest Conservation Program for Water Resource Regions program

Cooperation with NPO in Oceanographic Survey

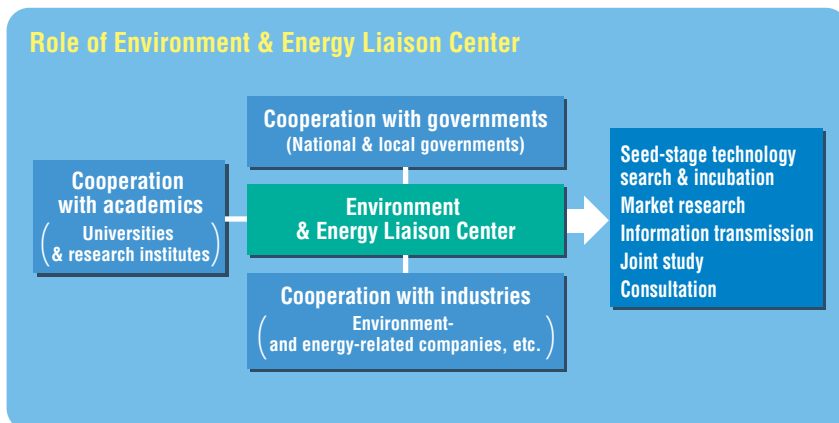
Together with NKK Marine & Logistics Corporation, JFE is cooperating with the NPO (nonprofit organization) VOS Nippon in a voluntary oceanographic survey by installing automatic monitoring equipment on oceangoing vessels operated by NKK Marine. Data are collected each time vessels return to Japan and made available to interested researchers.



Oceangoing vessel M/V SUN FRONTIER

Cooperation with Industry, Government, and Universities in Environmental and Energy Activities

JFE's Environment & Energy Liaison Center was established in 2001 to create new ideas and concepts for activating environmental businesses, conduct environment- and energy-related R&D, and provide information through cooperation with other industries, government agencies, universities, and local communities. It currently sponsors the Environment and Energy Network Research Committee, which is comprised of businesses in the Keihin Coastal Area, promoting recycling among different types of industries. The Center is active in information exchanges with national and local governments, businesses, and private citizens, and serves as a forum for communication on energy and the environment.



URL : <http://www.eelc.gr.jp/>



Reducing Environmental Loads in Business Operations

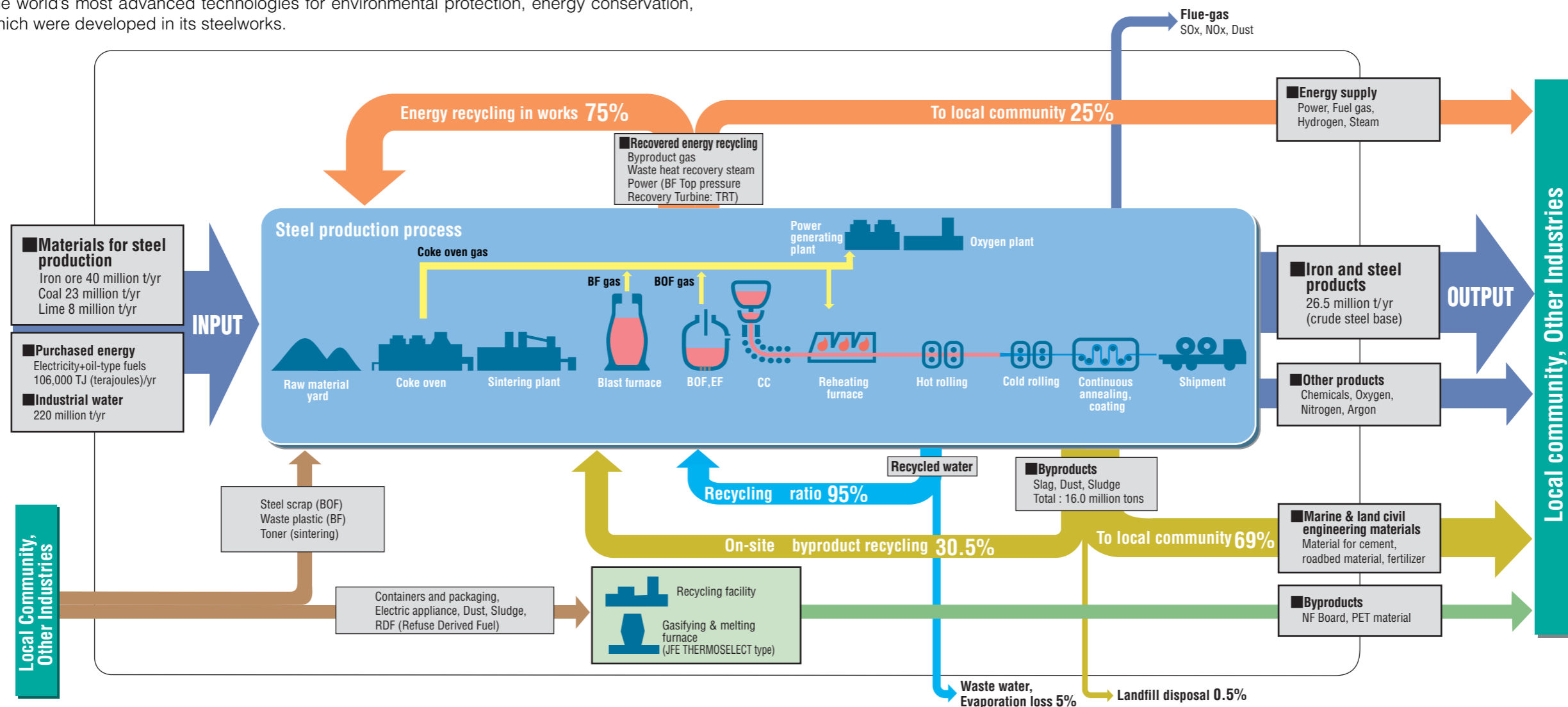
In responding to environmental problems, particularly in the steel division, JFE is reducing environmental loads by developing advanced technologies and implementing voluntary programs for energy conservation, air and water protection, and chemical substance control.



Efforts at JFE Steel

Resource and Energy Recycling in the Steel Production Process

JFE Steel is contributing to a recycling-oriented society in close cooperation with local community and other industries with the world's most advanced technologies for environmental protection, energy conservation, and recycling, which were developed in its steelworks.



	Steel production process	Raw material yard	Coke oven	Sintering plant	Blast furnace	BOF, CC, EF	Reheating furnace	Hot rolling, cold rolling	Continuous annealing, coating	Shipment
Primary energy conservation measures for steel production	Counter-measures (facility)		Coke dry quenching (CDQ), coal moisture control (CMC), combustion control	Sintering cooler waste heat recovery, ignition furnace line burner	Waste plastics feeding, pulverized coal injection, top pressure recovery turbine, hot stove waste heat recovery, fuel gas preheating	Gas recovery, gas sensible heat recovery, nitrogen jet heater, ladle heating	Regenerative burner, direct charging, low-temperature extraction	Endless rolling, process coupling	Waste heat boiler, rotary regenerative heat exchanger	Selection of transportation mode, shortening of transportation distance, improvement of load efficiency, modal shift, application of IT
		Gas turbine combined cycle power plant Power plant fuel preheating device High efficiency air separation equipment								
Primary environmental impact of steel production, and counter-measures	Generated substance	Dust	Flue gas, dust, wastewater (ammonia liquor)	Flue gas, dust, wastewater	Flue gas, slag, dust, wastewater	Flue gas, slag, dust, wastewater	Flue gas, dust	Rolling wastewater, pickling wastewater	Coating waste water	Exhaust gas
	Environmental impact	Dust	Dust, NOx, SOx, COD	Dust, NOx, SOx	Dust, SS	Dust, SS	NOx	SS, waste oil, waste acid, iron salt	Metallic ion, etc.	NOx, SPM (suspended particulate matter)
	Counter-measures (facility)	Yard water spraying, belt conveyor dust collection, laser dust monitoring	Coke oven gas desulfurization, waste ammonia liquor COD treatment, chemical by-product recovery	Flue gas desulfurization & denitrification	Gas recovery, dust collection, dust treatment, slag recycling	Gas recovery, dust collection, dust treatment, slag recycling	Low-NOx burner, use of cleaner fuel	Waste acid & waste alkali treatment, waste oil recycling, coagulating sedimentation	Wastewater treatment	Conversion to low-emission vehicles

Preventing Global Warming

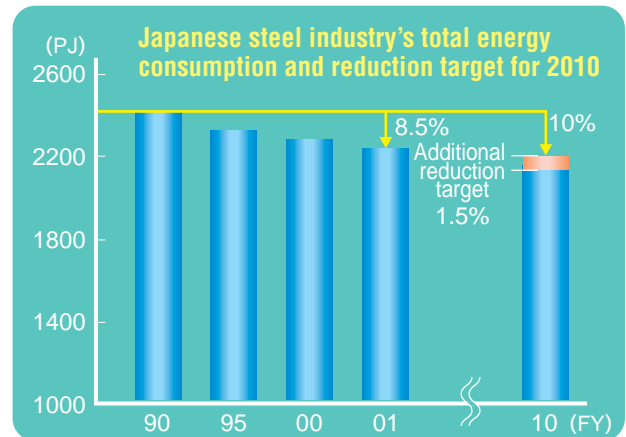
Global warming requires a long-term solution involving every individual and business. JFE Steel already boasts the world's highest energy efficiency,

but it has also set a high target for global warming prevention measures under the Voluntary Action of the Japan Iron and Steel Federation.

Voluntary Action Plan by Nippon Keidanren (Japan Business Federation)

In anticipation of the Kyoto Protocol, Nippon Keidanren established a Voluntary Environmental Action Plan in July 1997, targeting voluntarily CO₂ reductions in the industrial and energy conversion sectors to 1990 levels by 2010. Under Japan's Guidelines for Measures to Prevent Global Warming, results are reviewed annually in the Industrial Structure Council.

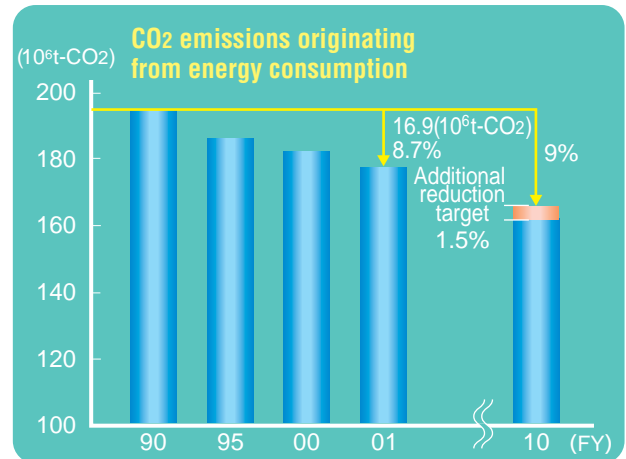
In 2001, CO₂ emissions showed a 3.2% reduction from the 1990 baseline. Recognizing this achievement, a third party assessment report for 2002 praised participating businesses for "doing everything in their power, in the face of various difficult circumstances."



(Source: The Japan Iron and Steel Federation)

Voluntary Action Program for Environmental Protection by Japanese Steelmakers

One distinctive feature of Japan's steel industry, in comparison with the U.S. and Europe, is remarkably wide adoption of energy-saving equipment, giving Japanese mills the world's highest energy efficiency. Reflecting Japan's technical capabilities, in December 1996, the Japan Iron and Steel Federation established a Voluntary Action Plan, which targets a 10% reduction in energy consumption in 2010 against a 1990 baseline. As a supplementary goal, a 1.5% reduction by using waste plastic in blast furnaces (assuming creation of an adequate collection system) was later incorporated in the Plan. In 2001, energy consumption was 8.5% below the 1990 baseline, demonstrating the success of voluntary action.



(Source: The Japan Iron and Steel Federation)

Terminology

● PJ

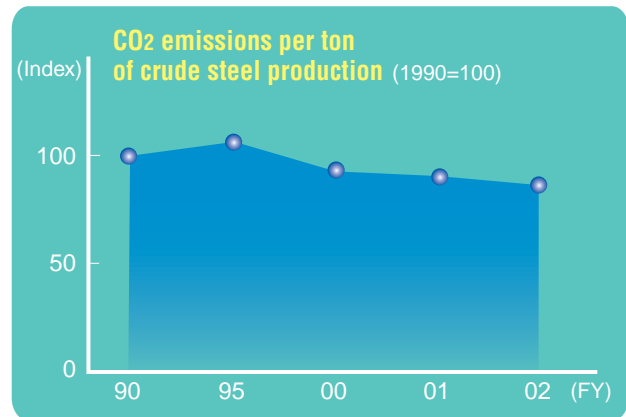
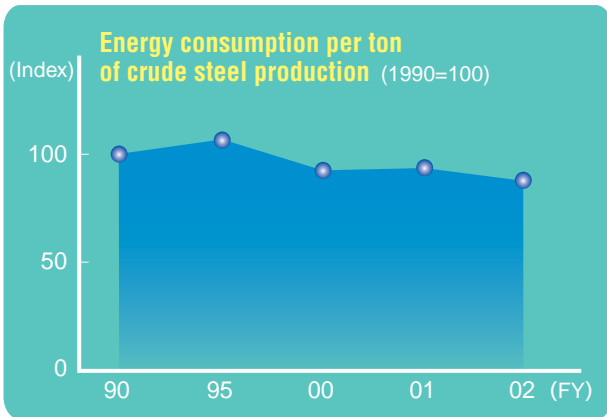
Petajoule, joule (heat unit) x 10¹⁵ (1000 trillion)



Success of JFE Steel's Energy Conservation Measures

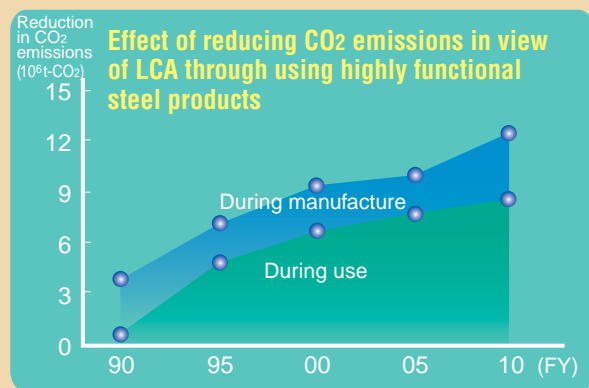
Between the first Oil Crisis in 1973 and 1990, JFE adopted an aggressive energy-saving policy, reducing consumption by a substantial 20%. Measures included waste energy recovery, improved equipment efficiency, integration of production processes, and construction of a comprehensive energy management system. As a global warming countermeasure, JFE has steadily reduced unit energy consumption (crude steel base),

and in line with the Japan Iron and Steel Federation's Voluntary Action Plan, is working toward an energy-saving target of -4.4%/ton-crude steel by 2010 against a 1995 baseline. In 2002, consumption was down 3.3% from 2001. JFE is also actively committed to new approaches to energy conservation, including next-generation ironmaking technologies and waste plastic recycling.



Environmental Contribution of LCA-based Products

JFE is contributing to energy conservation by developing high-performance steel products which reduce both material consumption in the manufacturing process and final product weight. An LCA assessment of six high-performance steel products estimated that CO₂ emissions can be reduced by 3.1 million tons in manufacturing and 6.5 million tons in use, for a total of 9.6 million tons-CO₂, by adopting high-performance products (estimate for FY2000, entire Japanese steel industry).



(Source: The Japan Iron and Steel Federation)

Product types surveyed are:

- H-beams for buildings.
- Heat-resistant steel tubes for boilers.
- High-strength steel sheet for auto bodies.
- High-tensile steel plate for shipbuilding.
- Electrical steel sheet for transformers.
- Stainless steel sheet for railway carriages.

Terminology

● LCA

Life Cycle Assessment. Method of assessing the total environmental load (resource depletion, energy consumption, waste, pollutants, etc.) over the entire product life cycle from raw material extraction through manufacture, use, recycling, and waste.

Building a Recycling-oriented Society

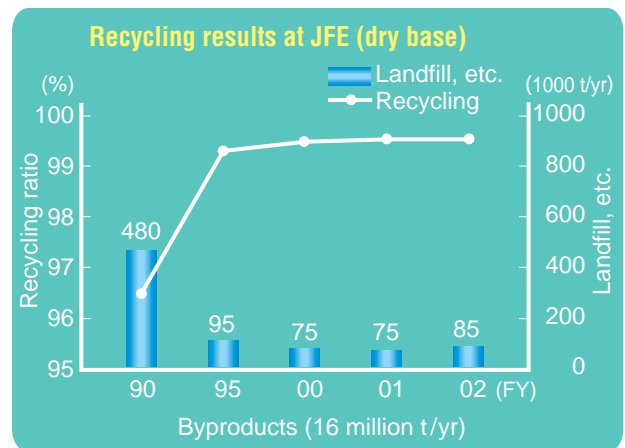
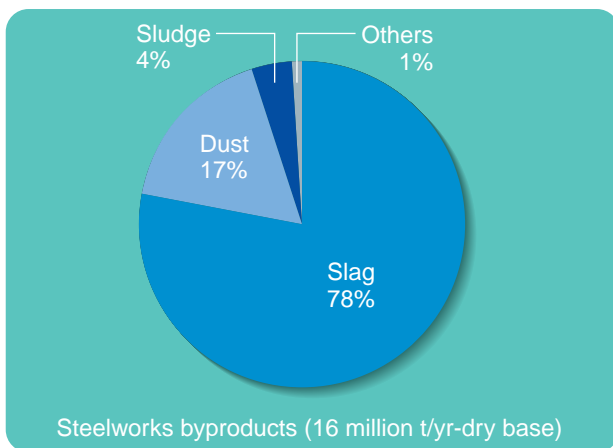
The transformation from a mass-production, mass-consumption, mass-waste society to a recycling-oriented society is causing a revolution in the basic paradigm of manufacturing. JFE is actively responding to the challenge of effective resource use, including the creation of new business to meet new social needs.

Zero Waste Activities in the Steelworks

JFE has implemented a program of “Zero Waste” activities for steelworks byproducts, which include slag, dust, sludge, waste oil, etc., and has already achieved 99.5% recycling. Landfill disposal has decreased to about 1/6 its 1990 level, meeting the Japan Iron and Steel Federation target of 1/5 the 1990 level by 2010. (This result includes a 10,000 ton increase in surplus dust in 2002 due to a

downturn in cement production.) Future measures will include on-site recycling equipment.

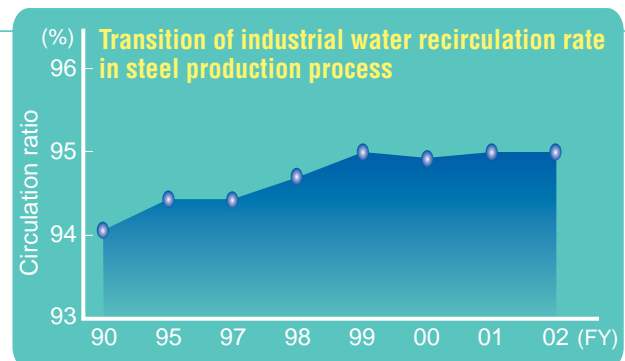
The synergy of outstanding environmental and energy technologies, plant operation know-how, and steelworks infrastructure is contributing to effective recycling of waste from local community and other industries, beginning with waste plastic.



Water Recirculation

Because steel manufacturing requires huge quantities of water, JFE has created a comprehensive water recycling system. Purification technologies include advanced biological and physiochemical processes. Off-site release is minimized by recirculation and cascade techniques, achieving a water circulation ratio of approximately 95%.

Circulation ratio (%) = (Total consumption – makeup water) / Total consumption



Waste Plastic Recycling

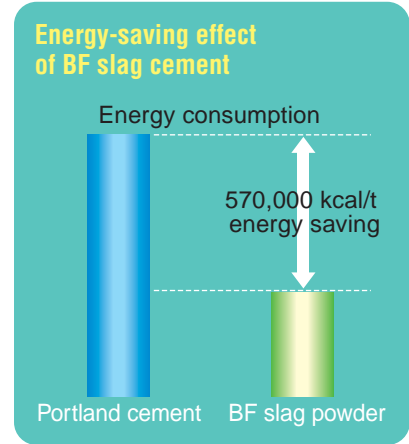
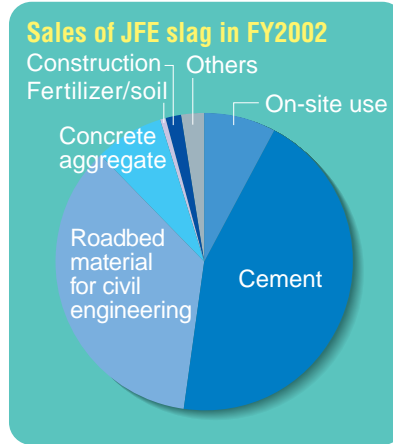
JFE entered the waste plastic recycling business in October 1996 and now has a treatment capacity of 190,000 tons/year.





Slag Reduction and Recycling

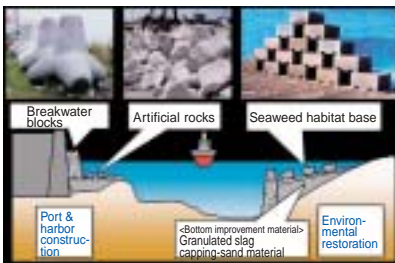
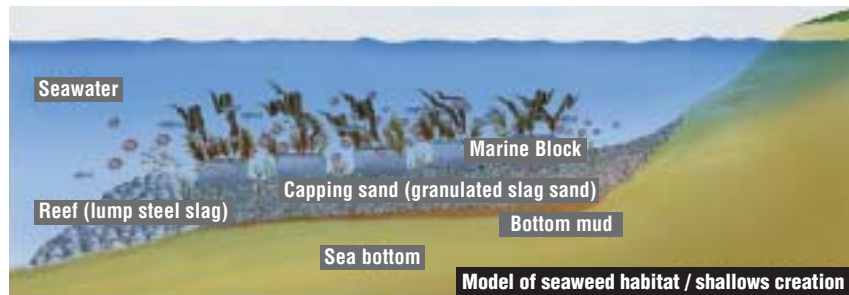
Slag generated by blast furnaces, BOFs, and electric furnaces accounts for about 80% of steel manufacturing byproducts. JFE Steel has a long record of reducing steel slag by applying hot metal pretreatment and on-site reuse. Thanks to JFE's efforts to develop product manufacturing/use technologies and encourage standardization under the Japan Industrial Standard (JIS), more than 99% of slag is now effectively used as roadbed material, aggregate for concrete, material for cement, etc. Cement using BF slag powder also contributes to energy saving and CO₂ reduction.



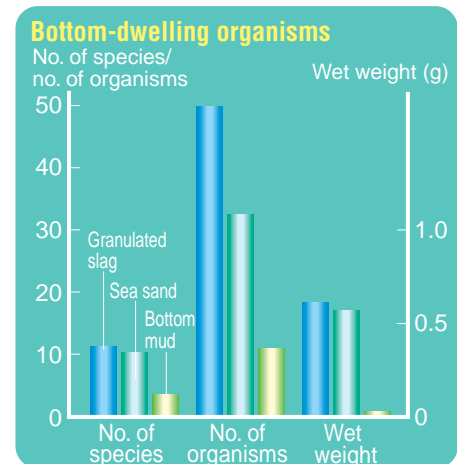
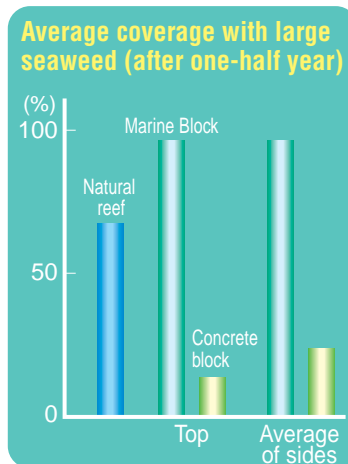
Development of Advanced New Applications for Slag (Example)

○ Use of slag to restore shoreline environments

- (1) Use of BF slag as sand capping material / shallows construction material for improvement of the marine environment
- (2) Artificial reefs (Marine Block) for seaweed / fish farming using CO₂-absorbed slag solids
- (3) Breakwater blocks and other marine structures using hydration hardening reaction (Ferro-Form)

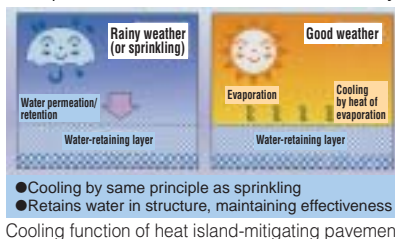


Examples of slag materials for port & harbor construction/ marine environment restoration



○ Heat Island-Mitigating Paving Material

The heat-island effect can be mitigated by using a water-retaining solid composed mainly of fine BF slag in asphalt pavement. The pavement retains water in rainy weather and is cooled by evaporation in good weather, reducing the pavement temperature.



○ Slow-release Potassium Silicate Fertilizer

Slag fertilizer is released slowly into soil over long period.



Slag fertilizer; slowly released over a long period of time to enrich the soil

Protecting the Environment

Historically, JFE Steel has developed or introduced numerous technologies to reduce loads on the atmosphere, water, and soil, and is now responding to recent requirements to control and reduce releases of chemical substances, for example, under the

PRTR system. JFE is reducing environmental loads while also developing new technologies which satisfy the needs of both business and the environment.

Air Quality

SOx

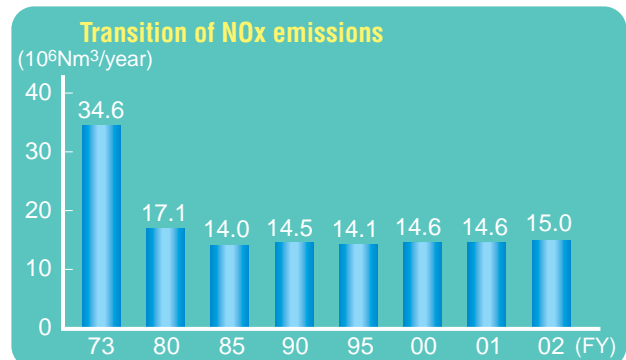
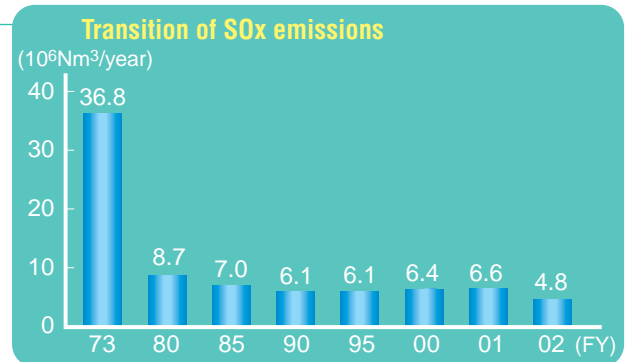
To reduce emissions of sulfur oxides (SOx), JFE has adopted low-S fuels and introduced the world's first high-efficiency ammonium-sulfate flue gas desulfurization system. After addition of another de-S system in 2002, JFE reduced SOx emissions to 1/7 the 1973 level.

NOx

For nitrogen oxides (NOx), JFE installed a sintering furnace flue gas denitrification system which decomposes NOx into nitrogen and water. Emissions have been reduced by more than 50% since 1973.

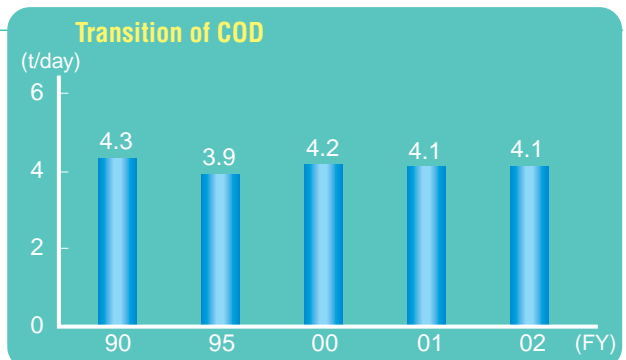
Dust

Sprinkling in ore and coal yards, sealed conveyor connections, and other measures prevent dust generation. At coke ovens, sintering furnaces, blast furnaces, BOFs, and other dust-generated facilities, high-performance dust collectors minimize airborne dust.



Water Quality

JFE has implemented thoroughgoing water recycling measures, achieving a recirculation rate of approximately 95%. Before discharge, wastewater containing organic matter is given biological treatment, and is then purified as required by coagulating sedimentation, filtration, adsorption with activated carbon (ammonia liquor), etc. to remove pollutants.



Soil Quality

JFE has adopted measures to prevent releases of hazardous substances into the soil and checks soil and groundwater to prevent pollution. To protect the soil and

groundwater environment, the company fully complies with the Soil Contamination Control Law enacted in February 2003.

Terminology

● COD

Chemical Oxygen Demand. Index of water pollution, expressing the amount of oxygen necessary to chemically oxidize and stabilize pollutants in water.



Control of Chemical Substances

PRTR

Japan's PRTR (Pollutant Release and Transfer Register) Law was enacted in March 2000. At the time, JFE was already participating in voluntary surveys by the steel industry as part of its commitment to controlling and reducing releases of chemical substances.

Substances reported under PRTR (FY2002, JFE steel division)

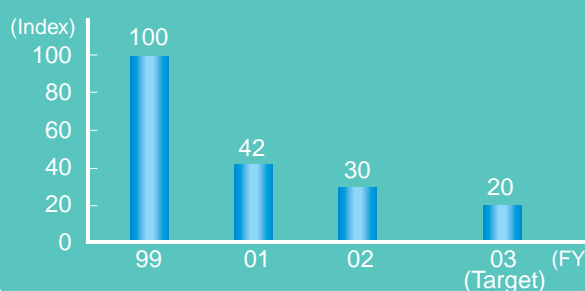
(Unit: t/yr; dioxins: g-TEQ/yr)

No.	Substance	Releases				Sewerage	
		Air	Public waters	Soil on-site	Landfill on-site	Off-site	Transfers
1	Zinc compounds (water-soluble)	0	4.6	0	0	0	0
16	2-aminoethanol	1.2	0.8	0	0	0	2
25	Antimony and its compounds	0	0	0	0	0	0
40	Ethylbenzene	35	0	0	0	0	0
43	Ethylene glycol	0.07	0	0	0	0	0
63	Xylene	270	0	0	0	0	0
68	Chromium and chromium (III) compounds	0	0.3	0	389	0	271
69	Chromium (VI) compounds	0	0	0	0	0	0.03
100	Cobalt and its compounds	0	0.02	0	0.3	0	0.002
102	Vinyl acetate	0	0	0	0	0	0
108	Inorganic cyanogen compounds	0	0.1	0	0	0	0
132	1,1-dichloro-1-fluoroethane; HCFC-141b	74	0	0	0	0	0
145	Dichloromethane; methylene dichloride	31	0	0	0	0	0
177	Styrene	1.2	0	0	0	0	0
179	Dioxins	15	0.00003	0	0.00002	0	0.1
200	Tetrachloroethylene	19	0	0	0	0	0
227	Toluene	53	0	0	0	0	3.6
230	Lead and its compounds	0	0	0	0	0	0.001
231	Nickel	0	0.03	0	0	0	36
232	Nickel compounds	0	0.8	0	105	0	115
283	Hydrogen fluoride and its water-soluble salts	0	52	0	0	0	0
299	Benzene	69	0	0	0	0	0
304	Boron and its compounds	0	8.9	0	0.001	0	0
309	Poly(oxyethylene) nonylphenyl ether	0	3	0	0	0	0
310	Formaldehyde	0	0	0	0	0	0
311	Manganese and its compounds	0	6.1	0	271	0	218
346	Molybdenum and its compounds	0	2.6	0	2.3	0	0.4
353	Tris (dimethylphenyl) phosphate	0	0	0	0	0	0

Benzene and Other Volatile Organic Compounds

Beginning in 2001, the steel industry adopted a second stage voluntary control plan for atmospheric releases of benzene and other volatile organic compounds, continuing from its first stage plan (FY1997-99), with the aim of achieving further reductions. JFE set a target of reducing benzene releases by 80% from the 1999 baseline by 2003 through company-wide improvement activities, and had achieved a 70% reduction by 2002. JFE is also reducing releases of tetrachloroethylene and dichloromethane. In addition to voluntary controls by industry unit, it is also participating in a new voluntary control plan for benzene by regional unit, which began in 2001, and is working to reduce benzene releases in cooperation with neighboring businesses in other industries.

Atmospheric Benzene release (1999 = 100)



Dioxins

The Law concerning Special Measures against Dioxins implemented in January 2000 set standard values for steelworks facilities (sintering furnaces, electric furnaces, and incinerators) effective December 2002. JFE satisfied

the standard values for all regulated steelworks facilities in 2000, well in advance of the effective date, but is implementing additional voluntary measures to further reduce dioxin releases.

Terminology

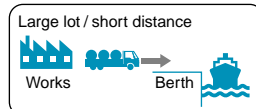
● PRTR

Pollutant Release and Transfer Register. A system of reporting to the government the amounts of designated chemical substances released into the environment and transfers as waste. Annual reporting of quantified amounts in the previous fiscal year is required, beginning in FY2002.

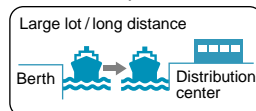
Improving Transportation

Distribution-related environmental impacts include CO₂, NO_x, and SPM generated by fuel combustion during product transportation. Because these are all factors in global warming and /or air pollution, distribution is an important environmental issue at JFE Steel. JFE endeavors to reduce environmental load through well-considered selection of transportation modes, reduction in distance, improvements in load efficiency, and introduction of information technology ahead of the steel industry. JFE is responding to stricter regulations on SPM in metropolitan areas beginning in October 2003 with a modal shift.

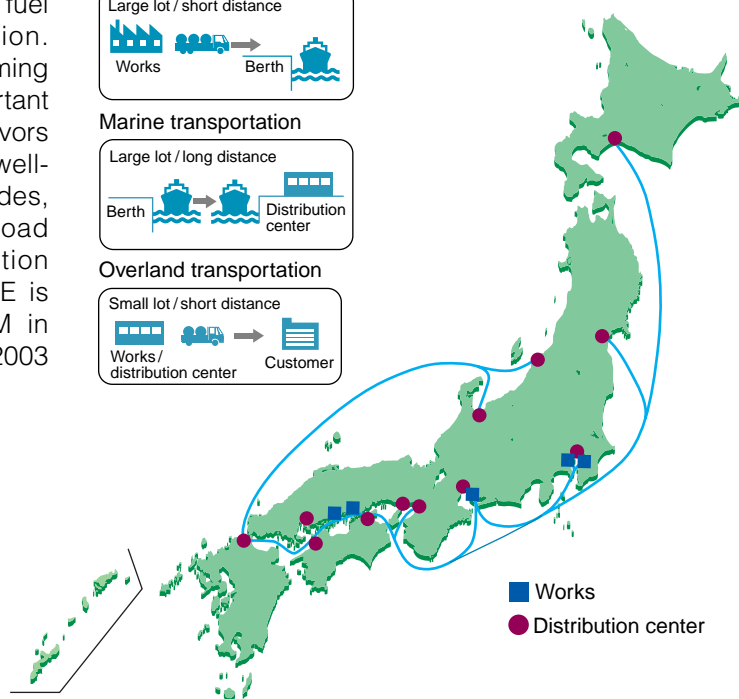
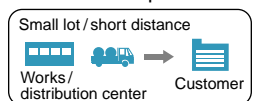
On-site transportation



Marine transportation



Overland transportation



■ Works
● Distribution center

Viewpoint for improvement	Specific measures
(1) Selection of transportation mode	<ul style="list-style-type: none"> · Promotion of modal shift by introducing innovative ships (RORO ships, FERO ships, etc.) · Avoidance of influence of weather by constructing all weather berths and using RORO ships and U-rack Ships
(2) Use of larger vehicles, effective use of information, and joint use (more efficient transportation)	<p>(On-site)</p> <ul style="list-style-type: none"> · Use of larger transportation vehicles such as U-frame vehicles and carrier vehicles · Direct transportation from mill ends to berths for eliminating temporary storage <p>(Off-site)</p> <ul style="list-style-type: none"> · Making land transportation more efficient by using IT and effective use of return trips · Development of a simulation system for optimizing the load efficiency of trucks · Reduction of transportation distances to customers by selecting optimum transportation routes
(3) Effective ship operation	<ul style="list-style-type: none"> · Improvement of operating efficiencies of ships by using the coastal ship operation management system (JFE Coastal Ship Control System) · Maximization of mixed loading of multiple products · Joint transportation with other companies
(4) Measures for coping with stricter exhaust gas regulations and lowering environmental impact	<ul style="list-style-type: none"> · Idling-stop operation · Use of vehicles with lower environmental impact · Energy-conserving operation of coastal ships in view of loading & unloading schedules · Use of ship-bottom paints containing no hazardous substances · Selective collection of wastes at unloading sites
(5) Avoidance of truck transportation through urban central areas	<ul style="list-style-type: none"> · Use of dedicated RORO ships in the Inland Sea · Use of FERO ships for coastal transportation in Tokyo Bay
(6) Reduction of materials	<ul style="list-style-type: none"> · Use of long-life cushioning materials (conversion from rubber to felt) · Reduction of retaining timber (RORO ships, U-rack ships, FERO ships) · Reduction of wire and timber (promotion of hoop lashing) · Repeated use of retaining materials · Simplification of packaging



Efficient On-site Transportation

Large on-site transportation vehicles such as the 100t U-frame vehicle and 160t carrier can carry larger single-trip loads than conventional trucks, helping to reduce CO₂ emissions.



100t U-frame vehicle

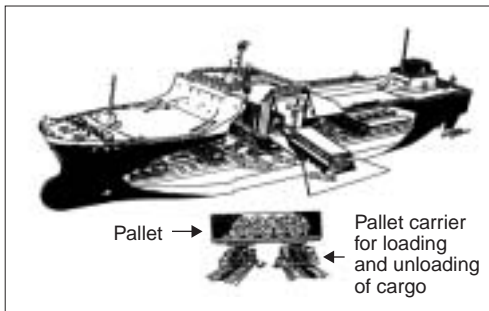


160t carrier

Innovative Marine Transportation

RORO Ship

RORO ships enable direct loading / unloading of pallet carriers and are used in scheduled service between JFE's steelworks and major cities.



FERO Ship

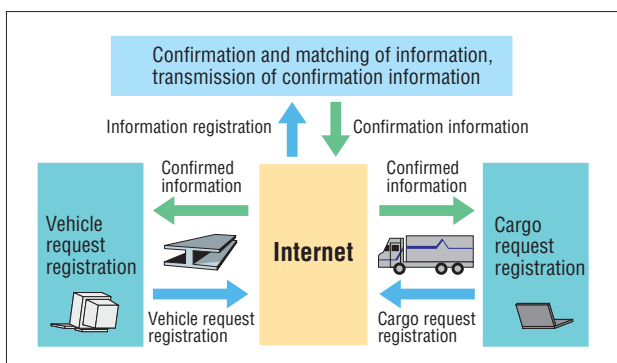
Similar to ferries, FERO ships are designed to carry loaded trucks. Regular service across Tokyo Bay between JFE's Chiba District and Negishi FERO base reduces truck traffic in the heavily-congested Tokyo area.



IT Applications and the Effect of the JFE Merger

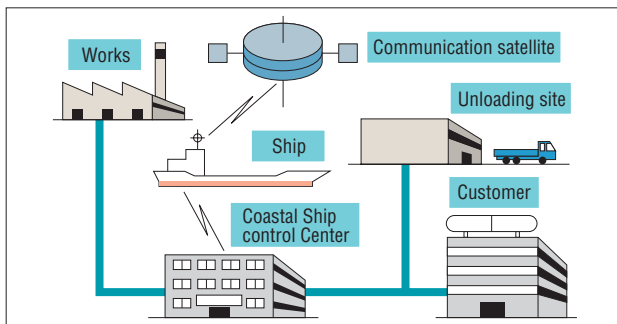
Optimized Land Transportation Network (Cargo, Vehicle Request System)

This is a specialized, IT-based dispatching system for heavy overland cargos, making maximum use of JFE's transportation and dispatching know-how for steel products and other heavy cargos. Optimum matching of cargo and vehicle information improves the vehicle operating rate and reduces the environmental impact of fuel consumption. JFE takes justified pride in this industry-leading open system.



Optimized Ship Operation Management (JFE Coastal Ship Control System)

An integrated system, for control of ship status and loading / unloading progress at JFE's works, reduces dead-heading and ensures more efficient coastal transportation by optimizing ship operation management.



Effect of the JFE Merger

To maximize transport lots and minimize distance, the selection of manufacturing plants and distribution relay bases was reviewed as part of the merger of NKK and Kawasaki Steel to create JFE.

Terminology

● SPM

Suspended Particulate Matter. Fine particulates under 10 μ m (1 μ m = 1/1000mm) which remain suspended in the atmosphere for long periods and tend to accumulate in the lungs and windpipe when inhaled.

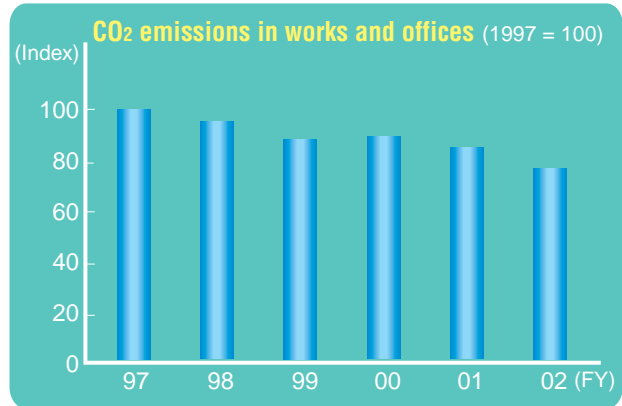
● Modal shift

Shift in transportation modes from truck to rail or ship to improve transportation efficiency and reduce environmental loads.

Efforts at JFE Engineering

Preventing Global Warming

In its works and offices, JFE Engineering has introduced wide-ranging energy and electricity conservation measures through education, adoption of energy-saving lighting systems, and other measures, resulting in continuing CO₂ reductions since 1997.



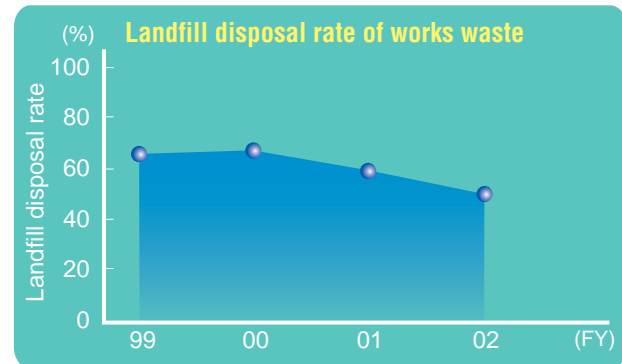
Building a Recycling-oriented Society

JFE Engineering implements waste control, reduction, and recycling in accordance with the industrial waste control sheet (manifest) system and large volume release business control system of the Waste Management Law, and Construction Recycling Law.

Reducing landfill disposal rate of works waste

Examples of recycling in works include effective use of slag and shot scrap as roadbed material, effective use of leftover paints (use of liquid component as recycled thinner), and conversion of waste lumber to chips. The landfill disposal rate in FY2002 was reduced to 48%.

Landfill disposal rate = (Generated waste – (Recycling + reduction)) / Generated waste



Reducing landfill disposal rate of construction sites waste

Waste reduction / recycling efforts at construction sites include separated collection and reduction of mixed waste to reduce incineration and enable easy recycling, use of intermediate treatment contractors, etc. As a result, landfill disposal rate in FY2002 was reduced to 26%.



Reducing Environmental Loads

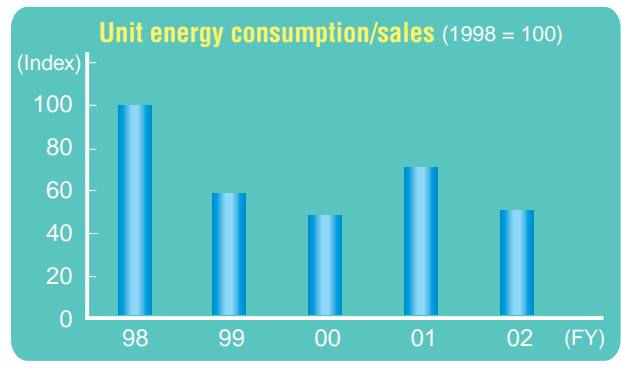
Under the PRTR Law, JFE Engineering has implemented measures to control and reduce releases / transfers of designated chemical substances.



Efforts at Kawasaki Microelectronics

Preventing Global Warming

Utsunomiya Works is a modern plant which began operation in October 1990 with a 2300-ton heat storage tank and a large number of inverter-type air conditioning units. In addition to improved control measures, Kawasaki Microelectronics is continuing to introduce energy-saving equipment and retrofit inverter-type equipment. Since 1998, unit energy consumption/sales, which is a control index used in the semiconductor industry, has decreased steadily, reaching about half the 1998 level in 2002.

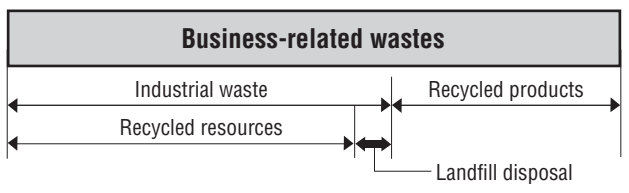


Reducing Environmental Loads

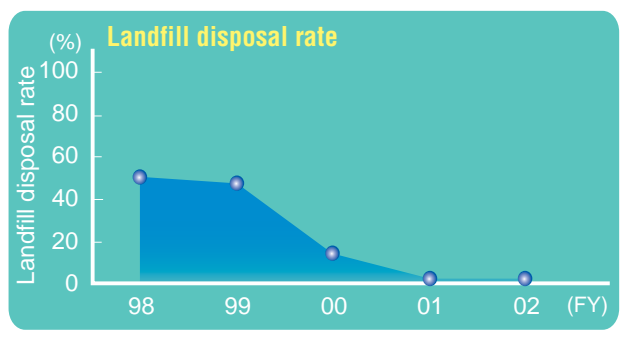
Some industrial chemicals used in semiconductor manufacturing and utilities contain PRTR substances. To lessen these loads, Kawasaki Microelectronics is reducing consumption and switching to substitutes. The company has been especially positive in adopting substitutes, and succeeded in totally phasing-out four PRTR substances in 2002.

Building a Recycling-oriented Society

Recycling of wastes includes material recycling by separated collection, use of waste oil as fuel, conversion to raw material for cement, etc. Kawasaki Microelectronics's landfill disposal rate in 2002 was less than 2%.



Landfill disposal rate (%) = Landfill disposal / Industrial waste
 "Landfill disposal" means waste which cannot be recycled as product or resource.



Efforts at JFE Urban Development

Preventing Global Warming

The "heat island effect" of abnormally high air temperatures in urban areas has become a problem in recent years. JFE Urban Development stresses environment-friendly urban development measures such as high water-permeability pavement, rooftop greening, etc.

Building a Recycling-oriented Society

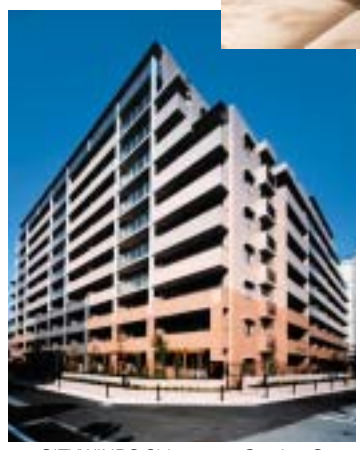
Materials and equipment are selected with priority to environmental considerations, and recycled materials are effectively used by adopting paving materials which contain municipal waste molten slag, etc.

Reducing Environmental Loads

JFE Urban Development was quick to introduce measures for the "sick house syndrome," and provides pleasant, durable housing using JIS / JAS premium-grade materials and products.



Model room



CITYWINDS Shinagawa Garden Court



Contributing through Products and Technologies

JFE provides a large number of products, technologies, and services which contribute to the environment. In addition to its in-company environmental protection program, JFE is working to develop products and services which minimize environmental impacts in society as a whole while meeting diverse customer needs.

Contributing through Steel Products and Technologies

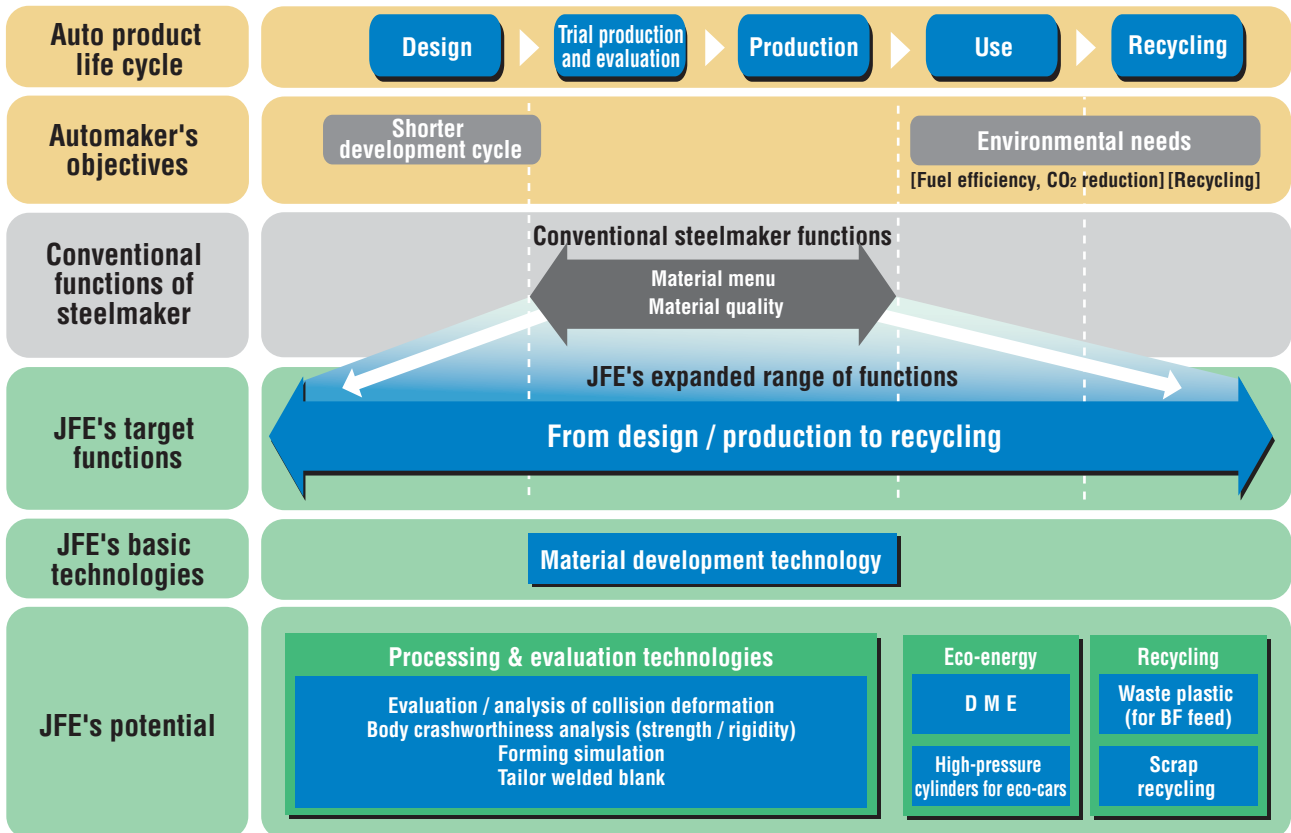
JFE has a long history of developing steel products to meet customer requirements for higher performance, including high strength, toughness, ductility, and corrosion resistance, elimination of toxic substances, and recycling. Applying the concept of Life Cycle Assessment (LCA), JFE is making important contributions to energy conservation and reduced environmental loads in society at every stage of product use.

Responding to Customers' Green Procurement Programs

In addition to ecological products R&D, JFE has strengthened its marketing and created a marketing system for ecological products. It is also actively responding to the entire range of customer needs related to ecological products, which include implementation of EMS, reduction of toxic substances, submission of environmental load data, development of judgment criteria for green procurement materials, and proposal systems.

JFE has created a Green Procurement Network to enable company-wide sharing of information on customers' green procurement programs and studies regulatory and social trends to better serve customers with product information and direct contact. As an ultimate goal, JFE is working to establish a quantitative evaluation method based on Life Cycle Assessment (LCA).

JFE's Approach to the Automotive Product Life Cycle



Life Cycle Assessment for Steel and Engineering Products

JFE has participated in studies of LCA in the International Iron and Steel Institute (IISI) since 1995 and in the MITI (now METI) LCA Project since 1998 as part of an effort to establish reliable methodologies and collect data. Data for 12 types of steel products have been completed, and work to further expand product data and research on use of LCA data is continuing. In engineering, LCA is applied to environment-related plants as an engineering product, and independent databases have been constructed to support high-environmental performance plant design.

Terminology

● Ecological products

JFE defines ecological products as products which contribute to energy saving and / or environmental protection in society, mobilizing the full resources of the JFE Group. Examples include products and services which respond to social and customer needs for resource and energy conservation, recyclability, low waste, long life, and/or low environmental loads, with environment-friendly eco-design and eco-processes as a precondition.



Steel Ecological Products

Preventing Global Warming

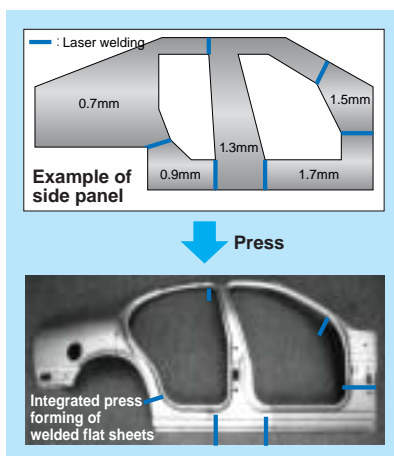
High Strength Automotive Steel Sheets (HITEN)

High strength steel makes it possible to reduce part thickness without sacrificing strength. JFE's full line of high strength automotive steel sheets (HITEN) contributes to improved fuel efficiency through body weight reduction while also improving collision safety. Galvannealed HITEN for inner and outer body panels includes virtually all grades and features excellent press formability, coating adhesion, spot weldability, and fatigue strength.



Example of application of HITEN (Door panel test produced with 1200t press at JFE)

Tailor Welded Blank

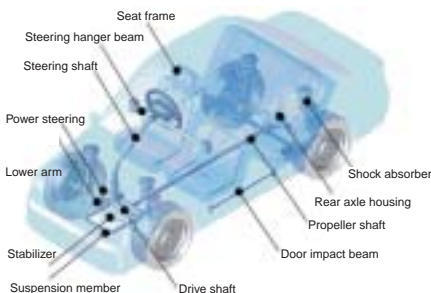


Tailor Welded Blank (TWB): Technology for press-forming welded blank of different materials and thicknesses, etc.

JFE was the world's first steelmaker to provide total solutions for the auto industry from the viewpoint of the auto life cycle from design to recycling. Its tailor welded blank (TWB) business is one example. TWB is a technology for press-forming welded blank of different materials and thickness. Commercial production began in October 2001 and is contributing to auto weight reduction.

High Strength, Light Weight, High Formability Tubes for Automotive Applications

Weight reduction, which is indispensable for fuel economy, can be achieved by substituting tubes for heavier sheets and solid bars. JFE's high strength, high formability HISTORY tube and ERW tube are products which can be formed into parts with complex shapes, contributing to weight reduction.



High strength, high formability automotive tubes

TMCP High Strength Steel

The trend toward larger structures in construction and shipbuilding requires high-strength, high-toughness steel plates and high-efficiency welding and other properties. TMCP (Thermo-Mechanical Control Process) high strength steel plates satisfy both of these performance requirements. JFE possesses the world's most advanced

TMCP technology (Super-OLAC on-line accelerated cooling). Products are used in large quantity in large-scale crude oil tankers and container ships, improving transportation efficiency, and in columns and beams in high rise structures where seismic design is applied.



Tanker constructed using TMCP high strength steel plates

Non-oriented Electrical Steel Sheets for High Efficiency Motors

Speed control drive systems dramatically improve motor efficiency. While pursuing low core loss in motor materials, JFE's high efficiency non-oriented electrical steel sheets were developed with particular emphasis on reducing high frequency core loss. JFE has also led other makers in developing reactor material products which prevent or reduce power source noise, meeting the requirements of new, high frequency electrical products.



Stator cores and rotors for motors

Terminology

● Non-oriented electrical steel sheets

Electrical sheets are steel sheets in which magnetic properties are improved by silicon addition, etc., and are used in transformers and motors. Non-oriented electrical sheets are a class of electrical steel with a highly random crystallographic axis orientation.

Grain-oriented Electrical Steel Sheets for High Efficiency Transformers

JFE produces grain-oriented electrical steel sheets with the world's highest magnetic properties, and exports more than half of these products to foreign markets. Because core loss in high efficiency grain-oriented electrical steel sheets has improved by 20-30% in the last 30 years, substantial long-term energy savings can be expected in iron cores.

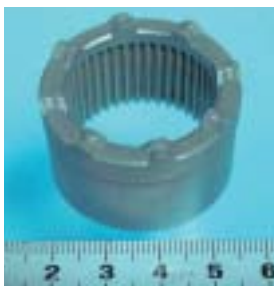


Cores for large transformers

Alloy Steel Powder for Sinter-hardening

The trend toward higher strength levels in sintered mechanical parts, particularly for automotive applications, requires heat treatment after

sintering. However, energy saving in heat treatment processes is also needed. JFE therefore developed an alloy steel powder which uses after sintering as a heat treatment process (sinter-hardening). Eliminating conventional heat treatment results in substantial energy savings in part manufacture.



Part for power tool

Solar Grade Silicon (High-purity Silicon for Solar Cells)

To meet the rapidly-growing demand for solar cells, JFE developed the

world's first mass-production technology for manufacturing solar cell substrates from molten metallic silicon by a metallurgical refining process. The product silicon is more than 99.9999% pure and achieves 14-16% conversion efficiency in solar cells. Commercial production of silicon blocks for substrates began in April 2001 on a 200 t/yr scale and was expanded to 400 t/yr in October 2002.



World's largest polycrystalline silicon ingot



Polycrystalline silicon solidification plant

Building a Recycling-oriented Society

Heat-treated Rails

Using a unique heat-treatment process, JFE has dramatically improved the hardness and wear resistance of railway rails, which show improvement of approximately 60% in wear tests. The extended rail life resulting from improved wear resistance reduces energy consumption and waste accompanying rail maintenance and replacement. These heat-treated rails have been commercialized for Japanese railways and heavy axle-load railways in North America and elsewhere.



Heat-treated rails

Steel-framed House

JFE's steel-framed house offers excellent earthquake resistance, safety, and durability. With its extremely long life, this environment-friendly housing product contributes to forest preservation and protection of the global environment.



Steel-framed House

Blast Furnace Cement (Granulated BF Slag)

JFE produces high quality blast furnace slag powder from water-granulated BF slag, which is a byproduct of ironmaking. Used as an admixture in cement, it displays outstanding properties including strengthening, reduced heat of hydration, and improved chemical resistance. Environmental advantages include energy and resource saving, effective use of resources, and reduction of greenhouse gases.



Granulated BF slag

Terminology

● Grain-oriented electrical steel sheets

A type of electrical steel sheet with the easy axis of magnetization in the crystallographic structure oriented in the rolling direction. Displays excellent magnetic properties in the sheet rolling direction.



Weathering Steels



Oku-Aso Bridge constructed using weathering steel

Weathering steels, which use rust to prevent rust to possess good corrosion resistance without painting because the steel is designed to form a protective rust film. Widely used in civil engineering and construction, and particularly in bridges, weathering steels extend the life of steel structures to 50-100 years without

painting. JFE has also developed Ni added high performance weather steels for use in environments with high airborne salt concentrations, which was impossible with conventional weathering steels, expanding the range of applications and contributing to global environmental preservation.

Rust Stabilizer for Weathering Steels

Rust stabilizers preserve the good appearance of structures by preventing rust streaks on weathering steels. For environmental protection, JFE developed a new rust stabilizer which is 100% free of chrome, lead, and other heavy metals and meets a variety of requirements for formation of a dense protective rust layer,

helping expand the application of environment-friendly weathering steels.



Example of use of rust stabilizer

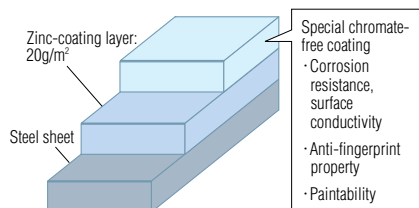
Clad Steel Plates

Clad steel plates consist of a surface cladding of stainless steel or titanium, which provides improved corrosion resistance, over a high-strength carbon steel plate. Clad steel contributes to saving energy consumption through saving rare earth metals.

Reducing Environmental Loads

Chromate-free Coated Steel Sheet

The EU has set a deadline of July 2006 for replacing hexavalent chrome, lead, mercury, and cadmium with substitutes. Because exported appliances must meet this requirement and similar regulations are expected in Japan in the near future, JFE developed a coated steel sheet which contains no chrome (VI) but still offers excellent corrosion resistance, surface conductivity, paintability, anti-fingerprint property, and lubricity. This product is now used in internal panels of appliances and vending machines, internal components of OA equipment and copiers, chassis of televisions, VTRs, and audio equipment, and other parts, and an expanded range of applications is expected.



Stainless Steel Sheets and Tubes for Automotive Exhaust Systems

In the form of sheets and tubes, JFE manufactures much of the ferritic stainless steel which is now used in automotive exhaust system components such as exhaust manifolds, converter cases, and mufflers. In particular, JFE manufactures a unique high oxidation resistance stainless steel, which the company itself developed, as a metal honeycomb carrier material for the catalytic converter used to remove CO and NOx from exhaust gas, and has won high marks from users for many such devices.



Exhaust manifold

clude a special two-side organic film coating which gives excellent press formability, weldability, corrosion resistance, and resistance to gasoline-induced degradation.



Example of use in auto fuel tank

Martensitic Stainless Steel Tubes

Natural gas is enjoying rising demand as a countermeasure for global warming, but development of this resource requires steel tubes with high corrosion resistance in high temperature environments. Martensitic stainless steel OCTG (oil country tubular goods) and linepipe can be used in these environments without inhibitors (corrosion prevention agents), contributing to environmental protection.



Offshore oil field

Lead-free Sheets for Fuel Tanks

Recognizing the need to reduce lead use, JFE developed a 100% lead-free steel sheet as a replacement for the lead-tin coated steel sheet long used in auto fuel tanks. Features of the Pb-free sheet in-

Water-permeable Steel Sheet Pile

Water-permeable steel sheet piles are a novel type of sheet pile with pre-cut water-passage holes. In revetments and embankments, they maintain water circulation between the land and water sides approaching that in nature, preserving, creating, and restoring the complex ecological systems around such structures. Placing mattress works on the front side and gabion works or stones on the back produces a synergistic ecological preservation effect. This type of composite construction can already be seen in project for creation of rivers richly-endowed with nature at the Nagara River, where it has proven its effectiveness in preserving the ecological system.



Example of use at Nagara River

“Tsubasa” Screw Pile

Because conventional foundation piles are placed during or after ground excavation, a large volume of surplus soil is deposited on the surface. JFE’s Tsubasa Pile is a steel pipe pile with a screw-like wing

plates at the bottom end and is placed by turning the pile. Displaced soil is compressed by the wing plates and accumulates around the pile, solving the problem of surplus soil, which is among the greatest problems in pile-driving work. As an additional advantage, the pile-turning machine does not cause the noise and vibration, resulting in a quieter environment during construction work.



“Tsubasa” Screw Pile

Fire Resistant Steel Products for Building Structures



Parking building using fire resistant steel

Under ordinary conditions, fire resis-

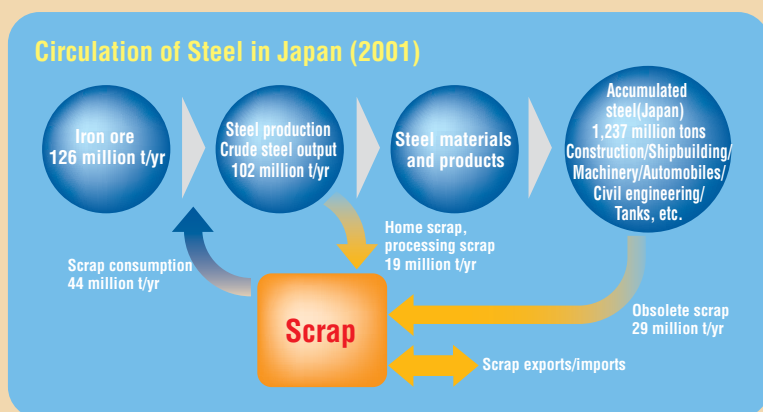
tant steel has the same properties as conventional steel, but as a strength guarantee, it has a minimum high-temperature (600°C) yield point of 2/3 the normal temperature standard. Fire resistant steel is widely used in semi-outdoor spaces, such as multi-level parking ramps, and in structures with large open spaces and little flammable material, such as atriums. By reducing fire resistant coating work, this product also improves the working environment at the site and reduces environmental loads in construction of buildings.

Lead-free Free-cutting Steel for Machine Structural Use

JFE developed a lead-free free-cutting steel offering a combination of good machinability and cold forging properties, which had been considered impossible without Pb addition. In spite of its high carbon composition, this steel has an excellent cold forging property, and at the same time, has better machinability than Pb-added free-cutting steel because a graphite, which has a lubricant effect, is used in place of lead. It has a good balance of fatigue strength after quenching and tempering, giving it a particularly outstanding combination of properties as an automotive steel material for processing by cold forging – machining – heat treatment.

Circulation of Steel in Japan

Each year, Japan produces approximately 100 million tons of steel, which is used in construction, machinery, and auto industry, and other fields. When products reach the end of their useful life, virtually all of this steel is recycled to the steel industry, including materials with long lives of 100 years or more. Recovered steel is used any number of times, demonstrating that steel is well-suited as a basic material for a recycling-oriented society. The total accumulation of steel in Japan is now more than 1.2 billion tons and is a resource which can be passed on to future generations.



(Source: ISIJ)



Contributing through Engineering Products and Technologies

JFE is contributing to a low environmental load and recycling-oriented society by developing engineering businesses in clean/recycled energy, water purification, soil preservation, and waste treatment and recycling.

Preventing Global Warming

Gas Engine Cogeneration

Since JFE delivered its first gas engine cogeneration system in 1981, it has supplied systems with outstanding reliability and durability using the WAUKESHA gas engine, which has earned an extremely high reputation with users around the world. Because this is a high efficiency system which greatly reduces CO₂ emissions, and furthermore, burns clean city gas made from natural gas, it generates no dust or SO_x, while NO_x is minimized using various reduction technologies.



Gas engine cogeneration package

District Heating and Cooling (DHC) by Sewage Heat



DHC system using waste heat in sewage

District Heating and Cooling (DHC) using sewage heat is an extremely effective energy-saving technology. DHC utilizes a heat pump to convert the difference between atmospheric temperature and unused sewage heat, which remains basically constant year-round, to a heat source. At its steelworks and waste treatment plants, JFE has accumulated abundant experience and technical know-how in using untapped energy sources and is continuing to contribute to

safe, comfortable urban development with DHC.

Environment-friendly Regenerative Burner

The environment-friendly regenerative burner heating system is an innovative "world's first" technology which realizes large energy savings in re-heating furnaces (30% or more) and at the same time, large reductions in flue-gas NO_x concentration (60% or more). As a combustion system which makes a significant contribution to both environmental protection and global warming prevention, it is winning wide acceptance among users in Japan and other countries.

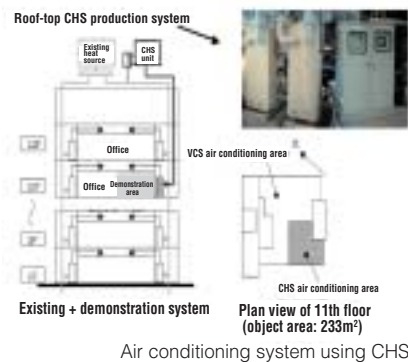


Regenerative burner heating system

Energy Saving Air Conditioning System Using Clathrate Hydrate Slurry (CHS)

CHS is a new thermal transportation and storage medium first developed by JFE as a substitute for cold water. In comparison with conventional cold-water air conditioning, trial calculations show that a year-round energy saving of approximately 50% is possible with CHS, offering great promise as an energy saving / CO₂ reduction technology for general use. CHS is a two-phase fluid comprised of fine particles of clathrate hydrate and its aqueous solution and holds latent heat in the same temperature range (5–12°C) as water for air conditioning, but its thermal density is more than double that of cold water. As a result, the pumping flow rate can be reduced by at least half, reducing pumping power consumption by up to 80%

and thermal storage tank size by 50% or more.



Wind Power Generation

Wind power generation has drawn considerable attention as form of clean energy and has been introduced rapidly in recent years.

JFE manufactures 750kW units featuring a variable rotor speed, direct drive transmission, synchronous generator in Japan and supplies total engineering for wind power plants from site selection through design, manufacture, construction, and maintenance. JFE is Japan's leader in the field, with a record of orders received for 121 units, mainly of the 750kW class, and a total installed capacity of 84,000kW (end of March 2003). As a clean power producer, JFE is participating in wind power projects in Hokkaido and Mie Prefecture to encourage wider use, and has also introduced a large-scale 2,000kW wind power generator from Gamesa (Spain), giving it a strong presence in the large-generator sector.



Wind power plant

LNG Storage



LNG base

Low-temperature liquefied gases, beginning with LNG, LPG, and ethylene, are widely used as fuels for electric power generation and general use and as feedstock for various industrial materials. In particular, LNG is expected to enjoy strong growth as the fuel with the least environmental impact. JFE is actively involved in a wide range of cryogenic technologies, and considers LNG

storage (above-ground and underground tanks) and other LNG facilities as a core business in the energy engineering division and is continuing to accumulate new technologies and enhance its business capabilities.

Building a Recycling-oriented Society

Waste Recycling Systems

As part of its response to the growing number of recycling laws enacted in recent years, JFE is actively involved in waste sorting technology and engineering such as automatic high-speed sorting systems for recycling plazas, which sort steel and aluminum cans, bottles, and plastic bottles by color and material. Other contributions include waste biomass power generating systems and high-speed composting systems.



Waste sorting and recycling system

Waste Treatment

JFE has developed and introduced numerous next-generation technologies for waste treatment plants, featuring advanced combustion technologies such as the stoker-type waste incinerator with fuzzy combustion control and the fluidized bed-type incinerator, as well as the high temperature gasifying & direct melting furnace and JFE THERMOSELECT gasifying & melting furnace. JFE's electric resistance-type and plasma-type ash melting furnaces recycle incinerator ash as clean, metal-free slag which can be used in roadbed material, tile, and acoustic panels. JFE has also developed an RDF (Refuse Derived Fuel) system technology, which is used to select combustibles from refuse for recycling as solid fuel (RDF),

as a promising new method of effectively using waste.

JFE has created a system for reducing loads on the environment, including study of developed products in Life Cycle Assessments (LCA), and is responding to advanced requirements for environmental protection with minimal secondary pollution in processes from incineration through melting.



Stoker-type incinerator



High-temperature gasifying & melting furnace



Electric resistance-type ash melting furnace



JFE THERMOSELECT gasifying & melting furnace

Power Generation using Circulating Fluidized Bed (CFB) Boiler

In 1990, JFE signed a license agreement with the German company Steinmüller and began manufacture and sales of circulating fluidized bed (CFB) boilers as an environment friendly, energy-saving power generation system. The most significant

features of the CFB boiler include wide compatibility with various fuels and high combustion efficiency, enabling substantial reductions in NOx, SOx, and other environmental pollutants. In addition to anthracite, semi-anthracite, bituminous coal, lignite, and low-grade coal, the system can also accommodate oil coke, biomass, wood chips, waste plastic, etc., meeting the diverse needs of a recycling-oriented society.



CFB boiler power plant

Driftwood Recycling

Up to now, driftwood which flowed into dam reservoirs as a result of floods and avalanches was simply incinerated, but this practice is undesirable for environmental preservation because it generates CO₂, a factor in global warming, as well as dioxins. Considering this driftwood a valuable wood resource, JFE developed effective use techniques such as conversion to chips for use as litter for livestock or mulch to prevent weeds in flowerbeds, or to charcoal for water purification, contributing to recycling and environmental protection.



Driftwood recycling plant



Reducing Environmental Loads

Demolition of Waste Incineration Plants

In waste incinerator demolition, preventing environmental impacts in neighboring areas and securing the safety of personnel have become important corporate missions. JFE is particularly well-prepared for this role, having constructed more than 100 incineration plants, as well as expanding and renovating many others. In the process, JFE has also performed demolition project management with safety as its first priority. For new demolition projects, it has developed a comprehensive environmental technology capability for total reduction in environmental loads, which includes advanced measurement and evaluation of dioxins, removal of pollutants and sealing of work areas, high-temperature detoxification of dust and waste (On-site Dio-Buster, Hi-Clean DX), and safe disposal of waste. As one notable accomplishment, Kawatetsu Machinery, a JFE Group company, established a completely flameless demolition technology and was the first company in Japan to carry out a dioxin-free incinerator demolition project.



High-pressure water cleaning and removal of deposits

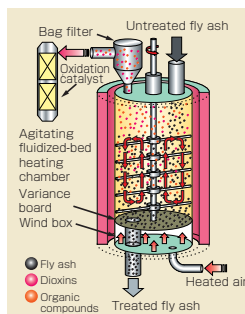


On-Site Dio-Buster

Detoxification Technology for Dioxins in Waste Incineration Fly Ash

As one current problem in dioxin countermeasures for waste incinerators, it is necessary to achieve a broad reduction in dioxin releases from the facility as a whole. Because fly ash accounts for more than 60% of dioxin releases, JFE recognized the need for a high-efficiency dioxin removal technology for fly ash and developed a fly-ash dioxin detoxification technology called Hi-Clean DX.

Dioxins are removed to the exhaust gas by heating the fly ash under an air flow to volatilize and separate dioxins, detoxifying the ash. At the same time, other organic compounds which cause resynthesis of dioxins are also volatilized and separated from the fly ash, eliminating the need for a rapid cooling process, which had been essential with conventional technologies, and saving plant space. Dioxins and organic compounds in the exhaust gas stream are decomposed and detoxified by a high-performance oxidizing catalyst. This technology has won high praise around the world and received the Japan Industrial Machinery Association's Chairman's Prize, "29th Excellent Environmental Equipment Award." A new plant for a regional waste treatment association was completed in March 2003 and is now operating smoothly at 345kg-fly ash/hr.



Structure of Hi-Clean DX

Protecting the Water Environment

JFE is contributing to attainment of a better water environment through comprehensive engineering which ranges from water purification to waste water treatment, such as, water pipeline construction, operation, management, water purification, sewage treatment, night soil and landfill waste water treatment, livestock waste treatment facilities and methane fermentation plants for food residue. JFE is also active in efforts to purify polluted water to prevent pollution in rivers, lakes, other closed water area and sea by supplying equipment for physical, chemical and biological treatment processes. JFE's water purification and sewage treatment equipment includes advanced biotechnology purification processes using microorganisms, an automatic dry powdered activated

carbon injection system and advanced membrane filtration technologies which effectively remove toxic substances from raw water at waterworks. Treatment of sewerage sludge includes methane fermentation, phosphorus recovery, and processing of molten slag as a construction material. These technologies demonstrate JFE's philosophy of total recycling.



Carrier-used advanced treatment facility



Dry powdered activated carbon injection system High-load membrane night soil treatment facility



Sewages sludge methane fermentation facility

Protecting the Soil Environment

With the enactment of new environmental legislation and rising public awareness of environmental issues, pollution of soil and groundwater has become urgent problems in some locales. Making full use of the experience and know-how gained in its wide-ranging engineering business, JFE provides total solutions for soil protection, from survey and evaluation to proposal and implementation of purification measures and monitoring.

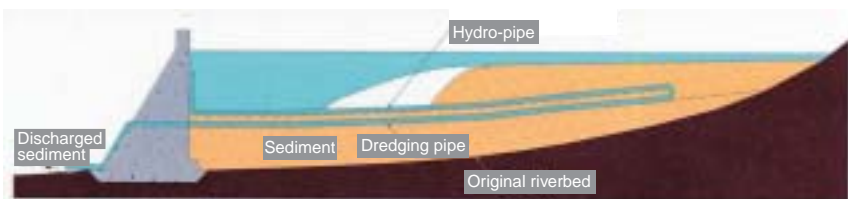


Water washing & classifying soil remediation system

Dam Sediment Removal

A variety of problems arise when the sediment transport in rivers is blocked by a dam reservoir, including reduced dam reservoir capacity, loss of downstream riverbeds, and coastline erosion. As a simple and effective solution, JFE developed a comprehensive sediment transport management technology based on the concept that the entire sediment transport region from the headwaters of a river basin to the coastline forms a “sediment

transport system.” JFE proposes a hydro-pipe sediment removal technology which dredges sediment from the dam reservoir and releases it into the downstream region. By combining a sediment dredging pipe (hydro-pipe), which uses the hydrostatic pressure to suck sediment from the reservoir, and sediment flush gate, this system enables efficient discharge of sediment over a wide area without large reductions in the dam water level.



Hydro-pipe sediment dredging system

Dam and River Water Quality Preservation

To prevent algal bloom due to eutrophication in rivers, dam reservoirs, and other enclosed water bodies, JFE developed the destratification system. This device, called “Mizusumashi”, improves shallow-level and total-level water quality by using a propeller stirring method to generate a circulating flow by lifting bottom water with the propeller and releasing it in a dispersed flow at the surface. Because power consumption is low, the system can be powered by a solar battery.



Water protection technology “Mizusumashi”

Seawater Exchange-Type Hybrid Caisson

Breakwaters interrupt seawater circulation and form a closed marine area in ports and harbors. In such area, water quality may deteriorate. For seawater exchange to improve water quality, outside fresh seawater is let into ports and harbors so far.

JFE’s seawater exchange-type hybrid caissons have the system to control the flow of water in the fixed direction by a wave sluice plate. This system produces not only efficient seawater exchange but calm water condition. As an economical breakwater system, wide adoption of this structure is expected.



Seawater exchange-type hybrid caisson

Contributing through Microelectronic Products and Technologies (Reducing Environmental Loads)

As a member of the JFE Group, Kawasaki Microelectronics, Inc. (KMI) contributes to progress in IT technology with low-environmental load Pb-free semiconductors.

Development of Pb-free Semiconductor Devices

To respond to customer requirements for high quality and quick delivery of highly-integrated high-performance system LSIs with low power consumption while positively addressing the needs of customers’ green procurement programs, KMI has strengthened control of designated

chemical substances contained in semiconductors. For example, conventional semiconductor devices use solder, which contains lead, in bore and outlead external connections, but KMI has replaced this with Pb-free materials. During FY2003, KMI also plans to complete a phase-out of halogens by replacing the small amount of bromine compound flame retardants added to mold resins with a substitute.



ASIC (Application Specific IC)



Research and Development

With its three-laboratory R&D system, which includes the laboratories at JFE Steel, JFE Engineering and JFE R&D Corporation, JFE is developing the world's most advanced technologies for global environmental preservation in response to social trends and needs.

Innovative Approaches to the Environment

Key Technical Development Subjects

Development Completed (Already Commercialized)

<p>Preventing global warming</p> <ul style="list-style-type: none"> • High purity silicon for solar cells • Environment-friendly regenerative burner • Clathrate hydrate slurry (CHS) air conditioning system (high-density cooling medium) 	<p>Reducing Environmental Loads</p> <ul style="list-style-type: none"> • Fly ash dioxin treatment (Hi-Clean DX) • Environment-friendly high-efficiency arc furnace (ECOARC) • Advanced sewage treatment system using microorganism carriers (Bio-Tube, Pegasus) • Lake & river purification equipment (River-Float) • Accelerated oxidizing treatment system (AOP more) • Simulation of biological reactions • Soil contamination 3-D imaging system • Slag recycling technologies (heat island-mitigating pavement, Ferro-Foam) • Low-dioxin combustion control system • Waste incinerator operation training simulator • Dioxin precursor analyzer • New dioxin analysis method • Automatic monitoring system for heavy metals
<p>Building a Recycling-oriented Society</p> <ul style="list-style-type: none"> • High-temperature waste gasifying & direct melting • JFE THERMOSELECT gasifying & melting • Electric resistance municipal waste incinerator ash melting • Plasma ash melting • Next-generation stoker furnace • JFE hybrid activated carbon with high thermal conductivity • Waste plastic recycling system for BF feed • Waste-to-resource recycling system • RDF (Refuse Derived Fuel) carbonizing system 	

Note: For iron and steel materials, see Ecological Products, pp. 30–33.

Under Development

<p>Developing Clean Energy</p> <ul style="list-style-type: none"> • Mass production technology for new clean energy source – DME (*1) • High efficiency fuel cell-SOFC (*2) • Natural gas hydrate (*3) • High-efficiency hydrogen production technology using sensible heat of ironmaking processes • Economical hydrogen production technology 	<p>Preventing Global Warming</p> <ul style="list-style-type: none"> • Innovative process for reducing CO₂ emission in ironmaking (*4) • High strength steel sheets (NANOHITEN) (*5) • Refrigeration system powered by low grade waste heat • Slag recycling technology (Marine Block) • Innovative ironmaking technology using Float Smelter
<p>Building a Recycling-oriented Society</p> <ul style="list-style-type: none"> • Economical activated coke production technology (*6) • 100% recycling technology for waste stainless steel pickling acid 	<p>Reducing Environmental Loads</p> <ul style="list-style-type: none"> • Low-sludge biological water treatment technology (*7)

* See pp. 39–40.

To date, JFE has developed a wide variety of products which reduce environmental loads. Following the creation of the three-laboratory system in April 2003, the JFE Group is now focusing its energies on the development of world's Only 1 products and No. 1 products which strengthen its ties with customers, process technologies, and leading technologies.

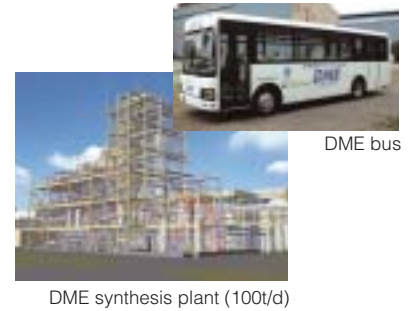
JFE places special importance on advanced global warming technologies and certain key technologies which envision JFE's core businesses in the long-term future. In many cases, these overlap, including DME and high-efficiency fuel cells (SOFC) in the field of clean energy and the low-CO₂ sintering process and NANOHITEN high strength steel sheets as global warming countermeasures.

Creating New Energy Sources for the 21st Century

Clean Energy for the 21st Century – DME (*1)

Because DME (dimethyl ether) produces absolutely no SOx or dust when burned, it is truly “clean energy for the 21st century.” Wide use is expected as a fuel for power generation and smoke-free diesel engines and as an LPG substitute. Using the world’s first large-scale bench plant (5 tons/day), JFE succeeded in direct synthesis of DME from coal mine gas and has begun work on a 100 ton/day

pilot plant project. The first DME-fueled test vehicle in Japan was approved in February 2002 and is now in road tests to popularize this clean energy resource. DME buses are also used in JFE’s steelworks, and a large-scale DME power generating system is under development as part of active efforts to create new applications.



High-efficiency Fuel Cell Power Generation – SOFC (*2)

In cooperation with Siemens Westinghouse Power Corporation (SWPC) in the U.S., JFE is commercializing and developing markets for solid oxide fuel cell (SOFC) systems which enable high-efficiency power generation at the 50% level at 250kW and more than 60% at multi-MW outputs. This technology is especially attractive as a distributed power system technology which contributes to the

global environment. JFE is also actively involved in developing and popularizing small-scale fuel cell power generation, and entered into a tie-up with Fuel Cell Technologies Ltd. (Canada) in December 2001 to commercialize systems with outputs of 50kW and under for households and small businesses. Because internal reforming is possible with SOFC, a variety of fuels can

be used. To take advantage of this feature, research on combination technologies involving DME and biogas is underway.



Natural Gas Hydrate (*3)

LNG (liquefied natural gas) equipment must be able to withstand a cryogenic temperature of -162°C . In contrast, natural gas hydrate can be transported and stored in sherbet form at temperatures of -10 to -20°C , much closer to room temperature. This greatly simplifies equipment, and lowers the cost of transportation and storage. This also contributes to

the development of small-and medium-sized gas fields. JFE has developed an extremely high-efficiency production technology for natural gas hydrate. Basic experiments using propane as a simulation gas have reached production rates 60 times faster than the conventional process. Equipment was constructed for

bench-scale experiments using methane, which is the main component in natural gas, and the experiments are now in progress.



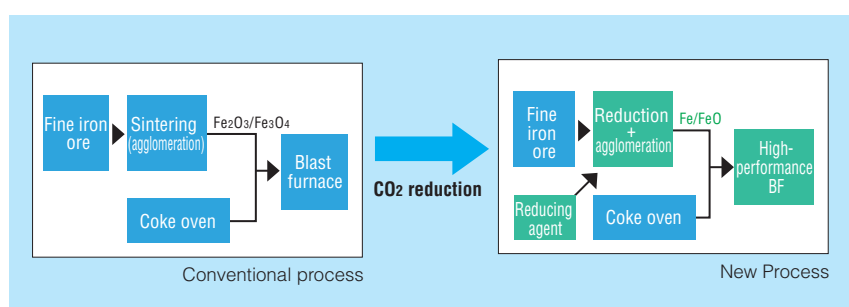
Preventing Global Warming

Innovative Process for Reducing CO₂ Emission in Ironmaking (*4)

More than half of all CO₂ emissions in steel manufacturing are discharged from the ironmaking process, and the countermeasures are indispensable. As one solution, JFE is developing a process for pre-reduced agglomerates production in which iron ores are reduced simultaneously with agglomeration by adding a reducing agent to the iron ore and other raw materials. With this new pretreatment process and control of the atmosphere in the sintering machine, reduction efficiency

and load of reduction on the blast furnace are improved. A 13% reduction in total CO₂ emissions from the

ironmaking process is expected.

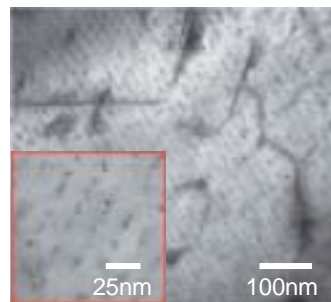




High Strength Steel Sheet – NANOHITEN (*5)

Improved fuel consumption by reducing auto body weight is indispensable for protecting the global environment. However, simply reducing the thickness of steel sheets to reduce body weight would cause safety and performance problems. JFE is the first steelmaker in the world to apply nanotechnology to the development of a high strength sheet, called "NANOHITEN," which makes it possible to reduce sheet thickness without sacrificing essential functions. The properties of

NANOHITEN are dramatically improved by controlling the microstructure at the nano level (10–9 meter), breaking the conventional micron (10–6 meter) barrier. NANOHITEN is being adopted by automakers, contributing to global warming prevention.



Example of application of NANOHITEN/
Nano-size precipitates in microstructure

Building a Recycling-oriented Society

Economical Activated Coke Production Technology (*6)

JFE is developing an economical production system for activated coke as an adsorbent for flue gas treatment and water purification. The system can use a variety of organic wastes as raw materials, including waste wood, and waste plastic. Organic wastes are first subjected to preliminary carbonization (precarbonization). The porous material obtained in this step is formed into briquettes by wet forming and then carbonized again to produce the activated coke

product. The high-calorie gas generated during precarbonization can be recovered and used effectively as a heat source, either in the coke process itself or in other steelworks processes.



Activated coke



Carbonizing kiln

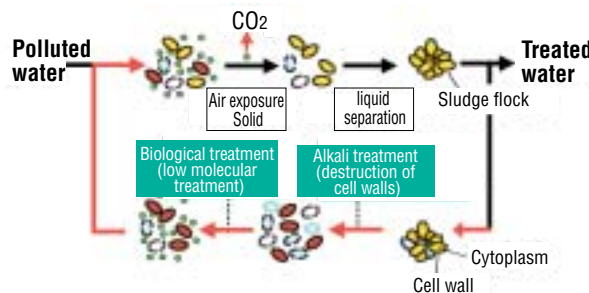


Reducing Environment Loads

Low-sludge Biological Water Treatment Technology (*7)

JFE has developed an economical, easily maintained and operated, low-sludge water treatment process for small- and medium-scale sewage treatment plants. The system greatly reduces sludge generation by effectively combining alkali treatment and biological treatment and can be ad-

ded on to conventional water treatment facilities with excellent results, avoiding excessive capital investment.



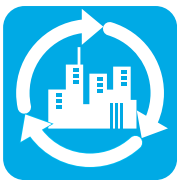
Terminology

● **DME**

Dimethyl ether. DME is a safe, clean substance with no danger of causing global warming gases or ozone layer destruction. When burned, it does not generate SOx or dust, and NOx generation is minimal. Because it is easily liquefied, it can be stored and transported in the same way as LPG.

● **SOFC**

Solid oxide fuel cell. A type of fuel cell which uses a solid oxide with oxide ion conductivity as the electrolyte. As features, SOFC operates at a high temperature of approximately 1000°C and has excellent power generating efficiency.

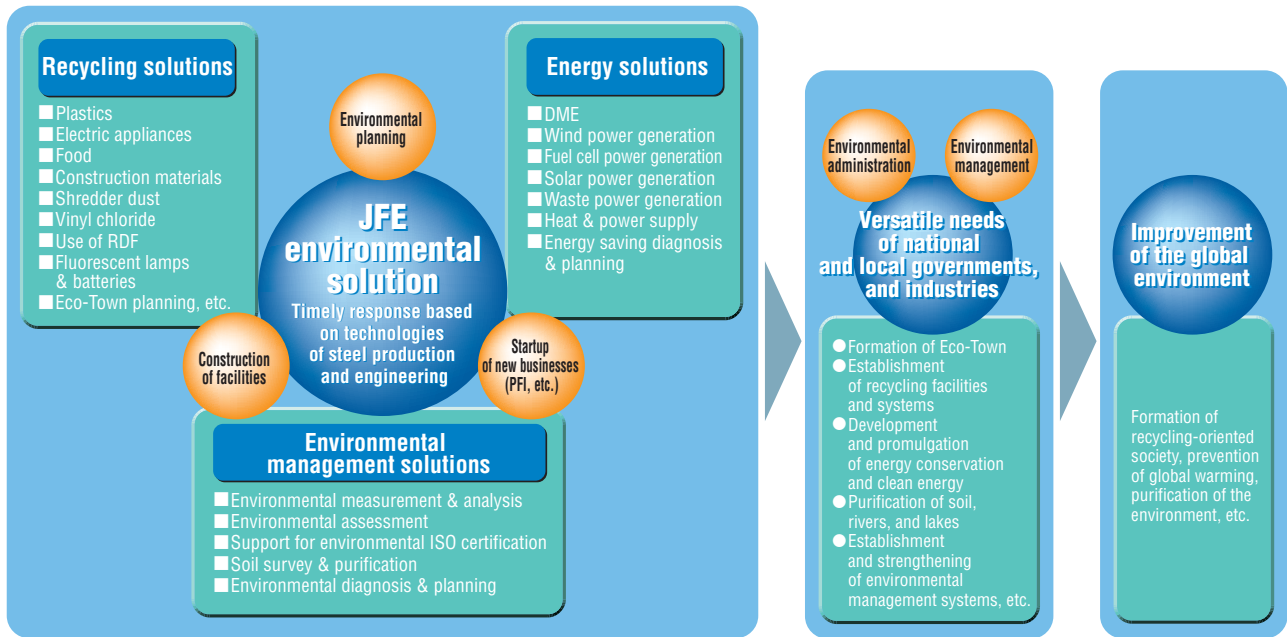


Building Environment-Friendly Towns

JFE possesses the technologies and know-how to provide total solutions for the many problems now confronting the global and regional environment. By applying the combined technical capabilities developed in its steel and engineering businesses, JFE is contributing to a recycling-based, clean energy society.

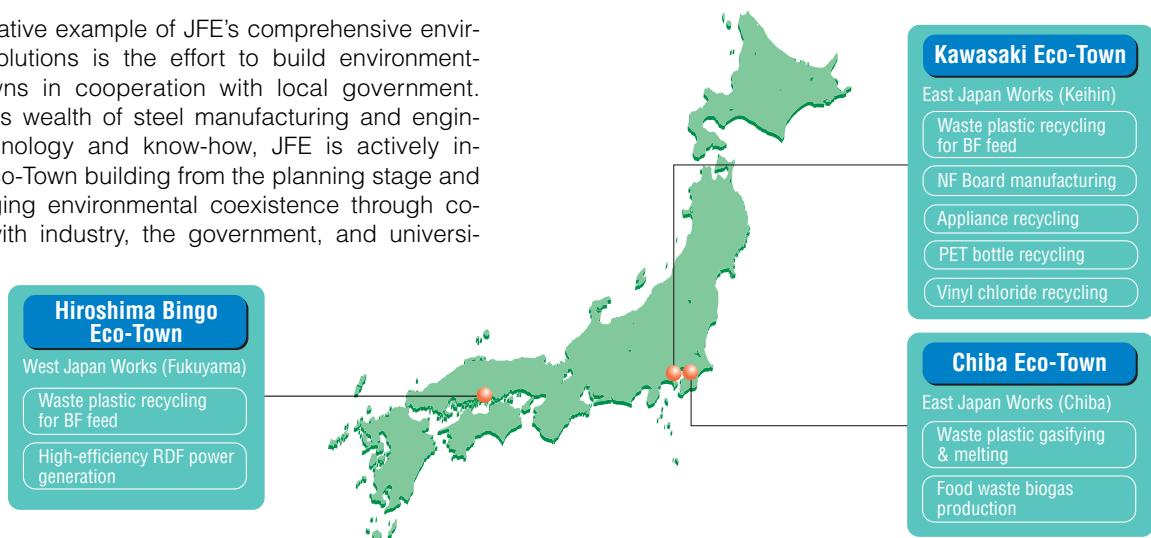
Providing Total Solutions for a Better Environment

JFE is leading the effort to build environment-friendly cities and towns in cooperation with industry, the government, and universities. Through its networks with society at all levels, JFE provides total solutions for a better environment.



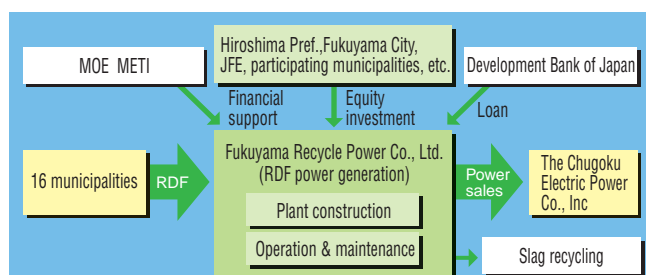
Building Eco-Towns

A representative example of JFE's comprehensive environmental solutions is the effort to build environment-friendly towns in cooperation with local government. Based on its wealth of steel manufacturing and engineering technology and know-how, JFE is actively involved in Eco-Town building from the planning stage and is encouraging environmental coexistence through cooperation with industry, the government, and universities.



Bingo Eco-Town Concept (Hiroshima Eco-Town Area)

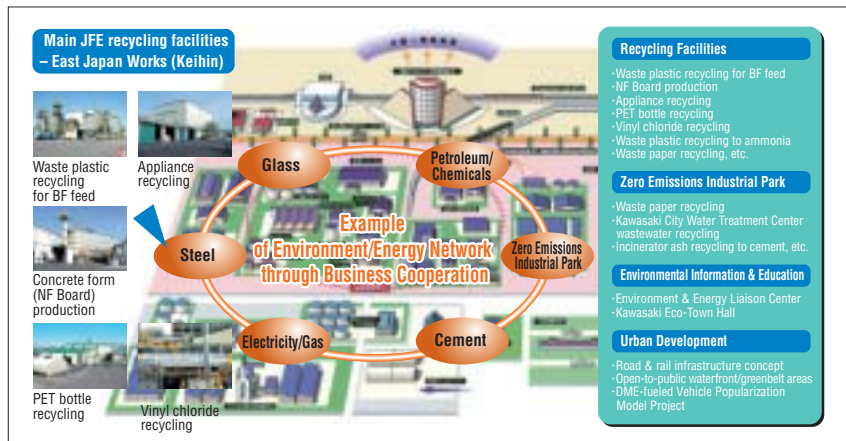
In Hiroshima's Bingo Area, the Fukuyama Waste Recycling Power Generation Project is scheduled for startup in 2004 and will generate power by melting RDF produced from municipal waste. JFE is responsible for the construction, operation, and maintenance of the high-efficiency power generating gasifying & melting furnace. With a treatment capacity of approximately 310 tons/day and output of 20,000kW, this plant will have the world's largest single-furnace capacity and will be a model case for wide-area recycling of municipal waste.





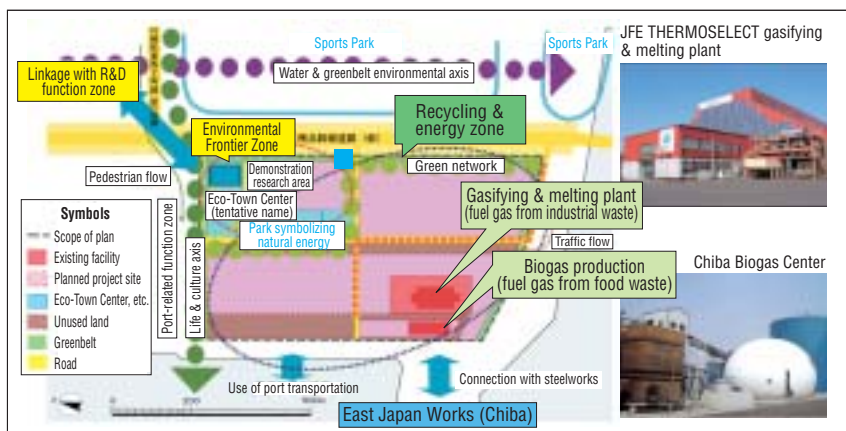
Keihin Coastal Area Environmental City Concept (Kawasaki Eco-Town)

Since designation as an Eco-Town in 1997, Kawasaki has created a Zero Emissions Industrial Park and a variety of recycling businesses. JFE has recycling facilities for plastics, appliances, and other materials which are recycled in steel production. Because the Keihin Coastal Area includes basic materials, petrochemicals, energy, and other industries, it is creating a recycling system for heterogeneous industries. Cooperating with local government and other industries in its environmental solution activities, JFE is playing a leading role in revitalizing Kawasaki as an environment-friendly city.



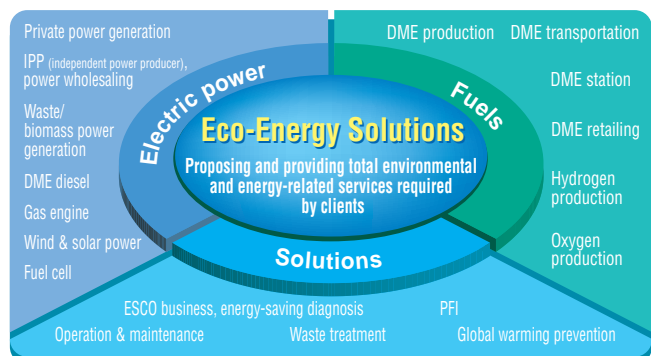
Soga Ecology Park Concept (Chiba Eco-Town)

Chiba City has created a group of recycling facilities for waste paper and timber, end-of-life vehicles and other waste collecting in the region in the 40ha Soga Designated Facilities District. The area also has environmental education facilities. As part of this urban-type environmental base, JFE's recycling businesses include the JFE THERMOSELECT gasifying & melting plant, which recovers fuel gas from waste for use at JFE's steelworks and the high-efficiency BIGADAN-type biogas plant which recovers biogas from organic wastes.



Contributing through Clean Electric Power and Other Eco-Energy Solutions

JFE intends to play a leading role in the "clean energy society" of the 21st century by providing total solutions encompassing both energy and the environment. The JFE Group has a wealth of technology and know-how related to the environment, electric power, and energy, and is positioned to provide eco-energy solutions not available from any other company. JFE already has a high-efficiency power business which meets the needs of improved service in conventional power supply, and is commercializing new energy sources such as clean fuel DME and fuel cell power generation to satisfy the growing need for clean energy and maximize its energy-related services.



Terminology

● Eco-Town Project

Projects for realizing the "Zero Emissions Concept" by utilizing waste from one industry as material in another field under a program created by the then-Ministry of International Trade and Industry (now METI) and Ministry of Health and Welfare in 1997.

Leading the Recycling-oriented Society with a Recycling Business

Ensuring smooth recycling is a key requirement for building a recycling-oriented society. JFE is meeting this need with advanced recycling businesses which apply a variety of unique technologies, beginning with waste plastic recycling as blast furnace feed, utilizing steel plant facilities as an infrastructure for recycling.

Waste Plastic Recycling for BF Feed

JFE currently recycles more than 100,000 tons/year of waste plastics by converting industrial waste plastic into raw material (substitute for coke) for its ironmaking. Because waste plastic recycling for BF feed makes an important contribution to reducing CO₂ emissions and saving coal, it is a key technology for recycling waste plastic.



Waste plastic recycling for BF feed

NF Board for Concrete Forms Manufactured from Recycled Plastic

In addition to chemical recycling of plastics, primarily as blast furnace feed, JFE also established a commercial material recycling business in 2002. Use of recycled plastic as a substitute for plywood in NF Board for concrete forms reduces CO₂ emissions and helps preserve rain forests. Because used NF Board can also be recycled as a raw material for ironmaking, it is an environment-friendly, Zero Emission product.



NF Board production line

PET Bottle Recycling

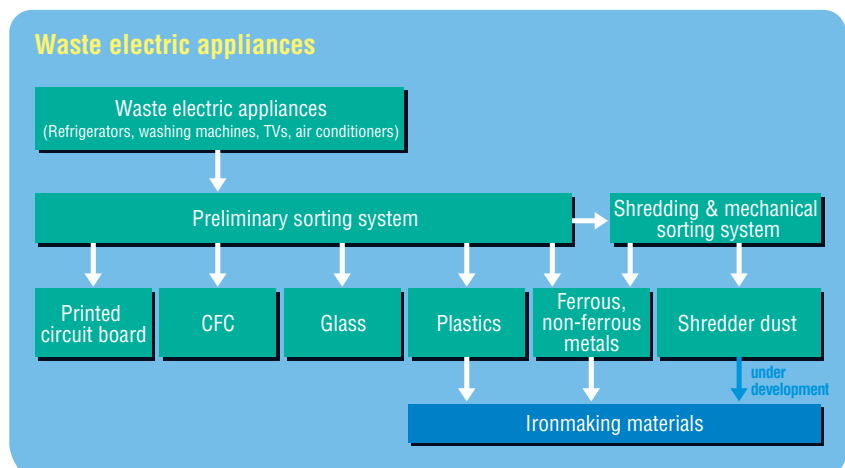
The JFE Group operates a PET bottle recycling business at East Japan Works (Keihin). Using PET bottles collected by local municipalities, PET resin flakes are recovered by a process of crushing, classification, washing, etc. and sold to polyester manufacturers and makers of PET sheets for egg cartons and similar packaging. Labels and caps are recycled as material for ironmaking in this distinctive Zero Emission process.



PET bottle recycling plant.

Home Electric Appliance Recycling

Japan's Electric Household Appliance Recycling Law requires recycling of scrapped refrigerators, washing machines, televisions, and air conditioners. To meet this need, JFE invested in an appliance recycling business located in its steelworks, where it efficiently dismantles appliances and recycles most steel and non-ferrous metals and waste plastics to iron and steel production processes. Thus, the steelworks is an indispensable part of the infrastructure for a recycling society.





Recycling by Waste Gasifying & Melting (Municipal / Industrial Waste, Shredder Dust)

Using the JFE THERMOSELECT waste gasifying & melting furnace, the Chiba Recycling Center at East Japan Works (Chiba) completely recycles industrial waste from Chiba Prefecture and the surrounding region, as well as waste plastic collected under the Containers and Packaging Recycling Law, as fuel gas for the steelworks.

At West Japan Works (Kurashiki), JFE invested in a PFI business called Mizushima Eco-Works, which is now constructing a JFE THERMOSELECT plant for municipal / industrial wastes and shredder dust and is scheduled to start operation in April 2005.



Chiba Recycling Center

Food Waste Recycling

Chiba Biogas Center at East Japan Works (Chiba) uses the BIGADAN process to produce fuel gas for the works from food waste by methane fermentation. Residue from the process is recycled to the Thermostelect plant at the Chiba Recycling Center, achieving zero-emission 100% recycling.



Chiba Biogas Center

Proof Test of Vinyl Chloride Dechlorination System

Because vinyl chloride comprises 15% of all plastics, a treatment process for this material is an essential requirement for plastic recycling. In addition to a technology for separating and removing vinyl chloride from container and packaging plastics, JFE has also developed a technology for separating chlorine (Cl) from vinyl chloride itself, for example, in pipes and gutters. This enables Cl-free recycling in blast furnaces. The separated Cl is also recycled as hydrochloric acid (HCl). This technology is now in the proof test stage, aiming at commercialization.



Demonstration plant for vinyl chloride de-Cl process

Primary Recycling Operations at JFE

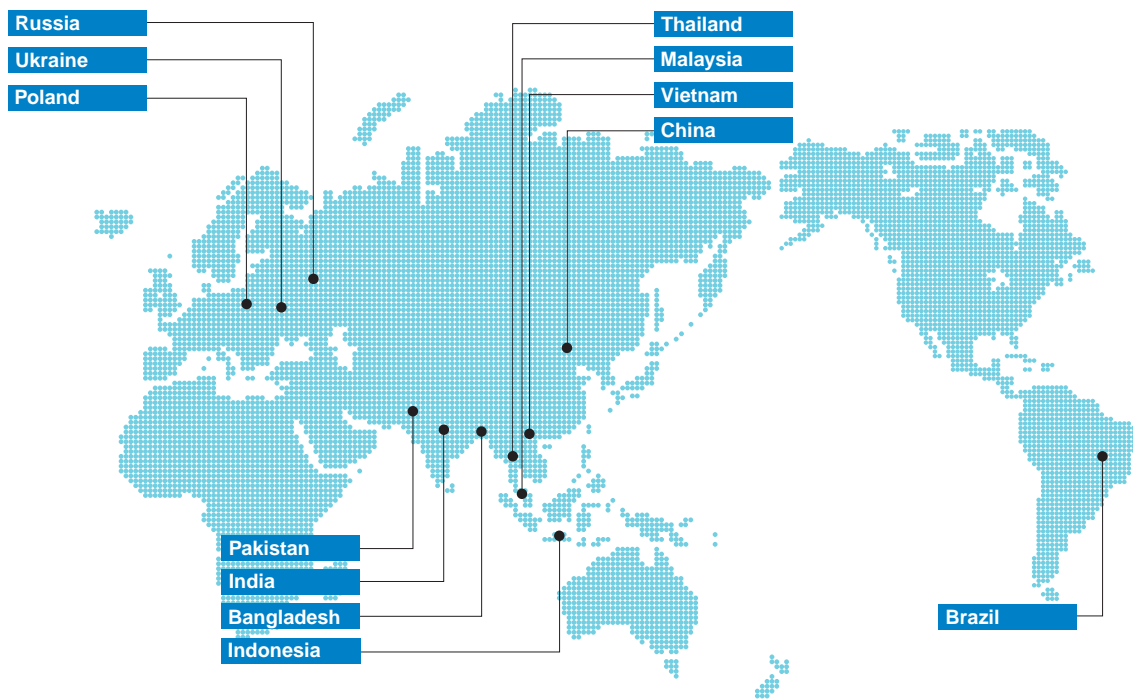
Operation	Started in	Capacity
Waste fluorescent tube recycling	April 1995	6,000 t/yr
Waste plastic recycling for BF feed	October 1996	50,000 t/yr
Waste gasifying & melting recycling	April 2000	50,000 t/yr
(1)Chiba	April 2005 (scheduled)	160,000 t/yr
(2)Kurashiki		
Plastic containers & packaging for BF feed	April 2000	120,000 t/yr
Plastic containers & packaging gasifying	April 2001	30,000 t/yr
PET bottle recycling	April 2002	10,000 t/yr (approx. 200 million bottles)
Concrete form boards from recycled resin	Sept. 2002	2 million/yr
Packaging plastic sorting & compacting	(1)Nagoya Aug. 2000	60,000 t/yr
(2)Sendai Dec. 2000		20,000 t/yr
(3)Hiroshima April 2004 (scheduled)		40,000 t/yr
Can/PET bottle sorting & compacting	Kawasaki Sept. 2003	5,500 t/yr
RDF recycling	(1)Haibara Town, Nara Pref. Nov. 2000	2,500 t/yr
(2)Nogi Town, Tochigi Pref. Dec. 2002		5,500 t/yr
Home electric appliance recycling	April 2001	800,000 units/yr
Dry cell battery recycling by non-ferrous metal melting furnace	March 2002	1,500 t/yr
Dry cell battery recycling by electric furnace	March 2003	1,000 t/yr
Food waste recycling	Aug. 2003	10,000 t/yr



Contributing to the Global Environment through International Cooperation

The global environment is now a matter of common concern among all nations. JFE participates in projects, supplies technology, and provides guidance which contribute to energy saving and reduced CO₂ emissions in developing countries to ensure that its abundant technologies and know-how are used effectively in environmental protection worldwide.

Anticipating actual introduction of the Kyoto Mechanism, JFE actively participates in government-sponsored programs such as NEDO model projects for rational energy use and feasibility studies (FS) for joint implementation of projects to reduce greenhouse gas (GHG) emissions and JETRO studies for global environmental protection/plant vitalization projects in overseas countries.



Country	Project
China	<ul style="list-style-type: none"> · Model project for energy conservation at ferroalloy electric furnace by raw material pretreatment and utilization of flue gas · FS for regenerative burners at Shoudu Iron & Steel Co. and Anshan Iron & Steel (Group) Co. · Energy-saving measures for lime burning furnace · Natural gas DME project in Sichuan Provinceo 14 others
Vietnam	<ul style="list-style-type: none"> · FS for energy conservation at Vietnam Steel Corp.
Thailand	<ul style="list-style-type: none"> · Industrial waste incinerator heat recovery model project for Industrial Estate Authority of Thailand · Study of introduction of high performance industrial furnace for steel rolling reheating furnaces in Thailand 5 others
Malaysia	<ul style="list-style-type: none"> · Energy conservation model project for waste heat recovery from WTE plant 2 others
Indonesia	<ul style="list-style-type: none"> · Biomass (palm refuse) power generation using circulating fluidized bed boiler (CFB) 2 others
Bangladesh	<ul style="list-style-type: none"> · FS for rehabilitation and optimization of pipelines to reduce GHG emissions
India	<ul style="list-style-type: none"> · Coke oven waste heat recovery facility for SESA GOA Ltd. · FS for waste heat recovery at sintering cooler at Tata Iron and Steel Co., Ltd. 3 others
Pakistan	<ul style="list-style-type: none"> · FS for energy conservation at Pakistan Steelworks
Russia	<ul style="list-style-type: none"> · Conversion of coal-fired power plant in Sakhalin to natural gas-fired 2 others
Ukraine	<ul style="list-style-type: none"> · Study of optimization of gas pipeline improvement 2 others
Poland	<ul style="list-style-type: none"> · Study of introduction of high-performance industrial furnace technology for reheating furnaces in Poland
Brazil	<ul style="list-style-type: none"> · Energy-saving measures by low-temperature waste heat recovery at Açominas Works Other



Model project for energy conservation at ferroalloy electric furnace by raw material pretreatment and utilization of flue gas (China)

This project, commissioned by NEDO, was implemented at the ferroalloy electric furnace at Liaoyang Ferroalloy Co. in China to reduce unit electric power consumption. Energy savings are achieved by improving air permeability in the furnace to increase the heat exchange efficiency with raw materials. Specifically, this involves size-adjustment and baking of powdery chromium ore to produce 10–15mm diameter pellets, which are charged into the electric furnace

in place of conventional Cr powder. In this project, JFE introduced a pelletizing technology for powdery Cr ore which it developed over many experience. Although heating is required to bake the pellets, gas is recovered from the EAF as a fuel for this purpose. A furnace cover with good sealability was installed on the EAF for gas recovery, and a dust collecting system was constructed for gas purification, simultaneously improving the environment.



Baking kiln for powdery Cr ore pellets

Energy conservation model project for waste heat recovery from waste to energy (WTE) plant to treat papermaking sludge (Malaysia)

Under a NEDO commission, JFE constructed a plant which sludge generate energy from papermilling in Malaysia and supply steam to papermill using the generated heat. This project was implemented as an international model project for rational energy use supporting the self-help efforts of developing nations in the Asia/Pacific region in dealing with energy and environmental problems.

Reflecting the outstanding reputation of JFE's technologies and record in

these fields, the company was given the responsibility for the design, construction, and operational guidance of a 110ton/day fluidized bed type WTE plant.

Although this papermaker had generated steam by burning fossil fuels, use of papermaking sludge saves energy, reduces CO₂ emissions, and eliminates methane gas leaks from the sludge, which had been buried in a landfill.

The plant was completed in March 2003 and is operating smoothly.



Papermaking sludge waste heat recovery plant

Study of introduction of high-performance industrial furnace technology for reheating furnaces (Poland)

This is a study of joint implementation project for energy saving and greenhouse effect gas (GHG) reduction by improving industrial furnace performance at a Polish steelworks,

using an energy-efficient regenerative burner developed by JFE in the reheating furnaces. Under a NEDO commission, JFE made a study for project planning and evaluation of

the energy-saving and GHG reduction effects. JFE is continuing to cooperate with its Polish counterpart toward implementation of the project.

Energy-saving measures by low-temperature waste heat recovery at Açominas Works (Brazil)

This project was planned to achieve energy savings at Açominas Works in Brazil. Using waste heat recovery equipment which circulates water (steam) as a heat medium, combustion air is preheated with the sensible

heat of combustion flue gas from the blast furnace hot stoves, while fuel gas is preheated with the sensible heat of combustion flue gas from boilers. Under a NEDO commission, JFE made a study for project plan-

ning and evaluation of the energy-saving and GHG reduction effects. JFE plans to exchange information with its Brazilian counterpart and support project implementation as requested by the steelworks.

Terminology

- **NEDO**
New Energy and Industrial Technology Development Organization
- **JETRO**
Japan External Trade Organization

Environmental Businesses of JFE Group Companies

The JFE Group includes approximately 50 companies which supply ecological products and are engaged in environmental businesses ranging from environmental surveys/measurement and support of ISO14001 certification to waste management/recycling, design and construction of environmental plants, and soil remediation. JFE Group companies provide integrated solutions from the initial proposal and planning to introduction, operation, and maintenance of equipment in a wide variety of fields, contributing to a better environment.

Field	Company	Business
Environmental surveys, analysis, and consultation	JFE Net Corporation	Consultation on development of environmental management systems; ISO-based environmental training; seminars for in-house environmental monitoring personnel; internal environmental auditing.
	KAWASAKI STEEL TECHNO-RESEARCH CORP.	Environmental and energy-related measurement, surveys, and analysis (dioxins, endocrine disrupters, agricultural chemicals, air pollutants, sick-house substances, soil surveys, energy-saving diagnosis); consultation on development of environmental management systems, and environmental technologies; environmental information collection and surveys.
	KOKAN MINING CO., LTD.	Soil and underground water pollution surveys and cleanup work; geothermal water surveys and development; asphalt and concrete recycling; production and sale of ecological products (slag sand, magnesium hydrate, etc.).
	KOKAN KEISOKU K.K.	Environmental and energy-related measurement, surveys, and analysis (dioxins, endocrine disrupters, agricultural chemicals, air pollutants, sick-house substances, etc.); soil surveys and analysis; energy-saving diagnosis; power peak shaving systems; environmental assessment; consigned development and testing; manufacture and operation of experimental devices; consultation related to these activities.
	NK TECHNO SERVICE CO., LTD.	Surveys on environmental technologies; overseas environmental surveys; energy surveys and analysis; consultation on environmental ISO certification; consigned life cycle assessment; consultation on environmental labeling and green procurement.
Waste treatment and recycling	JFE URBAN RECYCLE CORP.	Recycling of waste electric appliances under the Electric Household Appliance Recycling Law (4 designated categories; televisions, air conditioners, refrigerators, washing machines); recycling of household appliances used in business, OA equipment, vending machines, etc.; collection and transportation of industrial waste (including transshipment and storage).
	JFE KANKYO CORP.	Waste treatment and recycling (waste plastics, wastewater and sludge, waste construction materials, fluorescent lamps, batteries, etc.); collection and transportation of wastes; environmental measurement and analysis, environmental measurement certificates; consultation on waste treatment and recycling.
	NKK MARINE & LOGISTICS CORP.	Marine transportation of waste plastics, industrial wastes, and waste construction soil; collection of toner cartridges and fluorescent lamps; transportation of industrial wastes; removal and transportation for recycling of business automation devices.
	KAWATETSU MINING CO., LTD.	Recycling of iron and steel making slag (granulated slag, hard slag, BF slag powder); technological development for effective use of slag; development of high-value-added slag products (SCP method for improving soil quality by slag piling, solid slag blocks for marine construction); recycling business (recycling of waste concrete into concrete aggregate, recycling of molding sand).
	KAWATETSU LIFE CORP.	Recycling business (production and recycling of asphalt concrete); collection and transportation of industrial wastes; design, installation, sale, and maintenance of building and industrial air conditioner filter.
	JAPAN RECYCLING CORP.	Industrial waste treatment; recycling of waste containers and packaging; sale of by-products from waste treatment; operation and maintenance of municipal and industrial waste treatment facilities.
Environmental plant and equipment	JFE S-Tec Corporation	Manufacture, installation, and maintenance of waste treatment and water treatment equipment; operation and maintenance of waste incinerators.
	JFE PRECISION CORP.	Manufacture, installation, and maintenance of water treatment and waste treatment equipment.
	JFE Soldec Corporation	Design of waste treatment equipment; development of planning and operation management support systems for environmental equipment; design of environmental protection systems related to combustion exhaust gas; development, design, and manufacture of VOC treatment systems for responding to PRTR; development support for production and use systems related to environment-friendly fuels (DME, hydrogen, palm ester, etc.); energy-saving consultation by equipment diagnosis.
	JFE Technos Corporation	Manufacture, installation, and maintenance of water treatment and waste treatment equipment; experimental fabrication and testing related to research and development (DME diesel engine, countermeasures for dioxins, etc.).
	NKK TRADING INC.	Overall sales of environmental plants, equipment, commodities, and services.
	JFE Plant & Service Corporation	Construction, modification, and maintenance of waste treatment and water treatment equipment.
	KAWASHO GECOSS CORP.	Development of environment-friendly new construction methods; GSS method for recycling soil generated from soil-cement continuous wall construction.
	KAWATETSU ADVANTECH CO., LTD.	Manufacture and sale of measuring instruments for waste treatment facilities, sewage system, and waterworks (industrial weighing scale, measuring devices of water level, quality, flow rate, etc.).
	KAWATETSU ELECTRIC ENGINEERING CO., LTD.	Design, installation, and maintenance of electrical systems and instrumentation of waste treatment facilities; design and manufacture of photovoltaic power generation systems.

Field	Company	Business
Environmental plant and equipment	KAWATETSU MACHINERY CO., LTD.	Design, manufacture, installation, and overall maintenance of environmental equipment; manufacture and sale of small-scale incinerator for suppressing dioxin emissions; dismantling of incinerators.
	JFE Eletech Corporation	Design and installation of electrical systems and instrumentation of various plants such as water treatment plants and incinerators.
	Tohoku Dock Tekko Co., Ltd.	Design, manufacture, installation, and maintenance of waste treatment equipment (incinerators, recycling centers, etc.).
	JFE Environment Service Corporation	Consented operation of environment-related plants such as waste treatment and water treatment equipment.
	JFE Koken Corporation	Prevention of soil contamination; restoration of contaminated soil; installation of various water treatment equipment; manufacture of raw garbage treatment plants; environment-friendly construction method (no-trenching method).
	JFE PIPE FITTING MFG. CO., LTD.	Design, manufacture, and installation of molding sand recycling equipment (energy-saving fluidized calcination furnace, etc.).
	NIPPON CHUZO K.K.	Manufacture and sale of heat and wear resistant castings (grate, etc.) for waste incinerators; molding sand recycling equipment.
	Nippon Chutetsukan K.K.	Design, manufacture, and turnkey execution of waste environment engineering projects.
	Recycling Management Japan, Inc.	Consented municipal and industrial waste treatment; operation and maintenance of waste treatment facilities; production and sale of RDF and compost; design, manufacture, and sale of production facilities for RDF and compost fuel.
	Mizushima Green and Clean Service Corporation	Operation and maintenance of industrial waste treatment equipment.
General environmental protection	NK G.S. CORP.	Collection and transportation of municipal and industrial wastes; operation and maintenance of waste incinerating plants and auxiliary equipment; landscape planting; environmental measurement and measurement certificates; environmental surveys, evaluation, and consultation.
	KAWASHO CORP.	Overseas afforestation
	KAWATETSU TRANSPORTATION & TECHNOLOGY CO., LTD.	Environmental cleanup (high-pressure water washing, cutting, and peeling of machinery and containers, industrial washing and cleanup); collection, transportation, and intermediate treatment of industrial wastes; construction, operation, maintenance, dismantling, and washing of environmental equipment.
	KEIYO CITY SERVICE CORP.	Design and construction of gardens and civil works; maintenance of gardens and planted areas; consultation on environmental greening; green plant leasing; washing of waste collection containers; washing and leasing of restaurant kitchen filters.
	FUKUYAMA STEEL TECHNOLOGY CORP.	Collection and transportation of municipal wastes.
	FUKUYAMA TECHNO-RESEARCH CO., LTD.	Recycling of used power cables; landscape planting; environment- and energy-related measurement; energy-saving diagnosis; consultation on environmental ISO certification and energy saving.
	MINAMIAICHI TOWN SERVICE CORP.	Design and construction of gardens and civil works; maintenance of gardens and planted areas; consultation on environmental greening; green plant leasing; recycling of vending machines.
	MENTEC KIKO CORP.	Recycling of containers and packaging (glass bottles, PET bottles, plastic and paper containers, etc.); design, manufacture, installation, and maintenance of waste treatment and water treatment equipment.
Ecological products	JFE CHEMICAL CORP.	Plastic recycling; gas refining; by-products recovery (ammonium sulfate, liquid ammonia, gypsum); CO ₂ recovery and reuse (dry ice, etc.); water treatment chemicals (caustic soda, sulfuric acid, iron sulfide, hydrated lime, etc.)
	JFE METAL PRODUCTS & ENGINEERING INC.	Development of highly functional architectural and civil engineering products with low environmental loads; environment-friendly construction materials (sound barrier and guardrail using photocatalyst).
	KAWATETSU GALVANIZING CO., LTD.	Development of new applications for coated steel sheets with low environmental loads; production of environment-friendly steel products (raindrop-stain resistant prepainted steel sheet for roofing, siding, and sound insulating, heat insulating prepainted steel sheet, acid resistant prepainted steel sheet)
	JFE CIVIL ENGINEERING & CONSTRUCTION CORP.	Environment-friendly construction method (steep slope road widening method: Metal Road).
	JFE ROCKFIBER CORP.	Manufacture of rock wool and its products from BF slag (heat-resistant materials, thermal insulation, and sound-absorbing materials for energy saving and better housing environment).
	JFE CONTAINER CO., LTD.	Manufacture and sale of reusable drum cans (Eco-drum, S Open drum can); new drum and used drum can recovery service using comprehensive distribution system; manufacture and sale of various high pressure gas containers.
	CHIBA RIVERMENT AND CEMENT CORP.	Production of slag powder as mixed cement material, BF cement designated by the Green Procurement Law, and Eco-Mark product (Riverment).
	MIZUSHIMA RIVERMENT CORP.	Production of slag powder as mixed cement material, and BF cement designated by the Green Procurement Law.

External Evaluation of JFE's Activities

External Awards Received (since 1998)

● National Invention Award

- 2002 Invention Award
Invention of high-strength, high-formability titanium alloy with low-temperature super-plasticity
- 2000 Japan Federation of Economic Organizations Chairman's Invention Award
Environment-friendly regenerative low-NOx combustion technology
- 1999 Invention Award
Development of high efficiency, multi-size rolling technology for high dimensional accuracy wire rod material and steel bars
- 1998 Japan Institute of Invention & Innovation Chairman's Award
Industrial production technology for 6.5%-silicon steel sheet by continuous CVD

● Okochi Prize

(The prize given to companies and individuals who have made significant contribution to industrial production)

- 2002 Memorial Technology Award
Development and industrialization of critical cooling rate on-line accelerated cooling technology (Super OLAC)
- Memorial Production Award
Realization of ultra-short period blast furnace relining by innovative large capacity BF relining technology
- 2001 Memorial Technology Award
3-channel polarized light surface inspection equipment (Delta-Eye)
- 2000 Memorial Technology Award
Development of environment-friendly new steelmaking process by zero-slag BOF operation
- Memorial Production Award
Development of world's first endless hot strip rolling process and commercialization of new products
- 1998 Memorial Award
Development and industrialization of environment-friendly regenerative burner system
- Memorial Technology Award
Development of high-efficiency production process for environment-friendly, high-purity stainless steel

● Iwatani Memorial Prize

- 2002 Development and industrialization of critical cooling rate on-line accelerated cooling technology (Super OLAC)
- 1999 Development and world's first commercialization of gradient high-silicon magnetic steel sheet

● Ichimura Industrial Award

- 1999 Contribution Award
Development of endless rolling technology in hot rolling

● Energy Conservation Award

- 2000 METI Minister's Award
Development and application of technology utilizing waste plastics as blast furnace material
- Energy Conservation Center Chairman's Award
Energy conservation through activities to maximize equipment efficiency of oxygen plant
- 1999 MITI Minister's Award
Minimization of iron and steel making energy through development of new technology for measuring hot metal temperature
- Energy Conservation Center Chairman's Award
Activities for reducing oxygen gas dissipation
- Energy Conservation Center Excellence Award
Introduction of regenerative burners in Chita small-diameter seamless pipe rotary furnace
- 1998 MITI Minister's Award
Development of regenerative burner and application to large heating furnaces
- MITI Regional Bureau Director General's Award
Application of model control for BF hot stove

● Minister's Award for Global Warming Prevention (Environment Agency)

- 1999 Minister's Award
Recycling of waste plastics for blast furnace feed

● Excellent Energy Conserving Equipment Award

- 2000 METI Minister's Award
High-speed continuous annealing and heating system applying high-temperature rotary regenerative heat exchanger

● New Energy Award (award for new energy equipment for the 21st century)

- 2002 New Energy Foundation Chairman's Award
Floating-type solar power generation system
- 2000 Resources & Energy Agency Director General's Award
Project to produce fuel from wastes by gasifying & melting method in steelworks

● Resource Recycling Technology & System Award (Clean Japan Center)

- 2001 Clean Japan Center Chairman's Award
Technology for cascading & recycling of washing chemical fluorine nitric acid
- 2000 METI Industrial Technology & Environment Bureau Director General's Award
Technology for recycling stainless steel making dust using smelting reduction method
- 1999 Clean Japan Center Chairman's Award
Suppression of waste discharge in a casting plant (NIPPON KOKAN PIPE FITTING MFG. CO., LTD.)

● Japan Society of Mechanical Engineers Award

- 2001 Japan Society of Mechanical Engineers Award (Technology)
Continuous rolling mill of steel bar, section, and wire rod

● Combustion Society of Japan Award

- 2000 Technology Award
High-temperature waste gasifying & direct melting technology

● Recycling Award (NPO Recycle Solutions)

- 2001 First Planning Award
Marine Blocks (carbonated large solid block of slag for use in artificial reefs for seaweed and fish farming)

● Surface Finishing Society of Japan Award

- 2002 Technology award
Environment-friendly high-performance chromium-free steel sheet "Geo-Frontier Coat"

● Japan Coating Technology Association Award

- 2001 Technology Award
Rust stabilization agent for weathering steel Captain-Coat M

● Japan Society for the Promotion of Machine Industry Award

- 2001 Chairman's Award
Development of equipment for changing running direction of cold rolled steel sheet by air floatation
- 2000 Chairman's Award
Development of equipment for ultrasonic detection of electrical discharge

● Excellent Environmental Equipment Award (Japan Society of Industrial Machinery Manufacturers)

- 2002 Chairman's Award
Automatic sorting system for plastic bottles
- 2002 METI Industrial Technology & Environment Bureau Director General's Award
Small-scale incinerator using carbonizing & gasifying method (Kawatetsu Machinery Co., Ltd.)

● Japan Institute of Energy Award

- 2002 The JIE Award in Technical Division
Development of slurry bed dimethyl ether synthesis technology

● Japan Ozone Association Award

- 2002 Technology Award
Practical high-flux filtration system using ozone resistant microfiltration module

● Japan Society on Water Environment Award

- 2002 Technology Award
Bio-tube system

● Shinagawa Greening Award

- 2001 CITYWINDS SHINAGAWA GARDEN COURT

Coexistence with Nature—Protecting the Natural World at JFE’s Steel Works

“Fureai-no-ike”(Friendship Pond), a Gathering Place for Wild Birds

A remarkable natural environment in the Keihin Industrial Zone

Located on Ohgishima (Ohgi Island) in Kawasaki City, “Fureai-no-ike” covers an expanse of 4,100m² in JFE Steel’s East Japan Works—Keihin District. The pond is home to carp and ducks and is a gathering place for many species of wild birds throughout the year, giving visitors a pleasant surprise and a feeling of calm in the midst of a busy metropolitan area.

This quiet spot is actually part of a manmade island which was reclaimed in the 1970s, but at the time, 20% of the total cost of steelworks construction was devoted to environmental protection and greening, resulting in this beautiful park with more than 50 kinds of trees. The northeastern part of the footpath around the pond is now closed to the public to protect the habitats of visiting birds.



“Fureai-no-ike” (Keihin)

Protecting the City Bird of Chiba, the “Koajisashi”(Little tern)

On June 10, 2003, NHK TV broadcast a program on efforts to protect a bird called the “Koajisashi” (little tern) at JFE’s East Japan Works—Chiba District. Distinguished by a black head and yellow beak, the “Koajisashi” is a migratory bird which appears in April, breeds, then leaves Japan in August. According to the red data book of birds of Japan’s Ministry of the Environment, it is also a class II endangered species. In April 1992, Chiba invited suggestions for a city bird commemorating its new status as an ordinance-designated city and selected the “Koajisashi” in 1993.

In 2001, large colonies were observed in Chiba’s Chuo and Mihama Wards for the first time in more than 10 years. About 3500 birds were found building nests in roughly 1750 spots. The birds had raised more than 50 fledglings, but the percentage reaching this age was being sharply reduced by crows and birds of prey.

A movement to protect the “Koajisashi” spread among local residents, schools, businesses, and government agencies. At JFE’s Chiba plant, an embankment covering about 4,000m² was set aside and a gravelly area suitable for ground-breeding birds like the “Koajisashi” and plover was created. To prevent predation, shelters were constructed and decoys made by local middle school students were put out, and members of citizens’ groups in Chiba and other local areas now keep watch over the birds.



Bird-watching (Chiba)



JFE Steel East Japan Works (Keihin)

JFE Steel East Japan Works (Chiba)



Shelters and decoys to prevent predation





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We always welcome your opinions and comments on “JFE Environmental Report 2003”

Thank you for taking your time to read the JFE Environmental Report 2003.

We would appreciate your comments and opinions on this report for reference on our future environmental activities and revisions of this report.

The content of the report is also available on the JFE website at: URL : <http://www.jfe-holdings.co.jp/environment/>

Q1 After reading the report, what is your impression?

- Fully satisfactory Ordinary Unsatisfactory No comment

Q2 Which articles in the report particularly interested you?

- Toward sustainable growth Environmental accounting Research and development
 Transition of environmental measures Communication with society Building environment-friendly towns
 JFE technologies for sustainable growth Reducing environmental loads in business operations Others
 Environmental management system
 Activities in 2002 / Future objectives Contributing through products and technologies
 Promoting environmental management

Q3 Please describe any opinions in relation to JFE's policy on environmental issues.

- Excellent Poor No comment

Please describe further opinion here:

Q4 Which of the following best describes your position when you read the report?

- JFE's customer National or local government / its associated organization Academic or educational organization
 Shareholder / Investor Student
 Resident in neighborhood of JFE's works or offices Environment specialist at company or organization Employee / employee's family of JFE Group
 Environmental NGO / NPO Others (Media)

Q5 Where did you hear about this report?

- Newspaper / Magazine JFE's website JFE's employee JFE's plant tour
 Seminar / Lecture / Exhibition Other website Others ()

Q6 Please describe any opinions or requests for a future JFE Environmental Report.

Thank you for your cooperation. The following details would be much appreciated.

Name		Telephone number	(home/office)
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