



...for Tomorrow

NGK's environmental report is issued to inform people about its environmental activities. This report is the third edition in a continuing series, and follows up on our report for fiscal 1997. Our next report will be issued in autumn 2001.

Environmental Report 2000

The environmental impact data in this report is mostly taken from fiscal 1999 (from April 1999 to March 2000), but also includes some data from fiscal 2000.

Corporate name: NGK Insulators, Ltd.

Date of establishment: May 5, 1919

Paid-in capital: 49.4 billion yen (as of March, 2000)

Nature of business: NGK's main business is the production and sale of electrical insulators, advanced ceramic products, environmental systems, beryllium-copper products, and electronic components. All of NGK's products benefit from the company's extensive production experience, and are designed to reflect the needs of today's society. Backed by top product quality, NGK has achieved a reputation for reliability and is recognized as a leading global manufacturer.

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The Earth's environment, the natural circulation of air and water, depends on energy from the sun. All living things, from bacteria to humans, coexist in this circulatory cycle. As long as the cycle remains properly balanced, life on earth can thrive in a stable, sustainable system. Today, however, our environment is at risk. Mankind is consuming too many of the Earth's natural resources and destroying its irreplaceable environment.

The challenges facing the global environment must be addressed by all humans including those of future generations. Nations, industries, and citizens worldwide must work together to confront and solve today's pressing environmental concerns. For manufacturers in the 21st century, the pressure is on. We must learn to operate without increasing the burden on the global environment while also developing and implementing recycling-based technologies that will support a "zero-emissions" society.

At NGK, we are working to meet global standards for excellence by emphasizing three concepts: Strategic Growth, Competitive Performance, and Corporate Citizenship. In terms of the environment, we have already won recognition for our efforts to operate in a responsible manner. One key to NGK's success in this area has been the adoption of a truly global perspective, reflecting our ongoing commitment to taking on new challenges.

A handwritten signature in black ink that reads "Masaharu Shibata". The signature is written in a cursive, flowing style.

Masaharu Shibata
President and Chief Executive Officer

NGK's Core Policy on the Environment

Only by spreading awareness of environmental issues and acting on this awareness can we hope to conserve the earth's environment. In March 1996, NGK adopted a core policy for contributing to a reduction in global environmental impact. We are making ongoing, company-wide efforts to encourage environmental preservation.

Philosophy

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

Action guidelines

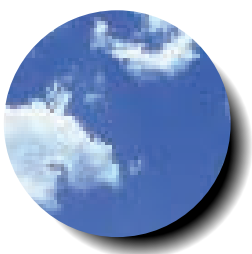
In the Design-Review (DR) process, NGK first scientifically evaluates the impact of its production technologies, anti-pollution measures, and waste treatment systems on the environment. Based on our findings, we then take appropriate measures.

Specifically, we:

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

History of NGK's Commitment to Environmental Activities

NGK has taken a far-ranging approach to environmental challenges for almost three decades, ever since we established our Environmental Preservation Office at company headquarters in 1972. In 1996, we introduced a Core Policy on the Environment, which included a number of "Action Guidelines." Based on these guidelines, we have developed new business in the "Triple-E" areas to contribute more effectively to global environmental conservation.



1972 (April)

Environmental Protection Committee and Environmental Preservation Office established.

Environmental Committee: Responsible for planning and drafting NGK's core policy for the environment.

Environmental Preservation Office: Responsible for control and management of NGK's environmental preservation activities. Currently designated as "Integrated Administration Department".

1992 (June)

Waste Countermeasures Commission established.

Waste Countermeasures Commission: Responsible for planning and drafting NGK's core policies regarding internal waste treatment.

1993 (March)

NGK's Voluntary Plan for environmental preservation established.

Voluntary Plan: A plan dedicated to global environmental preservation that emphasizes business development in the "Triple E" areas.

1994 (December)

Chlorofluorocarbons (CFCs) and 1,1,1-trichloroethane abolished.

Chlorofluorocarbons (CFCs) and 1,1,1-trichloroethane use was discontinued prior to the 1995 abolition date cited in the Montreal Protocol.

1995 (February)

Internal environmental audit conducted.

A company-wide environmental audit was conducted in preparation for application for ISO14000 series certification.

1996 (March)

NGK's "Core Policy on the Environment" established.

The Policy consists of three elements: Philosophy, Action Guidelines, and Promotion System.

Targets reached for NGK's First Industrial Waste Reduction Project (reduction of 50% from 1990 levels)

The Second Industrial Waste Reduction Project begins (target: reduction of 30% from 1995 levels, by 2000)

1996 (December)

CO₂ Countermeasures Commission established.

CO₂ Countermeasures Commission: Responsible for planning and drafting CO₂ reduction measures within NGK.

1998 (March)

NGK's three production bases simultaneously receive ISO 14001 certification.

1999 (June)

Engineering Business Group receives ISO 14001 certification.

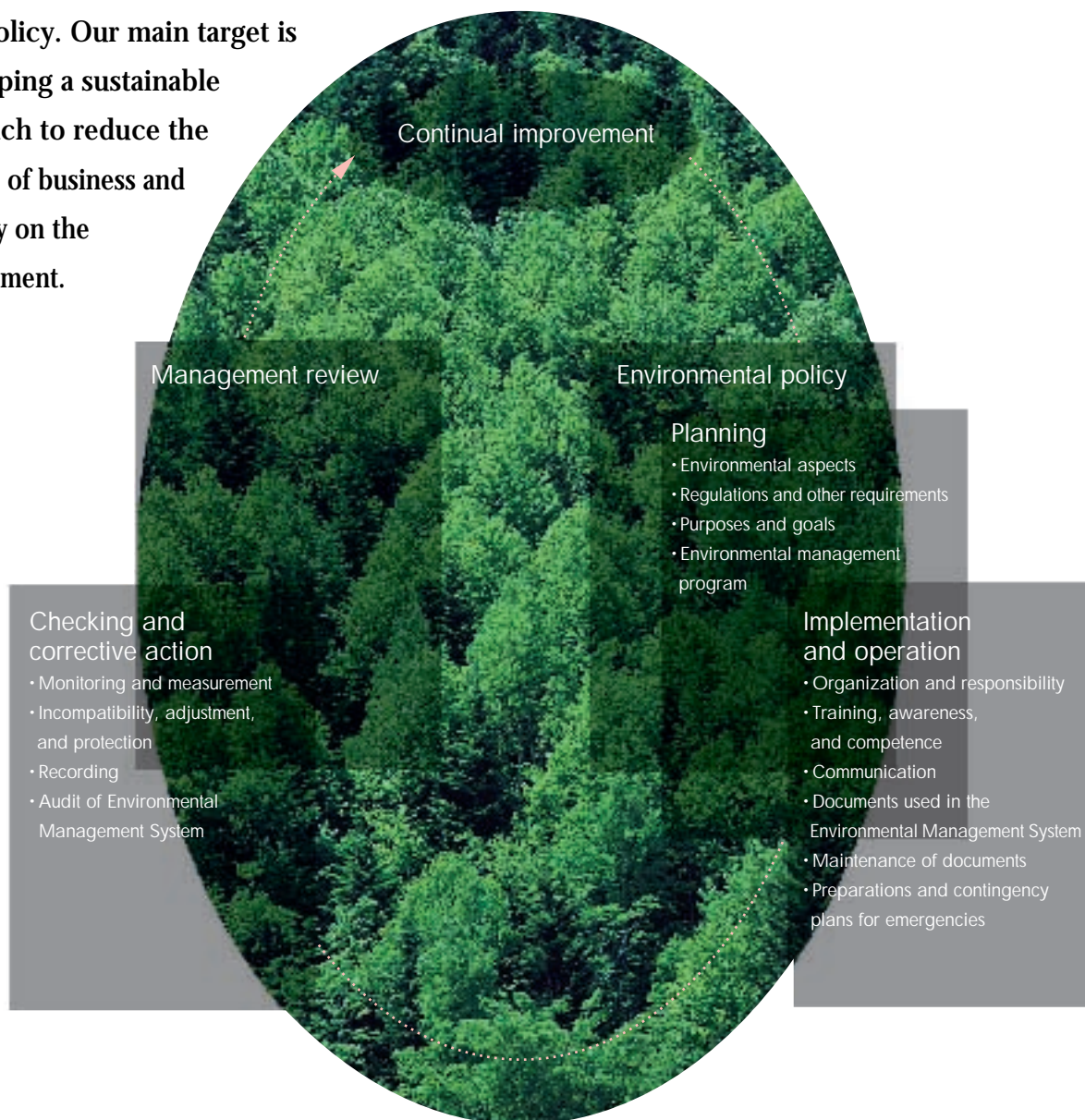
1999 (October)

Green Purchasing Commission established.

Green Purchasing Commission: Responsible for purchase planning and drafting of eco-friendly materials, components, and products.

Promotion System for Environmental Management

NGK has established a company-wide environmental management system to conduct activities based on our environmental core policy. Our main target is developing a sustainable approach to reduce the impact of business and industry on the environment.



ISO 14001

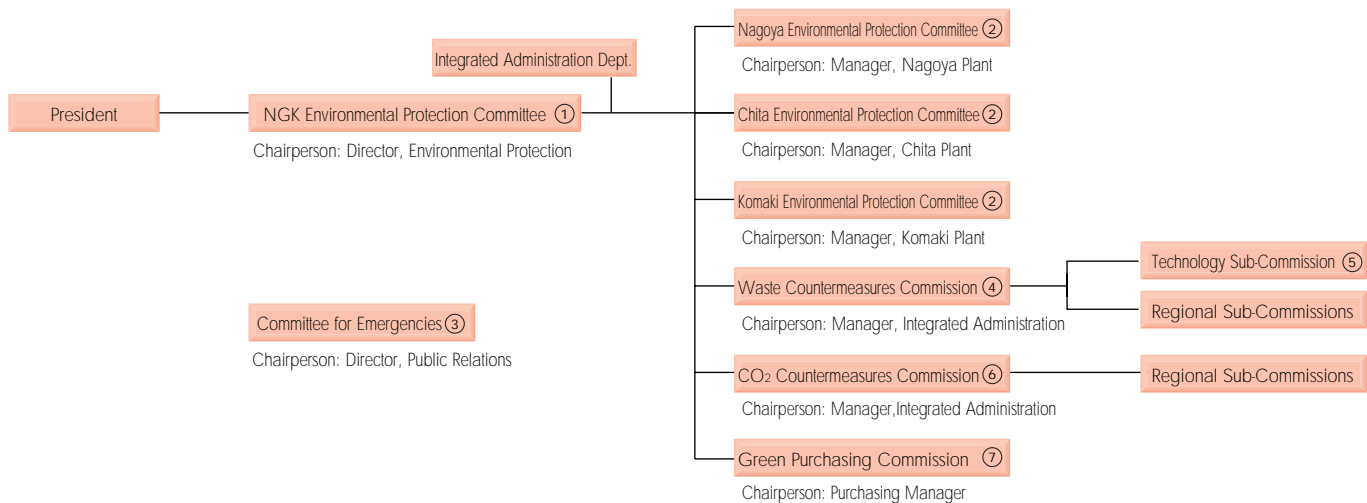


As part of NGK's efforts to address global environmental concerns, the Company has introduced an internal "Environmental Management System" (EMS). This system is already proving its worth. In 1998, three of our major production bases won recognition for environmental management performance and received ISO 14001 certification; in 1999, our engineering business group received ISO 14001 certification as well. In addition, R&D sites are currently working to acquire ISO 14001 certification by March 2001. Looking forward, NGK plans to obtain ISO certification for all its domestic and overseas subsidiaries and affiliates.

Environmental Management Organization

NGK has organized an "NGK Environmental Protection Committee," chaired by a director responsible for environmental protection, which oversees "Regional Environmental Committees," chaired by the plant managers. Our "Waste Countermeasures Commission" and "CO₂ Countermeasures Commission," chaired by the integrated administration manager and "Green Purchasing Commission," chaired by the purchasing manager, provide further coverage of key environmental concerns.

Our EMS promotion system plans for our Nagoya, Chita and Komaki production bases to become "Environmentally Autonomous Plants." Meanwhile, the Engineering Business Group has begun to supply products designated as having a "reduced environmental impact." The Group is also making continued efforts to improve its overall environmental performance. NGK is now conducting minimum twice-yearly internal audits and once-yearly external audits.



[Duties of committees]

- ① Plans and drafts basic policies for environmental protection throughout NGK (established April 1972)
- ② Implements the decisions of the NGK Environmental Protection Committee, and plans and drafts environmental protection in the region (established April 1972)
- ③ Implements emergency measures (established January 1991)
- ④ Plans and drafts basic policies on waste throughout NGK (established June 1992)
- ⑤ Conducts technical planning and implements waste-reduction measures (established October 1998)
- ⑥ Plans efforts to reduce CO₂ discharge (established December 1996)
- ⑦ Plans and drafts purchasing of eco-friendly materials, components, and products (established October 1999)

ISO14001-Certified Production Bases	Nagoya	Chita	Komaki	Engineering Business Group
Date	March 30, 1998			June 25, 1999
Inspection Agency	JIC Quality Assurance, Ltd. (JICQA)			Lloyd's Register Quality Assurance, Ltd. (LRQA)
Registered Scope	R&D and production of HONEYCERAM [®] exhaust-gas purification units	R&D and production of insulators and special metals (including beryllium-copper), and R&D of environmental systems	R&D and production of suspension insulators and translucent alumina parts	Site activities associated with project management, engineering, design, development, procurement and construction management relating to facilities/equipment for the purification of water, the treatment of wastewater, low- and mid-level radioactive waste, and noise-control equipment



Energy Conservation

In the ceramics business, the firing process plays an indispensable role in the production process. Unfortunately, this limits the degree to which we at NGK can eliminate CO₂ emissions, a key factor in both global warming and acid rain. However, by placing top priority on energy conservation, NGK has been able to establish ambitious targets for CO₂ reduction. These targets, established by a special internal task force, have encouraged us to identify methods for reducing CO₂ output through improved production practices and similar innovations.

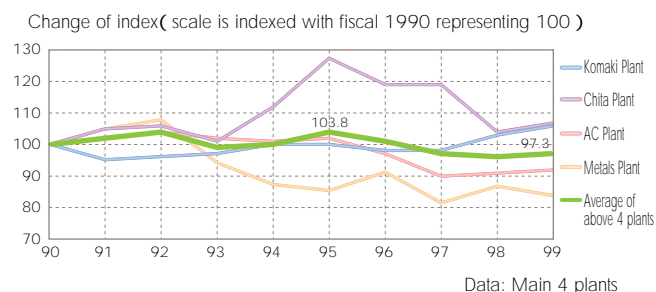
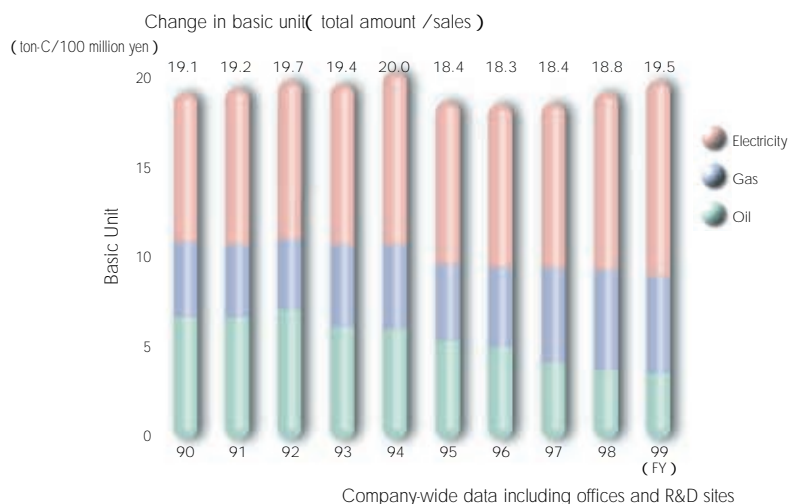
NGK's Commitment to Environmental Contribution

NGK produces a wide range of products in the "Triple E" business fields: Ecology, Energy, and Electronics. As a company that produces goods that will be indispensable in the 21st century, NGK hopes not only to improve our society, but to reduce the environmental impact of each step in a product's life cycle, from product development, to manufacturing, to disposal.

Change in CO₂ emissions

Production of NGK's expanding line of ceramic products and electronic components consumes a great deal of electricity and emits large quantities of CO₂. Accordingly, NGK has reviewed its target values for reducing CO₂ emissions and is making an all-out effort to use our natural resources sparingly.

- Target values for reducing CO₂ emissions (Fiscal 2005)
- Basic unit (total amount/sales) is kept within fiscal 1990 level.
- Basic unit for existing products such as insulators and HONEYCERAM is 10% reduced.



Development of new technologies for energy conservation

Refractory bricks, which used to be employed as a material for shuttle kilns, consumed extra energy due to their dense structure and large heat capacity. In the 1970s, NGK introduced insulating refractory bricks, which dramatically lowered heat consumption in shuttle kilns. In the 1980s, NGK introduced the first ceramic-fiber-based insulating materials, which provided further efficiency gains. In the 1990s, our efforts have focused on combustion technologies, including technologies for reducing gas output and recovering heat from high-temperature exhaust gas. In the area of burner control, NGK has developed two key innovations for energy efficiency: on-off combustion and regenerative combustion. The first allows the burner to be operated intermittently, thus reducing combustion intake; the second uses a heat reservoir, installed at the furnace's air outlet, to recover heat. Together, these two innovations reduce fuel consumption by approximately 50% relative to conventional ceramic-fiber-based furnaces. Additionally, the sharply decreased exhaust-gas reduces CO₂ emissions.

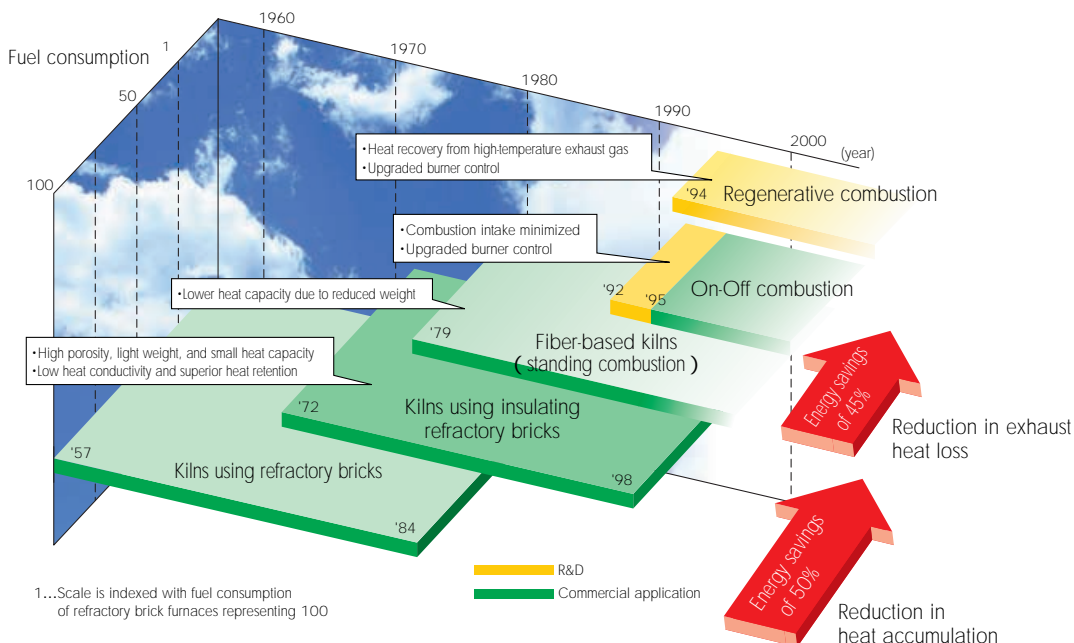
Efficient use of a combustion furnace's residual heat

The residual heat in a combustion furnace contains a substantial amount of energy. To utilize such energy efficiently, NGK converts the residual heat for use in the hot-drying process, which is indispensable in ceramics manufacturing. (For more information, see the Production Process Chart on page 8.)

CO₂ output reduced through a change in fuel

By changing the fuel used in its combustion furnace, from oil to gas, NGK's Chita Plant was able to reduce its CO₂ emissions drastically; even better, SO_x emissions were completely eliminated. All boilers at NGK now use LNG, and NGK's AC and Komaki plants are now working to change fuel types as well.

Development of NGK's energy-conservation technologies (for shuttle kilns)





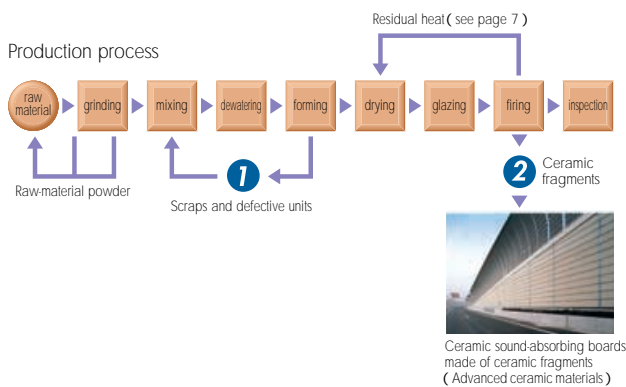
Resource Conservation and Recycling

NGK is promoting efficient use of resources and reduced industrial-waste output. We have achieved complete recycling by reusing all production-related wastes, such as scraps from the forming process. Furthermore, industrial-wastes are collected from our clients and are recycled in an effort to cut our emissions output to zero.

Complete recycling on the production line — Insulators and HONEYCERAM® Plant —

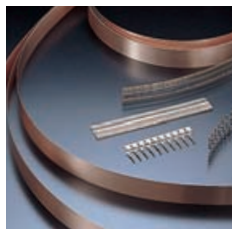
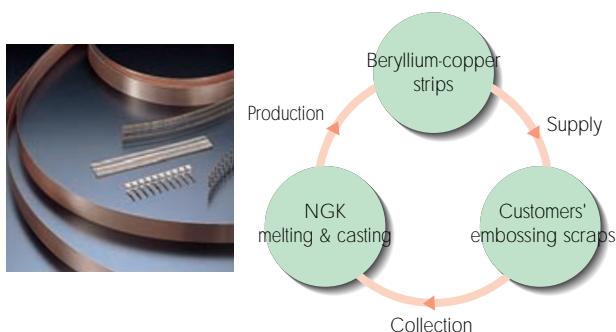
Scraps and defective units generated during the forming process are returned to the mixing area, then entirely reused. (1)

If already fired, defective units (ceramic fragments) are recycled into refractory raw materials, such as bricks and aggregate, for use in sound-absorbing or sound-diffusing boards. (2)



Initiative to collect and reuse scrap — Beryllium-copper Plant —

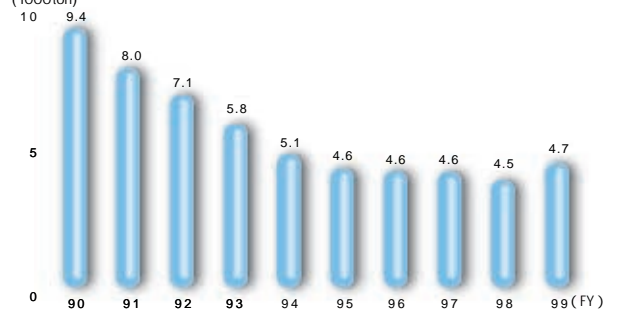
Beryllium-copper strips are typically processed for use in compact electronic parts and similar goods. Due to the precise nature of the production process, large amounts of scrap are generated during the embossing phase. NGK collects this embossing-related scrap from our customers and reuses it.



Industrial waste and recycling

NGK's 1st Industrial Waste Reduction Project (1990-1995) achieved a 51% reduction in industrial waste produced by the company. The 2nd Industrial Waste Reduction Project is aiming at an additional 30% reduction by fiscal 2000. However, the development of new products and increases in their production volume will make achieving that goal very difficult. We will thus take more drastic measures to cut down on industrial waste. NGK is now recycling about 70% of its industrial waste, with stricter countermeasures taken against waste oil and material fragments. In wastepaper reduction, NGK has achieved 100% recycling since October 1998 by means of thorough refuse sorting.

Change in NGK's industrial waste output (1000ton)



Industrial waste output is increasing due to product diversification.

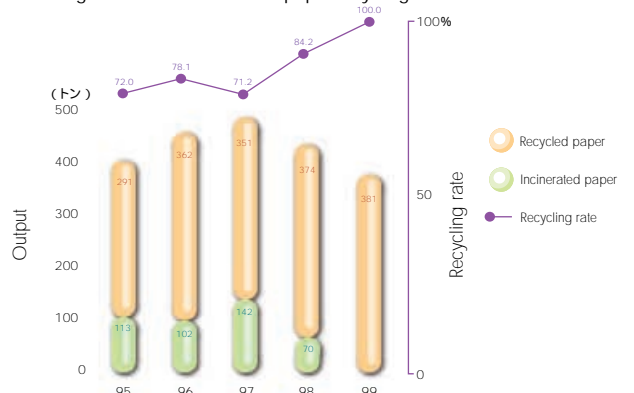
Recycling of industrial waste (FY 1999)

	Industrial	Sludge	Glass, Ceramics	Slag	Waste plastics	Waste oil	Waste acid, Waste alkali	Total
Output	8,130	5,011	47	1,088	121	572	14,969	
Recycled amount	5,647	4,488	47	0	43	0	10,225	
Rate	69%	90%	100%	0%	36%	0%	68%	
Main use	Materials for glazed pipes and roof tiles	Refractories Aggregate materials	Cement materials	—	B-class recycled products Low-energy fuel	—	—	

(Unit: tons/year)

NGK's countermeasures against waste plastics, waste acid, and waste alkali are reducing the output of industrial waste as well as the need for recycling. In fiscal 2000, we will consider the introduction of thermal recycling to convert waste plastics into fuel.

Change in the amount of wastepaper recycling



100% of wastepaper has been recycled since October 1998.



Reducing Environmental Impact

Another of NGK's goals is to reduce the environmental load of all our products and facilities to as close to zero as possible. To do this, we implement fundamental solutions starting from the design process. Products and facilities are approved only after extensive simulations that assess the production process as well as related applications. Through such careful planning, NGK seeks to minimize environmental impact while also enhancing the quality of its products.

Disuse of waste incinerator

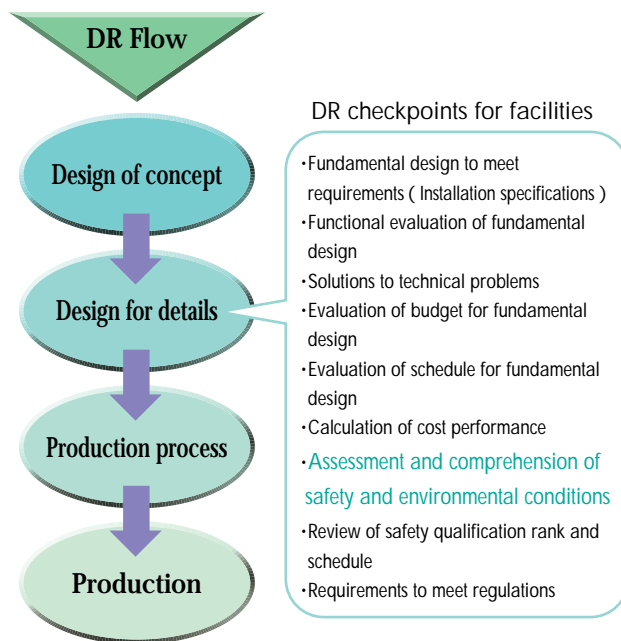
Before the Law Concerning Special Measures against Dioxins was enacted in July 1999, NGK had already stopped using waste incinerators in 1998.

Rapid removal of CFCs and Trichloroethane

NGK stopped using 1,1,1-trichloroethane and other ozone-depleting chlorofluorocarbons (CFCs) in 1994, prior to the Montreal Protocol, replacing them with environmentally friendly substances such as water-based detergents. All our replacement materials are completely ozone-safe.

Working to reduce the environmental impact

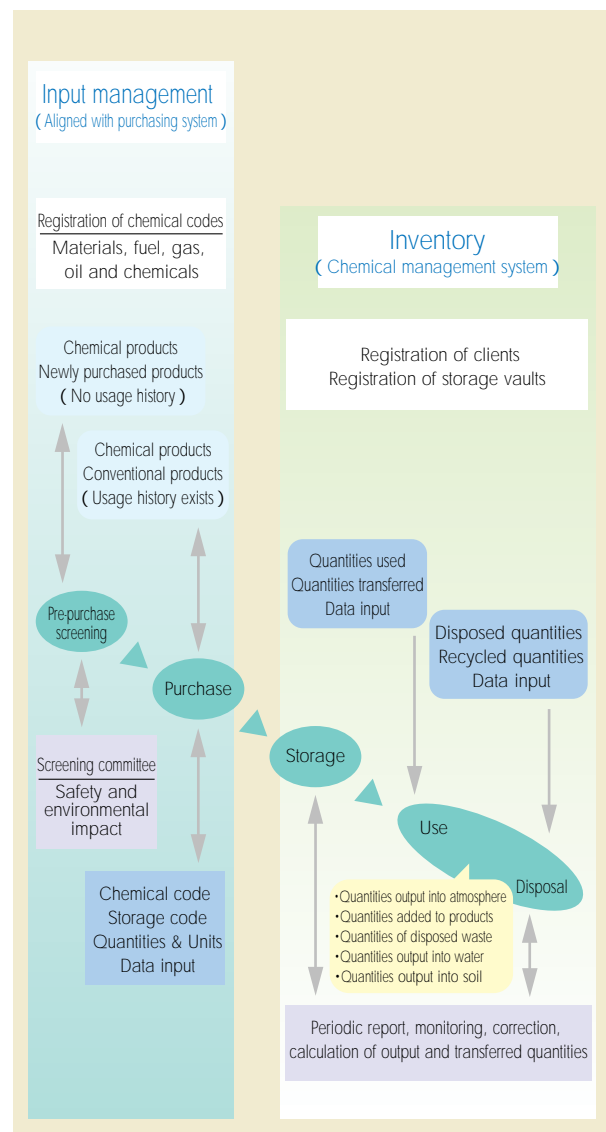
In an effort to develop new products and manufacturing technologies imposing less of a burden on the environment, NGK introduced a new concept in 1998: Design-Review (DR). The DR concept calls for a "design-review" stage at every step in the product development process, in which teams from the Design, Development, Production, and Sales areas all meet to discuss potential concerns. Among the topics discussed are measures to reduce pollution and industrial-waste output.





Management of Chemical Substances

There are serious concerns about how some chemicals affect human health, the ecosystem, and the global environment, and we must monitor the output of these chemicals more accurately than ever before. NGK has initiated a chemical management system as part of its Environmental Management System. According to this system, NGK strictly controls not only the chemicals that are subject to Pollutant Release and Transfer Register (PRTR), but any other chemical that requires appropriate management under environmental management, labor safety, or Fire Defense Law. NGK has also implemented strict control of each step in the purchase, transfer, storage, use and disposal processes. NGK continues to reduce quantity of chemicals consumed and related emissions.



NGK's chemical management system works in conjunction with our existing online purchase system [AFICS]. More than 7,000 chemicals are registered in the system. When the quantities purchased and consumed are input, the transferred and emitted amounts are automatically calculated. Prior to the new purchase of chemicals, comprehensive safety and environmental impact studies are conducted. All purchased chemicals are then carefully stored in one of NGK's 1,200 storage vaults.



Green Purchasing

NGK recognizes its responsibility both as a supplier and as a consumer of resources. We have thus adopted the policy of "Reduce, Reuse, and Recycle," and green purchasing is an important part of this effort. In October 1999, we established the Green Purchasing Commission and formed the "Green Purchasing Policy" and "Green Purchasing Guidelines" to coordinate with our suppliers.

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.

Green Purchasing Guidelines

NGK refers to the guidelines of the Green Purchasing Network (GPN) and gives priority to products and services that contribute to environmental conservation such as saving energy and resources.

NGK investigates the environmental conservation activities of each supplier to select Green Suppliers; preference will be given to these suppliers starting in 2001.

Activities of Green Purchasing Committee

NGK has already approved and started using about 50 "green" consumables (), including office and stationary supplies. NGK will continue adding to its Green Product List and start full-scale implementation in autumn 2000. Other products are also planned for in-house use, including work clothes and business cards designed to NGK's specifications. ()

For production materials and equipment, we will complete an investigation and evaluation of our suppliers' environmental activities by the end of the current fiscal year. From the next fiscal year, we will start giving priority to Green Suppliers and implementing Green Purchasing on a trial basis.

① Green stationary
Pencils, ball-point pens, automatic pencils, lead refills, highlighters, binders, file holders, businesscard holders, rulers, cutting mats, copy paper, notebooks, paper stickers, etc.

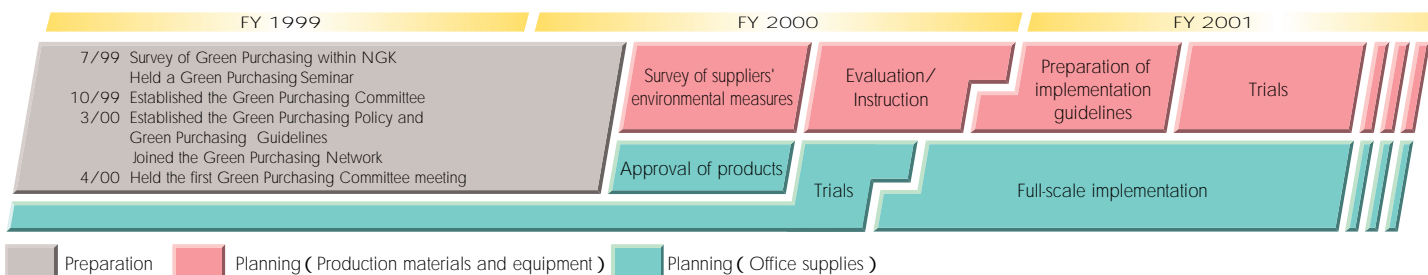
② Other purchases that meet NGK's specifications

- Work clothes** •Promote the purchase of work clothes and caps made from PET (polyethylene terephthalate) bottles.
- Business cards** •Print cards on 100% recycled paper.
- Brochures and envelopes** •Promote the use of 100% recycled paper and soy ink to reduce emissions of Volatile Organic Compounds (VOCs).
- Schedule books** •Use 100% recycled paper, soy ink, and covers that are made of biodegradable cornstarch resin.
- Business diaries** •Use 100% recycled paper, soy ink, and covers that are made of olefinic elastomer resin that does not generate dioxins when burned.
- CM character goods** •NGK's commercial character "Kuroko" is used for cellphone straps and antenna mascots. The "Kuroko" itself is made of olefinic elastomer resin.
- Company cars** •Hybrid cars and forklifts equipped with DPFs have already been introduced.

Classification of Green Suppliers

Level 1	Suppliers that comply with Industrial Safety and Health Law, Fire Defense Law, anti-pollution laws, Container and Packaging Recycling Law, and Waste Management Law
Level 2	Suppliers incorporating environmental conservation into their regular business activities
Level 3-1	Suppliers making an organized effort to promote environmental conservation
Level 3-2	Suppliers planning to apply for ISO 14001, those being examined, or those who have already received ISO 14001 certification

Schedule of green purchasing activities





Training and Education of Employees

At NGK, we believe that individual action is essential in environmental matters. Each of us has a role to play in learning more about environmental issues, in particular, how we can help preserve the global environment. NGK's campaign for the environment relies on several elements, including project teams, Quality System (QS) activities, internal newsletters, and company information videos.

Sorting & collection of office refuse

NGK production bases in Nagoya, Chita, and Komaki have all been equipped with "RISAPOST" recycling stations, so that employees can separate their trash into appropriate recycling containers. Since October 1998, all three workplaces have achieved 100% recycling of paper waste. Even thermal paper and wrapping paper are recycled and used to create a special toilet tissue (made entirely from recycled material) for use within the company.



The NGK headquarters building receives a "Commendation for Superior Garbage Reduction" from the Nagoya Citizens' Assembly on Garbage Reduction.

Environmental Partnership Organization Club

Fourteen companies in the Chubu area are taking an aggressive approach to lower environmental impact and have established the Environmental Partnership Organization Club (EPOC), a cross-industrial association committed to the development of a recycling-based, sustainable society. NGK is one of the founding members of EPOC. The Club's main goals are to turn the Chubu area into one of the most environmentally committed regions in the world, and to serve as a center for distributing information through lectures, seminars, and exchange activities.



Masaharu Shibata, NGK's President and CEO and vice-chairperson of EPOC, distributes shopping bags made of recycled cloth in a shopping area. This is one of many activities designed to step up environmental consciousness.

The "Paperless Office" campaign

NGK has sharply reduced paper usage by emphasizing the use of "paperless" office technology. Official notices and documents that used to be circulated in hard-copy form, for example, are now distributed over an intranet system. For meetings, employees are encouraged to use projectors instead of distributing paper handouts. When printed material must be distributed internally, employees save paper by printing the documents on the blank side of used paper.

Awards

In "Successful Cases of Energy Conservation" sponsored by the Energy Conservation Center, NGK was recognized for its Quality System activities, which include measures to counter industrial waste and improve energy conservation.

"Reduction of electric power use in kiln fans"
1998 Chairman of Energy Conservation Center Prize
NGK has focused on the reduction of electric power use in insulator kilns, and achieved a 27% reduction by employing automatic on-off control of fans, and inverter control of exhaust fans.

"Energy conservation of kilns"
1999 Director-General of Chubu Bureau of International Trade and Industry Prize
NGK monitored air intake and reviewed operation methods for exhaust-gas treatment equipment, and achieved a 40% reduction in fuel consumption, a 78% reduction in electricity consumption, and a 46% reduction in CO₂ emissions. In addition, switching from oil to LNG achieved a 100% reduction in SO_x emissions.

Improving environmental awareness

Individual awareness plays a key role in our efforts to address environmental problems. With this in mind, NGK offers the following educational initiatives for employees:

- A program to help engineers gain a better understanding of environmental regulations, so that they can support the Company's environmental efforts and responsibilities to society
- An Environmental Management System (EMS) program covering the main points of NGK's environmental policy. As part of the program, "Environment Cards" listing individual departmental and employee goals are distributed to all attendees. Special emphasis on environmental issues in company newsletters and videos.



Environmental Accounting

Environmental accounting is a tool used to identify and manage activities related to environmental measures and conservation. At NGK, we tabulate and analyze the costs of our environmental conservation activities to ensure their efficiency and sustainability.

Environmental Cost

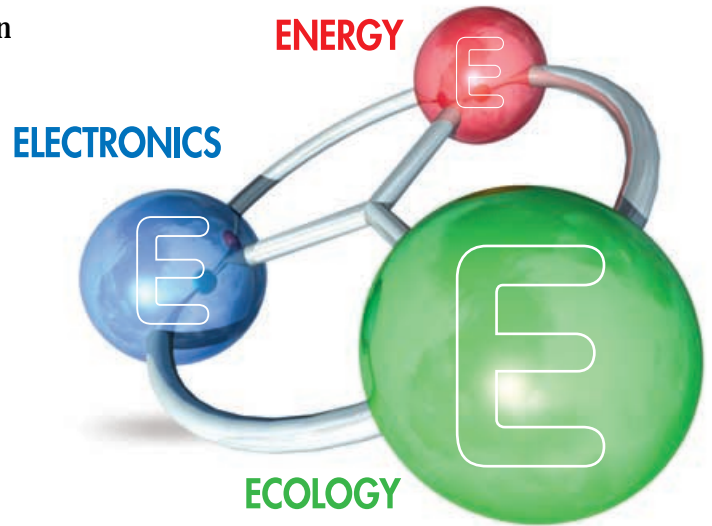
Category	FY 1999		
	Unit: million yen		Contents
	Capital Investment	Expense	
Pollution prevention costs	235	381	Equipment for pollution prevention, Maintenance
Global environmental conservation costs	133	0	Equipment for energy conservation
Resources circulation costs	44	172	Treatment equipment for industrial and general waste, Cost of disposal, Collection cost for ceramic fragments, Recycling cost of clay
Business area costs	412	553	
Upstream/downstream costs	0	0	Environmental impact reduction in the use and disposal of manufactured and sold products
Management activity costs	0	163	Maintenance of ISO, Management of environmental organization
Research and development costs	27	144	R&D on energy-saving combustion systems, R&D on PRTR systems
Social activity costs	0	165	Greening, Production of an environmental report
Environmental damage costs	0	55	Recovery from soil pollution, Compensation for pollution
Subtotal	439	1,080	
Total	1,519		

In accordance with the guidelines of the Japan Environment Agency, the above table shows only actual environmental cost in fiscal 1999. Note that R&D expenditures for environment-related products are excluded. The breakdown is as follows: ¥1.08 billion for expenses such as pollution prevention costs and ¥440 million for capital investment. In addition, environmental effects will be calculated in fiscal 2000 according to the Environment Agency guidelines. NGK will soon introduce environmental accounting to its affiliated companies.

Environmentally Friendly Products

NGK is committed to a future of global ecological harmony, in which an abundant society can coexist with nature.

Toward this end, we seek to manufacture products that promote environmental protection and energy conservation.



NAS^R Battery

This is a new electrical energy-storage system made using Beta-alumina ceramics. Electricity charges the NAS Battery during off-peak times, and this power is discharged during peak times. This system thus reduces power fluctuations by load leveling and improves the operating efficiency of power-generation units and transmission & distribution facilities.



HONEYCERAM^R

NGK has already shipped more than 400 million HONEYCERAM ceramic substrates for automotive catalytic converters. HONEYCERAM with ultra-thin walls of 0.10mm and 0.05mm thickness offer higher performance than conventional HONEYCERAM with a wall thickness of 0.15 mm in response to regulatory requirements for improved exhaust-gas purification immediately after engine startup.



DPF

With slight modifications, HONEYCERAM can remove diesel particulates from diesel-engine exhaust. The Diesel Particulate Filter (DPF) collects particulate matter (PM) to be burned and eliminated through the regeneration process. NGK DPFs are already being used in forklifts and municipal buses and will soon be widely equipped in diesel trucks and passenger cars.



Ceramic Membrane Filtration Systems

NGK uses ceramic membrane filters to produce compact and high-performance water purification systems capable of removing viruses and colloids efficiently. Ceramic membranes are highly durable, and their strong purification ability can be maintained by cleaning the clogged pores.



HRS

The Hi-cycle Regenerative combustion System (HRS) is an energy saving combustion system which contains a ceramic honeycomb to exchange the heat from exhaust gas to combustion air by switching the burner operation mode. This system enables the reduction of fuel consumption and CO₂ emissions.



NEWSIC[®]

Pores in SiC refractories are filled with metallurgical silicon. NEWSIC is oxidation resistant, highly durable, and enables long-term use in high-temperature environments. NEWSIC is five times stronger than conventional SiC refractories, and therefore enables the design of thin, lightweight, and energy-saving refractory structures.



Fluidized Bed Gasification and Melting Systems

The thermal decomposition and gasification of refuse generates gas, which is then used to melt the remaining material at 1,300 to 1,400 and turn it into slag. This system lowers fuel use and CO₂ emissions more effectively than one that processes incinerator ash in a melting furnace. In addition, thermal decomposition at high temperature also reduces toxic substances such as dioxins.



EXCERAM[®] Lightweight Setter

EXCERAM is a refractory that is 30% lighter than conventional setters due to the increased porosity of its alumina-mullite materials. These refractories absorb less heat during the firing process, and can therefore reduce fuel consumption and CO₂ emissions.



Wastewater Treatment Systems for Removing Dioxin Emissions

This system efficiently decomposes and removes dioxins and endocrine disruptors contained in water. Manganese dioxide that is baked onto the ceramic support functions as a catalyst to oxidize, decompose, and neutralize dioxins as well as eliminate Chemical Oxygen Demand (COD).



Recycle Plaza

At the Recycle Plaza, reusable bottles and plastic bottles are automatically sorted by color and material. Recycled building and paving materials were used in the construction of this facility.



Permeable Interlocking Block Manufacturing Systems

This system converts the ash from incinerated sludge produced in the sewage treatment process into highly permeable blocks. These blocks offer an innovative solution to the problems posed by excess rainfall.



Wastewater Treatment System

NGK has designed new wastewater treatment systems that allow large volumes of sludge to be incinerated, leaving only pollution-free byproducts. One of our more recent advances is a circulating fluidized system which is both compact and energy-efficient.



CULLET-HISONE[®]

Cullet is a recycled material made from used glass such as bottles. It makes an efficient sound absorber and is currently used along elevated areas of the Tokyo Metropolitan Subway, Mita line. In 1996, CULLET-HISONE received "Eco Mark" certification from the Japan Environment Association.



NGK's Performance vs. Current Pollution Control Standards

Nagoya Plant

Division	Item	Standard	Actual value		
			FY 1997	FY 1998	FY 1999
Exhaust gas	Sulfur produced in combustion (%)	0.1*	0.10	0.03	0.03
	NOx (ppm)	180	95	72	146
	Soot and dust (g/Nm ³)	0.15	0.002	0.002	0.005
Waste-water	pH	5.7~8.7	6.8~7.6	6.6~7.8	6.7~7.5
	SS (mg/l)	600	5~39	5~32	4~53
	BOD (mg/l)	600	1~21	1~32	1~6
	Oil (mg/l)	5	N.D.~4.5	N.D.~1.3	N.D.~4.8
	Copper (mg/l)	3	N.D.	0.01~0.03	N.D.~0.01
	Zinc (mg/l)	5	0.02~0.05	0.07~0.33	0.03~0.04
	Soluble iron (mg/l)	10	N.D.	N.D.~0.1	N.D.
	Soluble manganese (mg/l)	10	N.D.~0.2	N.D.	N.D.
	Cyanide (mg/l)	1	N.D.	N.D.	N.D.
	Lead (mg/l)	0.1	N.D.	N.D.	N.D.
	Hexavalent chromium (mg/l)	0.5	N.D.	N.D.	N.D.
	Total mercury (mg/l)	0.005	N.D.	N.D.	N.D.~0.0012
	Total chromium (mg/l)	2	N.D.	N.D.	N.D.
	Fluorine (mg/l)	15	N.D.~0.1	0.1~1.4	N.D.~0.1
	Trichloroethylene (mg/l)	0.3	N.D.	N.D.	N.D.
	Tetrachloroethylene (mg/l)	0.1	N.D.	N.D.	N.D.
1,1,1-trichloroethane (mg/l)	3	N.D.	N.D.	N.D.	
Noise	Day (dB)	70	54~69 ¹	53~69 ¹	54~69 ¹
	Night (dB)	60	49~60 ¹	53~62 ¹	51~60 ¹
Vibration	Day (dB)	70	37~51	37~55	34~54
	Night (dB)	65	37~45	35~63	38~56
Pumped underground water (m ³ /day)		330	180	152	118 ²

1...Including background noise 2...Switching to industrial water in December 1999

Relevant laws and agreements

Exhaust gas : Aichi prefecture regulations (* Pollution control agreement with Nagoya)
Wastewater : Sewage water law
Noise : Regulations of Nagoya
Vibration : Aichi Prefecture regulations (voluntary)
Pumped underground water : Aichi prefecture regulations

Chita Plant

Division	Item	Standard	Actual value			
			FY 1997	FY 1998	FY 1999	
Exhaust gas	Sulfur produced in combustion (%)	0.5	Shifted to LNG	Shifted to LNG	Shifted to LNG	
	NOx (ppm)	150	93	110	50	
	Soot and dust (g/Nm ³)	0.2	0.08	0.055	<0.002	
	Be	Total plant output (g/day)	10	0.475~0.660	0.477~0.571	0.483~0.596
		Output concentration in residential areas (µg/Nm ³)	0.01	0.00004~0.00008	0.00003~0.00008	0.00005~0.00012
Waste-water	pH	5.8~8.6	6.6~7.3	6.8~7.2	6.8~7.5	
	SS (mg/l)	30	2~8	2~6	1~7	
	COD (mg/l)	20	2~3	2~5	2~4	
	Oil (mg/l)	2	0.5~0.6	N.D.	N.D.~0.8	
	Copper (mg/l)	1	0.01~0.03	0.01~0.03	0.01~0.02	
	Zinc (mg/l)	1	0.03~0.10	0.05~0.09	0.02~0.14	
	Soluble iron (mg/l)	0.5	0.1~0.5	0.1~0.4	N.D.~0.1	
	Cadmium (mg/l)	0.1*	N.D.	N.D.	N.D.	
	Cyanide (mg/l)	1*	N.D.	N.D.	N.D.	
	Lead (mg/l)	0.1*	N.D.	N.D.	N.D.	
	Hexavalent chromium (mg/l)	0.5*	N.D.	N.D.	N.D.	
	Total mercury (mg/l)	0.005*	N.D.	N.D.	N.D.	
	Total chromium (mg/l)	2*	N.D.	N.D.	N.D.	
	Fluorine (mg/l)	15*	0.2~0.3	0.1~0.3	0.3~0.5	
	Nitrogen content (mg/l)	10**	2.3~4.8	2.1~6.1	2.7~7.6	
	Phosphorus content (mg/l)	1**	0.05~0.60	0.03~0.21	0.04~0.17	
	Trichloroethylene (mg/l)	0.3*	N.D.	N.D.	N.D.	
Tetrachloroethylene (mg/l)	0.1*	N.D.	N.D.	N.D.		
1,1,1-trichloroethane (mg/l)	3*	N.D.	N.D.	N.D.		
Noise	Day (dB)	65	44~64	44~63	50~63	
	Night (dB)	65	42~65	42~62	43~62	
Vibration	Day (dB)	70	<45	<45	<45	
	Night (dB)	70	<45	<45	<45	

Relevant laws and agreements

Exhaust gas : Pollution control agreement with Handa
Wastewater : Pollution control agreement with Handa (* Water pollution control law ** Aichi prefecture guidelines)
Noise : Pollution control agreement with Handa
Vibration : Pollution control agreement with Handa

Komaki Plant

Division	Item	Standard	Actual value		
			FY 1997	FY 1998	FY 1999
Exhaust gas	Sulfur produced in combustion (%)	0.6	0.09	0.09	0.10
	NOx (ppm)	170	100	100	120
	Soot and dust (g/Nm ³)	0.2	0.02	0.01	0.01
Waste-water	pH	5.8~8.0	6.4~7.8	6.3~7.8	6.3~7.7
	SS (mg/l)	80	1~7	N.D.~7	N.D.~4
	BOD (mg/l)	17	1~4	N.D.~4	N.D.~3
	Oil (mg/l)	2	0.1~0.6	N.D.~0.7	N.D.~0.7
	Copper (mg/l)	3 *	N.D.~0.02	N.D.~0.01	N.D.
	Zinc (mg/l)	3	0.1~0.3	N.D.~0.5	0.04~0.67
	Soluble iron (mg/l)	10 *	0.06~0.34	0.03~0.24	0.05~0.31
	Soluble manganese (mg/l)	10 *	N.D.~0.15	N.D.~0.07	0.03~0.06
	Cadmium (mg/l)	0.1 *	N.D.	N.D.	N.D.
	Lead (mg/l)	0.1 *	N.D.	N.D.	N.D.
	Total chromium (mg/l)	2 *	N.D.~0.07	N.D.~0.02	N.D.~0.03
	Fluorine (mg/l)	15 *	N.D.~0.5	N.D.	N.D.~2.7
	Nitrogen content (mg/l)	10 **	2.1~2.7	1.4~3.0	1.3~2.6
	Phosphorus content (mg/l)	1 **	0.06~0.25	0.03~0.30	0.02~0.17
	Dichloromethane (mg/l)	0.2 *	N.D.	N.D.	N.D.
Noise	Day (dB)	65	51~65 ³	53~63 ³	50~63 ³
	Night (dB)	55	45~62 ³	48~62 ³	49~60 ³
Vibration	Day (dB)	65	—	25~36	23~36
	Night (dB)	60	—	—	—
Pumped underground water (m ³ /day)		4023	3150	3145	2698

3...Including background noise

Relevant laws and agreements

Exhaust gas : Pollution control agreement with Komaki

Wastewater : Pollution control agreement with Komaki (* Water pollution control law ** Aichi prefecture guidelines)

Noise : Aichi prefecture regulations

Vibration : Aichi prefecture regulations (voluntary)

Pumped underground water : Aichi prefecture regulations

Nagoya Plant

Address: 2-56, Suda-cho Mizuho, Nagoya

Products: Ceramic honeycomb substrate for automotive catalytic converters (HONEYCERAM[®])
NAS[®] battery, 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



Komaki Plant

Address: 1155, Tagami, Futatabi, Komaki, Aichi

Products: Suspension insulators for electrical transmission, equipment for electrical transformation and distribution, translucent alumina (HICERAM[®])



SS : Suspended Solid

BOD : Biochemical Oxygen Demand

COD : Chemical Oxygen Demand

N.D. : Not Detected

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