



Environmental Report
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COMPANY DATA

Corporate Name: NGK Insulators, Ltd.
 Date of Establishment: May 5, 1919
 Paid-in Capital: ¥69.8 billion (As of March 31, 2002)
 Nature of Business: NGK uses cutting-edge ceramics technology in the "Triple-E" business fields of "Ecology," "Electronics," and "Energy." NGK is making efforts, as a good corporate citizen, not only to manufacture products that contribute to society, but also to provide a high level of disclosure and community relations activities.

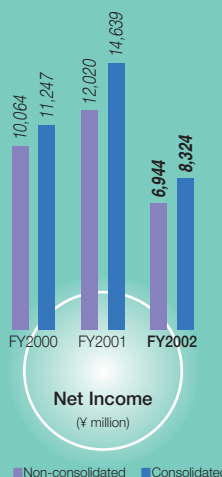
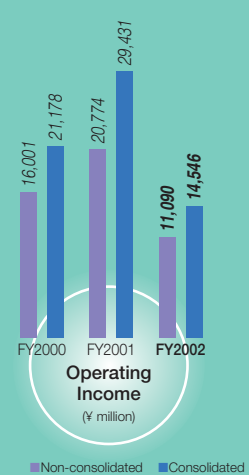
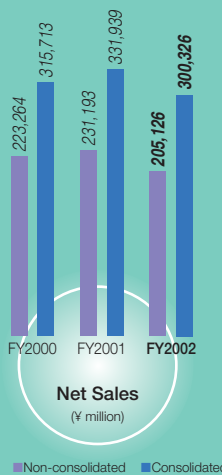
TERM AND ACTIVITIES COVERED IN THIS ENVIRONMENTAL REPORT

This environmental report is focused on fiscal 2002, from April 1, 2001, to March 31, 2002. Until the previous fiscal year, the Company referred to its fiscal years by the year of their starting date. However, the Company currently refers to its fiscal years by the year of their ending date. Consolidated data includes NGK's 14 domestic manufacturing subsidiaries.

Group companies covered in this environmental report:

Energy Support Corporation, Akechi Insulators Co., Ltd., Ikebukuro Horo Kogyo Co., Ltd., NGK Filtech, Ltd., NGK Adrec Co., Ltd., NGK Kilintech Corporation, NGK Frit Co., Ltd., NGK Mettex Corporation, NGK Fine Molds, Ltd., NGK Optoceramics Co., Ltd., NGK Printer Ceramics Co., Ltd., NGK Okhotsk, Ltd., Soshin Electric Co., Ltd., Asahi Tec Corporation

Our next environmental report will be issued in August 2003.



MESSAGE FROM THE PRESIDENT

Modern industrial society has caused irreparable damage to the ecological balance of the planet by endangering many species, contributing to global warming, and allowing the emission of various chemical substances and waste products. We now must sustain the Earth's precious balance and create a recycling-based society where every living creature, which all depend on energy from the sun, can coexist.

In Japan, six related sets of legislation went into effect in 2001, including the Basic Law for Establishing a Recycling-Based Society. This was an important step toward the creation of a truly sustainable society, one in which the nation, local governments, corporations, and citizens take environmental issues more seriously from a global perspective. Now, more than ever, it is essential for corporations to implement business operations that do not place a burden on the environment, such as comprehensive recycling programs and the development of products and technologies that contribute to environmental protection. At the same time, corporations are having to face the challenge of increasing efficiency to maintain profitability.

In this new age, in which the very structure of society is changing and regulation systems related to the environment are being augmented to respond to the needs of a society that values environmental protection, NGK Insulators, Ltd. (NGK), has established a "Core Policy on the Environment" aimed at contributing to the solution of environmental problems. In addition, one of the policies of the new three-year management plan, starting from fiscal 2002, is Green Management, which aims at contributing to a variety of environmental issues. Green Management has four main activities: 1) preventing global warming, 2) reducing emissions, 3) developing products that benefit the environment, and 4) implementing Green Logistics. In addition, to respond swiftly to the needs of a sustainable society, each fiscal year NGK establishes objectives and action plans for environmental issues. To achieve such objectives, NGK will further enhance its environmental activities through its business operations.

NGK will continue to manufacture products that contribute to society, as well as strongly promoting environmental protection activities and striving for transparency in providing information regarding the environment. Based on our new action guidelines of "Speedy (speedy management)," "Timely (concentration on development)," "Lean (highly efficient management)," and "Green (Green Management)," NGK will strive to achieve corporate excellence based on global standards.

September 2002



President and Chief Operating Officer

Shun Matsushita



NGK'S BUSINESS ACTIVITIES AND THEIR ENVIRONMENTAL IMPACT

NGK's Operating Divisions

Power Business

Electrical insulators and devices for power transmission and distribution lines and substations; NAS[®] (sodium sulfur) batteries for power storage



NGK's main products in the power business are electrical insulators, designed and manufactured from the most advanced technology and recognized worldwide for their high quality, which ensures a reliable power supply. In addition, NGK manufactures other products, such as bushings, lightning protection devices, switches, and NAS[®] batteries for the power industry.

Ceramic Products Business

Ceramics for exhaust gas purification; ceramics for the chemical industry; combustion equipment; refractories



HONEYCERAM[®], NGK's honeycomb ceramics for automotive catalytic converters, is an indispensable part for automobile exhaust gas purification and is the Company's main product line in the ceramic products business. HONEYCERAM[®] has been adopted by automakers throughout the world, and cumulative total production amounts to 500 million units. In addition, NGK manufactures and sells Diesel Particulate Filters, ceramic products for the chemical industry, drying furnaces, firing kilns, refractories, etc.

Engineering Business

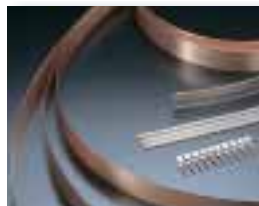
Waterworks and sewage treatment equipment; solid waste treatment equipment; low-level radioactive waste treatment equipment



NGK is highly regarded as a "plant engineering maker" covering all aspects of environment-related equipment from design to operation, mainly in sewage treatment. Also, in addition to developing reliable technologies in the field of nuclear power related equipment requiring high dependability, in recent years NGK has been active in the solid waste treatment field.

Electronics Business

Beryllium copper products; metal mold products; ceramic products for the electronics industry



NGK manufactures and markets a variety of electronics components based on its beryllium copper and ceramics technologies. Beryllium copper, because of its unique properties such as high conductivity and spring performance, is used as a conductive spring material in devices such as personal computers and mobile telephones. Cutting-edge fine ceramics technologies are used in Micro Ceramics components such as piezoelectric actuators for ink-jet printers, ceramic components for semiconductor manufacturing equipment, etc.

Casting Business

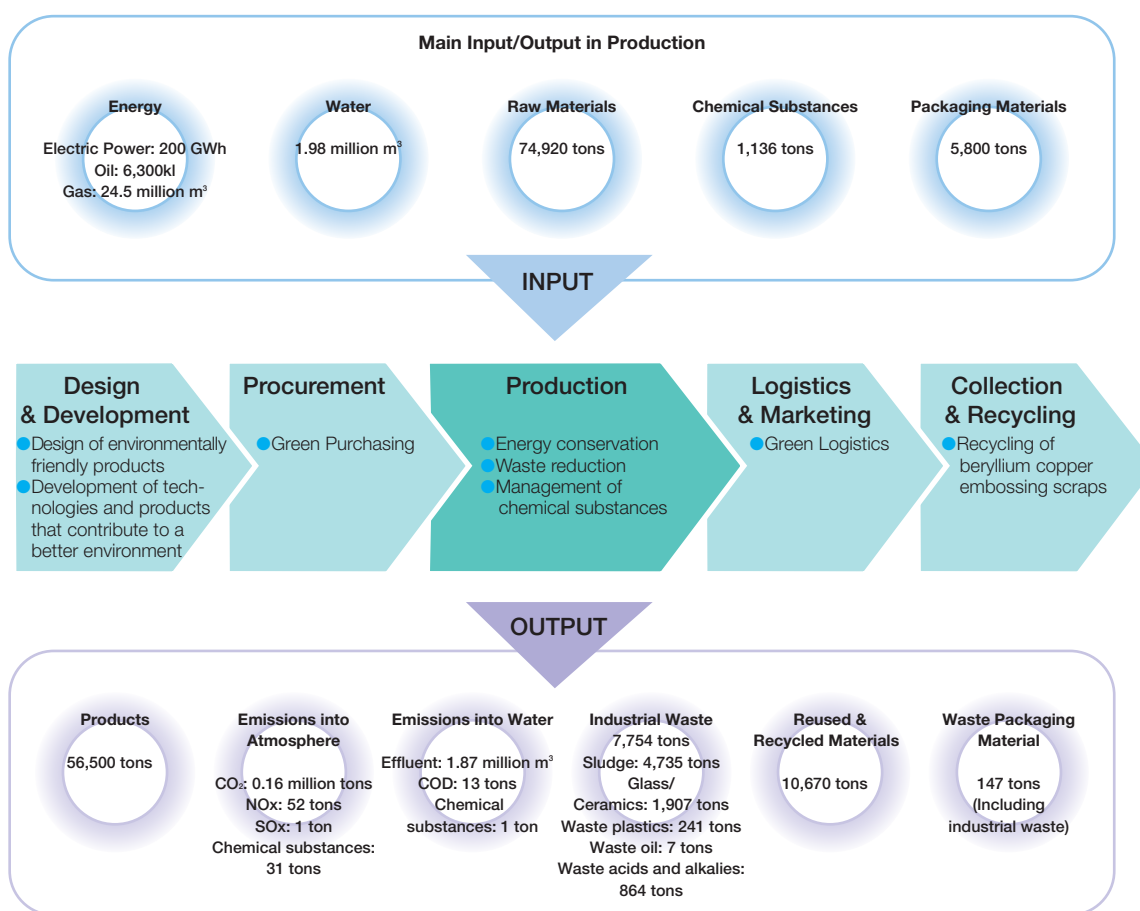
Casting parts; parts for industrial construction equipment; aluminum wheels for two- and four-wheel vehicles



This business segment is under the charge of Asahi Tec Corporation. The casting technologies accumulated over many years of experience have been leveraged to manufacture and market parts for automobiles and industrial construction equipment as well as aluminum wheels for two- and four-wheel vehicles. In addition to such electrical power related devices as fittings for insulators and electrical power lines, NGK is developing environmental equipment including water treatment facilities.

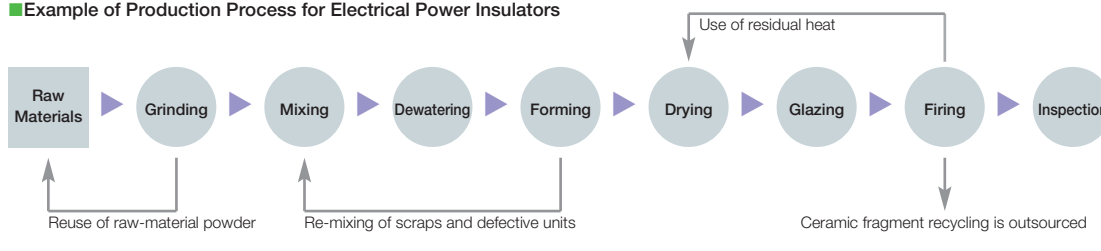
NGK's Environmental Impact

- NGK makes efforts to reduce the environmental impact of all business activities, from design and development to procurement, production, and logistics.
- In addition to using cutting-edge ceramics technologies to create products and technologies that contribute to a better environment, NGK promotes manufacturing techniques that take the environment into consideration.
- NGK strives to reduce the environmental impact of production by conserving energy, reducing waste, and properly managing chemical substances.
- In the ceramics business, the firing process, which discharges CO₂ emissions, plays an indispensable role in the production process. Therefore, NGK has given top priority to energy conservation to prevent global warming.



Data from Nagoya, Chita, and Komaki plants

Example of Production Process for Electrical Power Insulators



ENVIRONMENTAL MANAGEMENT SYSTEM

NGK's Core Policy on the Environment

NGK views global environmental conservation as one of the most important issues currently faced by mankind and strives to be a company in harmony with nature. In line with NGK's Core Policy on the Environment, established in March 1996, the Company will continue its business activities in the "Triple-E" business fields of Ecology, Electronics, and Energy. In addition to reducing the environmental impact of its business activities, NGK will actively contribute to a better environment through the development of products and technologies that benefit the environment.

Philosophy

NGK's positive approach to the environment begins with its basic corporate philosophy: "NGK products and technologies must create new value and contribute to the quality of life." In particular, we focus on the "Triple-E" areas of Ecology, Electronics, and Energy. Through our work in these areas, we seek to develop solutions to some of the critical challenges facing the next generation.

Action Guidelines

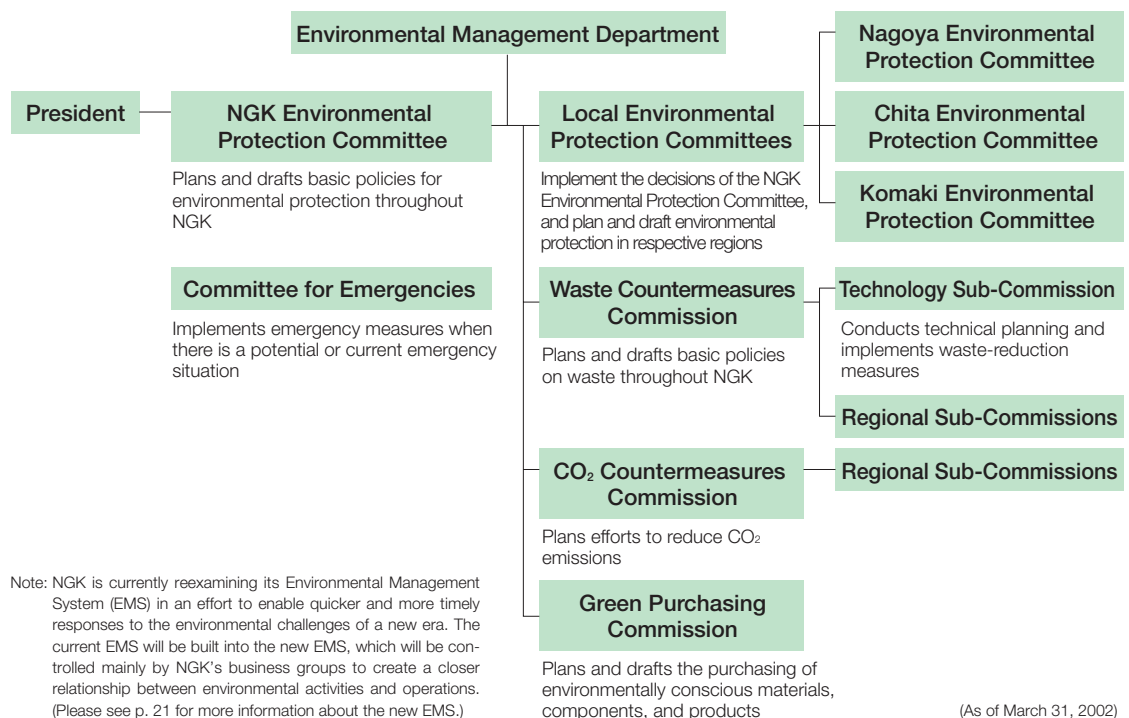
In the Design Review (DR) process, NGK first scientifically evaluates the impact of its production technologies, anti-pollution measures, and waste treatment systems on the environment. Based on our findings, we then take appropriate measures.

Specifically, we aim to:

1. Improve the environmental management system;
2. Reduce industrial waste by promoting resource conservation and recycling;
3. Promote energy conservation and reduce CO₂ emissions;
4. Give preference to the purchase of environmentally friendly materials, parts, and products;
5. Improve environmental awareness among NGK employees, through educational and informational activities; and
6. Begin the Life Cycle Assessment (LCA) of products, in an effort to reduce their environmental impact.



Promotion System for Environmental Management



NGK'S ENVIRONMENTAL ACTION PLAN

NGK's Voluntary Plan for Environmental Conservation was established in March 1993, and NGK's Core Policy on the Environment was established in March 1996. In addition to encouraging environment-related activities, these two plans have helped the Company address environmental issues in the "Triple-E" business fields of Ecology, Electronics, and Energy.

In 2001, NGK initiated its Five-Year Environmental Action Plan, which further encourages and expands environmental activities. The NGK Group will continue to enhance its efforts to strengthen its ability to respond to environmental issues.

■ Environmental Action Plan

	FY2002	FY2003	FY2004	FY2005	FY2006
Internal Environmental Activities					
Plan	Policy		Action Plan	Yearly Plan	
Environmental Management	Establishment and effective operation of ISO-EMS, domestic & overseas consolidated Group environmental management				
Environmental Accounting	Evaluation based on cost effectiveness		Incorporation of EA into business activities, streamlining of efforts		
CO ₂	Restraining basic unit (total amount/sales) to within FY1991 levels (70 tons-CO ₂ /¥100 million)				
Industrial Waste	Reduction of outsourced processing by 50% (compared to FY2001 levels) and promotion of recycling			Zero emissions	
Chemicals	Introduction and establishment of management system			Elimination, use of substitute materials, reduction of emissions into environment	
LCA	Investigation		Testing		Use as tool
Green Purchasing	Office-related supplies/all-purpose equipment		Expansion to parts & materials		
External Environmental Activities					
Communications	Publication of <i>Environmental Report</i> , community relations activities, etc.				
Participation in NPO activities	Participation in the Environmental Partnership Organization Club (EPOC)				

■ Results of FY2002 Environmental Activities

Item	Target	Achievements
Environmental Management	1) Establishment and improvement of ISO-EMS 2) Achieving of positive evaluations in development areas 3) EMS support for domestic Group companies	1) Certification was renewed with no major faults found 2) Made positive progress on 25 development themes and 3 design themes 3) Conducted on-site hearings and guidance with follow-up at 14 domestic Group companies
Environmental Accounting	1) Establishment of cost effectiveness evaluation system by the Ministry of the Environment 2) Evaluation of cost effectiveness for each business group	1) Established cost codes and linked up to financial management system Established effectiveness calculation standards (50% completion) 2) Established tabulation route for business groups
CO ₂	1) Maintaining the rate of emissions per unit of sales within FY1991 levels	1) Achieved year-on-year increase of CO ₂ emissions of 0.3% 2) Achieved rate of emissions per unit of sales 9.2 tons-CO ₂ /¥100 million
Industrial Waste	1) Reduction of outsourced processing to 2,700 tons in FY2004 (50% of FY2001 levels) 2) Planning and implementation of measures to reduce emissions of specified substances	1) Achieved year-on-year increase of 1,961 tons 2) Established and executed targets for each substance •Started consideration of technical issues regarding reduction of sludge and acid waste, completed a portion of necessary capital investment •Established recycling yards to thoroughly separate resources at each place of business. Since the establishment of recycling yards, we have reduced plastic emissions by 30% and increased recycled material by 40%.
Chemicals	1) Introduction and construction of evaluation system 2) 80% reduction of atmospheric emissions of PRTR-listed solvents by FY2006 (compared to FY2001)	1) Nearly completed introduction of total chemical management system Conducted companywide calculation of PRTR-listed chemicals 2) Established and invested in technology to handle PRTR-listed solvents
LCA	1) Conducting of study and investigation	1) Conducted silicon nitride ceramic testing
Green Purchasing	1) Expansion of range of Green Products (to 850 items) 2) Introduction of Green Power 3) Inspection of suppliers' environmental protection programs	1) Introduced <i>Benninet</i> purchasing system 2) Started purchase of 2 GWh/year of wind power to achieve a significant reduction of yearly CO ₂ emissions (806 tons-CO ₂ /year) 3) Conducted exchange of views with 10 major suppliers regarding environmental protection measures
Communications	1) Early publication of <i>Environmental Report</i> 2) Participation in the Environmental Partnership Organization Club (EPOC)	1) Scheduled for release in September 2002 2) Supported the activities of the Exchange Promotion Committee (Clean Campaign, Eco-Campus Festival, international exchange)

Environmental Accounting

In fiscal 2000, NGK introduced environmental accounting as one tool for managing and ascertaining the state of its environmental protection activities. By tabulating and analyzing its environmental protection-related costs, NGK is striving to enhance the efficiency of its environmental protection efforts while attaining continual improvements in these activities.

Analysis and Use of Tabulated Results

(1) Environmental Costs

In fiscal 2002, the total environmental costs of three of NGK's business sites in Japan rose approximately ¥890 million from the previous fiscal year, to ¥2.61 billion. This figure included capital investment of ¥1.25 billion and ¥1.36 billion for expenditures.

More than 70% of the total environmental costs were used in business area costs such as pollution prevention expenditures, followed by management activity costs. These two items accounted for approximately 86% of the total environmental costs.

Examples include the development of processes and the renovation of facilities to decrease the burden on the environment and the establishment, operation, and management of recycling yards to promote the recycling of such materials as waste plastics. In addition, as a means to contribute to the prevention of global warming—one of the most serious environmental problems we face—NGK continues to install kilns employing such energy-saving technologies as rapid drying, pulse firing, and regenerative combustion systems. It is also conducting research and making test installations on energy-saving technologies, such as micro gas turbine co-generation systems and ice thermal storage tanks, and has begun using Green Power.

■ Environmental Accounting Results (Non-consolidated)

(¥ million)

Cost	Capital Investment		Expenses		Total	
	FY2001	FY2002	FY2001	FY2002	FY2001	FY2002
Business area costs	437	1,241	656	623	1,093	1,864
Upstream and downstream costs	0	0	0	20	0	20
Management activity costs	0	0	256	392	256	392
R&D costs	169	12	54	144	223	156
Social activity costs	0	0	135	174	135	174
Environmental damage costs	0	0	14	7	14	7
Total	606	1,253	1,115	1,360	1,721	2,613

■ Environmental Accounting Results (Consolidated)

(¥ million)

Cost	Capital Investment		Expenses		Total	
	FY2001	FY2002	FY2001	FY2002	FY2001	FY2002
Business area costs	801	1,301	1,449	1,081	2,250	2,382
Upstream and downstream costs	7	1	8	39	15	40
Management activity costs	0	1	373	541	373	542
R&D costs	186	47	102	268	288	315
Social activity costs	2	0	186	220	188	220
Environmental damage costs	3	0	20	90	23	90
Total	999	1,350	2,138	2,239	3,137	3,589

Definition of Environmental Costs and Tabulation Methods: Environmental protection costs are categorized in accordance with guidelines* set by the Japan Environment Agency. For consolidated results, we have calculated figures for NGK as well as its 14 domestic Group companies.

Expenses for the development of such environment-related products as water and sewage treatment equipment falls within one of the Company's business domains. Because these are large-amount expenditures that would naturally be incurred in the Company's normal business activities, these expenses are not included in the calculations.

* Developing an Environmental Accounting System (Year 2000 Report)

(2) Environmental Conservation Effects

To determine environmental conservation effects, we have calculated "environmental conservation effects" and "economic effects."

NGK has satisfied all relevant pollution prevention related standards and has not been cited for any incidents of violations of standards. Although the rate of emissions of CO₂ per unit of sales increased, the total volume was approximately the same as that of the previous year. Due to energy saving measures such as the efficient operation of heat sources for

clean room air-conditioning and the boilers, emissions decreased on a mass conversion per basic unit (total amount/production) (index)—see note ** on page 12. The conversion to rapid drying, pulse firing energy saving systems, which are used for porcelain insulators, has been proceeding smoothly since fiscal 2003 began and in two years, when the conversion is complete, a yearly reduction of approximately 3,000 tons of CO₂ emissions is expected to be achieved. The purchase of Green Power was initiated in fiscal 2002. However, its environmental effects are not reflected in this environmental report.

In the area of industrial waste, in addition to a temporary increase due to the renewal of tunnel kilns, there was also an increase accompanying the rise in the test manufacturing of automobile gas purification ceramic products. However, due to improved production and processing yield rates and in-process recycling rates, overall emissions decreased.

The direct economic effect from environmental protection measures totaled ¥280 million, mainly as a result of increased recycling, sale of useful substances, and energy conservation.

■ Environmental Effects (Non-consolidated)

(1) Protection Effects

Category	Environment Protection Effects		Effects
	FY2001	FY2002	
Business Area	Superior to standards; Number of violations: 0		
Effects	Pollution prevention	Superior to standards; Number of violations: 0	
	Volume of CO ₂ emissions (tons)	161,800	162,300
	Basic unit (total amount/sales) (tons/¥100 million)	70.0	79.2
	Basic unit (total amount/production) (%)	95.6	92.4
	Volume of waste generated (tons)	14,362	18,424
	Volume recycled Volume disposed	8,569 5,793	10,670 7,754
	Volume of water consumed (10,000 m ³)	194	198
Other	ISO-related: Introduction of "Positive Environmental Effect Evaluation System" to R&D and design divisions to promote processing, products, and facilities that make positive contributions to society and the environment		

* Positive Environmental Effect Evaluation System: NGK system in which positive effects contributing to the reduction of the burden on the environment of R&D or design themes are evaluated and those which are highly evaluated are followed up on by those responsible for EMS

(2) Economic Effects

Category	FY2001		FY2002	
	Economic Effects (¥ million)	Volume Reduction	Economic Effects (¥ million)	Volume Reduction
Energy conservation	60.4	1,610 ton-CO ₂	46.5	1,313 ton-CO ₂
Resource conservation (water)	3.1	170,000 m ³	0.7	5,000 m ³
Resource conservation (raw materials)	—	—	135.4	(Increase in reusing rate of the material, etc.)
Waste material management & disposal costs	9.3	649 tons	13.1	918 tons
Income from the sale of useful substances	112.2		89.5	(Metallic and ceramic waste, etc.)
Total	185.0		285.2	

Notes: 1) Costs are calculated by the difference from the previous year, achieved by progressing with activities regarding energy conservation, resource conservation, and waste material reduction.

2) Economic effects have been calculated independently.

3) The following values are used to calculate economic effects:

- Energy conservation: Unit price of electrical power at each business site (ex. Nagoya Plant: ¥14.6/kWh)
- Resource conservation (water): Unit price at each business site (ex. Nagoya Plant: ¥605/m³)
- Resource conservation (raw materials): Unit price for each raw material
- Waste material management & disposal costs: Unit price for treatment by type of industrial waste (sludge (ex. Nagoya Plant): ¥8,500/ton)

4) FY2001 economic effects were recalculated based on the figures shown in 3) above.

Future Issues and Directions

Environmental accounting is an important index allowing the Company to continuously merge economically efficient business procedures with environmental activities. As a means to promote Green Management, the costs and effects of all environmental protection activities will be assessed so that more efficient, sustainable, and practical environmental activities may be implemented.

Presently, environmental accounting is being calculated based on the surveys of each supervising division. To improve precision, in fiscal 2004, we plan to shift to a system that is linked to an accounting system. In fiscal 2002, environmental costs were calculated only for NGK and 14 domestic manufacturing Group companies. However, we plan to expand the coverage of these appraisals to include all consolidated Group companies. We also plan to calculate environmental conservation effects for all consolidated Group companies.

Activities Related to ISO 14001

As part of the Company's efforts to develop long-term and Companywide environmental conservation activities in line with NGK's Core Policy on the Environment, continuing efforts are being made to acquire ISO 14001 certification. In March 1998, NGK's three main domestic production bases simultaneously received ISO 14001 certification and 10 domestic Group companies and 4 overseas Group companies also received certification for their plants. Currently, 53% of our consolidated business sites are ISO 14001 certified. In addition, by fiscal 2007, 100% of our consolidated business sites will have ISO 14001 and other certification.

■ NGK Group ISO 14001 Certification (Overseas included)

(Fiscal year)

Certified Production Basis	2001	2002	2003	2004	2005	2006	2007
NGK Insulators, Ltd. Nagoya Plant (including Engineering Business Group and R&D section)							
Chita Plant							
Komaki Plant							
Energy Support Corporation, Main Plant							
Akechi Insulators Co., Ltd., Akechi and Matoba plants							
Ikebukuro Horo Kogyo Co., Ltd.							
NGK Filtech, Ltd.							
NGK Adrec Co., Ltd.							
NGK Kilntech Corporation							
NGK Mettix Corporation							
NGK Fine Molds, Ltd.							
NGK Optoceramics Co., Ltd., Komaki Plant							
NGK Printer Ceramics Co., Ltd. Komaki Plant							
Yamanashi Plant							
NGK Okhotsk, Ltd.							
Soshin Electric Co., Ltd. Asama Plant							
Chikuma Plant							
Miyazaki Plant							
Asahi Tec Corporation Kikukawa South Plant							
Toyokawa Plant							
LOCKE INSULATORS, INC.							
NGK-LOCKE POLYMER INSULATORS, INC.							
NGK CERAMICS USA, INC.							
NGK METALS CORPORATION							
NGK EUROPE S.A.							
NGK CERAMICS EUROPE S.A.							
NGK BERYLCO FRANCE							
P.T. WIKA-NGK INSULATORS							
NGK STANGER PTY. LTD.							
NGK INSULATORS TANGSHAN CO., LTD.							
P.T. NGK CERAMICS INDONESIA							
NGK CERAMICS SOUTH AFRICA (PTY) LTD.							
ISO 14001 and other certification	19%	53%	72%	81%	91%	97%	100%

Environmental Auditing

In February 1996, even before the standards for the ISO 14000 series were established, NGK began independent, internal audits for three plants—Nagoya, Chita, and Komaki. Now, for facilities that have already acquired ISO 14001 certification, 120 internal auditors from other departments conduct audits twice a year in addition to the annual audits conducted by external organizations. There were no major faults found and all passed the external audits in fiscal 2002.



External audit by JICQA

Environmental Risk Management

Our manufacturing plants are working to upgrade their environmental management structures and prevent accidents in accordance with an environmental policy of preventing water, air, and other types of pollution. In addition, we have taken all necessary measures, including providing emergency response education and training, in preparation for the occurrence of an accident.

Strict Adherence to Legal Restrictions

As part of their environment policies, our manufacturing facilities strictly adhere to relevant legal restrictions as well as environmental categories agreed upon with supervising government agencies. Also, NGK forms pollution prevention agreements with local government bodies and implements independent measures to prevent pollution in accordance with autonomous standards even more stringent than legal restrictions.

In fiscal 2002, there were no instances in which NGK breached legal restrictions and standards. Also, the Company had no recorded instances of pollution-related lawsuits and received no pollution-related complaints from local communities.

Emergency Response

In preparation for an emergency, our manufacturing plants implement education and training based on an annual plan with the aim of minimizing the spread of pollution in the event of an accident. In fiscal 2002, we carried out emergency response education and training that included training for emergency response to photochemical smog and abnormalities in water quality.

Employee Education and Development

To protect the Earth's environment, it is essential that each individual employee deepens his or her understanding of environmental issues and makes conscious efforts to protect the environment. One of NGK's action guidelines under its Core Policy on the Environment is to carry out educational and public affairs activities to raise environmental awareness among employees. Thus, NGK implements a wide array of environmental education and development activities.

Companywide Education

On a Companywide level, we provide overall environmental education to new employees. Also, for employees responsible for product design, we implement educational programs for ensuring compliance with laws and strive to foster a greater awareness of corporate activities and public responsibility. We are also raising environment awareness through an array of enlightening activities, such as the publication of in-house newsletters and internal broadcasts specially focusing on environmental problems.

At our manufacturing facilities, we are carrying out education on environmental management systems to promote a greater understanding of the intent and content of the environmental policies of each manufacturing site. In addition, we distribute "environment cards," on which environmental targets for each division are listed, and each person records environmental declarations and strives to raise his or her awareness regarding the environment.

Moreover, in order to raise their consciousness regarding Companywide environmental activities, the NGK *Environmental Report 2001* was distributed to approximately 350 employees in charge of EMS and recycling yards, and a questionnaire was also conducted to promote communication regarding the environment.

Obtaining Various Qualifications

We are focusing on cultivating staff members who possess the necessary legal qualifications—including those for pollution control manager and energy manager—for the operation of each business site. We are also providing support that enables employees to obtain such environment-related qualifications as those for environment management system auditor and environmental counselor. The number of staff members holding environment-related qualifications as of the end of March 2002 is shown on the accompanying chart.



Garbage separation methods and garbage-related standards are explained to employees in charge of waste disposal.

Number of Employees with Environment-Related Qualifications (As of March 31, 2002)

Senior pollution control manager		5
Pollution control manager	Air	66
	Water	109
	Noise	50
	Vibration	23
	Dust	4
	Dioxin	11
Specially controlled industrial waste manager		5
Energy manager		13
Environmental certified measurer		6
Heat manager		17
Intermediate waste disposal controller		5
Final waste disposal controller		4

NGK'S LIFE CYCLE ACTIVITIES

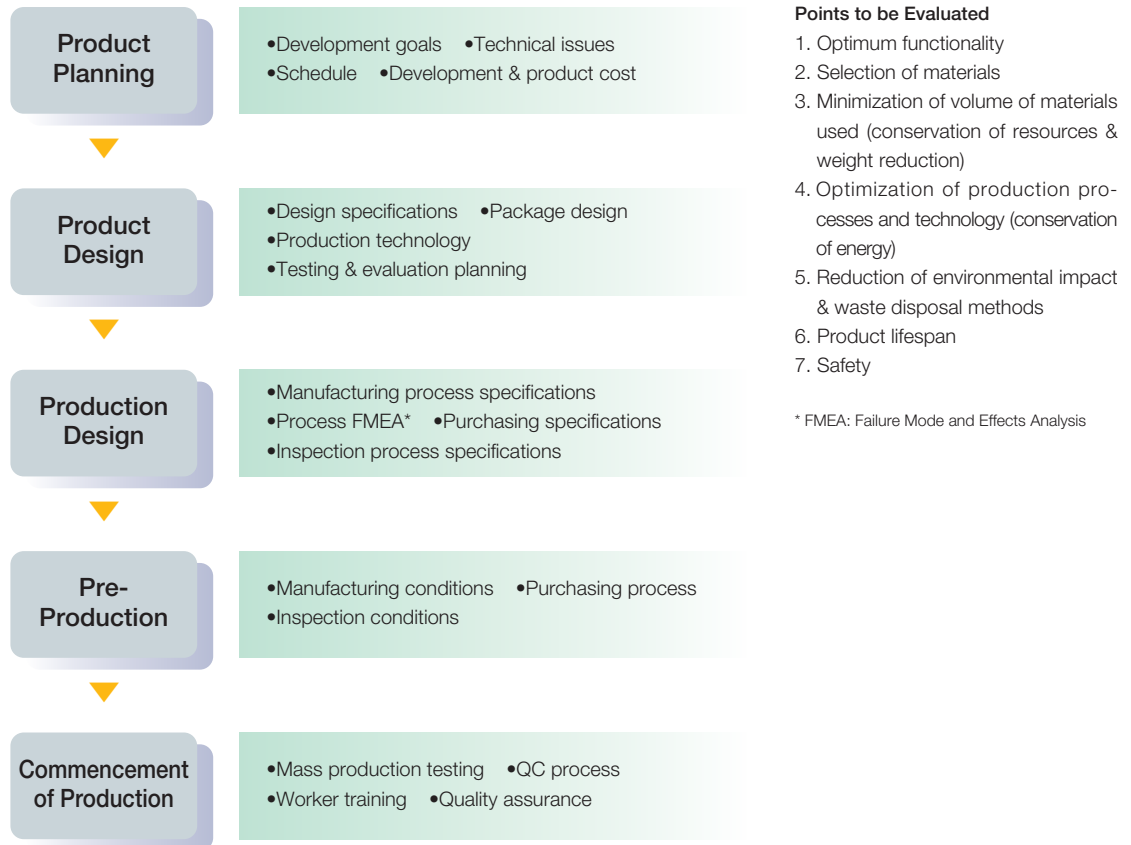
Design and Development

In its Core Policy on the Environment introduced in 1996, NGK decided to begin Life Cycle Assessment (LCA) studies to find ways of reducing the environmental impact of its manufacturing processes and products. In 1998, it introduced the full-scale application of its Design Review (DR) process, which is aimed at minimizing the environmental impact in product design and manufacturing technologies.

Design Review

To produce environmentally friendly products by forestalling potential problems at the design stage, all design, development, manufacturing, marketing, and purchasing departments are involved in DR activities at each stage of development. Such factors as optimum functionality, selection of materials, minimization of volume of materials used, optimization of production processes and technology, reduction of environmental impact, and methods of waste disposal are evaluated. This environment-conscious product design and manufacturing process not only results in more environmentally friendly products, it also reduces emissions of pollutants and industrial waste.

DR Flow



* FMEA: Failure Mode and Effects Analysis

Production-Related Environmental Activities

Energy Conservation

NGK takes a multifaceted approach to reducing energy consumption. Efforts to prevent global warming are focused on such production facilities as kilns and include developing or improving combustion technologies to conserve energy as well as shifting to the use of environmentally friendly fuels that reduce the volume of CO₂ emissions. We are also introducing energy-saving equipment when replacing air-conditioning and lighting equipment and have started Green Power purchasing. NGK is finding new ways to conserve energy, such as educating its employees on energy conservation.

In addition, NGK will implement unified emissions volume control management and, with the ratification and enforcement of the Kyoto Protocol, between 2008 and 2012, Japan will be obliged to reduce the emissions of greenhouse gasses to 6% lower than fiscal 1991 levels. This will necessitate further reduction measures.

Long-Term Schedule for Energy Conservation (CO₂ Reduction)

	FY2002	FY2003	FY2004	FY2005	FY2006
Target: Restrain rate of emissions per unit of sales to within FY1991 levels (70 tons of CO₂/¥100 million)					
Kiln energy conservation: Regenerative combustion					
Heat recovery: Use of high-efficiency boilers					
Energy conversion: Use of LNG					
Office energy conservation: Appropriate climate control, high-efficiency lighting, promote energy savings measures such as turning off lights					
	Energy conserving inverters, introduction of high-efficiency devices and facilities				
	Improvement of operating procedures and energy management				
	Introduction of new types of energy: Green Power				
	Promotion of Green Purchasing				
			Establishment of high-efficiency production system: Consolidation of production sites		
			Introduction of environmental assessment methods: LCA		

Due to the expansion of the production of ceramic and electronic products, which require high-energy consumption during production, CO₂ emissions have been on the increase. As a result, the Company revised its emissions reduction goals in November 2000. New targets will be established for the years up to fiscal 2006 and energy conservation activities will be stepped up to meet these targets.

Fiscal 2006 CO₂ Emissions Reductions Targets

- 1) Keep basic unit (total amount/sales) within fiscal 1991 levels.
- 2) Reduce basic unit (total amount/production) (index) by 10% in existing main products such as insulators and catalytic converters for automobile exhaust gas purification.

Conserving Energy in Clean Rooms: Toward a 7% Reduction in the Volume of CO₂ Emissions

The R&D Division of the Nagoya Plant has many clean rooms that have recently shown an increase of CO₂ emissions volume due to the increased development and expanded production of new products. Consequently, NGK implemented energy conservation measures to curb this trend. In addition to increasing energy efficiency by operating the optimum number of air-conditioning/heating units, in the winter, water is cooled using the outside air to reduce energy consumption. As a result, the CO₂ emissions volume was decreased 7%, to 292 tons.

In addition, in March 2002, a micro gas turbine co-generation system was introduced and test operation has begun. This system uses LNG as fuel and is expected to be a very highly efficient power source.



R&D Division of the Nagoya Plant

COLUMN

Change in CO₂ Emissions

The total CO₂ emissions volume in fiscal 2002 was 162,000 tons, showing only a slight (0.3%) increase year on year. The main factors contributing to this increase were preproduction activities for DPFs* and increased trial manufacturing in preparation for the introduction of new products such as Hi-Performance Ceramics (HPC). The basic unit (total amount/sales) was 79.2 tons of CO₂/¥100 million, a year-on-year increase of 9.2 tons of CO₂/¥100 million. This was mainly due to a drop in net sales. On the other hand, due to increased efficiency, the basic unit (total amount/production) (index**) was 92.4%, showing a year-on-year decrease of 3.2%. In addition, the use of heavy fuel oil has been eliminated through NGK's Clean Energy Program. Fuel ratios are 90% for electricity and LNG and 54% for electricity only.

In fiscal 2002, NGK started to calculate its greenhouse gas emissions. Of the six types of designated greenhouse gasses***, atmospheric emission volumes were calculated for CO₂, CH₄, N₂O, and SF₆ insulating gas. A significant 166,000-ton, or 10.7%, year-on-year reduction was achieved largely due to the 60% reduction of SF₆, which has a particularly strong greenhouse effect.

NGK will continue to reduce CO₂ emissions in accordance with energy conservation laws through the implementation of energy conservation measures regarding machinery, replacement of main facilities to energy saving types, and the introduction of co-generation systems to other business sites as well as the reevaluation of manufacturing processes.

* DPF: Diesel Particulate Filter (see p. 22)

** Basic unit (total amount/production) (index): FY1991 basic unit production=100

*** Greenhouse gasses: Gasses that trap thermal radiation reflected from the surface of the Earth, thus resulting in a "greenhouse effect" wherein the overall temperature of the Earth increases. Carbon dioxide (CO₂), methane (CH₄), dinitrogen monoxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF₆) are designated as greenhouse gasses. The greenhouse effect of SF₆ is approximately 24,000 times as strong as that of CO₂.

Conversion to Natural Gas

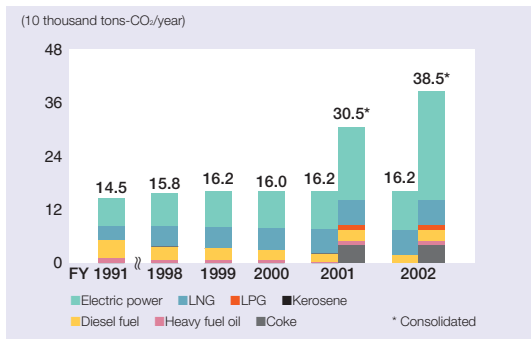
NGK has completed a shift to the use of natural gas in boilers at all manufacturing sites. Natural gas emits the smallest amount of CO₂ among all fossil fuels, emits no SO_x, and emits extremely low amounts of soot and NO_x.

In addition, NGK is shifting from the use of oil to natural gas when renewing its kilns. We have completed the changeover to the use of natural gas at our Chita Plant and are steadily proceeding with a changeover at our Nagoya Plant as well as at our Komaki Plant.

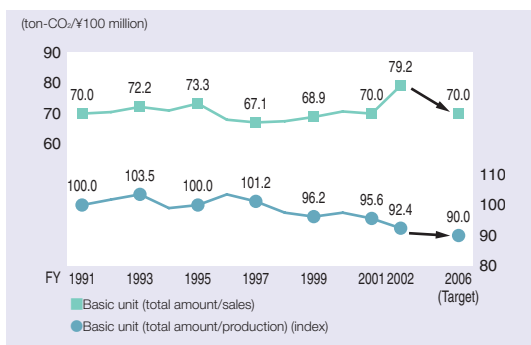
Use of Excess Heat from Kilns

We recover excess heat from kilns and effectively use this heat in a portion of the drying process for formed products. (See page 3.)

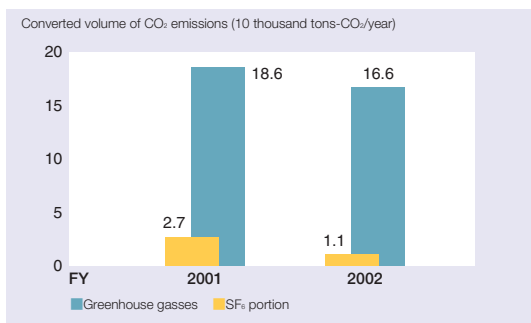
Change in CO₂ Emissions



Change in Basic Unit



Emission Volume of Greenhouse Gasses (SF₆ Portion)



Energy-Conserving Kiln Furniture

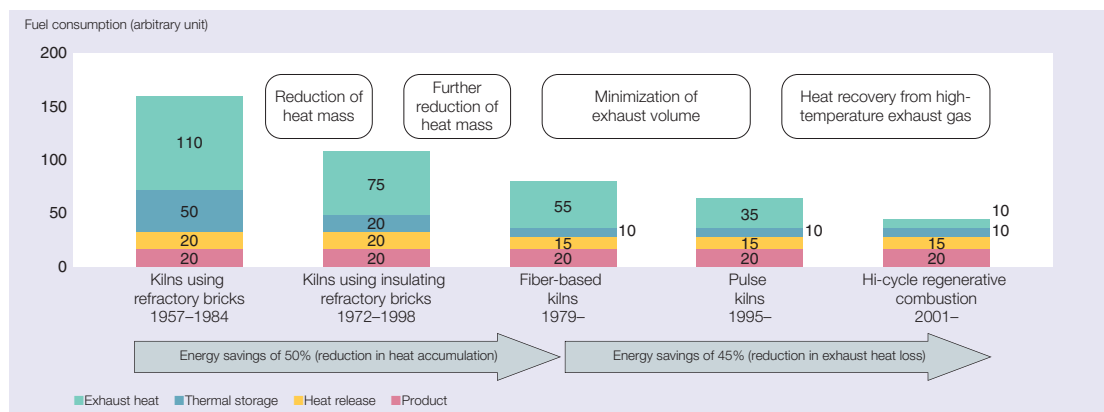
To reduce the amount of energy consumed in the firing process, we have vigorously shifted to the use of lightweight materials that do not retain heat for shuttle kilns. In the 1970s, we shifted from refractory brick to insulating refractory brick and, in the 1980s, introduced the first ceramic-fiber-based kiln furniture. Regarding setters on which products for firing are placed, we have reduced the volume of heat accumulation by using thinner components, which has enabled us to save energy.

Energy-Conserving Combustion Systems

In the 1990s, we worked to reduce kiln exhaust gas emissions, progressed with heat recovery from high-temperature exhaust gas, and moved toward the use of computer-controlled intelligent burners. As part of these efforts, we independently developed the Pulse Firing System and the Hi-cycle Regenerative Combustion System.

The Pulse Firing System reduces combustion intake through intermittent operation of the burner. The Hi-cycle Regenerative Combustion System uses a heat reservoir, installed at the burner's outlet, to recover heat from high-temperature exhaust gas. Together, the use of these two systems has enabled a 50% reduction in the consumption of fuel compared with conventional ceramic-fiber-based kilns and has significantly reduced the volume of exhaust gas, thus contributing to reductions in CO₂ emissions.

■ Reduction of Energy Loss through Kiln Energy Conservation Technology



Regenerative Combustion Systems Finally Put into Practical Use

At the Nagoya Plant, which produces HONEYCERAM®, a catalytic converter for automobile exhaust gas purification, an NCT-3 tunnel kiln was completed in December 2001, the first of its kind to use a regenerative combustion system. In this system, the heat from the exhaust gasses is recovered and stored in a ceramic-made heat reservoir and used to produce air for a high-temperature firing system. Firing with this stored high-temperature air allows a 15% reduction in fuel burned compared to conventional burners under identical conditions. A yearly reduction of 15% by volume (250 tons) of CO₂ emissions is expected from this new technology.



Regenerative burners installed in the upper and lower faces of the kilns

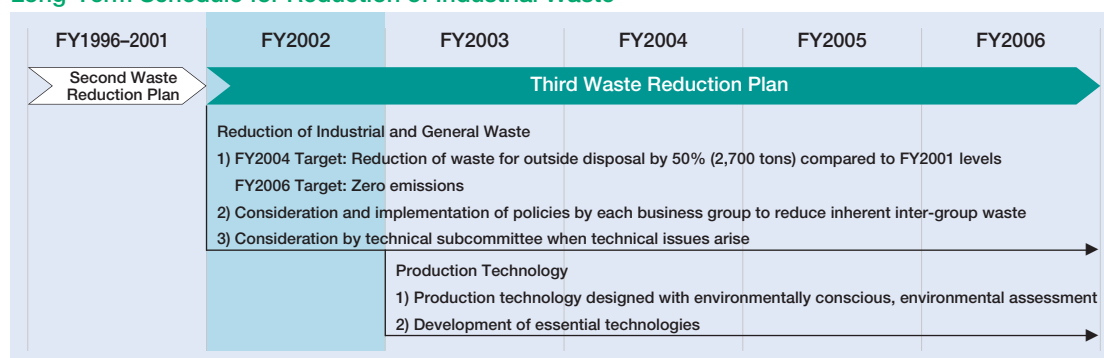
COLUMN

Reductions in Industrial Waste

The practice of industrial waste reduction through recycling is rapidly establishing itself throughout society. NGK is strengthening efforts to reduce various types of industrial waste generated during its production processes. Efforts are being stepped up to effectively reuse and render into new resources such products as sludge and glass-ceramic fragments, waste acids and alkalis, and waste plastics, along with efforts to realize zero emissions*.

* Zero emissions: The reduction of the volume of waste for final disposal into landfills to 10% of FY2001 levels. This will be achieved through the reuse of waste materials as raw materials or fuels and the reduction of ordinary waste through improvements in production and manufacturing processes.

Long-Term Schedule for Reduction of Industrial Waste



Volume of Industrial Waste

The total volume of industrial waste produced in fiscal 2002 was 18,424 tons, a year-on-year increase of 26%, or 3,747 tons. This increase was due to such factors as a temporary increase in waste materials accompanying the renewal of the tunnel kiln as well as increased test manufacturing in the commencement of operations of a new line and increased volume of metallic products. These factors were partially mitigated by improved production and processing yield rates and in-process recycling rates and the establishment, in October 2001, of recycling yards for the separation of industrial waste, which reduced the volume of waste plastic produced.

Recycling of Industrial Waste

The total volume of material recycled at NGK's three plants in fiscal 2001 was 10,670 tons, a year-on-year increase of 1,785 tons. However, the Company's overall recycling rate was 58%, a 2% year-on-year reduction. The reason for this was the large incidence of waste materials due to the renewal of kilns. Viewed by type of waste, the recycling rate for sludge remained steady year on year, ceramic scrap worsened, and waste plastic and waste oil improved significantly.

The total volume of material recycled on a consolidated yearly basis was 30,326 tons, a significant year-on-year increase of 15,743 tons, and the consolidated yearly recycling rate improved from 33% to 60%. The great improvement in Asahi Tec Corporation's slag recycling rate contributed greatly to this increase. The recycling rates of waste plastic and waste oil are also on the rise.

■ Recycling of Industrial Waste in Fiscal 2002 (Non-consolidated/Consolidated)

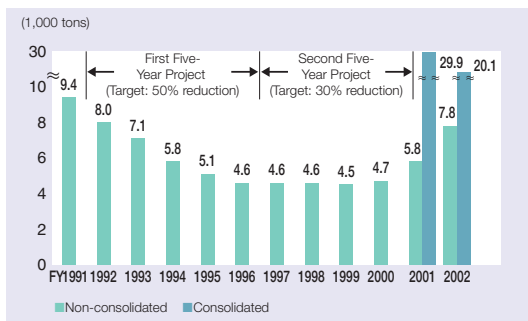
(tons)

Type of Industrial Waste	Total Output		Amount Recycled		Recycling Rate	
	Non-consolidated	Consolidated	Non-consolidated	Consolidated	Non-consolidated	Consolidated
Sludge/waste material	11,522	13,116	6,787	6,971	59%	53%
Glass, ceramics	5,546	6,656	3,639	4,229	66%	64%
Slag	77	27,221	77	18,632	100%	68%
Waste plastics	272	761	31	96	11%	13%
Waste oil	143	1,112	136	155	95%	14%
Waste acid and alkali	864	1,554	0	243	0%	16%
Total	18,424	50,420	10,670	30,326	58%	60%

Volume of Industrial Waste for Final Disposal

Fiscal 2002 marked the beginning of NGK's Third Waste Reduction Plan and the Company began working toward the goal of zero emissions by fiscal 2006, the final year of the plan. However, in this first year of the period covered by the Third Waste Reduction Plan, the total volume of waste for final disposal was 7,754 tons, an increase of 1,961 tons from the previous fiscal year. Much of this was one-time temporary waste due to the renewal of kilns. NGK attempted to recycle this waste, but disposed of 1,415 tons of waste. Disregarding these factors, the unexpectedly large increase in waste accompanying increased production volumes and increased test manufacturing associated with the continuous introduction of new products contributed to a 546-ton increase in disposal volume year on year. The total consolidated waste disposal volume for the fiscal year was 20,000 tons, a significant decrease of 33% compared to the previous fiscal year.

■ Changes in amount of industrial waste for final disposal



Future Initiatives

We are stepping up efforts to increase the recycling of sludge and waste acid and alkali. In the area of sludge, in addition to striving for lower emissions through increasing the yield ratio, NGK is working to develop more uses for recycled sludge. As for waste acid, the Company is considering reduction technologies, in addition to phasing out the use of nitric acid, and, with regard to waste alkali, countermeasures at the point of release and recycling methods are being considered.

In addition, NGK will concentrate its efforts on stabilizing manufacturing technology for its new products and increasing its recycling rate as a means to achieve zero emissions in fiscal 2006.



Transformation into a Sustainable Company: Establishment of Recycling Yards

As a means to fully implement the separation of such waste products as waste plastics and increase the recycling rate, waste collection areas were improved. To promote the consciousness that garbage is a resource, these areas were renamed "recycling yards." In addition to improving the waste management system, making it possible to unify the management of general waste along with industrial waste, a registration system for persons in charge of waste was introduced and the business group responsible for emissions was clarified. Improvements such as a more thorough implementation of waste separation and improved inspections were also made to the operations system.



As a result of these activities, we will improve the recycling rate and reduce the volume of waste plastics emitted, which had risen to 331 tons in fiscal 2000. NGK's goal is to recycle 70% of the yearly waste plastics output (232 tons) by converting it to solid fuel.

Operations commenced in October 2001. An officer responsible for emissions was placed in each division and the separation of plastics was improved.

Maximization of Recycling of Ceramic Kiln Parts

The aging NCT-3 kiln at the Nagoya Plant, which had been producing HONEYCERAM® since 1973, was scrapped. The renewal was conducted in accordance with the spirit of revision of the Waste Management Law, Leverage Resources Law, and Construction Recycling Law, which went into effect May 2002. Of the waste generated, 17% (290 tons) of the glass and ceramic waste and all of the metallic waste (179 tons) was sold as recyclable material. Of the 40,083 liters of light oil waste, 3% (1,200 liters) was sold for recycling purposes and the remainder was recycled at other business sites.

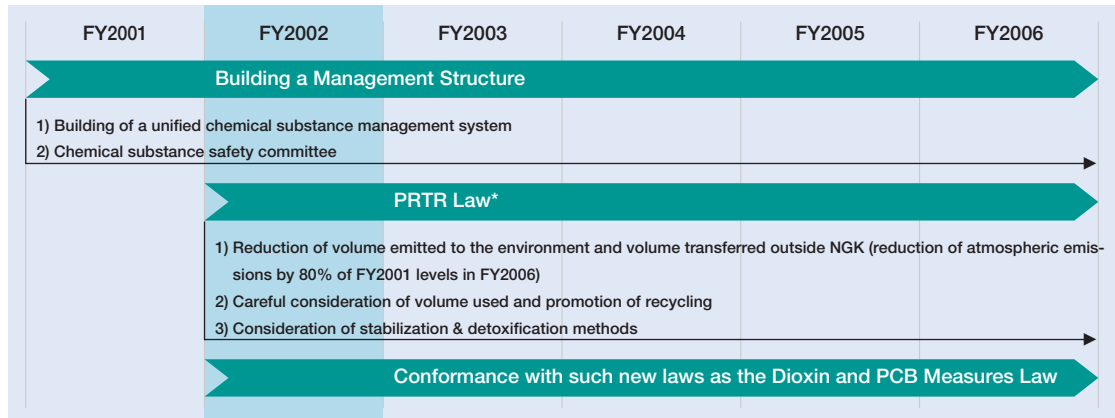
Waste Sand Recycled as Cement Material

To reduce waste sand, Asahi Tec Corporation, whose main business is casting, has been cleaning and recycling waste sand since 1994. In addition, it has recycled waste sand as material for cement since 1997. Of the 28,800 tons of waste sand generated in fiscal 2002, 33% (9,600 tons) was reused and 25% (7,200 tons) was recycled as cement material. Research is being conducted to find other uses for waste sand to further reduce emissions volume.

Management of Chemical Substances

Chemicals are essential to industry and daily life. However, if they are mishandled, there is a risk of harm to the environment and eco-systems. Aware of these characteristics of chemicals, NGK is committed to thoroughgoing safety-oriented management and has created systematic chemical substance management procedures covering all stages of handling from procurement through transportation, storage, use, and final disposal.

Long-Term Schedule for Management of Chemical Substances



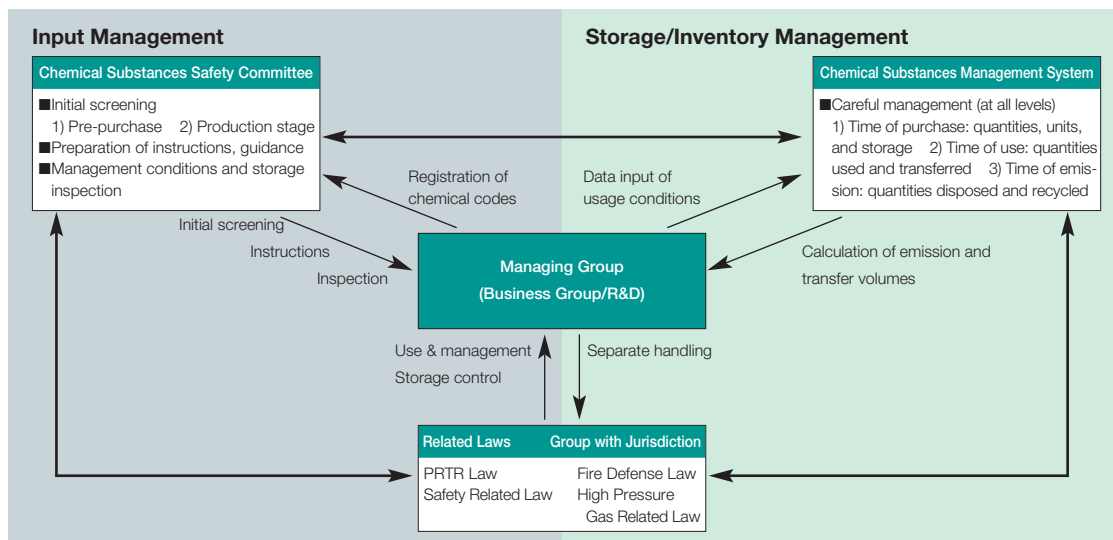
* PRTR Law: Law Regarding the Pollutant Release and Transfer Register

Chemical Substances Management System

The full-fledged operation of the Chemical Substances Management System began in October 2001 and, currently, more than 8,000 chemicals are registered in the system. NGK's chemicals are carefully stored in its approximately 1,200 storage boxes. The Chemical Substances Management System has been integrated with the on-line purchasing system and all raw materials, fuels, gasses, oils, paints, and chemicals used by the Company are all handled on one system and may be managed by division or storage box location. When the quantities of purchased and consumed chemical substances covered by the PRTR Law are input, the transferred and emitted amounts of such chemical substances are automatically calculated. Furthermore, prior to the purchase of additional chemicals, comprehensive safety and environmental studies are examined and approved by the chemical substances safety committee.

In addition to the committee's input management, the business section strictly controls storage of the chemicals. With this two-part process, NGK improves both accident prevention and information sharing functions.

Chemical Substances Management Flow



Chemical Substance Handling

The PRTR Law, enacted in July 2000, specifies 354 Type-1 chemical substances. NGK handled 62 of these substances in its Companywide operations in fiscal 2002. The total volume of these substances handled was 337 tons. NGK must report to the government on 10 substances, including solvents for insulator varnish and raw materials for metallic products. In fiscal 2001, 236 tons of 67 of such substances were handled. The decrease in the number of substances was due to a reevaluation of substances used and in the standardization of procedures. The increase in volume used was partially due to the higher precision of data available due to the full-fledged operation of the Chemical Substances Management System, resulting in a higher apparent use rate.

Viewed by business site, the Nagoya Plant handled approximately 65 tons of 56 chemical substances, the Chita Plant handled approximately 226 tons of 42 chemical substances, and the Komaki Plant handled approximately 45 tons of 26 chemical substances.

Response to PRTR-Listed Substances

Atmospheric emissions of PRTR-listed substances in fiscal 2002 totaled 31.3 tons, mainly of volatile organic compounds. NGK is currently giving high priority to the execution of a plan with the aim of reducing atmospheric emissions of organic compounds from insulator varnish solvents.

Amount of PRTR-Listed Substances Handled, Emitted, and Transferred

(tons)

Substance	Amount handled	FY2002						
		Amount emitted			Amount transferred			
		Atmosphere	Water	Soil	Landfill	Sewage	Outside	
Nagoya Plant	Xylene	19.16	0.89	0.00	0.00	0.00	0.00	3.31
	Toluene	29.54	0.66	0.00	0.00	0.00	0.00	0.22
	Benzene	1.29	0.00	0.00	0.00	0.00	0.00	0.01
	Nickel compounds	1.07	0.00	0.00	0.00	0.00	0.01	0.78
	Ethylene glycol	4.98	0.00	0.00	0.00	0.00	0.16	3.55
	Ethylbenzene	3.27	0.00	0.00	0.00	0.00	0.00	0.02
	1,2,3-trimethyl-benzene	0.84	0.00	0.00	0.00	0.00	0.00	0.00
	Hydrogen fluoride and its water-soluble salt, other	4.06	3.62	0.00	0.00	0.00	0.01	0.10
Total	65.46 (56 substances)	5.40	0.00	0.00	0.00	0.30	8.90	
Chita Plant	Beryllium and its compounds	130.49	0.00	0.00	0.00	0.00	0.00	0.11
	Nickel	46.24	0.00	0.00	0.00	0.00	0.00	0.00
	Copper water-soluble salt	20.77	0.00	0.01	0.00	0.00	0.00	20.76
	Cobalt and its compounds	15.77	0.00	0.00	0.00	0.00	0.00	0.01
	Manganese and its compounds	4.49	0.00	0.05	0.00	0.00	0.00	0.00
	Chrome and its trivalent compounds	3.37	0.00	0.01	0.00	0.00	0.00	0.00
	Toluene	2.12	2.06	0.00	0.00	0.00	0.00	0.06
	Nickel compounds	0.45	0.00	0.00	0.00	0.00	0.00	0.44
Total	226.42 (42 substances)	2.68	1.12	0.00	0.00	0.00	23.54	
Komaki Plant	Toluene	12.74	12.13	0.00	0.00	0.00	0.00	0.51
	Dichloromethane	10.94	10.53	0.00	0.00	0.00	0.00	0.41
	Manganese and its compounds	5.62	0.00	0.04	0.00	0.00	0.00	0.04
	Nickel compounds	0.74	0.00	0.00	0.00	0.00	0.00	0.09
	Polymer of 4,4'-isopropylidenediphenol and 1-chloro-2,3-epoxypropane	4.09	0.00	0.00	0.00	0.00	0.00	0.04
	Chrome and its trivalent compounds	3.88	0.00	0.00	0.00	0.00	0.00	0.09
	Antimony and its compounds	3.73	0.00	0.01	0.00	0.00	0.00	0.40
	Cobalt and its compounds	1.61	0.00	0.00	0.00	0.00	0.00	0.16
Hydrogen fluoride and other water-soluble salt, other	0.93	0.13	0.04	0.00	0.00	0.00	0.00	
Total	44.83 (26 substances)	23.12	0.10	0.00	0.00	0.00	1.83	
Total	336.71 (62 substances)	31.30	1.22	0.00	0.00	0.30	34.27	

Future Initiatives

To reduce the emission and transfer volumes of chemical substances, NGK is currently giving priority to reducing the volume of atmospheric emissions of volatile organic compounds. The Company is currently conducting a reevaluation of the amounts used of these compounds and considering ways to reduce the volume it handles through such measures as the use of substitute materials, the reduction of emissions, the reduction of the volume of such compounds processed through outsourcing, and detoxification. Furthermore, in fiscal 2002, NGK made the capital investments necessary to completely eliminate the use of dichloromethane as well as making other related investments. These measures are expected to result in an over 80% reduction of atmospheric solvent emissions from fiscal 2001 levels in fiscal 2006.

In addition, NGK will continue to strictly control other chemical substances and consider technologies enabling the reduction of chemical substance usage volumes or the use of alternative materials.

Procurement and Logistics

Green Purchasing

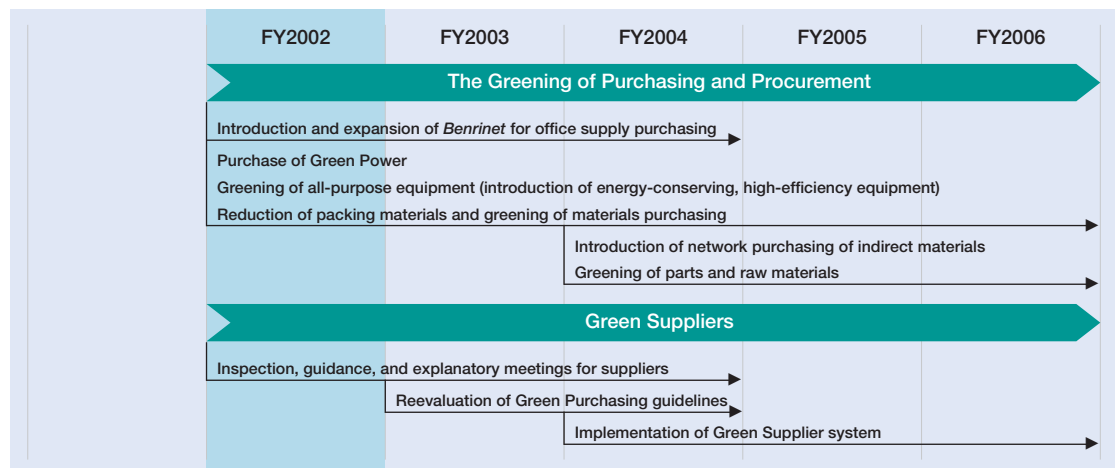
To reduce the environmental impact of NGK's corporate activities, including purchasing, NGK has a Green Purchasing Policy, which covers all purchased items and services, from office supplies, raw materials, and parts to manufacturing facilities.

Through its Green Purchasing Commission, established in October 1999, NGK works in unison with suppliers to put into practice the Company's "Green Purchasing Policy."

The Green Purchasing Policy

1. NGK conducts Green Purchasing of all materials, components, manufacturing equipment, office supplies, and services.
2. After considering quality, price, and delivery periods, NGK gives preference to companies that provide products and services in an environmentally friendly manner.

Long-Term Schedule for Green Purchasing



Green Products and Green Suppliers

Starting in the fall of 2000, NGK began full-fledged implementation of the policy of giving preference to the purchase of consumables, such as office supplies, that qualify as Green Products*. In March 2002, with the restructuring of NGK's internal purchasing system, as a means to promote Green Purchasing, *Benninet* was introduced and 500 new Green Products were added to the system, bringing the total to 850 products.

Regarding the purchase of raw materials and equipment, based on surveys and analyses regarding environmental protection activities of suppliers that the Company conducted until fiscal 2001, discussions regarding environmental activities were conducted with NGK's 10 main suppliers during fiscal 2002. In addition, NGK examined the revision of Green Purchasing Guidelines and the establishment of standards for Green Purchasers. In fiscal 2003, in addition to revising these guidelines, NGK will increase the number of suppliers to which it provides guidance on Green Purchasing related issues. The Company is also promoting Greening through the introduction of energy-saving devices, high-efficiency devices, and non-polyvinyl chloride products to its facilities. Furthermore, in September 2001, NGK introduced Japan Natural Energy Co., Ltd.'s Certification of Green Power system and began purchasing 2 GWh of wind power per year in January 2002.

* Green Products: Products with the Eco-Mark or the Green Mark, products included in the Green Purchasing Network (GPN) databook, products meeting the standards specified in the Green Purchasing Law

COLUMN

Green Product List Expands to 850 Products with Introduction of New Purchasing System

The *Benrinet* purchasing system was introduced not only to make NGK's internal purchasing system run more smoothly, but also to promote Green Purchasing. Currently, approximately 1,500 non-polyvinyl chloride products are registered in the *Benrinet* system, 850 of which are Green Products. It is also possible to specify Green Products when placing orders. The entire ordering process is on-line and paperless. The former purchasing system was only operational for the three main plants. However, with the introduction of the *Benrinet* system, NGK business locations all over Japan as well as some NGK Group companies are able to use the system. NGK intends to expand the *Benrinet* system to include all Group companies.

Reduction of CO₂ Emission Volumes corresponding to 806 Tons through the Purchase of Green Power

To counter the trend of rising CO₂ emission volumes due to the expanded use of electric power as a result of the increased production of ceramic products and electronic parts, NGK has become increasingly interested in wind power, a renewable energy that causes the emission of very little CO₂. In September 2001, NGK made a 15-year agreement with Japan Natural Energy Co., Ltd., to implement a Certification of Green Power System* and start purchasing 2 GWh of wind power per year from January 2002.

Compared to the burning of fossil fuels, the generation of electric power using wind produces less than 10% of the volume of CO₂ emissions per unit of electric power. With the use of 2 GWh of wind power per year, NGK will reduce CO₂ emission volumes corresponding to roughly 806 tons per year.

* Japan Natural Energy Co., Ltd.'s Green Power Certification System is a program that allows companies and other organizations wishing to use wind power and other natural energies to entrust electric power generation, as well as the construction and operation of related facilities, to the electric power generation companies of their choice that provide appropriate and efficient electric power. The electric power thus generated is sold to a local electric power company and the electric power generation company receives the proceeds from these sales as well as income from entrustment fees paid by the company or organization.



Logistics/Containers/Recycling

To reduce the burden on the environment due to logistical activities, NGK is promoting Green Logistics and continuously researching a "Returnable Logistics System" to promote the more effective use of resources and reduce waste through the use of returnable containers. Research is also being conducted on developing an efficient operating system to reduce CO₂ emissions.

These activities include the creation of a returnable recovering system in which pallets and shipping boxes would be aggressively collected, making more effective use of resources.

■ NGK's Green Logistics

Aim of Research	Concrete Measures
Reduction of CO ₂ emissions	Modal Shift
	Use of Green Energy
	Increase in loading efficiency
Reduction of volume of packaging materials	Returnable packaging
	Improvement of packaging efficiency

Initiative to Collect and Reuse Scrap

Beryllium copper strips are typically processed for use in compact electronic components and similar goods. Due to the precise nature of the production process, large amounts of scrap are generated during the embossing phase. NGK collects this embossing-related scrap from customers and reuses it.



COLUMN

COMMUNICATIONS

NGK's environmental protection efforts are not confined to the Company itself but extend to greater society. As a good corporate citizen, NGK is involved in a wide range of community relations and keeps society informed of its various activities through public relations channels.

Environmental Report

In 1997, the Company issued its first environmental report, summarizing its environmental conservation activities. It detailed energy-saving activities aimed at preventing global warming and waste reduction efforts, chemical substance management, Green Purchasing, and environmental accounting. We plan to continue to publish this report once a year and to make it available on NGK's Web site.

Environmental Partnership Organization Club

NGK is one of the leading members of the Environmental Partnership Organization Club (EPOC), a multi-industrial alliance of companies in the Chubu area dedicated to the development of a sustainable society. Along with vigorously supporting the club's educational exchange activities, for which the Company is the coordinating entity, NGK participates in all EPOC activities, such as the club's walking tours held to increase the environmental awareness of residents. In addition, in fiscal 2002, NGK participated in the "Nagoya 2001 Clean Campaign" and made a presentation at the "Eco-Campus Festival."



During fiscal 2002, approximately 400 area residents joined in the picking up of garbage during EPOC's environmental walking tours.

Community Relations Activities Pamphlet

In March 2001, NGK issued *NGK Is Also Here*, a pamphlet that introduces NGK's community relations activities.

The pamphlet gives an overview in words and photos of the activities of the NGK Foundation for International Students, which provides accommodation and scholarships for international students, as well as NGK's environmental protection activities, plant tours, support for regional events, and activities being undertaken by Group companies in Japan and abroad.



NGK Is Also Here introduces NGK's community relations activities.

COLUMN

Participation at Environmental Symposium

On March 7, 2002, Masanao Ono, an NGK director who is responsible for the Environmental Committee, participated as a panelist at the Environmental Symposium Nagoya, which was part of the Nikkan Kogyo Shimbun Ltd.'s Green Forum 21. The panel discussion was titled, "The Kyoto Protocol and the Resource Recycling Society—On Industry's Response." Mr. Ono explained the status of the manufacturing industry and NGK's Core Policy on the Environment as well as the actual measures taken regarding the reduction of industrial waste, energy conservation (reduction of CO₂ emissions), and chemical substances management.



Masanao Ono, an NGK director, speaks at the Environmental Symposium Nagoya.

Environmental Information Activities

As a member of the consulting committee for the Nikkei Business Publications Environmental Forum, NGK actively sponsors and participates in a wide variety of seminars and exhibitions on the environment. This forum provides a venue for corporations to consider joint environmental management to benefit both the corporations and the environment and to make information available to the public. In addition, NGK provides support for the Summit of Environmental Economists sponsored by Nihon Keizai Shimbun, Inc.

Advertisements

NGK provides a wide variety of products that contribute to environmental conservation. The Company strives to keep the public informed regarding these products as well as NGK's environmental activities.



Awards

Date	Award	Granted to
Jul. 2001	Commendation from the Chief of the Aichi Labor Bureau for progress in the area of safety	Komaki Plant
Jan. 2002	Energy Management Excellent Technician Award; Chairman's Award	One Member of Energy Management Staff
Feb. 2002	Energy Management Achievement Award; Economy, Trade and Industry Bureau Chief Award	One Member of Energy Management Staff
	Energy Management Achievement Award; Tokai Hokuriku Department Chief Award	One Member of Energy Management Staff
	Energy Management Excellent Technician Award; Tokai Hokuriku Department Chief Award	One Member of Energy Management Staff

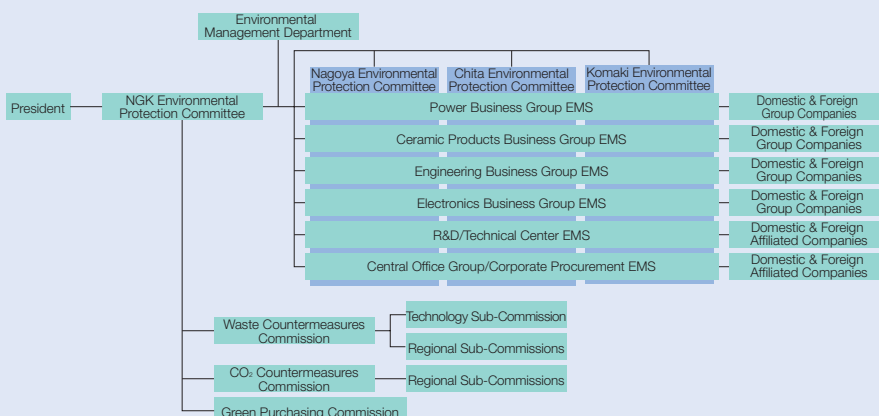
COLUMN

Companywide Environmental Management System

As a means to further strengthen its ability to respond to environmental issues, NGK is currently considering ways to reform its environmental management system.

The former system was basically run by each Environmental Protection Committee of the three main plants. The main purpose of these committees was to assure compliance with the laws related to pollution prevention in their respective geographic areas. The Environmental Management System will be reorganized to enable the Company to respond to the specific environmental issues of each business group, such as the reduction of industrial waste and CO₂ emission volumes and the strengthening of chemical substance management. This will allow the heads of each regional environmental protection committee (plant managers) to set targets based on the environmental issues and action plans put forth by the head of the NGK Environmental Protection Committee.

The new Environmental Management System is expected to be operative by the second half of fiscal 2003.

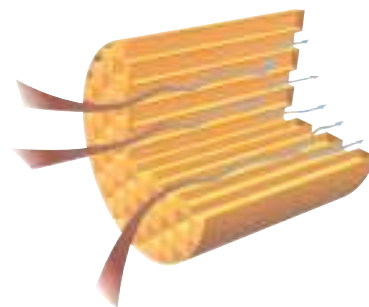


ENVIRONMENTALLY CONSCIOUS PRODUCTS

Based on its ceramics technology, NGK develops and supplies a wide range of products that contribute to environmental protection in the "Triple-E" areas of Ecology, Electronics, and Energy. NGK products improve the efficiency of power generation facilities, make automotive exhaust gas cleaner, treat wastewater and waste matter, and help users save energy.

Diesel Particulate Filter

The Diesel Particulate Filter (DPF) eliminates the particulate matter (PM) in exhaust gas from diesel engines. By utilizing the technology nurtured in the design and production of the HONEYCERAM®, a ceramic substrate for automotive catalytic converters, NGK developed cordierite-DPFs and has been manufacturing and selling them since 1989. By plugging alternate honeycomb cells at each end, their porous ceramic walls filter out 90% or more of the PM in exhaust gas. The DPF is regenerated by treatment of accumulated PM by heat, etc. NGK also developed silicon carbide (SiC)-DPFs in 2000 and their mass production is scheduled to start in April 2003.



DPF Structure: By alternately blocking off each side of the honeycomb cells, the PM is allowed to accumulate.

In addition, NGK's cordierite-DPFs are included in a monitoring vehicle test program in Europe of the Diesel Particulate NO_x Reduction (DPNR) System, which has been operated by Toyota Motor Corporation since March 2002, and they are expected to be commercially used in this system.

NGK is proceeding with further R&D activities to solve PM problems and thus enhance the merits of diesel-powered vehicles, which boast lower CO₂ emissions, lower fuel consumption, and higher durability compared with gasoline-powered vehicles.

* An exhaust gas purification system developed by Toyota that continuously and simultaneously purifies harmful substances, such as PM and NO_x, contained in the exhaust gas from diesel engines

NAS® Battery (Sodium Sulfur Battery)

The NAS® battery, containing sodium and sulfur electrode material, is a compact secondary battery for large-scale energy storage. The battery is charged by the chemical reaction caused by the movement of sodium ions between the two electrodes. The separator between the electrodes is made of beta alumina solid electrolyte, which NGK has developed based on its core fine ceramics technology. Because discharging these batteries does not involve the burning of fossil fuels, no atmospheric pollutants such as NO_x, SO_x, or particulate matter are released into the atmosphere, and the energy stored in the battery can be provided as a source of nighttime energy with a low fossil fuel burning ratio.



The Tokyo Electric Power Company (TEPCO) has been entrusted by the New Energy and Industrial Technology Development Organization (NEDO) since March 2001 to conduct testing of NAS® batteries on the island of Hachijojima in conjunction with wind power generation facilities.

NAS® batteries have a variety of possible applications. Because they are charged during off-peak times and discharge electricity during peak times, they can be used to reduce peak power requirements through load leveling and enable power generation and transmission facilities to operate more effectively, thus allowing the deferral of expansion of such facilities. They are also suitable for use as an uninterruptible and emergency power supply in data centers, factories, and hospitals, and can be used in combination with wind and solar generation systems to stabilize such renewable energy.

NAS® batteries have been tested, demonstrated, and put to practical use at dozens of locations throughout Japan, including the Bureau of Sewerage of the Tokyo Metropolitan Government, which began using them in December 2001. NGK's NAS® battery was first tested overseas in January 2001 by the American Electric Power Company, a major U.S. power company based in Columbus, Ohio. This has led to its hosting the first overseas demonstration project, slated for summer 2002.

NGK is currently constructing a new plant in Komaki with an annual production capacity of 60,000kW. Commercial production is scheduled to begin in April 2003.

Ceramic Membrane Water Purification Systems

Ceramic membrane water purification systems use ceramic membrane modules with pore size of 0.1 μ m, smaller than bacteria, to completely remove both bacteria and protozoa from water. Ceramics are both heat and corrosion resistant and do not elute any impurities. They may also be recycled for use as tile, other ceramic products, or raw materials such as bricks for the ceramic industry.

Aware of the superb reliability and high durability of ceramics, NGK has been developing ceramic membrane water purification systems since 1989. In addition to developing the first ceramic membrane water purification system in Japan in 1996, NGK developed a large-scale (180mm in diameter) ceramic membrane in 2001, as a means to drastically reduce the costs of water purification systems. In July of that same year, the Company received an order from the Tokyo Waterworks Department for the largest ceramic membrane system ever used in Japan, purifying 3,400m³ of water per day.

NGK will continue to conduct product design that takes the environment into consideration and strive to be a total engineering company in the waterworks field.



Large ceramic membrane

Other Environmentally Conscious Products



HONEYCERAM®



HRS, Hi-cycle Regenerative Combustion System



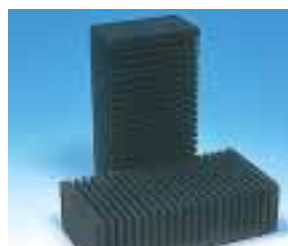
CERALLEC®, filter for high-temperature dust collector



Fluidized bed gasification and melting systems



EXCERAM® lightweight setter



Manganese dioxide catalyst for dioxin decomposition



Wastewater treatment system



CULLET-HISONE®

* To learn about more products that help protect the environment, see NGK's home page at <http://www.ngk.co.jp/>

ENVIRONMENTAL DATA BY PLANT

Actual values for exhaust gasses, noise, vibration, pumped underground water, and wastewater for all business sites met all relevant laws, regulations, and voluntary standards.

■ NGK's Performance vs. Current Pollution Control Standard

Item	Nagoya Plant		Chita Plant		Komaki Plant		
	Standard	Actual Value	Standard	Actual Value	Standard	Actual Value	
Exhaust gas	Sulfur produced in combustion (%)	0.5 ^{*2}	0.024~0.033	0.5 ^{*7}	(Shifted to LNG)	0.6 ^{*8}	≤0.09
	SO _x (Nm ³ /Hr)	—	—	—	—	11.7 ^{*8}	≤0.06
	NO _x (ppm)	144 ^{*2}	21~131	150 ^{*7}	≤50	170 ^{*8}	≤89
	NO _x volume (g/Hr)	23,456 ^{*1}	18,389	—	—	—	—
	Soot and dust (g/Nm ³)	0.15 ^{*1}	≤0.002	0.2 ^{*7}	≤0.002	0.2 ^{*8}	≤0.01
	Be total plant output (g/day)	—	—	10 ^{*7}	0.173~0.567	—	—
	Be output concentration in residential areas (μg/m ³)	0.01 ^{*2}	0.0001~0.0003	0.01 ^{*7}	0.00004~0.00034	—	—
Noise	Fluorine and its compounds (mg/Nm ³)	(10) ^{*10}	N.D.~9.5	—	—	—	—
	Day (dB)	70 ^{*2}	48~66 ^{*6}	65 ^{*7}	44~61	65 ^{*5}	51~65 ^{*11}
	Night (West side of Plant) (dB)	60 ^{*2}	46~60 ^{*6}	65 ^{*7} (60 ^{*7})	40~62 (40~59)	55 ^{*5}	49~61 ^{*11}
Vibration	Day (dB)	70 ^{*4}	35~55	70 ^{*7}	≤45	65 ^{*5}	24~35
	Night (dB)	65 ^{*4}	27~55	70 ^{*7}	≤45	60 ^{*5}	—
Pumped underground water (m ³ /day)	—	—	—	—	4,023 ^{*5}	2,263	
Waste-water	pH	5.0~9.0 ^{*3}	6.5~7.6	5.8~8.6 ^{*7}	6.7~7.2	5.8~8.0 ^{*8}	6.5~7.6
	SS (mg/l)	600 ^{*3}	7~78	30 ^{*7}	2~7	80 ^{*8}	1.0~7.0
	BOD (mg/l)	600 ^{*3}	2.5~14	—	—	17 ^{*8}	0.7~6.9
	COD (mg/l)	—	—	20	2.7~5.1	—	—
	Total COD emissions (kg/day)	—	—	59.2	17.9	—	—
	Oil (mg/l)	5 ^{*3}	0.5~1.5	2 ^{*7}	N.D.~0.7	2 ^{*8}	N.D.~1.8
	Copper (mg/l)	3 ^{*3}	N.D.~0.01	1 ^{*7}	N.D.~0.03	3 ^{*3}	N.D.
	Zinc (mg/l)	5 ^{*3}	0.03~0.04	1 ^{*7}	0.04~0.11	3 ^{*8}	0.05~1.1
	Soluble iron (mg/l)	10 ^{*3}	N.D.~0.1	0.5 ^{*7}	0.1	10 ^{*3}	0.08~0.33
	Soluble manganese (mg/l)	10 ^{*3}	N.D.~0.1	—	—	10 ^{*3}	0.01~0.07
	Cadmium (mg/l)	—	—	0.1 ^{*3}	N.D.	0.1 ^{*3}	N.D.
	Cyanide (mg/l)	1 ^{*3}	N.D.	1 ^{*3}	N.D.	1 ^{*3}	N.D.
	Lead (mg/l)	0.1 ^{*3}	N.D.	0.1 ^{*3}	N.D.	0.1 ^{*3}	N.D.
	Hexavalent chromium (mg/l)	0.5 ^{*3}	N.D.	0.5 ^{*3}	N.D.	0.5 ^{*3}	N.D.
	Total mercury (mg/l)	0.005 ^{*3}	N.D.~0.0005	0.005 ^{*3}	N.D.	0.005 ^{*3}	N.D.
	Total chromium (mg/l)	2 ^{*3}	N.D.	2 ^{*3}	N.D.	2 ^{*3}	N.D.
	Fluorine (mg/l)	8 ^{*3}	0.1~0.2	8 ^{*3}	0.3	8 ^{*3}	N.D.
	Nitrogen content (mg/l)	—	—	10 (guideline) ^{*5}	7	10 (guideline) ^{*5}	1.9
	Phosphorus content (mg/l)	—	—	1 (guideline) ^{*5}	0.08	1 (guideline) ^{*5}	0.06
	Tri-chloroethylene (mg/l)	0.3 ^{*3}	N.D.	0.3 ^{*3}	N.D.	0.3	N.D.
	Tetra-chloroethylene (mg/l)	0.1 ^{*3}	N.D.	0.1 ^{*3}	N.D.	0.1	N.D.
	1, 1, 1-tri-chloroethylene (mg/l)	3 ^{*3}	N.D.	3 ^{*3}	N.D.	3 ^{*3}	N.D.
	Nickel (mg/l)	—	—	—	—	0.01 (recommendation) ^{*9}	N.D.
Antimony (mg/l)	—	—	—	—	0.002 (recommendation) ^{*9}	N.D.~0.002	
Dichloromethane (mg/l)	—	—	—	—	0.2 ^{*3}	N.D.	

- *1. Air Pollution Control Law *2. Nagoya Regulations *3. Water Pollution Control Law *4. Vibration Control Law
 *5. Aichi Prefecture Regulations or Guidelines *6. Including background noise *7. Pollution control agreement with Handa
 *8. Pollution control agreement with Komaki *9. The Basic Environment Law *10. Self-imposed control
 *11. Adjacent to the road (includes background noise)

* Background noise: Total volume of noise from unverifiable sources. Because plant noise and human activity are generally lower at night, foreground noise decreases and background noise becomes more conspicuous. (Foreground noise is noise from verifiable sources.)

pH : Density of Hydrogen Ions
 SS : Suspended Solids
 BOD: Biochemical Oxygen Demand
 COD: Chemical Oxygen Demand
 N.D.: Not Detected
 Be : Beryllium



Nagoya Plant

- Address: 2-56, Suda-cho, Mizuho, Nagoya
- Products: Ceramic honeycomb substrates for automotive catalytic converters (HONEYCERAM®), NAS® batteries, etc.



Chita Plant

- Address: 1, Maegata-cho, Handa, Aichi
- Products: Insulators, equipment for electrical transmission and distribution, ceramic products for the chemical industry, beryllium-copper strips, ceramic components for semiconductor manufacturing, etc.



Komaki Plant

- Address: 1155, Tagami, Futaebori, Komaki, Aichi
- Products: Suspension insulators for electrical transmission, equipment for electrical transformation and distribution, translucent alumina (HYCERAM®), etc.

History of NGK's Commitment to Environmental Activities

Apr. 1972	Environmental Protection Committee and Environmental Preservation Office established
Jun. 1992	Waste Countermeasures Commission established
Mar. 1993	NGK's Voluntary Plan for Environmental Preservation established
Dec. 1994	Chlorofluorocarbons (CFCs) and 1,1,1-trichloroethane abolished
Feb. 1995	Internal environmental audit conducted
Mar. 1996	NGK's Core Policy on the Environment established
Dec. 1996	CO ₂ Countermeasures Commission established
Mar. 1998	NGK's three production bases simultaneously received ISO 14001 certification
Jun. 1998	<i>Environmental Report</i> published
Apr. 1999	Environmental accounting introduced
Jun. 1999	Engineering Business Group received ISO 14001 certification
Oct. 1999	Green Purchasing Commission established
Nov. 1999	Consolidated meeting on environmental issues for all NGK Group companies held
Feb. 2000	Established and began active participation in Environmental Partnership Club (EPOC*)
Mar. 2001	NGK's three production bases simultaneously renewed ISO 14001 certification; Renewal in Nagoya was expanded to include its R&D site
Mar. 2002	The Electronics Business Group of NGK Insulators, Ltd., and three NGK Group companies jointly received ISO 14001 certification

**We are making every effort to recycle resources
and protect the environment.**



100%-recycled paper was used for the text of this publication and for the cover. By reusing old paper, NGK is helping to preserve greenery and making effective use of resources as well as reducing waste.



This report was printed with soy ink, which uses reduced levels of oil-based solvents compared with conventional inks. By using soy ink, we are reducing petroleum-product consumption and cutting emissions of VOCs, a cause of atmospheric pollution during printing. Because vegetable oil is used, waste products break down naturally and quickly, and it is also suitable for recycled paper because of its excellent decoloring properties.



This report employed waterless printing, which reduces the burden on the environment caused by toxic waste liquids emitted during conventional printing. This environmentally friendly printing method meets all the laws and standards for prevention of water pollution and Green Purchasing and placed very little burden on the environment.



NGK INSULATORS, LTD.

**Public Relations Dept.,
Environmental Management Dept.**

E-mail: pr-office@ngk.co.jp

2-56, Suda-cho, Mizuho, Nagoya 467-8530, Japan

Phone: +81-52-872-7181 Fax: +81-52-872-7690

<http://www.ngk.co.jp/>