



**NSK Ltd.**  
Environmental  
Report  
**2003**

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## Reporting Policy

This report has been compiled with the aim of presenting our environmental activities in a comprehensible manner to our various stakeholders, including investors, shareholders, suppliers, and citizens residing near our factories.

Furthermore, as a manufacturer of parts for machines and automobiles, we believe it is our duty to contribute to the environment through our products and to reduce the environmental impact of our manufacturing divisions. This year's environmental report focuses on our efforts in products and manufacturing, as well as the efforts of each manufacturing site.

### 1. Maintaining Objectivity

In order to present our environmental activities in an objective manner, this year's report was compiled in accordance with the Japanese Ministry of the Environment's "Environmental Reporting Guidelines."

### 2. Maintaining Transparency

In this year's report, we have also included various complaints concerning environmental matters, reflecting our belief of the importance of maintaining a high level of transparency in our activities.

### Note on 2003 Edition

In the course of compiling the 2003 Annual Report, our third such report, we have made an effort to incorporate the opinions of our stakeholders as received through surveys etc. We also made various adjustments in the design and layout of the report in order to improve its overall visual appeal and readability. Furthermore, we also strived to provide a clear description of the relationship between our efforts in products and environmental conservation, as well as information on our activities and relationship with society.

### Scope of report

The report covers the activities of NSK, our subsidiaries, manufacturing and distribution subsidiaries in which we have a stake of 50% or more. We have added NSK Logistics Co., Ltd. to the list of companies through which we perform environmental activities in line with the efforts made to promote environmental activities in distribution since FY2002. For details, please refer to page 48.

### Period of coverage

The report covers FY2002 (April 2002 to March 2003).

### Date of Issue

December 2003 (Date of issue of last year's report: Nov. 2002. Date of issue of next year's report: Dec. 2004)

## Promoting Environmental Management as a Matter of Prime Importance

NSK is in the midst of establishing a corporate structure with sufficient strength to surmount the waves of change sweeping through the global economy, and towards this end, have established a “Restructuring Management Office” within the company.

Amid these circumstances, however, we still hold environmental efforts as an essential part of our corporate activities, and have positioned environmental management as a matter of prime importance. As part of our effort to improve our overall level of corporate governance, we have recently established an Audit Committee and an Audit Office, the first step in our development of a new auditing system. We have also designated environmental management as one of the four main audit items to be covered under the new auditing system, which we hope will lead to more widespread practice of environmental management within the NSK Group.

Under our corporate philosophy of “Contributing to Society through Motion & Control,” our objective is to become a system supplier who can actively offer solutions based on our customers’ requirements. Considering the global scale of today’s environmental problems, we have little choice but to leave behind our current economic system based on mass production and mass consumption in favor of a recycling-oriented economic system and a sustainable society. In the midst of this change, we believe our mission is to produce “products that contribute to society.”

Our bearings and other products each contribute to the environment by reducing friction. We hope that our stakeholders will appreciate our environmental management objective, and we hope to continue to “contribute to the development of a recycle-oriented society,” through improvement in R&D, as well as through our efforts to improve resource efficiency during the manufacturing stage.

The environmental management that we practice at NSK is still at an elementary stage. We welcome any advice or comments that our stakeholders, including investors, shareholders, suppliers, may have regarding its content, and hope to use your constructive ideas to further improve our environmental management.

September 2003



A handwritten signature in black ink, appearing to read 'S. Aoki', written in a cursive style.

President & CEO

# Corporate Profile

## ■ Corporate Overview

**Company Name** NSK Ltd.

**Establishment** November 8, 1916

**Capital** ¥67.1 billion (As of March 31, 2003)

**Head Office** 1-6-3 Ohsaki, Shinagawa-ku, Tokyo 141-8560, Japan  
TEL +81-3-3779-7111

**President & CEO** Seiichi Asaka

**Employees** Consolidated: 20,351 (As of March 31, 2003)  
Unconsolidated: 6,438 (As of March 31, 2003)

**Group Companies** No. of Companies: 98 (As of March 31, 2003)  
(Domestic companies, including NSK: 36)  
(Overseas companies: 62)

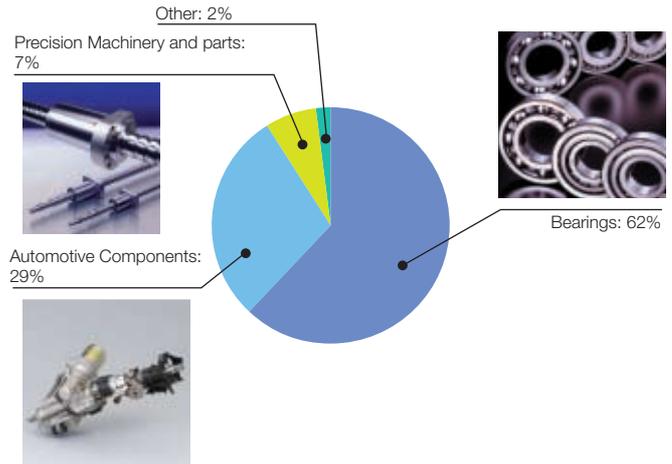
**Net Sales** Consolidated: ¥522.8 billion (As of March 31, 2003)  
Unconsolidated: ¥332.4 billion (As of March 31, 2003)

**Website** <http://www.nsk.com>

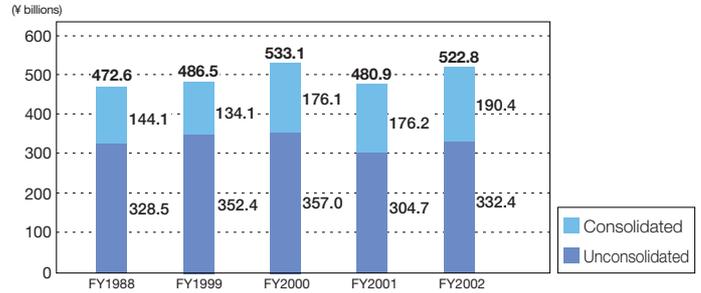
## ■ Main Lines of Business of the NSK Group

Manufacture and sale of bearings, automotive components, precision machinery and parts, etc.

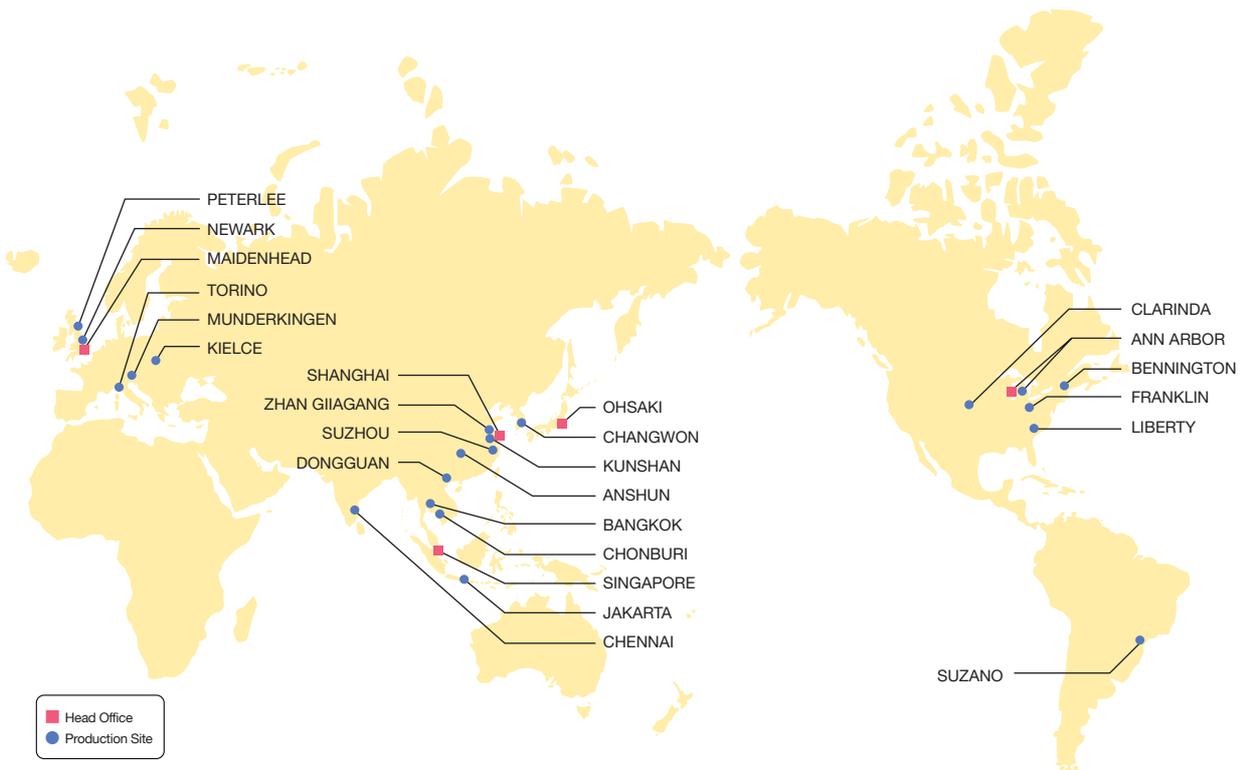
### Breakdown of net sales by product (in FY 2002)



### Sales Trend



## ■ NSK Group Production Sites and Head Offices



Note: For details regarding Japan domestic production sites, please refer to page 14.

# Corporate Philosophy

NSK aims to contribute to the well-being and safety of societies and to protect the global environment through its innovative technology integrating Motion and Control. We are guided by our vision of NSK as a truly international enterprise, and working across national boundaries to improve relationships between people throughout the world.

## NSK Environmental Policy

Our commitment to environmental management forms the basis of our existence and our pursuits. We are determined to take independent and assertive actions.

### 1. Overall Goals

To create a harmony between people and the Earth by developing environmentally friendly manufacturing processes and technology, such as our tribology friction control technology, using the full efforts of all employees and all departments in our company.

### 2. Reduction of Negative Environmental Impact

To establish and continually improve the environmental management system, comply with regulations, prevent pollution and reduce environmental impact.

### 3. Contribution to Societies

To be a good global corporate citizen, contributing to the social development of countries and communities where we operate, and also to advance the realization of affluent societies that are in harmony with the environment.

## Environmental Code of Conduct

1. To reform environmental management organizations, by improving operational systems and clarifying chains of responsibility.
2. To develop products and technology that will decrease environmental impact.
3. To tackle environmental protection more aggressively by setting and adhering to high internal standards in addition to complying with laws, ordinances and agreements.
4. To ensure energy and resource conservation, waste reduction, and recycling in all spheres of our business operations.
5. To convert from ozone-depleting and hazardous chemical substances to environmentally friendly alternative substances, and where possible switch to alternative processes and technologies.
6. To communicate with environmental authorities and local communities in order to receive insightful and constructive opinions.
7. To contribute to local communities through participation in social environmental activities.
8. To encourage employees to understand our environmental policies and to ensure an environmental mindset in the company through education and internal communications.
9. To disclose the ongoing status of our environmental management activities to the public when necessary.

Originally compiled: December 12, 1997

Last revised: June 27, 2002

# For people and for the environment, the services performed by bearings are immeasurable.

As the world turns, people and objects are constantly on the move. The essential requirement for making objects move is motive power, and bearings ensure that such motive power can be delivered in a smooth manner. Bearings support our daily activities, and make a significant contribution to our standard of living and conservation of the global environment.

## Bearings—essential elements to friction-free rotation

In our daily lives, we are surrounded by machines with rotating parts, most of which contain axles supported by bearings. Bearings reduce friction by making use of the rotating contact action of balls, thereby enabling smooth rotation. Bearings come in all shapes and sizes—from a few millimeters in diameter to huge bearings 5 meters wide. There are some 100,000 different types of bearings. Although the outside appearance of bearings has changed little over the years, the materials and performance of bearings have steadily improved with the improvement of technology.

## Bearings—helping us in places close to home

Use of bearings is not limited to special machinery and equipment—they play an active role in numerous situations, being used in everything from home appliances such as personal computers, DVD players, washing machines and vacuum cleaners and means of transport such as automobiles, locomotives, aircraft, to industrial machinery such as machine tools, looms, and robots, as well as large industrial machinery.

Bearings are also at the heart of a broad variety of mechanisms supporting advanced technology.

It has been 90 years since we first succeeded in making the first domestically produced ball bearings. Used in numerous rotational applications, the production of bearings has expanded to the point where they are referred to as an “industry staple.”

### Special Column

#### “Tribology,” the Foundation of Energy-Saving Research

First proposed in England in 1966, Tribology is a form of energy conservation research encompassing friction, wear, lubricants and materials. The initial report suggested that England would be able to make an annual savings of 515 million pounds (1.3% of the nation's GNP at the time) by reducing energy consumption through reduction of friction, and by reducing costs in labor, lubricating oils and machinery repair and maintenance costs. In 1997, a proposal for tribology was also made in America, suggesting that 2/3 of all the energy used in American industry was lost through friction and heat.

# Bearings—Helping to Reduce Worldwide Energy Consumption

The use of bearings goes back as far as the building of the Pyramids. Just how did they carry those huge stones? The answer is rollers. Even at the time, it was known that it is much easier to move objects on rollers than to try and drag them along the ground. The concept of rollers eventually led to the development of bearings. Bearings have been the source of progress throughout human history. Today, bearings contribute to conservation of energy and the global environment.

## 1 Energy-Conservation Effect

**Bearings have enabled Japan to save energy equivalent to 2.6% of GNP.**

Tribology, which began in England (See Special Column), began to make inroads in Japan in 1970. At the time it was suggested that improved energy efficiency could save the nation ¥2 trillion a year, the equivalent of 2.6% of the nation's GNP. Bearings and their efficiency are a key element of Tribology research, which aims to improve efficiency by creating bearings that are lighter, smaller, and of improved efficiency.

Automobiles use over 100 different bearings, most of which are rolling bearings. But what if these bearings were all replaced with simple plain bearings? It has been estimated that, even at 60km/h on flat ground, the point at which the energy saving effect of rolling bearings is smallest, when converted to crude oil, the amount of extra energy needed in Japan per year would be 480,000 kℓ (567 times the height of Mt. Fuji when measured in terms of oil drums stacked end-on-end).

## 2 Resource Conservation Effect

**Bearing development has reduced environmental impact.**

When considering the environment, it is necessary to reduce the environmental impact of a product throughout its entire lifecycle. This objective should not be considered solely a corporate responsibility, this should be the responsibility of all individuals who wish to help preserve the global environment.

Bearings are often made of recycled materials. Given that these recycled materials also include used bearings, once could say that bearings are recyclable products with superior resource-saving qualities. Although the outward appearances of bearings have changed little over the years, today's bearings offer substantially improved performance thanks to advancements in design, manufacturing processes, materials and lubricant technology. The function of bearings is to support load while allowing free rotation. Improving the loading performance of bearings helps to extend the life of machinery, reduce maintenance, and allow for compact, lightweight designs.

### Four Effects that Help the Environment

## 3 Clean Effect

**Helping to protect the earth through reduction in hazardous substances.**

Recent years have seen increased environmental problems stemming from hazardous substances such as mercury, lead, cadmium, arsenic and hexavalent chromium. Being made almost entirely of steel, bearings contain almost no hazardous substances.

Furthermore, as they are recycled after use, bearings also contribute greatly to the reduction of industrial waste problem. Recent years have also seen the development of special greases for use in bearings that can be converted to CO<sub>2</sub> and water through application of certain microbes, and solid lubricants that will not leak outside the bearing.

## 4 Comfort Effect

**Human comfort—an essential requirement**

Simply improving the functions and performance of a product does not necessarily mean it will be received favorably.

If, for example, the noise levels of fan motors of air conditioners and air cleaners were too great, they could interfere with one's sleep. At NSK, we have addressed this particular problem by improving the accuracy of bearing outer rings, inner rings and the balls themselves, thereby reducing vibration and noise. Substantial advancements have been made in the performance of bearings for air conditioner fan motors over the past two decades, the noise level in the year 2000 being about 60% less than what it was in 1980. This has resulted in a substantial improvement in the level of comfort afforded by such machines.

# NSK and the Environment—Aiming to Contribute

At NSK, we believe it is our duty to take the initiative in contributing to the development of a sustainable, recycling-oriented society, and are making efforts towards this on a Group level.

At the development and design stage, we perform lifecycle assessments (LCA), and strive to develop products with ever-lower levels of environmental impact throughout the entire product lifecycle. In FY2002, we added a further 15 items to our list of environmentally friendly products/technologies that satisfy our voluntary standards, bringing the total number to 80.

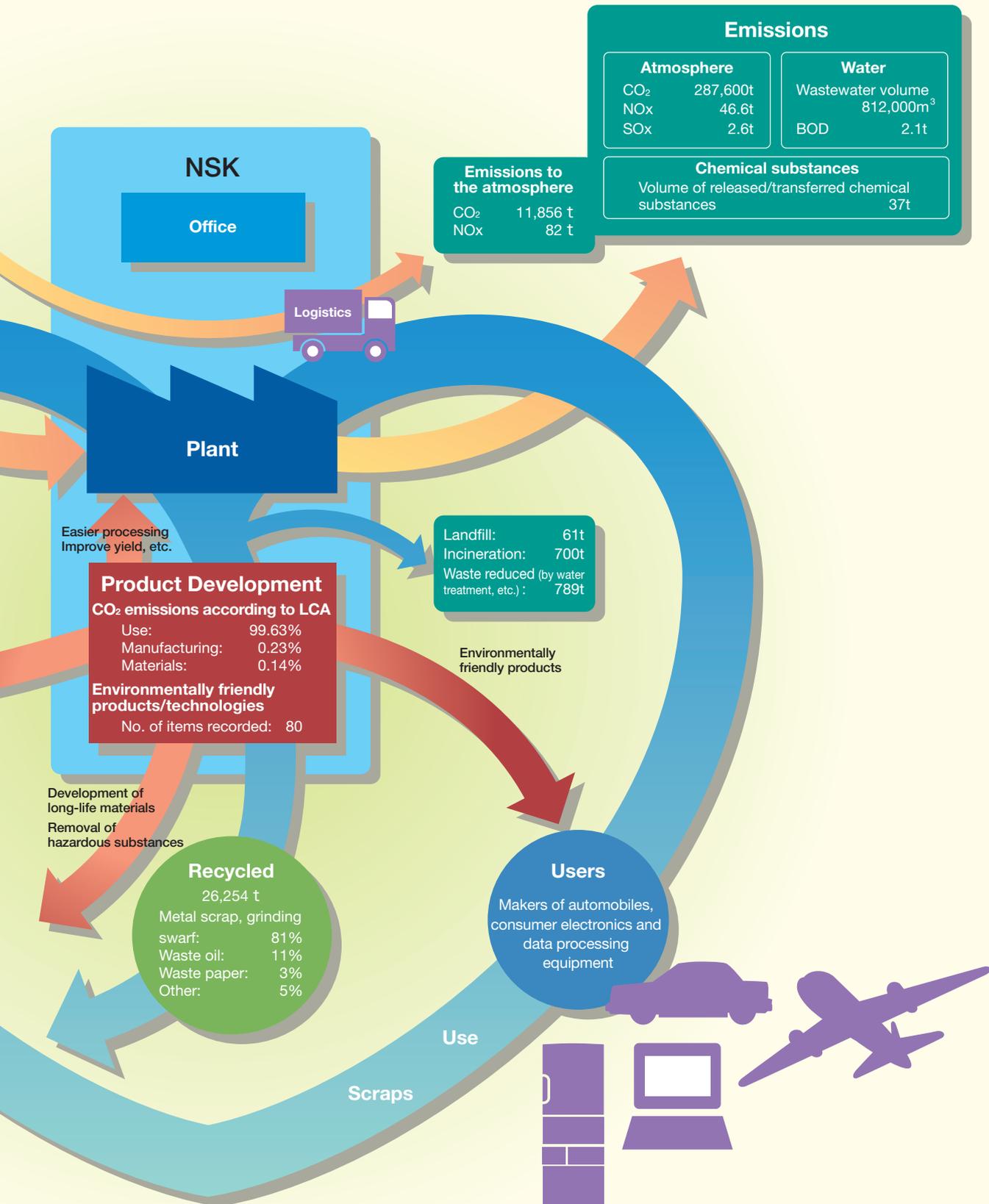
We have singled out the manufacturing process as the stage exerting the biggest effect on the environment, given the large amounts of energy and resources consumed and waste emitted at this stage. Our efforts at this stage include execution of energy-saving measures, waste and recycling measures and reduction of hazardous chemical substances. In FY2002 we achieved zero emissions at all production plants, reducing year-on-year landfill waste by 86%. Furthermore, following implementation of our chemical substance measures, we managed to reduce emissions of substances subject to PRTR law by 21%. We also improved the environmental soundness of our wastewater treatment facilities, reducing the amount of BOD released into rivers by 69%.

Despite these achievements, however, our consumption of resources and energy exceeded the amount consumed in FY2001. This is a result of increased production which offset the effects of our conservation effort.

In our continuing efforts to contribute to a recycling-oriented society, we will simultaneously expand our conservation activities to include our subsidiaries and overseas production plants and improve the level of these activities.



# to the Recycle-Oriented Society



## Our Environmental Management Efforts in FY2002

In June 2003, I assumed the position of Chairman of our Global Environment Protection Committee, which oversees the environmental management affairs of the NSK Group.

One of the key managerial reforms currently being pursued by the company is the promotion of environmental management. As part of our environmental management policy, we are currently implementing company-wide activities to reduce negative environmental impact at our production plants, improve the environmental performance of our products and expand environmental efforts to divisions not under direct control such as the Procurement Division.

In FY2002 we managed to achieve our basic targets for environmental management, including the achievement of zero emissions at all production plants one year ahead of schedule. Also during the year, our environmental efforts as a machine parts maker received praise from various domestic and overseas ratings agencies. The effects of these environmental achievements can now be seen throughout the entire company.

Nevertheless, we still have a little way to go before environmental management finds its way into the day-to-day activities of each and every employee. In order to address this situation, we have incorporated environmental management as an important audit item within our new auditing system, which we hope will lead to practice of environmental management throughout the entire Group. Furthermore, in the future, we intend to “actively develop environmentally friendly products” using “tribology technology,” one of the strengths of our company, and highly effective “environmental impact-reducing measures” not only in our own factories but those of our subsidiaries and overseas subsidiaries.

In addition to the content and achievements of our efforts in FY2002, this report also gives a comprehensive description of environmental efforts and the environmental aspects of our bearings. We have also made an effort to present detailed examples of the efforts of our Subcommittees and activities of our domestic and overseas sites.

We look forward to receiving your opinions and advice regarding the content of this report as a means of enhancing the quality of our future editions.



A handwritten signature in black ink, appearing to read 'Murata', written in a cursive style.

*Senior Executive Vice President (Chairman, Global Environment Protection Committee)*

# NSK Environmental Management

**NSK is striving to establish a comprehensive company-wide environmental management system that is effective in all business operations as part of our measures to reduce environmental impact.**

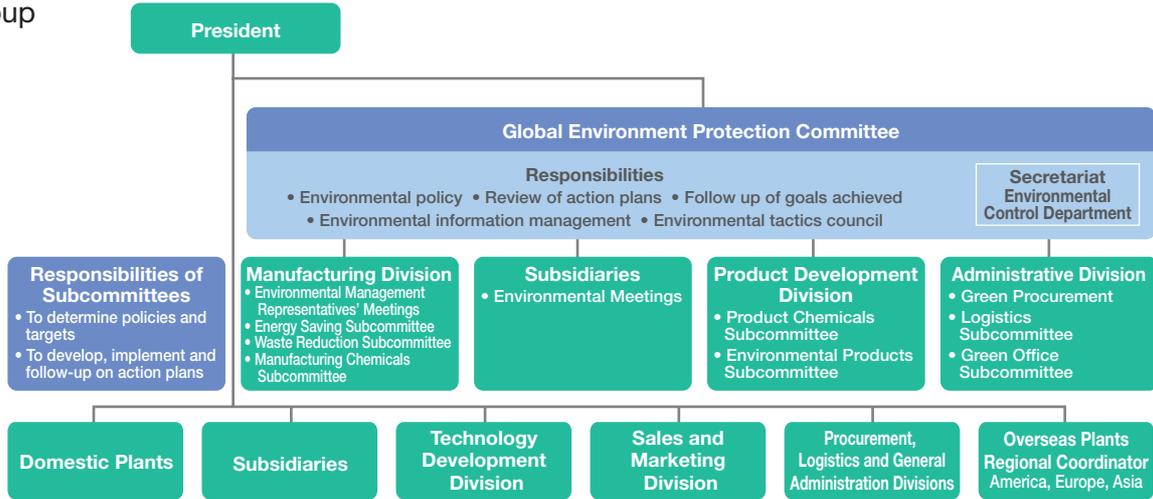
- 
- 11** Environmental Management Organization
  - 12** Voluntary Action Plans
  - 13** Auditing Methods and ISO14001
  - 15** Environmental Accounting

# Environmental Management Organization

In an effort to tackle environmental issues, in 1993 we established the Global Environment Protection Committee. Until 1999, however, the Committee mainly focused on issues concerning the manufacturing process. In order to address this situation, between 2000 and 2002, we established the Management Innovation Project and within this project, we created the Environmental Stewardship Group. Through this project, and efforts of this group, we expanded the scope of our environmental activities to a company-wide effort, covering products, logistics and procurement, etc. Furthermore, in order to promote environmental efforts

across the entire company, we have established various subcommittees under the Global Environment Protection Committee, chaired by Mr. Murata (as of June 2003), the NSK Vice President. The head of each Subcommittee appoints directors from each division, establishing clear scopes of responsibility within the subcommittee. Furthermore, we have established Environmental Management Committees at each site, each chaired by the Plant Manager, and have established environmental policies for each site. The Environmental Management Representative promotes environmental conservation activities under this structure.

## NSK Group



## Plants



## History of activities by the Global Environment Protection Committee

Category	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	
Voluntary Action Plans	1st voluntary action plan								2nd voluntary action plan		
Global Warming Measures	1st plan				2nd plan				3rd plan		
Waste and Recycling Measures	1st plan		2nd plan		3rd plan		4th plan				
Measures for Hazardous Chemical Substances	Chemical Substances Management	Establishment of chemical substances management system for products containing substances with high-environmental impact							Establishment of a manufacturing processes management system		
	Ozone-depleting Substances	Elimination of cleaning chemicals from all sites							Reduction of specified refrigerant-use CFCs		
	Chlorinated Solvents	Elimination of trichloroethylene from all sites			Elimination of dichloromethane from all sites				Plan for dichloromethane reduction at subsidiaries		
	Dioxins						Elimination of incinerators from all sites		Conversion to chlorine-free machining oils		
PRTR Management						Participation in pilot project		Reduction plan			
Pollution/Environment Hazards Management	Legal compliance				Environmental hazards management/Reduction of negative environmental impact						
Logistics Management	Abolishment of PVC and polystyrene foam packaging					Introduction of returnable packing materials		Automotive committee	Logistics subcommittee		
Product Management									LCA introduced by products subcommittee		
Procurement Management									Implementation of green procurement and green purchasing		
Office Management									Green office subcommittee		
Establishment of Environmental Management System	NSK Environment Policy Statement					Establishment					
	ISO 14001					NSK domestic site		Subsidiaries/overseas operation			
	Environmental Accounting									Introduction of environmental accounting	
	Environmental Audit	Audit of legal compliance		Audit of performance		Audit of system and support		Audit of affiliates and subsidiaries			
Measures by Subsidiaries								Environmental meetings		Action plans	
Disclosure of Environmental Information						Launch of website		Status report on annual report		Environmental report	

# Voluntary Action Plans

In FY2000, we achieved the targets set forth in our Primary Voluntary Action Plan for environmental conservation, established in 1993. In FY2001, we embarked on our Secondary Voluntary Action Plan, encompassing fields such as development, procurement and distribution, which we implemented on a company-wide basis. Furthermore, we worked to implement the plan among our subsidiaries, setting improvement targets in 2001. In FY2002, the Development Division registered a total of 80 different environmentally-friendly products, 15 more than the number recorded for the previous year. The Manufacturing Division cleared

targets for reduction of industrial waste, which were revised upwards the previous year, enabling achievement of zero emissions at the production plants of NSK and newly spun-off subsidiaries. Regarding our measures against global warming, although we were unable to achieve our targets, year-on-year CO<sub>2</sub> emissions per production unit improved by 4%. For the future, however, we will make continual improvements in an effort to reach the targets. We have set standards at our overseas sites based on common guidelines for measures against global warming, waste and hazardous chemicals, which we are steadily working towards.

## NSK Voluntary Action Plans

Category		Midterm Goal	Performance in FY2002	Evaluation
Development	Product Development	To create environmentally-friendly products	No. of registered environmentally friendly products and technologies: 80	○
		To Reduce environmentally hazardous substances	Abolished uses of hexavalent chromium in bearing shields and lead-based additives in grease	○
Manufacturing	Anti-global Warming Measures	To reduce CO <sub>2</sub> emissions and energy consumed per production unit 23% by FY2010	Reduced CO <sub>2</sub> emissions per production unit by 14.8% (FY1990 base year) (Year-on-year improvement: 4%)	△
	Waste Reduction and Recycling Measures	To achieve a recycling rate of at least 98% by FY 2010	Improved the recycling rate by 2% to about 94% compared to previous fiscal year	○
		To achieve zero emissions at all plants by FY2002	Zero emissions achieved at all plants (8 plants)	○
	Measures for Hazardous Chemical Substances	To eliminate ozone-depleting substances (Refrigerant-use CFCs and halon-based fire extinguishers) by FY2005	Decreased use of refrigerant-use CFCs by 51% and fire-extinguisher-use halon by 38% (Base year: FY2000)	○
To reduce the use of products containing PRTR-designated substances and machining oils with chlorine-based additives by 50% by FY2005 (Base year: FY2000)		Reduced 41 products containing PRTR-designated substances and 10 types of machining oil with chlorine-based additives	○	
Measures for Logistics		To reduce CO <sub>2</sub> and NOx emissions during distribution	Reduced year-on-year CO <sub>2</sub> emissions per production unit by 6.7%	○
		To promote environmentally friendly packaging (Reduction of packaging materials)	Promoted use of returnable containers for overseas exports	○
Green Procurement		To adopt green procurement standards	Applied standards to 93% of suppliers; expanded application to subsidiaries	○
		To adopt guidelines for green purchasing	Replaced 1,000 units of office equipment and 11 new vehicles	○
Green Office Activities		To improve awareness of environmental conservation	Published ECO News and implemented environmental education	○
		To reduce the volume of paper used and promote sorting of waste material and energy saving	Reduced year-on-year consumption of paper by 15%	○

## NSK Group Voluntary Action Plans

Item	Midterm Goal	Performance in FY2002	Evaluation
Environmental Management	To acquire ISO14001 certification by FY2003	Newly acquired at two companies, bringing the total to 8 of 11 companies with certification.	○
Anti-global Warming Measures	To reduce CO <sub>2</sub> emissions per production unit by 1%	Year-on-year CO <sub>2</sub> emissions per production unit reduced by 1.8%	○
Waste & Recycling Measures	To achieve a recycling ratio of 98% or more by FY2010	Ratio of 90.3% achieved	○
Hazardous Chemical Substance Measures	To eliminate ozone-depleting substances (Refrigerant-use CFCs and halon-based fire extinguishers) by FY2010	Currently being reduced	○
	To reduce chlorine-based machining oils by 50% by FY2005 (Base year: FY2000)	Reduction plan established. Four products being reduced	○
	To abolish dichloromethane by FY2003	Year-on-year use reduced by 40%	○

○ : Indicates target achieved

△ : Indicates an 80% achievement of target

× : Indicates target unachieved

# Auditing Methods and ISO 14001

Environmental conservation activities are corporate social responsibilities, and an integral part of a company's expansion and sustainability. In view of this, NSK has adopted as part of its corporate management system ISO 14001, the international standard for environmental management systems, and uses the system to continually reduce any negative environmental impact. Based on this corporate philosophy and environmental policy, each production site conducts conservation activities in accordance with its own environmental conservation policy, which has been developed to fit

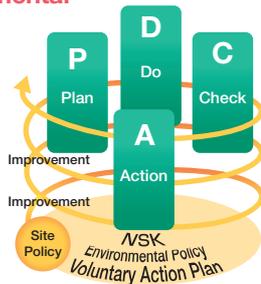
the location and the products that are manufactured. NSK also performs environmental audits to ensure that environmental conservation activities are being carried out properly. The audits allow us to detect and improve points requiring attention as well as establish and improve environmental management systems and as a measure for improving environmental performance. Furthermore, we are currently striving to acquire ISO 14001 certification for the entire NSK Group. During the previous year, two affiliates and three overseas companies acquired such certification.

## ■ Environmental Auditing—Used to Verify the PDCA Cycle and Improve Environmental Management Systems

Our environmental audits include the following types of audit.

### • System Audit

A key part of NSK's environmental management system is the internal audit, which is performed once a year for the purpose of improving management systems and to ensure that the PDCA (plan, do, check, action) system is being implemented properly. Based on the company's training and education program, the internal auditor will internally recruit new individuals for participation in outside seminars and other educational activities as a means of increasing the number of internal auditors.



Furthermore, an external certification body will conduct an annual examination or a 3-yearly renewal examination. These



Internal audit

examinations are simultaneously designed to confirm that all systems are functioning normally and to review the state of daily environmental improvement activities. Subsidiaries that have yet to acquire the ISO standards are audited by the Environment Control Department.

### • Performance Audits

The various subcommittees under the Global Environment Protection Committee (the Energy Saving, Waste Reduction and Chemical Substance Management subcommittees) perform regular examinations of our voluntary action plans, checking levels of improvement and compliance.



ISO14001 examination

### • Audit by Audit Committee

Each year, the company Audit Committee performs an audit of our environmental management activities.

## ■ Correcting Minor Deficiencies (Results of FY2002 Audit)

In FY2002, we performed both an internal audit and external examination. In the external examination, the examiner pointed out a number of minor deficiencies, namely, the failure to perform a regular review of standard work forms used at certain sites as part of documentation management. We immediately rectified the problem, unifying the review period and preparing the required planning documentation. We also resolved other areas that the examiner indicated as requiring improvement.

### Results of Environmental Audits

	Audited Location	Internal audit			ISO14001 Examination				Date of acquisition of ISO14001
		C1	C2	OB	C1	C2	OB	SP	
NSK and Newly Spun-off Subsidiaries	NSK Fukushima Co., Ltd.	0	1	9	0	0	12	1	Jul. 1998
	Saitama Plant/ NSK Precision, Co., Ltd., Saitama Precision Machinery & Parts Plant	0	4	30	0	0	16	1	Sep. 1998
	Shiga Manufacturing Division (Otsu & Ishibe Plants)	0	20	47	0	1	18	2	Oct. 1998
	Fujisawa Plant, Technology Department	0	2	29	0	0	14	7	Sep. 1999
	NSK Precision Co., Ltd., Kirihara Precision Machinery & Parts Plant	0	0	4	0	0	7	3	Nov. 1999
	NSK Precision Co., Ltd., Maebashi Precision Machinery & Parts Plant	0	4	30	0	0	16	1	Dec. 1999
	NSK Steering Systems Co., Ltd.	0	14	0	0	2	13	2	Dec. 1999
Subsidiaries	NSK Kyushu Co., Ltd.	0	0	12	0	0	6	1	Oct. 2000
	NSK Needle Bearings Co., Ltd. (Haruna Plant) (Formerly NSK Torrington Co., Ltd.)	0	0	1	0	0	7	0	Jan. 2001
	Inoue Jikuu Kogyo Co., Ltd.	0	6	12	0	0	5	3	Feb. 2001
	NSK Warner K.K.	0	9	23	0	0	10	2	Mar. 2001
	NSK Micro Precision Co., Ltd.	0	7	24	0	0	6	1	Jun. 2001
	Shinnippon Koukyu Co., Ltd.	0	6	21	0	0	6	1	Sep. 2001
	Shinwa Seiko Co., Ltd. (Kutsuki Plant and Shinasahi Plant)	0	0	13	0	3	14	1	Dec. 2002
	NSK Machinery Co., Ltd.	0	2	10	0	0	4	1	Mar. 2003

Note: Indicates results of 2nd certification audit of NSK Machinery Co., Ltd. & Shinwa Seiko Co., Ltd.  
 C1: Serious in conformance, such as total lack of procedures required for system

C2: Minor in conformance, such as partial lack of important items  
 OB: Not in conformance, but effectiveness of system should be improved  
 SP: Noteworthy achievement

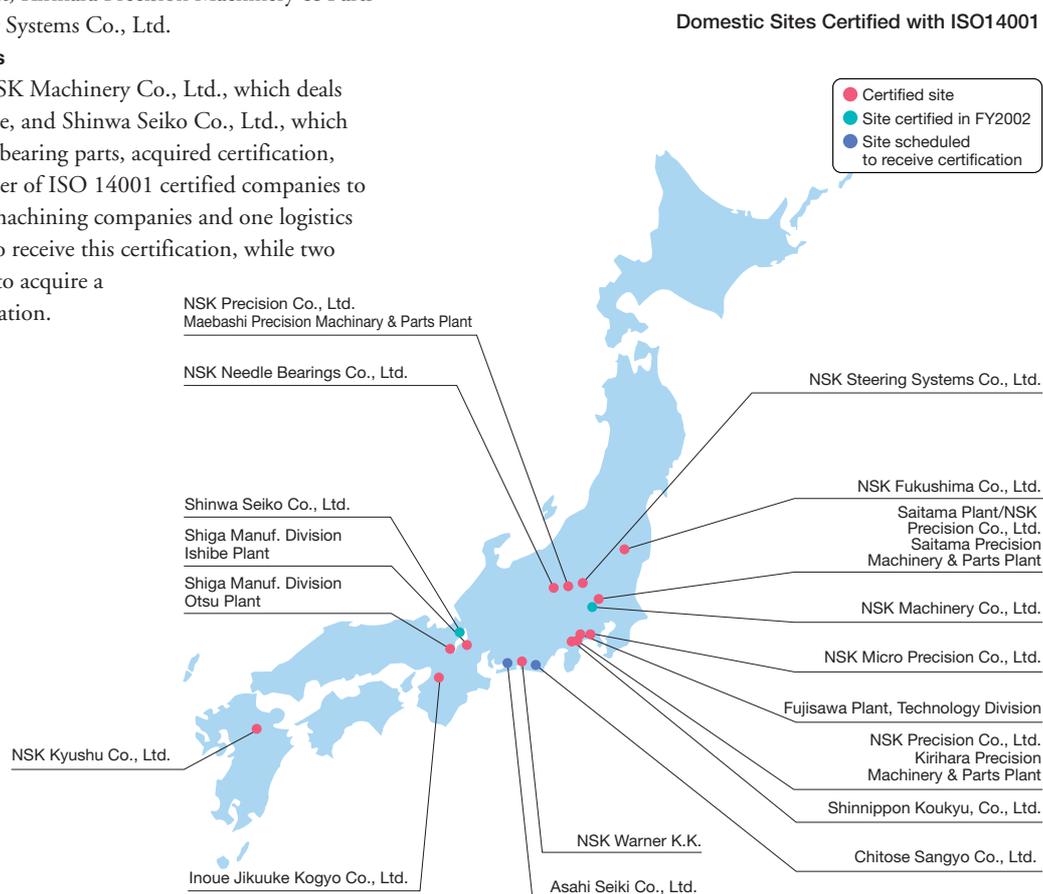
## ■ Two NSK Subsidiaries and Three Overseas Plants Acquired ISO 14001

### • Domestic Sites

Following our efforts to acquire ISO 14001 certification at all domestic plants since 1997, all domestic plants have achieved ISO 14001 certification. In the last fiscal year, five plants were re-certified following extensive examinations, including the Shiga Manufacturing Division, the Fujisawa Plant/Technology Department, NSK Precision Co., Ltd., Maebashi Precision Machinery & Parts Plant, Kirihara Precision Machinery & Parts Plant and NSK Steering Systems Co., Ltd.

### • Domestic Subsidiaries

In the last fiscal year, NSK Machinery Co., Ltd., which deals with facility manufacture, and Shinwa Seiko Co., Ltd., which manufactures machines bearing parts, acquired certification, bringing the total number of ISO 14001 certified companies to eight. In FY2003, two machining companies and one logistics company are expected to receive this certification, while two other sites are expected to acquire a broader scope of certification.



### • Overseas Sites

Being a global corporation, NSK carries out environmental conservation activities in its overseas plants under a common set of environmental guidelines. These activities include acquisition of ISO14001 standards, which the company is striving to acquire for all sites. In FY2002, three sites acquired ISO14001 certification, bringing the total number of sites with ISO14001 certification to 13, out of a total of 19.

Date of Acquisition of ISO14001	Name of Site	Country of Location
Dec. 1997	NSK Korea, Co., Ltd., Changwon Plant	Korea
Feb. 1999	NSK Bearings Europe Ltd., Peterlee Plant	U.K.
Jan. 2000	NSK Brasil LTDA., Suzano Plant	Brazil
Mar. 2000	P.T. NSK Bearings Manufacturing Indonesia Ltd., Jakarta Plant	Indonesia
May. 2000	NSK Bearings Europe Ltd. Newark-Linear Plant	U.K.
Nov. 2000	Siam NSK Steering Systems Co., Ltd.	Thailand
Jan. 2001	Neueg Fertigung GmbH	Germany
Sept. 2001	NSK Steering Systems Europe Ltd., Peterlee Plant	U.K.
Nov. 2001	NSK Corporation, Ann Arbor Plant	U.S.
Jan. 2002	NSK Micro Precision Sdn. Bhd Malaysia Plant	Malaysia
July. 2002	NSK Corporation Clarinda Plant	U.S.A.
Nov. 2002	NSK Corporation Franklin Plant	U.S.A.
Dec. 2002	NSK Steering Systems America, Inc.	U.S.A.

# Environmental Accounting

NSK recognizes environmental accounting as an important tool for evaluating the costs and benefits of environmental activities and as a means for our stakeholders to verify and appreciate our efforts. In 1999, NSK implemented an accounting system, which

discloses the results for each fiscal year. This accounting system is based on the Environmental Accounting Guidelines published by the Ministry of the Environment.

## ■ Results for FY2002

Environmental costs and expenses stood at ¥1.04 billion and ¥3.34 billion respectively, of which R&D expenses related to environmentally friendly products and conservation technologies accounted for as much as 55%. This percentage is greater than that for the FY2001 figure, reflecting our increased efforts to develop environmentally friendly products and environmental

conservation technologies. The economic benefits of our conservation activities amounted to around ¥200 million. Regarding the effects of our efforts on materials, our waste recycling ratio improved 2.5% while our landfill waste amount was reduced by 1.2%. We also achieved zero emissions at NSK plants and plants of spun-off subsidiaries.

## Environmental Conservation Costs

Category		Investment		Cost		Main Purpose
		2001	2002	2001	2002 (FY)	
		Millions of Yen	Millions of Yen (%)	Millions of Yen	Millions of Yen (%)	
Business area costs	Pollution prevention costs	135.1	163.2 (15.6)	382.3	373.1 (11.2)	<ul style="list-style-type: none"> <li>• Installation of dust collectors, smoke and soot removers</li> <li>• Improvement and relocation of underground tanks and pipes to above-ground locations</li> <li>• Inspection, repair and maintenance of facilities with an environmental impact</li> <li>• Inspection, repair and maintenance of drainage and waste liquid treatment facilities</li> </ul>
	Global environmental costs	251.8	198.2 (19.0)	137.8	156.5 (4.7)	<ul style="list-style-type: none"> <li>• Energy conservation measures</li> <li>• Measures to reduce ozone-depleting substances</li> </ul>
	Resource recycling costs	35.9	106.5 (10.2)	326.8	377.4 (11.3)	<ul style="list-style-type: none"> <li>• Installation of machinery for compacting grinding swarf into briquettes</li> <li>• Measures for recycling and reducing waste products</li> <li>• Treatment/disposal of municipal and industrial waste</li> </ul>
	Subtotal	422.8	467.9 (44.8)	846.9	906.9 (27.2)	
Upstream/downstream costs		2.5	0.0 (0.0)	135.1	103.4 (3.1)	<ul style="list-style-type: none"> <li>• Green purchasing (Low-emission vehicles, office equipment, paper, stationary, etc)</li> <li>• Recycling of plastic boxes, returnable containers</li> </ul>
Management costs		48.3	1.1 (0.1)	433.4	397.7 (11.9)	<ul style="list-style-type: none"> <li>• Greening development</li> <li>• Maintenance and operation of ISO 14001</li> <li>• Measure and analysis of environmental impact</li> </ul>
R&D costs		367.8	574.5 (55.0)	1,623.0	1,870.0 (56.0)	<ul style="list-style-type: none"> <li>• R&amp;D of environmental technologies and features for new products</li> </ul>
Social activity costs		0.0	0.0 (0.0)	43.4	38.6 (1.2)	<ul style="list-style-type: none"> <li>• Donations and dues for WWF Japan, Keidanren Nature Conservation Fund, and Electro-Mechanic Technology Advancing Foundation</li> </ul>
Environmental remediation costs		13.5	1.2 (0.1)	22.9	23.7 (0.7)	<ul style="list-style-type: none"> <li>• Maintenance of discharge treatment facilities</li> </ul>
Total		854.9	1,044.6(100.0)	3,104.7	3,340.3(100.0)	

## Economic Benefits of Environmental Activities

Category	Amount (Millions of Yen)	
	2001	2002 (FY)
Cost saving by energy conservation <sup>1</sup>	89.1	94.7
Cost saving by waste reduction <sup>1</sup>	31.2	38.8
Sales of valuable waste <sup>2</sup>	64.4	74.9
Total	184.7	208.4

<sup>1</sup> Including benefits of investments made during 5-year period from FY1998 to FY2002

<sup>2</sup> Income from sale of salvaged value to subsidiaries

## Scope and Method of Data Collection

- Accounting term: April 2002 to March 2003
- Sites covered: NSK plants, Newly spun-off subsidiary plants, Technology Division, Logistics Division and Headquarters
- Criteria for entering environmental conservation costs

*\*Environmental costs and expenses determined in accordance with the "Environmental Accounting Guidelines 2002", published by the Ministry of the Environment.*

*\*Depreciation is entered as a cost in using the 5-year straight line depreciation method.*

*\*Compound costs are divided in proportion to the relative environmental purpose*

*\*Costs incurred through green purchasing are entered as full amounts; not the differential amount.*

## Physical Benefits

Category		In comparison with previous FY	
		2001	2002 (FY)
Plants	CO <sub>2</sub> emissions per prod. unit	11.0% increase	3.9% improvement
	Water consumption	12.9% improvement	2.0% improvement
	Landfill waste ratio	0.8% improvement	1.2% improvement
	Waste recycling ratio	3.3% improvement	2.5% improvement
Logistics	CO <sub>2</sub> emissions per prod. unit	4.8% improvement	6.7% improvement

- Criteria for entering environmental conservation benefits

*\*Economic benefits determined through factual evidence (in monetary units) and physical benefits resulting from environmental benefits are entered.*

*\*Deemed benefits (Risk avoidance benefits, estimated profit contribution benefits, etc.) are not included.*

## Notes on Terminology

**Briquettes** : First-size bricks of compressed grinding swarf. Grinding swarf is compressed into briquettes to make it easier to use as a raw material in steelmaking.

# Environmental Efforts during Product Lifecycles

**NSK performs measures to reduce environmental impact incurred during each stage of the product lifecycle, from development to disposal. In this chapter, we will introduce the efforts we have made in this regard.**

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## **Product Development**

**17** Product Measures

## **Manufacturing**

**21** Waste Reduction & Recycling Measures

**23** Measures against Global Warming

**24** Measures against Hazardous Substances

**25** Compliance & Environmental Risk Management

## **Logistics**

**27** Logistics Measures

## **Procurement**

**28** Green Procurement

## **Office**

**29** Green Office Activities at the Head Office Building

# Product Measures

NSK products help conserve energy and resources by greatly improving the efficiency of rotational and linear movements in a broad array of industrial machines. In FY2002, we further strengthened the activities of our Environmental Products Subcommittee and Product Chemicals Subcommittee and actively promoted the creation of environmentally friendly products, measures against hazardous chemicals, design for environment and LCA.

## ■ Aiming to Design & Develop Environmentally Friendly Products

One of the goals of our environmental policy is the “development of products and technologies to reduce environmental impact.”

In order to have our design and development divisions adopt this goal into their daily routine as standard policy, in FY2001 we established a basic common policy for all technical divisions as well as a set of independent action plans for each division. Based on this goal, we are aiming to design and develop environmentally friendly products that reduce environmental impact throughout the entire product lifecycle.

### Basic Policy for the Development of Environmentally Friendly Products

For the purpose of supplying products friendly to the environment, we will endeavor to develop products with the least negative environmental impact throughout their lifecycle from research and development, through design, production and use, until final scrapping. Specifically, we will manufacture products according to the following standards:

1. Products will contribute to saving energy and reduce negative impact on natural resources when used by customers;
2. Products should have minimal energy requirements, and minimal impact on natural resources in the process of being manufactured;
3. Products should be manufactured using processes that are free of any hazardous substances, or at least use the safest substances available;
4. Products will contribute to the health and safety of end users with low noise, low vibration and low dust.

## ■ Protecting the Environment through Products and Technologies

### Creation of Environmentally Friendly Products and Environmental Conservation Technologies

Given their ability to conserve energy and resources, our rolling bearings, ball screws, linear guides and other products are intrinsically environmentally friendly products.

The bearings we manufacture conserve resources by being largely created from scrap steel and being recycled into new products at the end of their useful lives. With such recycling, our products create minimal environmental impact throughout their entire lifecycle, from manufacture to disposal. At NSK, we also strive to develop and apply technologies that contribute to environmental conservation. Creating environmentally friendly products is achieved by simultaneously designing products that conserve energy and resources and utilizing manufacturing technologies that minimize environmental impact throughout the entire production system, including material and parts selection, manufacture, shipping and disposal.

In FY2002, we registered on our books a total of 80 environmentally friendly products and environmental conservation technologies, each of a quality reaching our own voluntary standards, up 15 from the previous year.

### ■ Elimination of Hazardous Substances

At NSK, we design products based on our fundamental product development policy of “Aiming to manufacture of products free of hazardous substances.” Furthermore, we have established an

Matrix for environmental conservation from a technical perspective

Environmental effects	Process	Product planning Features & functions (Customer benefits)	Considerations for selection of materials, parts & lubricants	Considerations for manufacturing and shipping	Considerations for disposal
Energy conservation (Electricity, gas & fuel)		Compact & lightweight, Low torque, High speed CVT, EPS, Hub units, Low torque ball bearings, Roller clutches with plastic cages, Needle roller followers	Selection of parts & materials with low environmental impact and consuming minimal energy Fast-carburizing medium carbon steel	Simplified processing, Reduction of stock removal Reduced heat treatment times Technology for correcting heat treatment distortion, Micro-machine process	Recycling
Resource conservation (Long-life design, low resource consumption, recyclable)		Long-life, Unit design, Compact design, Corrosion & heat resistant New material long-life bearings, Linear guides with lubricating unit, Robust series bearings	Easy-to-recycle, Lightweight materials Use of hollow shafts	Increased yield rate, Utilizes both main and odds, Near-net-shaping Cold rolling, Roll forming, Segment-facing technology, Use of recycled plastics	Recycling
Clean, health & safety (No hazardous substances, maintenance-free, non-polluting, low noise & vibration)		Cleanliness, Tighter sealing, Lower noise & vibration, No dust, No need of lubricant replenishment Molded Oil™ bearings, Squeak-free bearings, Quiet ball-screws	Use of hazardous-chemical free materials & parts Use of new, substitute materials, Biodegradable lubricants Biodegradable greases Chrome-free materials, Use of titanium alloys	Use of non-hazardous substances within plants Use of non-hazardous cleaning agents, Promotion of dry processing	Non-leakage of hazardous substances even after disposal (through burial or incineration)

Environmentally friendly products Environmental conservation technologies

Notes on Terminology

**Rolling Bearings** : Bearings containing balls or rollers between the inner and outer ring, which facilitate rotation while supporting load.

**Ball screws** : Load-supporting screws with balls between the nut and the screw.

**Linear guide** : Load-bearing guide with balls or rollers between the rail and slider that slides in a liner direction.

organizational structure that allows us to respond quickly to domestic and overseas laws and regulations and voluntary chemical substance regulations of our customers and each industry.

In March 1997, we established our "Management Regulations for Hazardous Substances Contained in Products" and accompanying management system for controlling the chemical substances contained within the products we manufacture and sell. In June 2002, we revised the regulations in accordance with new laws, specifying 28 banned substances, including brominated flame retardants and  $\beta$ -naphthylamine, 5 restricted substances (to be phased out), including lead compounds, hexavalent chromium compounds and nitrite 12 observation substances, including anti-mony compounds, and polycyclic-aromatic compounds. Furthermore, we have made it mandatory for departments using restricted substances to propose and execute a plan for phasing out the substance until its abolishment and for departments using restricted substances to appoint substitute substances.

In September 2000, the European Parliament and the Council of the European Union adopted a directive on ELVs, with the aim of reducing and properly treating waste arising from end-of-life vehicles (ELVs). Effective on all new vehicles sold as of July 1, 2003, the law in principle prohibits use of lead, mercury, cadmium, and hexavalent chromium, while recognizing that certain parts and materials are excluded from this prohibition. Furthermore, in January 2003, the RoHS Directive, applicable to a broad variety of electrical products, was adopted. This law effectively prohibits use of lead, mercury, cadmium, hexavalent chromium and two types of brominated flame retardants (PBB,

PBDE) in all new electrical products sold as of July 1, 2006.

In order to accommodate the above new laws, NSK has developed a plan for abolishing the newly prohibited substances. The following chart indicates the progress we have made towards phasing out environmentally hazardous substances. In the future, we will continue to reduce use of environmentally hazardous substances through our own voluntary efforts and management systems.

### ■ Promotion of LCA

Life Cycle Assessment (LCA) is a method for determining and evaluating the amount and type of environmental impact incurred by a product throughout each stage of its life cycle, including extraction of raw materials, manufacture, processing, distribution, sale, consumption, use and recycling or disposal.

At NSK, we have performed LCA on each of our key product groups.

One such product is our NSK K1 ball screw and linear guide with built-in lubrication unit. Installation of such a guide to the feeding apparatus of a machine tool allows one to omit use of lubricating oil and the oil supply unit. It also prevents decomposition due to coolant entering the lubricating oil, thereby reducing consumption of coolant.

After performing an LCA on the machine tool concerned, we determined that installation of this type of linear guide effectively reduced CO<sub>2</sub> emissions by 1 ton per machine tool. In the future, we intend to actively implement LCA in response to user needs and to help improve environmental soundness of products at the planning stage.

#### State of Efforts to Reduce Environmentally Hazardous Substances

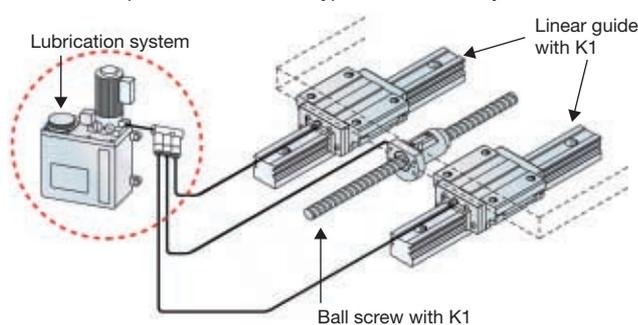
Hazardous Substance	Material Name	Name of Part or Product	State of Phase-out or Development of Substitutes
Lead	Solder	Electrical components	Substitutes under consideration
	Steel, non-ferrous metals	Free-cutting steel	Substitutes under development
	Electro-deposit paints	Painted parts	Currently switching to substitutes
	Grease	Grease	Substitution completed in March 2003
Cadmium	Nickel cadmium batteries	Nickel cadmium batteries	Switched to substitute with new design
Hexavalent chromium	Surface treatment	Bearing shields	Substitution completed in March 2003
		Core plate of bearing seals	Currently switching to substitutes
Mercury	Electronic parts	Parts of substrate	Currently switching to substitutes
Brominated flame retardants	Wire coatings	Mechatronic products	March 2003 Converted to new-design product

#### Notes on Terminology

**RoHS Directive** : Directive by the European Parliament and the Council of the European Union concerning restricted use of specified hazardous substances in electric and electronic equipment.

#### Eliminating need for lubrication system

Conventional machine tools use a force-feed lubrication system, requiring lubrication oil and an oil supply unit. Such systems also require regular change of coolant liquid to resolve problems of decomposition and odors which occur as a result of the coolant liquid being contaminated with lubricating oil. Installation of the NSK K1 linear guide and ball screw with built-in lubrication unit, however, makes it possible to omit this type of lubrication system.



#### LCA Calculation Criteria

- Applied to feeding mechanism of machine tool (single machine)
- Total power consumption: 12.5kW; Motor operation ratio: 30%; Operation time: 12 hours a day for 10 years; Lubrication system motor: 100W.

## Introduction of Products

### Development of Power-Conserving Micro-machines

#### Environmental Conservation Technologies

NSK has developed the industry's first micro-machine for grinding the inner and outer rings of bearings. The new micro-machines fit into a space the size of A3 paper (297 x 420 mm), approximately 1/10 of the footprint required for a standard sized machine.

Consuming 200–400W of power, the new machines consume approximately 1/5 the amount of conventional machines, thereby contributing to conservation of energy and resources.

In the future, we hope to use the machines to produce products with minimal environmental impact, modifying the machines to grind larger bearings, and perform the processes of lathing and grinding as well as assembly.

Micro-machine grinder fits on a table top



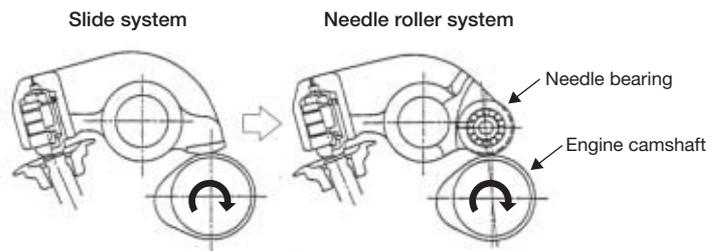
### Energy-Saving Needle Rocker Arm for Use in Automobile Engines

#### Environmentally Friendly Product (Energy-saving)

Roller followers are highly effective in reducing friction torque by replacing slide-system rocker arms with needle-roller based systems. In automobile engines with slide-system rocker arms, a substantial proportion of frictional drag occurs between the rocker arms and camshaft. Our roller follower (Roller-based cam followers) systems are a highly effective method for reducing the friction in valve-drive systems and realizing substantial savings in energy.

By using a needle bearing as the roller support both the contact surface with the cam and the face between the shaft and the roller bore are separated by rollers. Use of a roller follower system in an engine can improve fuel economy by 3 to 5% under the

Mode 10 fuel efficiency measurement method. Application of needle bearings deep within the mechanics of an engine can significantly contribute to conservation of energy.

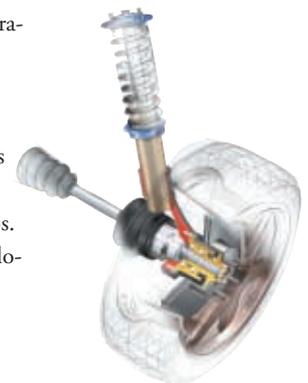


### Lightweight Wheel Hubs

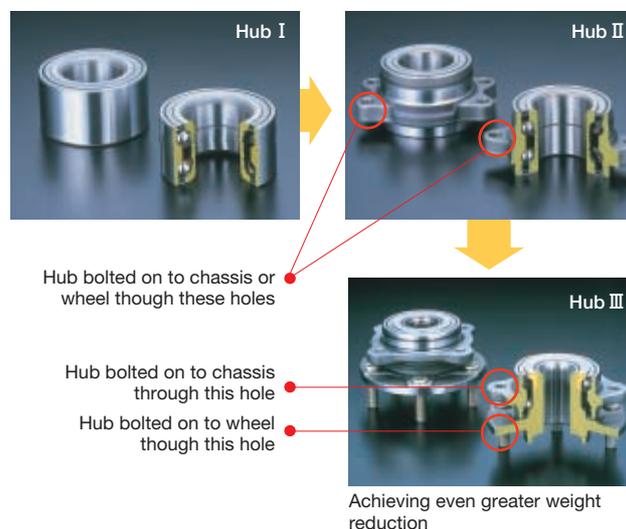
#### Environmentally Friendly Product (Energy- and resource-saving)

As is true for general rolling bearings, the hub-unit bearings used in automobile wheels consist of a bearing ring, a rolling element and a cage. With the advancement of chassis fittings and development of increasingly sophisticated hub units, our hub units have gone through three distinct generations of development—1st generation (Hub I), 2nd generation (Hub II) and 3rd generation (Hub III).

Each new generation of hub has been designed to better accommodate the needs for long-life, low torque and easier assembly, and is lighter in weight such that each generation III hub is some 300g lighter than generation I hubs. At NSK, we use our own computerized technology to analyze the strength and rigidity of hubs, which allows us to create optimum designs for lightweight construction.



#### Progression of hub-unit bearings for automobile wheels



#### Notes on Terminology

**Valve-drive system** : General term for parts that comprise the vehicle inlet and exhaust valves and their drive system.

**Cam follower** : Rotating part that follows cam guide.

**Needle bearings** : Small-diameter bearing that uses long, thin rollers designed to carry high loads in confined spaces.

## ■ Aiming to Produce Products Free of Hazardous Substances

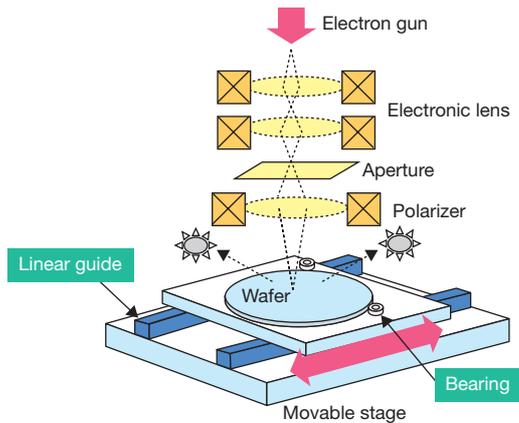
### • Non-magnetic Titanium Alloy Bearings & Linear Guides

#### Environmentally Friendly Product (Clean)

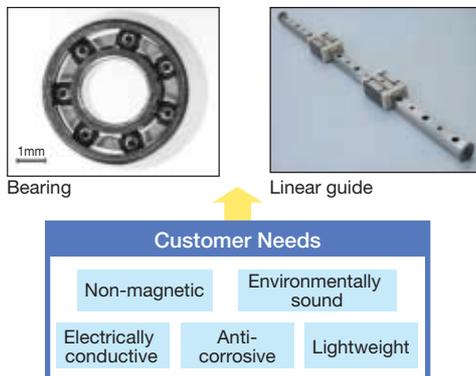
One of the requirements of microscopes that use electron beams and semiconductor manufacturing equipment is that the materials and parts thereof be completely non-magnetic.

Traditionally, beryllium copper has been used as a material in such machinery. This material, however, can be hazardous to human health. As a possible substitute for this material, NSK has developed bearings and linear guides made from titanium alloy. Made from our own composition of alloy elements and method of heat treatment, the new material has excellent wear resistant properties and is completely non-magnetic, and corresponds with our aim to produce products that are free of hazardous substances.

#### Application example: Electron beam exposure apparatus



#### Titanium alloy bearing, linear guide



## ■ Molded Oil™ Bearing

#### Environmentally Friendly Product (health & safety)

Grease is the most commonly used bearing lubricant. The grease initially injected into bearings occasionally causes problems by leaking out, contaminating the area around the machine in which it is fitted. Consequently, recent years have seen an increased need for clean lubrication systems. In an effort to address these needs, NSK has developed Molded Oil bearings, which contain solidified oil that releases small amounts of lubricant over time.

The solidified oil is made of a synthetic plastic with high affinity for lubricating oil, which itself consists of at least 50% of lubricating oil. Thanks to this composition, the plastic releases oil gradually over a long period of time, allowing a constant supply of lubricating oil. Molded Oil bearings are used extensively in conditions that would normally cause ordinary bearings to leak, such as places of high exposure to water, liquids or dust, or in applications where contamination though leaked grease would be unacceptable.

#### Molded Oil™ Bearing-helping to prevent oil contamination



#### Applications of Molded Oil™ bearings:

Needs	Applications
Prevention of oil contamination	Steelmaking facilities, Construction machinery, Farm machinery, Papermaking machinery, Food processing machinery
Prevention of leakage when exposed to water	Washing machines, Washing conveyers
Long-term lubrication	Conveyer lines, Manufacturing machinery (Steelmaking, papermaking machinery)

#### Notes on Terminology

**Electron beam** : Stream of electrons focused on a microscopic region used in exposure apparatuses and analytical equipment.

**Beryllium copper** : Copper alloy containing small amounts of beryllium.

**Wafer** : Thin slice of polished silicon crystal used as a substrate in integrated circuits.

# Waste Reduction & Recycling Measures

Following achievement of zero emissions at four plants in FY2001, we had another four plants achieve zero emissions in FY2002 thereby achieving zero emissions at all plants. Our recycling ratio also increased by 2% to reach 94%.



## Reduction of Waste through 3Rs

We are making full implementation of the 3Rs (Reduce, Reuse & Recycle) to bring landfill waste close to the zero mark while improving our recycling ratio.

### Reduce

Improve yield ratio by reviewing the processing conditions for products and by improving the production process.

### Reuse

Reuse oils, cardboard boxes, containers and others.

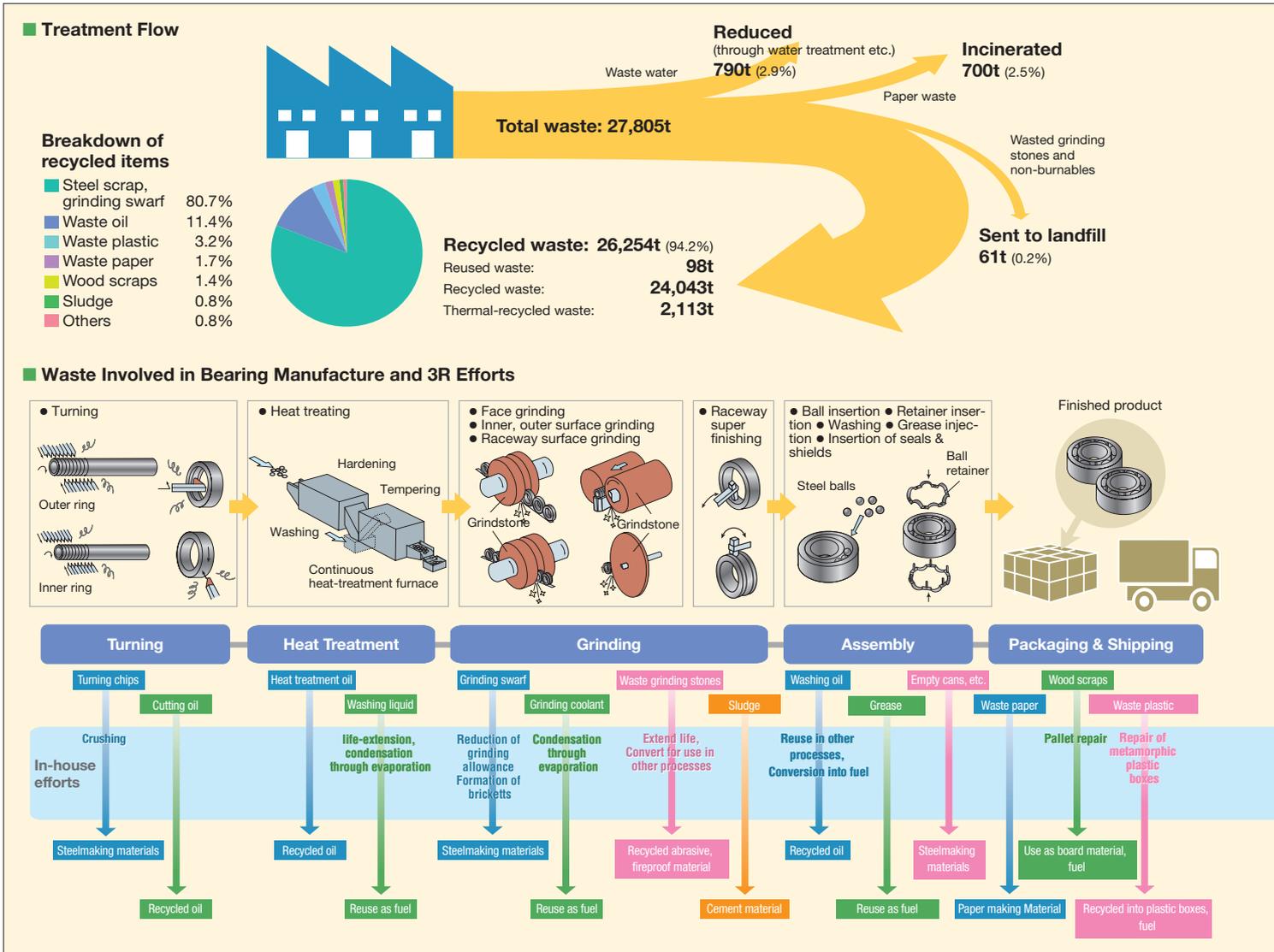
### Recycle

Improve the recyclability of products and develop uses for recycled materials.

## Zero Emissions Achieved at All Plants (FY2002)

Part of our activity to achieve zero emissions at all plants was to take the measures that had proved effective in helping other plants and apply them to plants that had yet to achieve zero emissions. As a result, in FY2002 four new plants achieved zero emissions (Shiga Manufacturing Division's Ishibe Plant, Maebashi Precision Machinery & Parts Plant and Kirihara Precision Machinery & Parts Plant of NSK Precision Co., Ltd., and NSK Steering Systems Co., Ltd.), thereby bringing full zero emissions to all plants. Our year-on-year recycling ratio in FY2002 increased by 2% to reach 94%.

## Waste Emissions and 3R Efforts at the Manufacturing Stage



### Notes on Terminology

**Zero emissions:** Defined as the state where direct landfill waste accounts for less than 1% of the total waste emissions. It should be noted that landfill includes waste after the interim processes, such as dehydration, crushing or

compressing under the Waste Disposal Law. Landfill. Wastes include industrial waste such as metal by-products, oil and sludge, as well as commercial related municipal waste such as waste paper and wood scraps.

### 1. Recycling of Plastic Waste

At NSK Steering Systems Co., Ltd., one of the by-products of plastic gear manufacturing is oil-stained waste plastic cutting chips. In the past, such waste was unrecyclable and disposed of through incineration. We addressed this problem, however, by developing a system that recycles the cutting chips into solid fuel after removing the oil using special centrifuges. The system also makes effective use of resources by also allowing the recovered oil to be recycled.

### 2. Measures for Handling Grinding Swarf

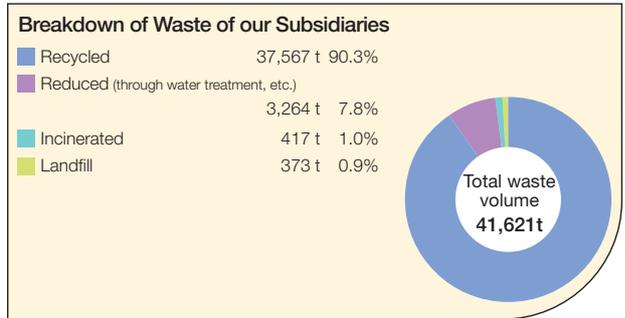
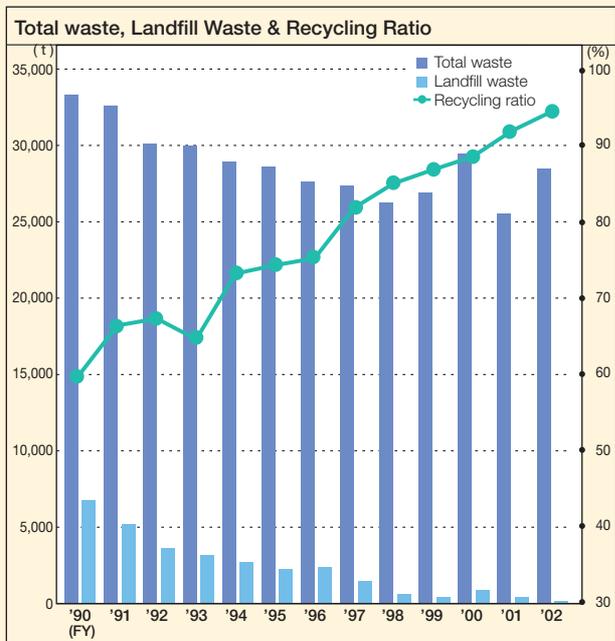
Of the types of waste, grinding swarf accounts for the largest proportion. Consisting mainly of steel shavings, the waste also con-

tains grinding coolant which made the material difficult to recycle. In order to address this problem, we made various efforts to recycle such waste from an early stage. In 1987 we attempted to use the waste as a heating agent in disposable pocket warmers. Thereafter, we tried converting grinding swarf into briquettes by mixing in resin. Finally, in 1998, a method to fully recycle the material was devised. In order to further improve the recycling ratio, we also compress the waste into briquettes, extracting in the process the grinding coolant, which is then recycled.

### Achieving Zero Emissions at Subsidiaries

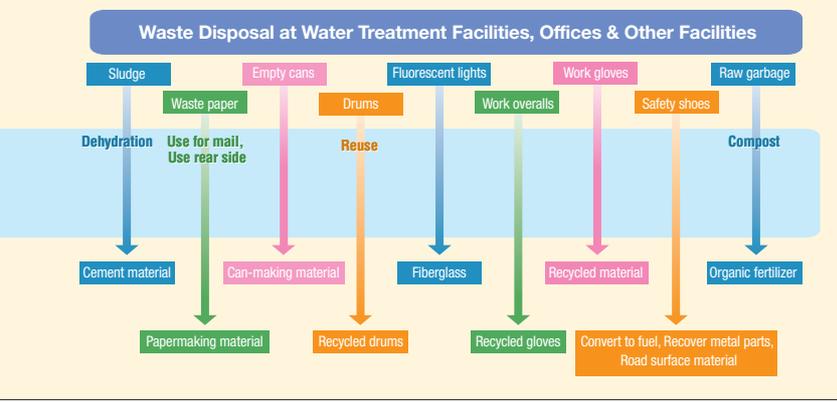
#### Zero emissions attained at seven companies

In an effort to achieve zero emissions at our subsidiaries, we applied the waste reduction measures conducted at our own plants to the plants of our subsidiaries. As a result, zero emissions and a recycling ratio of 90% was achieved by seven of our subsidiaries.



### Improving Recycling Ratio to 98% by 2010

Although we have already achieved zero emissions at all plants, there still remains a number of issues concerning waste reduction and separation. In the future we intend to resolve these issues while maintaining zero emissions. Furthermore, we have set a recycling ratio of 98% by 2010, in an effort to contribute to the development of a recycling-oriented society by further improving our recycling ratio.



#### Notes on Terminology

**Grinding coolant** : Special emulsified liquid to cool surfaces during the grinding process.  
**Briquettes** : Fist-size bricks of compressed grinding swarf. Grinding swarf is

compressed into briquettes to make it easier to use as a raw material in steelmaking.

# Measures against Global Warming

In FY2002, year-on-year CO<sub>2</sub> emissions per production unit fell by 4%, a significant improvement. However, against the base year of FY1990, emissions have only fallen by 14.8%, falling short of the guideline target of 16.8%. We are also striving to reduce the CO<sub>2</sub> emissions of our subsidiaries, for which year-on-year CO<sub>2</sub> emissions per production unit fell by 1.8%.



## Reduce CO<sub>2</sub> emissions per Production unit by 23% by 2010

At NSK, we are striving to reduce CO<sub>2</sub> emissions and prevent global warming by improving efficiency of energy consumption and conversion to cleaner energy sources. Towards that end, we are carrying out the following measures, with the objective of reducing CO<sub>2</sub> emissions per production unit to 23% by FY2010, against 1990.

- Reduce consumption of fixed energy (Energy requirements not directly related to changes in production)
- Conversion to high-efficiency energy facilities
- Establishment and enforcement of control standards for energy facilities
- Meticulous control of energy use
- Conversion to natural gas

We also intend to reduce our water consumption, in line with our policy to treat water resources as an energy source.

## Further Improvement of Efficiency of Energy Consumption (FY2002)

In FY2002, we failed to reach our targets for energy consumption reduction, partly due to climatic conditions and a reduction in production at some plants. Nevertheless, we continued our efforts towards reducing consumption of fixed energy, reducing energy wasted during production line stoppages, converting to inverter-type pumps and reducing the power level of our compressors. We are also striving to improve efficiency of energy consumption through production streamlining measures and restructuring of production lines by transferring control of products.

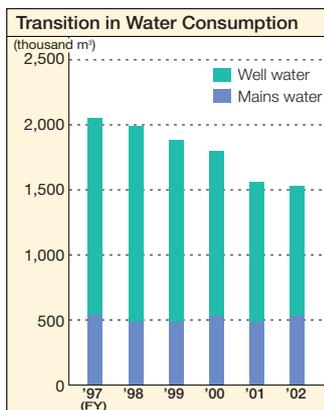
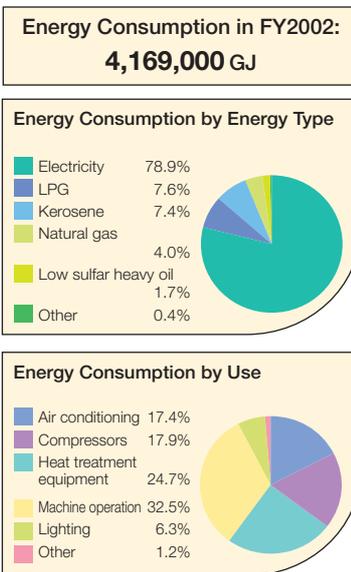
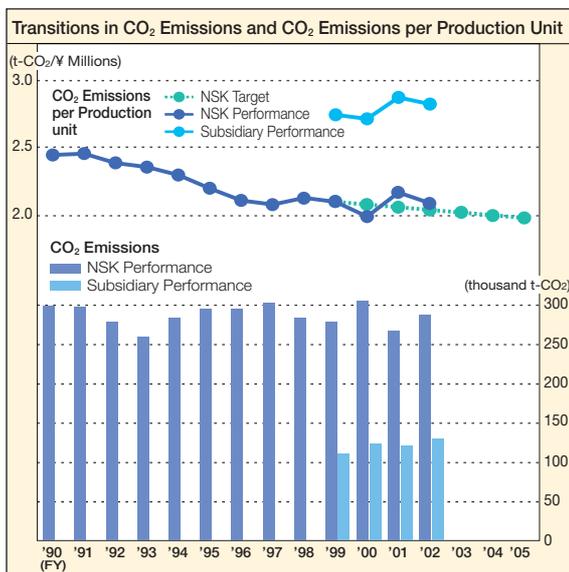
- NSK Precision Co., Ltd., Maebashi Precision Machinery & Parts Plant was unable to improve its CO<sub>2</sub> emissions per production unit, partly due to the reduced production.

Nevertheless, the company strives to reduce its CO<sub>2</sub> emissions, taking on ESCO operations and installing a cogeneration system. Cogeneration is a system that creates different types of energy, such as electricity and thermal, from a common energy source. The plant installed an engine-powered generator that can meet 2/3 of the plant power requirements. The system makes efficient use of energy, using the heat and steam arising when in operation to condition the air of thermostatic rooms and general rooms, as well as to cool production facilities. The system has been certified by NEDO (New Energy and Industrial Technology Development Organization), and the plant designated as a business that has rationalized energy consumption eligible for support.

- The Fujisawa Plant reduced its energy consumption by improving the operation of its dehumidifying system. Previously the plant used two different types of compressed-air dehumidifier, a heat-recycling type and a cooling-type dehumidifier. The plant improved efficiency by converting these into a single cooling dehumidifier, and decreased power consumption by reducing pressure loss during operation and the compressed air discharge pressure. Furthermore, the plant made a substantial reduction in CO<sub>2</sub> emissions by decreasing the power for the conventional heat recycle heater.

## Preventing Global Warming through Stable Operation of Cogeneration System

We are establishing our cogeneration energy system as planned, and with the stable operation of this system, we expect substantial energy savings. In the future we will continue our efforts to reduce our consumption of fixed energy, consider and execute conversion to natural gas to reduce global warming.



Note: CO<sub>2</sub> emissions per production unit means CO<sub>2</sub> emissions per value added production of ¥1 million. (value added production = production - disbursements)  
 CO<sub>2</sub> emissions of purchased electricity are calculated assuming that the electricity is generated through a thermal-powered generation system.  
 Conversion of consumption of LPG, kerosene, low-sulfur heavy oil, municipal gas, diesel and gasoline to CO<sub>2</sub> emission values is based on Ministry of the Environment guidelines.

### Notes on Terminology

**ESCO** (Energy Service Company) : Company that provides comprehensive services regarding energy conservation. The remuneration is performance based, with the ESCO receiving a certain percentage of the energy expenses saved by the customer in exchange for its services. Under the Revised Energy Conservation Law, the gov-

ernment recommends use of such companies.

**Inverter** : Apparatus for controlling the frequency of the electrical power supply to adjust the speed of compressor pump motors, etc. in accordance with demand, to improve efficiency of electricity consumption.

# Measures against Hazardous Substances

We have implemented various measures to reduce hazardous chemicals. In FY2002 we achieved our targets, reducing PRTR-designated chemicals by 26%, coolant-use specified CFCs (which is not normally released into the environment anyway) by 51% and fire extinguisher-use Halon by 38% against a base year of 2000.



## Reduction Targets

We have established a management system for hazardous substances used in factory production and operations, and have implemented programs for the reduction or replacement of such substances with substitutes.

- Completely eliminate ozone-depleting substances (Specified CFCs, Halon fire extinguishers) by FY2005
- Reduce PRTR-designated substances by 50% (against FY2000) by FY2005
- Reduce use of machining oil with chlorine-related additives by 50% (against FY2000) by FY2005.

## Reduction of Ozone-Depleting Substances; Promotion of Substitutes

**Reduction of Ozone-Depleting Substances**  
We abolished use of cleaning-use ozone-depleting substances in 1994. In FY2002 we achieved our targets for reduction of other types of ozone-depleting substances, replacing cooling use specified CFCs used in turbo chillers and machine oil coolers with substitutes, reducing our total CFC stock amount by 51% and reducing our halon-based fire extinguishers by 38% (against FY2000) by substitution with other products.

**Reduction of Substances designated under PRTR Law**  
In FY2002, we reduced the number of PRTR-designated substances from eight to six, decreasing our handling amount by 26% against FY2000.

In our Breakdown of PRTR-designated Substances, xylene and toluene, which are mainly contained in fuel for air-conditioning systems and forklifts, accounted for 94%. In our Breakdown of Released and Transferred Substances, Release to the atmosphere accounted for 18%, due to evaporation of cleaning solvents,

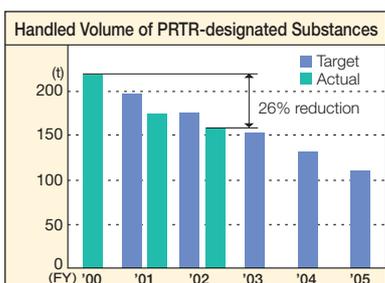
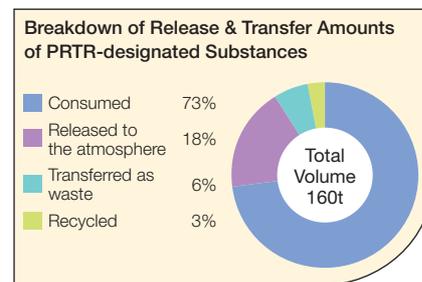
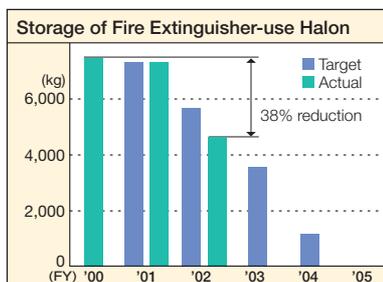
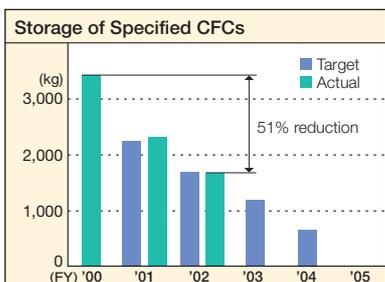
paints and thinners. Furthermore, of the bulk of the 73% of PRTR-designated substances consumed were incinerated.

In total, we found substitutes for 41 PRTR-designated substances, reducing consumption by 6.7t. This we achieved by eliminating use of cleaning agents ( n-alkylbenzene sulfonic acid ) in products, and restricting use of additives in heat treatments (barium), etc.

- **Reduction of Chlorine-related Additives Containing Machining Oils**  
During the cutting and grinding process, we occasionally use chlorine-related additives containing machining oils. In FY2002, we reduced the handling amount by 16% or 3t (against FY2000), while falling short of our target by a small margin. We achieved this by developing substitutes for 10 different types of machining oil after much testing to resolve various quality and technical issues.
- **Controlling Banned Substances at the Source**  
We have established stringent management procedures to ensure that banned substances are not used in any materials or packaging materials used in the production process. Management controls this standard at source, i.e., at the time of purchase.

## Continued Improvement of Environmental Quality Management System

Our objective is to achieve our reduction targets for the PRTR-designated substances and chlorine-related additives containing machining oils, using our knowledge of chemical reduction at our plants, and with the cooperation of our technical divisions. In addition, we will continually improve our environmental quality management system in order to ensure full compliance with demands on manufacturers to eliminate regulated substances in line with more stringent environmental regulations in Europe.



Results of Survey of PRTR-designated Substances (FY2002) (kg)

Substance no.	Substance name	Handled volume	Released to the atmosphere	Released into water	Transferred to sewage	Transferred as waste	Consumed	Recycled	Number of sites used
16	2-aminoethanol	2,047	0	0	10	2,037	0	0	2
40	Ethylbenzene	3,021	379	0	0	304	2,338	0	1
63	Xylene	110,549	17,412	0	0	3,410	85,427	4,300	8
224	1,3,5-trimethylbenzene	4,010	2,025	0	0	164	1,146	675	2
227	Toluene	39,555	8,719	0	0	2,936	27,900	0	5
299	Benzene	782	2	0	0	0	780	0	1

Note: Annual volume of Class 1 designated chemical substances being handled exceeding 1 ton, and of specified Class 1 designated substances exceeding 0.5 tons, are listed.

### Notes on Terminology

**PRTR Law**: The Law Concerning Reporting, etc. of Releases to the Environment of Specific Chemical Substances.

**Consumed**: Amount of PRTR-designated substances converted to other sub-

stances following chemical reaction, incorporated or included within products that are removed from the site.

# Compliance & Environmental Risk Management

The NSK Group strives to reduce environmental risks, ensuring compliance with environmental laws and ordinances, upholding of plant environmental preservation agreements and establishing our own voluntary standards for important items. Furthermore, we are implementing various measures to minimize our environmental impact on the air, water and ground.

### ■ Preserving Air Quality

The equipment we use that has the greatest environmental impact is air conditioning equipment and heat treatment facilities. We have made efforts to preserve air quality by using LPG, kerosene, natural gas and low-sulfur heavy oil (LSA heavy oil) as fuel. In FY2002, we performed particulate and smoke tests on our plants. The results indicated that the volume of sulfur oxides and density of soot and dust and nitrogen oxides fell within the emission standards at all plants.



Heat treatment facility recently converted to natural gas

### ■ Preserving Water Quality

Wastewater with the greatest impact on water quality are water-based emulsified wastewater in the grinding and heat treatment processes, and wastewater in the barrel process. We are striving to reduce the environmental impact caused by the release of such wastewater into rivers.

We have installed “evaporating-concentrator” facilities to treat the water-based emulsified wastewater, which is difficult to treat given its content of surface activation agents and oil. The facilities are highly efficient, separating water and oil by evaporating the waste liquid within a low-pressure evaporation chamber. Thanks to the performance of these facilities within the NSK Precision Co., Ltd. Maebashi Precision Machinery & Parts Plant, year-on-year BOD emissions were reduced by 69% in FY2002. In future, we intend to further strengthen our efforts to preserve water quality.



The evaporating concentrator facility

### ■ Responding to Environmental Risk

We have established a “Corporate Ethics Regulations” and a “Risk Management Committee” to respond to various risks and emergency situations in an appropriate manner. We have also improved our environmental risk management system, based on the fundamental principal of “Compliance and Accident Prevention” and have established a common code of conduct for all employees, so that the system functions in an organized manner.

#### • Review of Operations Program and Re-Education of Employees in Effort to Prevent Repeat of Oil Leakage Accident

NSK performs various operations to ensure prevention of oil leakage accidents, establishing “Voluntary Standards for Underground Tanks and Pipes containing Dangerous Substances”, and performing regular seal tests on underground tanks and pipes. In FY2002, we performed seal tests on 56 underground tank and pipe facilities, detecting no abnormalities in each case. At each plant we perform daily inspections and have established oil retaining walls in an effort to contain oil spillages arising from accidents, fires or earthquakes. In addition, we have also established discharge ponds and oil-water separation equipment at discharge to contain the spread of pollution in event of an accident.

Despite these measures, however, NSK Needle Bearings Co., Ltd. experienced an accidental release of grinding coolant into a local river following the sudden breakdown of a grinding coolant filtering system. Immediately after the event, we performed an investigation into the cause of the accident, and established measures to prevent a repeat of similar accidents, including review of procedures, re-education of employees, addition of analysis and monitoring functions to the system operational program and

construction of a retaining wall. Based on the lessons learned from this accident, NSK and our subsidiaries performed an investigation and audit into the management of similar facilities, with special emphasis on grinding coolant filtering systems. The investigation examined the content of operational programs and procedures, oil leakage prevention measures, emergency procedure manuals, as well as the state of emergency education and drills. The results highlighted deficiencies in leakage prevention measures and employee education, for which we have since implemented improvement measures.

• **Emergency Drills Performed 98 Times at NSK and Subsidiaries to Ensure Prevention of Contamination**

We have established an emergency response system, installed emergency equipment and sand bags, oil-absorbing mats, and perform emergency drills to minimize environmental impact in the event of an emergency.

NSK and our subsidiaries have taken all precautions to prevent the spread of contamination in the event of an accident, performing emergency drills on 98 different occasions in FY2002. The Shiga Manufacturing Division, Otsu Plant, performed extensive drills under the assumption that oil had leaked from a piping connection of an industrial machine into a storm water drain and into a nearby river. The drills included practice of con-



Workers deploy an oil fence in an emergency drill

tainment measures, such as establishment of an oil fence and recovery of surface oil, as well as confirmation of the in-house and competent-authority reporting system.

■ **Complaints from Local Residents**

In recent years, we have received a number of complaints concerning our factories with the increasing urbanization of such regions. In FY2002, we received 10 complaints regarding noisy exhaust fans, machinery buzzers, smells of oil, etc., for which we implemented improvement measures. We will continue to make improvements in response to neighborhood complaints arising from our plants.

Initiatives on environmental risks performed at plants of NSK and newly spun-off subsidiaries

Item	1970	1980	1990	1992	1994	1996	1998	2000	2002
General measures		Reinforcement of monitoring systems through in-house regulations			Compliance audits	Performance audits	System audits		Audit of subsidiaries companies Risk Management Committee
Air conservation		Conversion to cleaner fuels for air conditioning systems Convert from heavy oil to LSA heavy oil and kerosene		Measures to remove oil mist from exhaust gas arising in heat-treatment process			Eliminated use of on-site incinerators		Convert from LSA heavy oil and kerosene to LPG and natural gas
Water conservation		Compliance measures: Established comprehensive wastewater treatment facilities (able to treat nitrogen and phosphorus)			Measures to reduce environmental impact of emulsified wastewater (expansion of on-site treatment capacity): Installed evaporating concentrators				Installed oil-water separators, discharge ponds and monitoring equipment at discharge points Improved examination and monitoring systems through addition of oil film detector, etc.
Soil and groundwater conservation		Abolished use of trichloroethylene 1,1,1-trichloroethane		Abolished use of dichloromethane					Reduced solvent emissions, installed recovery equipment Measures against leakage of underground tanks and buried pipes; improved monitoring Completed heavy-metal ground study Completed study for contamination of ground by chlorinated organic solvents, implemented remediation measures

# Logistics Measures

The Green Logistics Committee is responsible for performing comprehensive logistics activities such as promotion of acquisition of ISO 14001 certification at a subsidiary logistics company and measures to improve logistics operations. The plants are working with their suppliers to improve logistics. In FY2002, we made significant improvements to our logistics efficiency, reducing our year-on-year CO<sub>2</sub> emissions per production unit by 6.7%.



## Goals

### 1. Reduce the environmental impact arising from transportation (Reduce emissions of CO<sub>2</sub>, NOx and PM)

- Improve loading efficiency by combining product logistics with procurement logistics
- Reduce vehicle mileage and number through implementation of joint deliveries and "milk-run" style delivery routes
- Promote eco-oriented driving styles and convert to low-emission vehicles

### 2. Reduce environmental impact of packaging & packing

- Promotion of 3Rs (reduce, reuse & recycle) in packaging and packing materials
- Review recycling of plastic boxes

### 3. Environmental activities of NSK Logistics Co., Ltd.

- Comprehensive logistics activities through Environmental Management Committee
- Promotion of acquisition of ISO14001 certification

## Reduce the Environmental Impact Arising from Transportation

### Efforts concerning procurement logistics

In the past, we performed continual improvements to efficiency of transportation, focusing on base-to-base distribution (in-house distribution) and transportation to users (delivery distribution). In recent years, however, we have focused on improving the overall efficiency of deliveries to and from both NSK and our suppliers by incorporating procurement-oriented logistics with our product distribution operations. Specific efforts include proposal of plans for our logistics subsidiaries to performing delivery operations at competitive prices, performance of systems where we pick up parts and materials at our expense,

merging or abolishing routes and improvement of loading capacities. These measures are applied gradually to deliveries of parts for hub unit bearings manufactured by the Shiga Manufacturing Division and the roller bearing parts manufactured by the Fujisawa Plant.

## Reducing the Environmental Impact of Packaging & Packing

### Use of returnable packing containers

In order to reduce the environmental impact of packaging and packing, NSK is simultaneously converting returned boxes for domestic use as well as using these returnable boxes as packaging for export products. Since FY2002, we have been using returnable plastic boxes as packaging for exports of unit hubs to Australia and for small size bearings imported from our Jakarta plant.

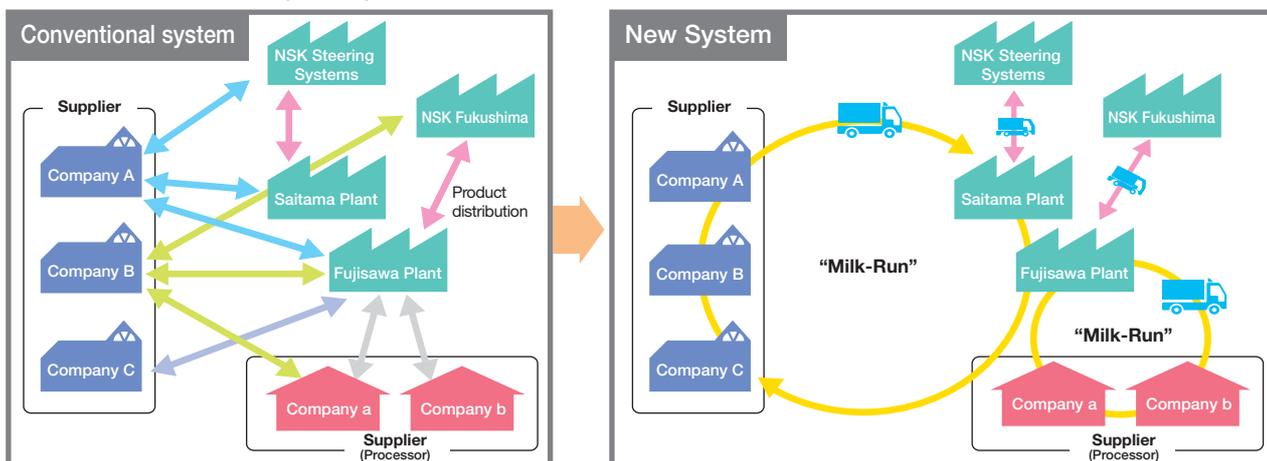
### Separation of returned containers & packaging materials

Recent years have seen an increase in the amount of used containers and packaging materials received from customers performing their own environmental efforts. In order to address this increase in waste, the Logistics Center is promoting reuse, separating and managing such containers and packaging materials and returning them to the production plants of the original shippers.

## NSK Logistics Co., Ltd.—Aiming to Acquire ISO14001 Certification during FY2003

- NSK Logistics Co., Ltd., which handles shipping from production plants to customers has established an Environmental Management Committee. The company is establishing an environmental management system to improve the efficiency of its efforts, and is striving to acquire ISO14001 certification during FY2003.

Procurement of products through carriage



Under the conventional system, multiple truck shipments carried parts and materials from our suppliers (A, B & C) to each of our plants or to our processor suppliers. We have since merged these into a single "milk-run" delivery route. Parts and materials from companies excluded from the milk run for location reasons are now delivered by mixing in with existing product deliveries. Furthermore, milk-run for 2 processor suppliers was established by merging deliveries of materials from suppliers and parts from processors into a single route. As a result, deliveries carried out in a single direction on 9 different routes are now covered by 2 milk runs routes and 2 product deliveries routes, thereby significantly increasing distribution efficiency.

### Notes on Terminology

**PM** : Particulate matter emitted from diesel engines.

**Returnable** : Effort to reduce container packaging leftover after product delivery by replacing cardboard packaging with plastic boxes, which are collected from users for reuse.

**Milk run** : System of delivery resembling milk delivery route, where delivery is per-

formed through a single circulatory route by traveling multiple pick-up points and delivery destinations. In comparison with transport backwards and forwards between pick-up points and delivery destinations, the system reduces mileage, the number of trips, as well as environmental impact.

## Green Procurement

In an effort to strengthen our chemicals management, we have revised “NSK Green Procurement Standards” to meet stricter environmental standards, and asked for cooperation from 235 of our suppliers (accounting for 93% of the total purchase expenditure) by distributing the new standards.

We also promoted green purchasing for office-use products, purchasing a cumulative total of 1,055 units of environmentally sound office equipment and 11 low-emission vehicles.

### ■ Promotion of Green Procurement & Green Purchasing

At NSK, our green purchasing and green procurement efforts to go one step beyond our conventional scope of activities for the development of a recycling-oriented society.

#### Green procurement (raw materials, materials & parts)

- Reduce the environmental impact of raw materials, materials, parts and packaging materials, etc.
- Tighten the management of hazardous substances
- Encourage suppliers to make their own voluntary environmental efforts

#### Green purchasing (office-use products, vehicles, etc.)

- Reduction of environmental impact of purchased goods
- Improve employees' awareness of environmental issues

### ■ Revision of the NSK Green Procurement Standards and Application to Subsidiaries

Recent years have seen a tightening of domestic and overseas regulations regarding the use of hazardous chemicals and release of information following the establishment of the PRTR law in Japan, the ELV Directive and RoHS directive in Europe. As a result of these changes, we revised our “NSK Green Procurement Standards” issued in FY2001, tightening the provisions regarding management of hazardous chemicals during procurement and the production stage, as well as those concerning the release of information in this regard.

In FY2002, and as an additional effort to promote manufacturing or environmentally sound products, NSK divisions and subsidiaries that manufacture NSK-brand products distributed the revised NSK Green Procurement Standards to a total of 235 suppliers, encouraging them to cooperate with NSK's efforts to conserve environmental resources. Responses and self evaluations were received from 210 companies (89%), of which, 84% gave “top priority” to green procurement, while 16% regarded their activities as “requiring improvement.”

### ■ Purchases of environmentally sound OA equipment and low-emission vehicles

In FY2001, we strived to increase the scope of our green purchases in line with the NSK Green Purchasing Guidelines. As a result, purchases of OA equipment made in FY2002, including 922 personal computers, 102 printers and 20 copiers, were all environmentally sound products. Furthermore, of the 12 vehicles scheduled for replacement during the year, all were changed to low-emission vehicles, except for one special-use vehicle not available in a low-emissions format. The results of such green-purchasing efforts were announced in the December 2002 edition of our in-house newspaper NSK News.



### ■ Promotion of Green Purchasing through the Internet

Following our conversion to procuring our office products through the Worldwide Web, NSK head office placed a menu of products that meets the required guidelines for green purchasing on the NSK intranet. The menu contains a list of 57 products, including files and stationery products that are registered as green purchase products, recommending that priority be given to purchase of such products. As a result, green products accounted for approximately 61% of office supplies bought by the NSK head office in FY2002.



### ■ Encouraging Full Green Purchasing at NSK and our Suppliers

In order to expand the scope of green purchasing outlined in the NSK Green Purchasing Guidelines, our employees are familiarized with the content of this book and its practices are heavily promoted.

Furthermore, we have taken out Green Procurement activities a step further by encouraging our suppliers to follow environmentally sound practices.

## Green Office Activities at the Head Office Building

NSK has implemented various environmental measures within the Head Office Building, mainly through the Green Office Subcommittee established in 2001. In FY2002, we succeeded in reducing our paper consumption by 15%, exceeding our target of reducing consumption by 10% against FY2001.



### Promotion of Environmental Activities at the Head Office

At the head office, we promote the following environmental activities:

- Improving awareness of the environment through education and awareness-raising activities
- Efficient use of resource-conserving paper use, waste separation, promotion of energy-saving practices
- Promotion of green purchasing

### Environmental Education and Awareness Raising Measures (FY2002)

- We performed “Environmental Education Seminars” attended by 64 new employees. The seminars were integrated into the employee educational curriculum and covered general environmental trends, an overview of ISO 14001 and efforts required for NSK environmental activities.
- We issued ECO News, an intranet-based newsletter, six times during the year. The newsletter helps to raise awareness through sharing of information.
- We performed “Green Patrol” inspection tours of the Head Office Building twice a year. At the end of the year we performed the tour in cooperation with the Central Safety & Health Committee.



The Green Office Subcommittee inspected the various sections of the Head Office Building, evaluating the state of separation of paper and waste, and feeding the results back to each section. During the inspection, the Subcommittee member performs detailed checks, inspecting the paper separation and collection boxes, containers for separated waste and the box for reusable paper. The Committee then makes a report of findings to the head of each section to instill an awareness of proper waste separation practices.



#### a) Separation of printer paper

We maintain a box for reusable paper that had been printed on one side only near copiers and printers. We also have 3-story separation boxes with separate trays for dividing white blank paper (copy paper and printer paper) and miscellaneous paper, into confidential and non-confidential papers.



#### b) Separation of office waste

We have installed “waste separation containers” with different bins for resource waste, combustible waste, bottles, cans PET bottles and raw garbage.

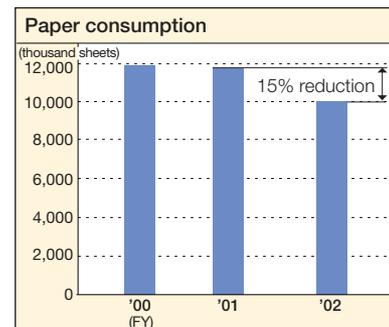


### Reducing Paper Consumption

In the day-to-day operation of our offices, we consume a great deal of paper resources. We are addressing this problem by transforming our offices into paperless offices, by making more effective use of copy paper and making greater use of electronic documentation.

In FY2002, our year-on-year paper consumption fell by 15%, exceeding our targeted reduction of 10%. Furthermore, we were able to achieve a significant reduction in costs by separating waste documents into general and confidential documents.

- Separation of waste documents
- Active use of double-sided copies
- Active use of back-sides of copies made by mistake and printed paper, taking care to avoid used papers containing confidential information
- Review of use of printed handouts during meetings
- Use of electronic means for making in-house notifications procedures
- Use of electronic documentation systems



### Firm Establishment of Environmental Practices

In the future, we will continue with our efforts to observe environmental practices and implement similar measures at our branch offices.

# Environmental Communications

Each and every one of our employees will continue with their efforts to actively pursue environmental conservation activities in order to maintain the NSK brand and the trust of the communities in which NSK operates. We also promote disclosure of our environmental activities to our stakeholders so that they will have a better understanding and appreciation of the nature of our conservation efforts.

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# Environmental Education

An important requisite for the promotion of environmental efforts is to raise awareness of each and every employee. NSK Ltd. has continuously provided environmental education and awareness activities for all its employees.

## Environmental Education and Awareness Activities

- At NSK, we perform multi-level education, ranging from those for management executives of NSK and our subsidiaries to those for general employees. The programs provide extensive coverage of environmental trends and teach general knowledge and skills in connection with environmental matters.

Each new employee takes courses that include easy-to-follow classes on environmental matters such as why environmental efforts are necessary, the environmental efforts of NSK and issues that are relevant in environmental reports.

Number of employees that received environmental education in FY2002 and number of programs

Type of Programs	Number of employees receiving program	Number of times
1. Environmental laws, regulations and compliance	2,057	3
2. Environmental knowledge	6,067	43
3. Background on acquisition of environmental qualifications, such as environmental auditor	34	30
4. Environment-friendly design and green purchasing	347	6

- NSK Sales Co., Ltd., which manages the operations of our Sales Divisions, held the “Environmental Report 2002 Briefing Session” at its annual sales meeting.

The purpose of the presentation was to explain the current state of our environmental efforts and the role of the Sales Divisions and to enlist further support for conservation efforts.

Emphasis was also made on the environmental contributions of NSK products, raising the Sales Division’s appreciation and awareness of how NSK’s products reduce the negative environmental impact of automobiles, home electronics and industrial machines while meeting user needs.

- Each of our plants release “Environmental Monthly”, a monthly newsletter on the environmental efforts of each plant. Focusing on the characteristics of each plant, each newsletter contains information on the environmental activities and performance data, as well as topics of interest. The newsletter helps to raise environmental awareness of our employees.

- We also release an in-house newspaper NSK Group News for all employees, which regularly includes special features on environmental matters. Our other company newspaper, NSK News Letter, a publication for our overseas employees, features regular reports on our environmental efforts and environmentally sound products.
- The environmental advertisement that we placed in “National Geographic Japan” received favorable reviews, prompting the Environment Control Dept. and the Public Relations Dept. to turn it into an environmental poster for raising awareness within the company. Our bearings and other products support the environment for energy conservation, facilitating the smooth movements of machines and reducing energy loss through friction. If each and every user of such products awoke to the importance of environmental conservation and made efforts in this regard, no matter how small, the overall effect would be huge. We have placed this poster in each division and department, in the hopes that it will help to raise interest in environmental activities.



# Community Activities

Based on our Environmental Policy, NSK is, as a corporate citizen, committed to performing community activities.

## Volunteer Clean-up Campaign

NSK conducted 26 volunteer clean-up campaigns in FY2002. Part of our fundamental philosophy calls for implementing corporate activities that benefit the local community. In order to realize this principle, we actively participated in the Ishibe cho and Saitama Clean-up Campaign, as one of our volunteer efforts to clean-up areas around our plants.



## Plant Viewing Tours (Open House)

On September 7, 2002, we held our annual "Otsu Open Day" at the Shiga Manufacturing Division, Otsu Plant. During the day, we hold plant viewing tours, allowing employee family members, local residents and our subcontractors to see the inside of a working plant. The open day enjoyed popularity among the 200 or so visitors in attendance. During the family viewing tour, many children could be seen listening attentively to the explanations given by the tour guide or peering wide-eyed into the inner mechanics of our machines and equipment.



## Helping People with Visual Impairments through Support of Guide Dog Training (NSK Welfare Fund)

Established in 1995 on the notion of, "Let's collect a cup of coffee's worth of goodwill," the "NSK Welfare Fund" (the Fureai Club) performs local support and planning of local volunteer activities. The fund is supported by 3,688 of our 6,438 employees.

- NSK is a corporate member of the Japan Guide Dog Association, to which we make corporate donations. Of the 160,000 people with class 1 or 2 visual impairments in Japan, some 4,700 are in urgent need of guide dogs. Only 875 guide dogs are available (as of the end of March 2001), however, far less than the required number. In view of such circumstances, we support guide dog training programs as part of our activities to support people with visual impairments.
- We made contributions to the Japan Committee for UNICEF and the Japan Relief & Clothing Center to help needy children around the world.

## Supporting Nature Protection Activities in Japan and Developing Countries

- Through the "Keidanren Nature Conservation Fund," we support nature protection activities performed by non-profit organizations in Japan and in developing countries within the Asia-Pacific region.
- In 1981, NSK and our subsidiaries combined capital to establish the "Electro-Mechanic Technology Advancing Foundation." The foundation performs support activities such as the fostering of research issues at domestic universities and research institutions to promote the advancement of mechatronics and mechanical technology, as well as contribute to the improvement of the lives of the nation's citizens.



## Overseas Community Efforts

● In addition to the economic benefits to the local community, our Jakarta Plant also helps them with educational and cultural activities. In this regard we are making efforts to cultivate future staff, establishing a scholarship system among the 20 elementary-, junior high- and senior high schools.

Furthermore, we also contribute to local cultural life, performing fundraising and donating goats, among other things, for use in the Iduladha (sacrifice) festival, a custom of Islam, the national religion of Indonesia.



● In the summer of 2002, eastern Germany, the Czech Republic and Hungary experienced severe flooding, bringing severe damage to many areas. In response to this emergency, so-called “thousand year flood”, NSK Deutschland GmbH provided emergency relief in the form of funds collected from employees and corporate donations. These emergency relief funds were sent to an elementary school in the German town of Grima, where an official presentation ceremony was held in January 2003.



● In March 2003, the first “NSK Sino-Japanese Friendship Outstanding Paper Prize for Students of the Mechanical Engineering Department Award” was held at the School of Mechanical Engineering, Tsinghua University.

The prize was established to encourage research and commend the achievements of researchers and students in fundamental research in the field of mechanical engineering. Each year the prize is awarded to 10 post graduate students or professors who released distinctive research papers in the field.

The prize giving ceremony was attended by the vice principal of Tsinghua University, Mr. Sekiya, Chairman of the Board of NSK Ltd., as well as various NSK officers posted in the Asian region. Following the ceremony, the Executive Chief Engineer of our Basic Technology Research & Development Center gave a speech on academic matters.



## Environmental Communications

As part of our effort to promote on-going environmental activities, NSK releases environmental information in a variety of ways, so that our stakeholders may better understand and appreciate our environmental policies and activities.

### Promoting Two-way Communication via Our Website

The NSK environmental report can also be found on our website. Instead of presenting information one-sidedly, since 2001, we have been accepting public opinions and advice through e-mail to encourage the free communication and exchange of ideas between NSK and the public.

URL: <http://www.nsk.com>

E-mail: [eco@nsk.com](mailto:eco@nsk.com)



### NSK Environmental Report Entered in Mie Prefecture's "1st Japan Environmental Management Prize"

The Environmental Report contains information on a wide range of topics and is not limited to environmental issues. Our Environmental Report 2002 was evaluated by the Committee of Mie Pref. 1st Japan Environmental Management Awards as follows:



“Senior management has made a clear commitment to environmental management, and the scope and level of performance is excellent. Their actions point to clear policies, and establishing a sophisticated system remains a priority. Their efforts in this regard are commendable, and we expect the company to realize steady achievements in the future.”

### Advertising our Commitment towards Conservation

*National Geographic Japan* is a monthly photo-journal that specializes in all themes concerning the earth, including nature to science, history and geology. NSK has been placing an environmental advertisement on the back cover of this magazine twice a year for the past few years. In the February 2003 edition, the advertisement carried a heartwarming picture of a father and son fishing while talking about the environment. The advertisement describes how we are making an utmost effort towards the environment based on our desire to be known as a brand that supports the environment and declares our ongoing commitment to the environment in all fields, all of which helps to improve awareness of NSK's environmental activities.

### Participation in International Manufacturing Technology Show 2002 held in Chicago

NSK participated in the International Manufacturing Technology Show (IMTS2002) held in Chicago, Illinois between September 4 and 11. Based on the concept of “Machine Solutions,” the NSK booth presented solutions to the various problems associated with machinery tools, with maintenance free, high speed, high precision and high dust prevention.

We exhibited HMC ball screw for high-speed machine tools (mainly the Precision Rolled Ball Screw with K1), LA Linear Guides, super-long linear guides, dust seals, precision ball screws, trans-slide systems, mechatronic products, including the new YSB motor, and precision spindle bearings.

Many of the visitors expressed interest in our ball screws with high performance dust seal, demonstration-use machine for operating in saw-dust environments, precision roller bearings, demonstration-use machine for operating in foreign-object environments using a trans-slide system.



### Opinions and Impressions from our Readers

The following are a few of the more notable opinions and impressions concerning our Environmental Report 2002 received from our readers responded to the survey.

“The environmental report was very well done. The corporate philosophy was indicated clearly and the method of indicating themes was easy to understand, while charts, texts and tables on each page were a little difficult to understand.”

*(Female, 23)*

“The report is commendable, being compiled in accordance with the Environmental Reporting Guidelines. We would like to use the report as a reference when making our own reports. The report includes articles that we seldom find in the reports of other companies and contains a wealth of information on environmental accounting and environmental communications.”

*(Male, 30)*

“The pages were thick, making it difficult to open. The section on design for the environment was difficult to follow. Although there were various pictures and charts, I found it hard to picture just how much consideration they were paying to the environment.”

*(Male, 52)*

“The report was crammed with writing, giving the impression of being a serious publication. The publication, on the whole, was nicely packaged.”

*(Male, 39)*

“I thought that including individual site reports and Group company reports was a good idea. It was nice and concise without too much information, making it easy for people like me to read. In the future, I would like to see more site reports, which are of interest to local citizens. It would also be good if you could describe how complaints and opinions from citizens are dealt with as part of your communications with local residents.”

*(Female, 57)*

The letters were too small for a senior citizen like me to read.

*(Male, 75)*

We would like to thank those who forwarded opinions and use them as an important reference when performing new environmental activities in the future.

# Social Responsibility

Assuming social responsibility for our actions helps us earn the trust of our many and varied stakeholders. Towards this end we implemented a wide variety of measures, believing that it is indispensable for each and every one of our employees to act in accordance with our corporate code of ethics.

## “Basic Risk Management Policy”

### (Determines course of action during crisis, based on fundamental principle of “life first”)

NSK has established a “Risk Management Committee” to manage emergency situations occurring within the NSK Group. The aim of the Committee is to avoid both internal and external risks, such as worldwide recessions, and international tensions, and to minimize damage in the event of a crisis.

Being directly connected with the Board of Directors, the “Risk Management Committee” manages significant risks affecting the NSK Group at the operational level. During an emergency, the Committee sets up a Risk Strategy Headquarters, which will assume control of the situation.

The “Basic Risk Management Policy” functions as general guidelines for the “NSK Risk Management Manual”. The Policy determines the course of action during a crisis, such as emergency response procedures and standards of behavior, based on the fundamental principle of “placing maximum value on human life.”

## Realizing Corporate Activities with High Ethical Standards

Besides terrorist attacks and natural disasters, the makings of a crisis can include such things as damage to corporate image through serious misfortunes or accidents caused by the company. Indeed, the high frequency of scandals in recent years has given rise to anti-corporate sentiment. In order to prevent such misfortunes from occurring, we have identified the fundamental laws and regulations that our directors and employees must follow, sharing this information throughout the entire Group. By doing so, we have set forth the “NSK Business Ethics Regulations (Compliance),” designed to ensure corporate activities of a high ethical standard.

Furthermore, as a legal compliance guide, we have determined 14 items, including compliance with the antimonopoly law, the prohibition of insider trading and treatment of intellectual property. We have also established punitive provisions and a help desk for queries regarding legal matters.

“NSK’s Code of Conduct Policies” are for executives and employees. They were established in order to ensure the proper action in all daily business activities.

The six basic policies are as follows:

- NSK shall enhance the value of its brand and become the world’s top brand.
- NSK employees shall put customers first by acting sincerely and swiftly.
- NSK employees’ behavior reflects pride in the NSK brand.
- NSK employees’ behavior reflects awareness of shareholder value.
- NSK employees shall act in accordance with the awareness that they are members of the global NSK Group.
- NSK employees shall act in a highly ethical manner as corporate citizens by observing laws.

Based on this policy, all employees in the entire Group, each division, such as sales, logistics, technical development, environment, procurement and information, will set forth their own detailed behavioral policy.

## Establishment of NMS (NSK Management School) to Foster a New Generation of Business Leaders

Based on the notion that human resources form the foundation of corporate wealth, and with the aim of fostering and utilizing a diverse range of human resources, in FY2003 we established the NSK Management School (NMS), restructuring our traditional executive fostering system. The school offers four multi-level courses, namely (1) the Managerial Course, (2) the General Manager Course, (3) the Executive Course and (4) the Global Officer Course, which are combined to complement a specific theme and held over a six month period. By providing ongoing early development of the next generation of business leaders with the required managerial skills and career background, we provide human-oriented support for the expansion of the NSK Group global development and the acceleration of our subsidiary operations.

# Site Efforts

**NSK's efforts to reduce environmental impact encompass the entire NSK Group, not only to individual sites but also Group companies and manufacturing subsidiaries' sites.**

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## **Efforts at NSK and Newly Spun-off Subsidiary Plants**

- 37** Shiga Manufacturing Division, Ishibe Plant
- 38** Saitama Plant/NSK Precision Co., Ltd., Saitama Precision Machinery & Parts Plant
- 39** NSK Steering Systems Co., Ltd.
- 40** NSK Precision Co., Ltd., Kirihara Precision Machinery & Parts Plant

## **Efforts by Group Companies**

- 41** NSK-Warner K.K.
- 42** NSK Kyushu Co. Ltd.
- 43** Shinnippon Koukyu Co., Ltd.  
Shinwa Seiko Co., Ltd.
- 44** NSK Machinery Co., Ltd.  
NSK Logistics Co., Ltd.

## **Overseas efforts**

- 45** NSK Brazil LTDA, Suzano Plant

## **46 Reference Data**

# Shiga Manufacturing Division, Ishibe Plant

## Overview:

Location:	1-1-1 Ishibegaoka, Ishibe-cho, Kouga-gun, Shiga
Site area:	185,330m <sup>2</sup>
Number of Employees:	956 (As of March 31, 2003)
Products:	Automotive bearings, ball bearings
ISO 14001 Certified:	October 1998



## Summary of environmental efforts

Flanked by the Hira, Tanakami and Shigaraki mountains, the Yasu River and Lake Biwa, the Ishibe plant is located in a rich natural environment, abounding in greenery and water resources. Accordingly, preserving and enhancing our coexistence with this environment is an essential element of our operations. Recent years have seen the expansion of residential areas into regions close to the factory grounds. With so many new residents on our doorstep, we now have to take extra care to see that noise, vibrations and smells, which have been items of little concern until now, do not become a problem for our new neighbors.

## Aiming for better communications and harmonious existence with local community

In this age of increased media attention on environmental issues, the Ishibe plant is making a continuous effort to establish and maintain a rapport with the local community, making a clear presentation of its efforts and stance towards environmental matters by performing clean-up operations around the factory, holding information disclosure sessions with community directors, and holding of factory tours and plant viewing. The plant also releases its own environmental report for its suppliers and local residents.

## Achievement of zero emissions through establishment of recycling system

Formerly, the plant had sent solid waste plastic to landfills, but began to recycle the plastic by converting it into compressed bricks (RDF) to improve the plant recycling ratio. Thanks to the establishment of systems to recycle other items such as grinding stones, used overalls, gloves, safety shoes and plastic bags, the plant has achieved zero emissions.

## Emergency response of lock gates improved through conversion to remote controlled electric valve system

Once a year, we perform emergency response drills under the assumption of oil spillage. In our last two drills, we responded under the assumption that oil had leaked out of the plant. During the following evaluation meeting, however, it was determined that the safety and ease of operation of the lock gate in the final discharge pond was in need of improvement. As a result, we converted the lock gate from a hand-operated system to a remote-control electric-valve system, shortening response time and reducing the danger of operators falling into the pond. We also set up a lighting system easily capable of responding to emergencies both night and day.

Environmental Management Representative:  
Toshiki Yamaguchi

### Notes on Terminology

pH : Hydrogen-ion concentration

COD : Chemical oxygen demand. Used as an indicator to determine the density of organic water pollutants and indicates the oxygen in the oxidant consumed in order to oxidize the pollutants contained in the water.

## Water quality

Item	Regulatory requirements	NSK requirements	Actual value
pH	6.0 – 8.5	6.3 – 8.3	7.2
BOD (mg/l)	70	50	3.8
COD (mg/l)	70	50	6.7
Suspended solids (mg/l)	90	70	3.5
Oils (mg/l)	5	4	0.1
Nitrogen (mg/l)	40	30	2.0
Phosphorus (mg/l)	2	1.6	0.1

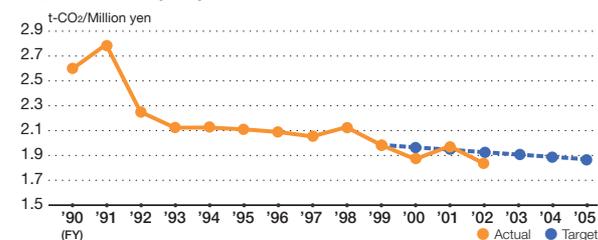
• Discharge point: River (Yasu River)

## Air quality

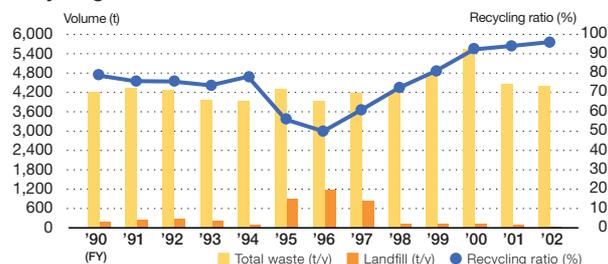
Item	Facility	Regulatory requirements	NSK requirements	Actual value
NOx (ppm)	Boiler	150	120	73
	Metal furnace		No such facility	
Soot & dust (g/m <sup>3</sup> N)	Boiler	0.1	0.05	Less than 0.02
	Metal furnace		No such facility	
SOx (K value)	Boiler	8.76	5	Less than 0.1
	Metal furnace		No such facility	

Actual value for NOx, Soot & dust, SOx is the maximum value recorded from a number of applicable facilities.

## CO<sub>2</sub> emissions per production unit



## Recycling ratio & landfill waste



## Release & transfer volume of PRTR-designated substances (Kg)

Substance no.	Substance name	Handled volume	Released to the atmosphere	Transferred to sewer	Consumed
			Released into water	Transferred as waste	
63	Xylene	11,181	3,813	0	6,109
			0	0	1,259
224	1,3,5 -trimethyl benzene	2,436	1,706	0	55
			0	0	675

BOD : Biochemical oxygen demand. Used as an indicator to determine the density of organic water pollutants and indicates the oxygen consumed in order to oxidize the pollutants contained in the water using microbes.

# Saitama Plant / NSK Precision Co., Ltd. Saitama Precision Machinery & Parts Plant

## Overview:

Location:	1-1 Onuma, Hanyu-shi, Saitama
Site area:	280,627m <sup>2</sup>
Number of Employees:	717 (As of March 31, 2003)
Products:	Automotive bearings, CTV, precision machinery & parts
ISO 14001 Certified:	September 1998



## Summary of environmental efforts

The Saitama Plant manufactures automotive bearings and precision machinery & parts. With heat treatment and grinding accounting for a large proportion of operations, the plant uses a substantial amount of energy and water soluble cutting oil. The plant was one of the earlier NSK Group plants to acquire ISO14001 certification.

### Year-on-year CO<sub>2</sub> emissions per production unit reduced by 7% through streamlining control of compressor operation number

Manufacture of compressed air accounts for about 20% of the energy consumed by the plant. As a means of reducing our electricity consumption, finding the most efficient way to use this air has presented quite a challenge. In FY2002, we reduced our year-on-year CO<sub>2</sub> emissions per production unit reduced by 7% by converting turbo compressors to engine compressors, streamlining control of compressor operation number, and tightening regular air leakage inspections, etc.

### Halon 1301 abolished; PRTR-designated substances reduced by 12%

As a measure against ozone-depleting substances, we promoted conversion of halon-based fire extinguishers to CO<sub>2</sub>-gas type, abolishing use of halon 1301. Furthermore, we replaced our grinding coolant with substitutes free of PRTR-designated substances, reducing our use of products containing PRTR-designated substances by 12%.

### Plan for advance prevention of soil and groundwater contamination completed, reducing risks

In FY2002, we completed on schedule our plan for the advance prevention of soil and groundwater contamination, relocating buried pipes and tanks above ground and installing retaining walls, all of which helped to reduce risk.

### Saitama plant environmental management representative contributes to draft Hanyu fundamental environmental plan

The city in which the Saitama plant is located, Hanyu, is striving to address environmental issues, establishing its own fundamental environmental plan in March 2003, and the Saitama Plant Environmental Management Representative participated in the Drafting Discussion Committee. The plant also released its "Eco-up Declaration" (Plan for Reduction of Environmental Impact).

Environmental Management Representative:  
Mitsuru Mori

#### Notes on Terminology

**NO<sub>x</sub>** : Nitrogen oxides, including nitrogen monoxide and nitrogen dioxide. Such substances are emitted when fuel is burned in boilers.  
**Soot & dust**: Emitted with the burning of fuel.

## Water quality

Item	Regulatory requirements	NSK requirements	Actual value
pH	5.8 – 8.6	6.0 – 8.4	7.2
BOD (mg/l)	25	18	14.0
COD(kg/day)*	5.1	4.8	2.0
Suspended solids(mg/l)	50	40	13.8
Oils(mg/l)	5	4	0.2
Nitrogen(mg/l)	60	20	10.8
Phosphorus (mg/l)	8	3	0.6

• Discharge point: River (Naka River)

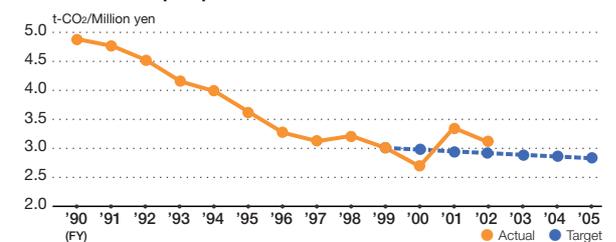
\*Tokyo Bay COD Total Volume Regulations

## Air quality

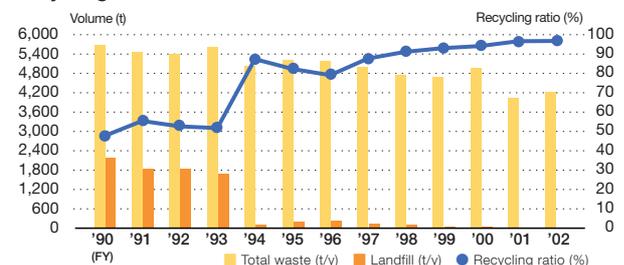
Item	Facility	Regulatory requirements	NSK requirements	Actual value
NO <sub>x</sub> (ppm)	Boiler	150	135	120
	Metal furnace	180	150	88
Soot & dust (g/m <sup>3</sup> N)	Boiler	0.3	0.2	0.003
	Metal furnace	0.25	0.15	0.006
SO <sub>x</sub> (m <sup>3</sup> N/hr)	Boiler	1.42	0.6	0.002
	Metal furnace	1.53	0.75	Less than 0.004

Actual value for NO<sub>x</sub>, Soot & dust, SO<sub>x</sub> is the maximum value recorded from a number of applicable facilities.

## CO<sub>2</sub> emissions per production unit



## Recycling ratio & landfill waste



## Release & transfer volume of PRTR-designated substances (Kg)

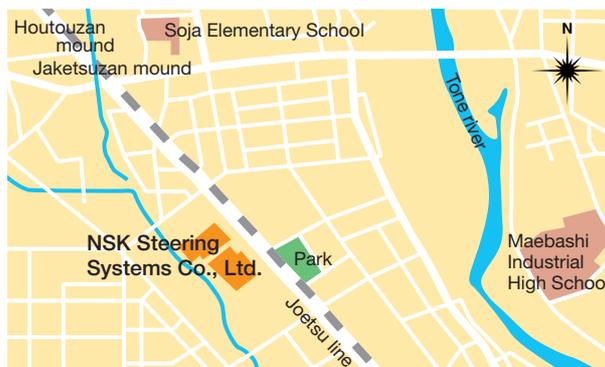
Substance no.	Substance name	Handled volume	Released to the atmosphere	Transferred to sewer	Consumed
			Released into water	Transferred as waste	Recycled
63	Xylene	12,187	3,053	0	8,774
			0	5	355
227	Toluene	2,756	9	0	2,747
			0	0	0

**SO<sub>x</sub>** : Sulfur oxides, including sulfur dioxide and sulfur trioxide. Emitted when fuels containing sulfur are burned.

# NSK Steering Systems Co., Ltd.

## Overview:

Location:	1-8-1 Soja-machi, Maebashi-shi, Gunma
Site area:	73,381m <sup>2</sup>
Number of Employees:	1,385 (As of March 31, 2003)
Products:	Automotive parts
ISO 14001 Certified:	December 1999



## Summary of environmental efforts

NSK Steering Systems Co., Ltd. (Formerly: NSK Ltd., Soja Plant) was spun-off in October 2002. The plant manufactures and develops EPS (Electric Power Steering) systems and other car parts. Among NSK plants, the company consumes relatively small amounts of energy, but large amounts of oil-based and water-soluble machining oil. In January 2003, the plant renewed its ISO14001 certification and is making an ongoing effort to reduce its environmental impact.

## Achieved zero emissions with a recycling ratio of 97.2% and landfill ratio of 0.2%

As part of its waste reduction activities, the plant made a concentrated effort to recycle waste plastic. The manufacture of plastic gears for use in EPS produces plastic cuttings containing a substantial amount of oil. In the past, we burned and/or placed in landfills over 10 tons of such plastic each year. Thanks to the adoption of an oil-removing centrifuges, however, we now convert the cuttings into solid fuel. Furthermore, by recovering the used cutting oil we have saved cost at least ¥100,000 a month. In addition, we have strengthened our internal waste separation capabilities. Solid fuel, for example, is separated and reused as fuel to produce electricity. We also recycle rubber gloves and safety shoes. The combination of these and other measures have allowed us to achieve zero emissions and attain a recycling ratio of 97.2% and a landfill ratio of 0.2%.

## PRTR-designated substances reduced by 4 items; machining oil with chlorine-based additives reduced by 2 items

We strive to reduce PRTR-designated substances in the production process and eliminate chlorine additives from machining oil. Towards this end, we have reduced products containing PRTR-designated substances reduced by 4 and machining oil with chlorine-based additives reduced by 2. Furthermore, in consideration of the health of residents living near the plant parking lot, which is located in the middle of a residential area, we have abandoned use of weed killer in our weed control operations, converting to use of mechanical grass cutting equipment.

Environmental Management Representative:  
Masaomi Takebe

## Water quality

Item	Regulatory requirements	NSK requirements	Actual value
pH	5.8 – 8.6	5.9 – 8.5	7.8
BOD (mg/l)	25	24	6.2
COD (mg/l)	25	24	7.8
Suspended solids (mg/l)	50	45	3.5
Oils (mg/l)	5	4	1.0
Nitrogen (mg/l)	120	100	6.9
Phosphorus (mg/l)	16	14	0.1

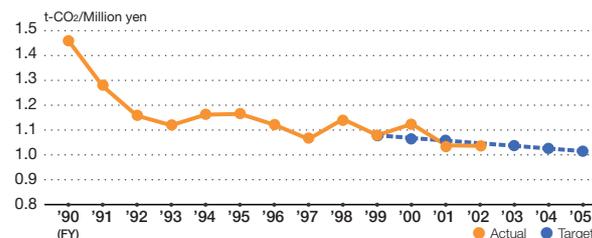
• Discharge point: River (Taki River)

## Air quality

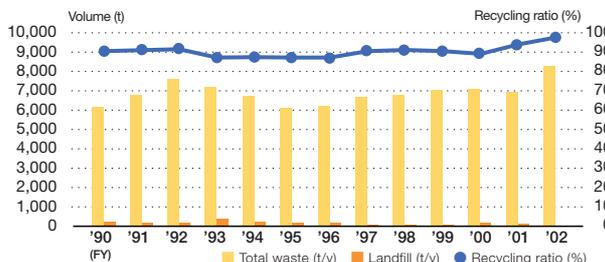
Item	Facility	Regulatory requirements	NSK requirements	Actual value
NOx (ppm)	Boiler	180	150	100
	Metal furnace		No such facility	
Soot & dust (g/m <sup>3</sup> N)	Boiler	0.3	0.2	Less than 0.01
	Metal furnace		No such facility	
SOx (K value)	Boiler	17.5	8	Less than 0.02
	Metal furnace		No such facility	

Actual value for NOx, Soot & dust, SOx is the maximum value recorded from a number of applicable facilities.

## CO<sub>2</sub> emissions per production unit



## Recycling ratio & landfill waste



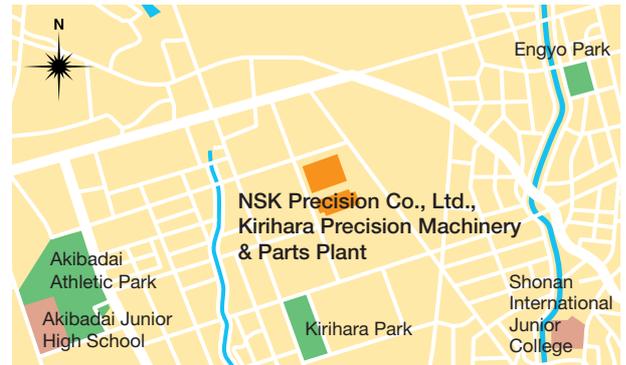
## Release & transfer volume of PRTR-designated substances (Kg)

Substance no.	Substance name	Handled volume	Released to the atmosphere	Transferred to sewer	Consumed
			Released into water	Transferred as waste	
40	Ethylbenzene	3,021	379	0	2,338
			0	304	0
63	Xylene	21,691	2,447	0	17,304
			0	1,940	0
224	1,3,5-trimethyl benzene	1,574	319	0	1,091
			0	164	0
227	Toluene	23,507	6,430	0	15,244
			0	1,833	0
299	Benzene	782	2	0	780
			0	0	0

# NSK Precision Co., Ltd., Kiri-hara Precision Machinery & Parts Plant

## Overview:

Location:	12 Kiri-hara-cho, Fujisawa-shi, Kanagawa
Site area:	44,044m <sup>2</sup>
Number of Employees:	273 (As of March 31, 2003)
Products:	Mechatronics products, precision machinery and parts
ISO 14001 Certified:	November 1999



## Summary of environmental efforts

In May 2001, new building construction at the Kiri-hara Plant was completed. The production line from the Maebashi Plant was transferred to Kiri-hara in April 2002. This line transfer took up all vacant space within the Kiri-hara Plant. Production at Kiri-hara Plant increased resulting in greater consumption of energy and a larger impact on the environment. In November 2002, we extended our ISO14001 certification, and continue to make ongoing improvements in energy conservation.

## CO<sub>2</sub> emissions per production unit reduced though conversion of air conditioning systems to natural gas

Air conditioning and lighting account for some 80% of the energy consumed by the plant, with a high proportion attributable to fixed energy. In FY2002, we reduced our CO<sub>2</sub> emissions per production unit thanks to efforts to improve energy efficiency following the transfer of production from the Maebashi Plant and the effects of installing gas-powered air conditioning systems in the new building. In the future, we intend to convert other systems to natural gas and improve building insulation for higher efficiency.

## Achieved zero emissions through waste separation and development of new uses for recycled materials

In the past, the plant had difficult-to-recycle products, such as packaging materials made out of several different types of material or unit parts comprising a large number of smaller parts, which served to hinder improvement of our recycling ratio. In order to address this situation, we initiated thorough waste separation and developed new uses for recycled products, achieving zero emissions in FY2002.

## Use of chlorine eliminated

We have managed to eliminate use of machining oils with chlorine-based additives. This we achieved by replacing such oils with chlorine-free types, which were then subject to a series of performance trials.

Environmental Management Representative:  
Hiroyuki Kato

## Water quality

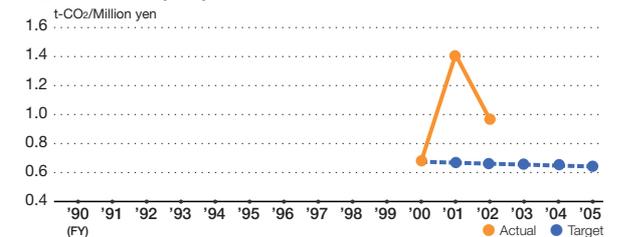
Item	Regulatory requirements	NSK requirements	Actual value
pH	5.8 – 8.6	6.2 – 8.2	7.9
BOD (mg/l)	60	55	4.0
COD (mg/l)	60	55	3.7
Suspended solids (mg/l)	90	85	2.2
Oils (mg/l)	5	4	1.0

• Discharge point: River (Hikichi River)

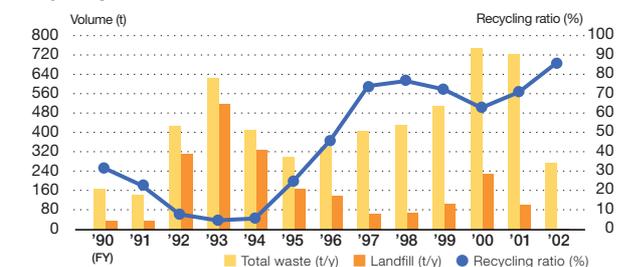
## Air quality

Item	Facility	Regulatory requirements	NSK requirements	Actual value
NOx (ppm)	Boiler			
	Metal furnace			
Soot & dust (g/m <sup>3</sup> N)	Boiler		No such facility	
	Metal furnace		No such facility	
SOx (m <sup>3</sup> N/hr)	Boiler			
	Metal furnace			

## CO<sub>2</sub> emissions per production unit



## Recycling ratio & landfill waste



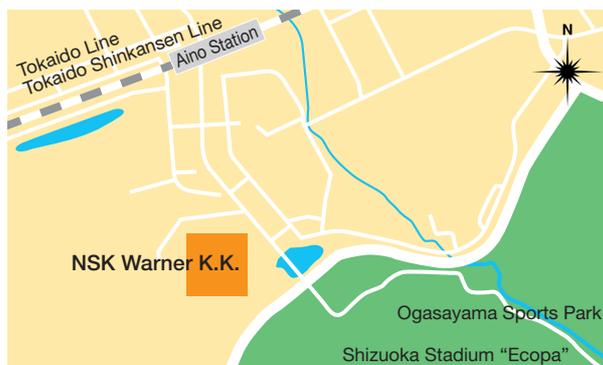
## Release & transfer volume of PRTR-designated substances

The plant did not handle any PRTR-designated substances in excess of 1 ton/year at our own voluntary standards.

# NSK-Warner Kabushiki Kaisha

## Overview:

Location:	2345 Aino, Fukuroi-shi, Shizuoka
Site area:	136,430m <sup>2</sup>
Number of Employees:	923 (As of March 31, 2003)
Products:	One-way clutches and friction material products
ISO 14001 Certified:	March 2001



## Summary of environmental efforts

Located near Ogasayama park, the venue for the 2002 world cup football tournament, and surrounded by rich natural environment, NSK-Warner K.K. develops and manufactures one-way clutches and friction material products. The plant maintains strict environmental measures in order to conserve its rich natural surroundings.

## Plant grounds commended by the Japan Greenery Research and Development Center

Since its construction and initiation of operations in 1989, NSK-Warner K.K. has made an active effort to beautify the plant grounds. In recognition of such efforts, the plant was commended by the Japan Greenery Research and Development Center in the 2002 National Factory Beautification Competition, being chosen over eight other contestants. The company also strives to improve the regional environment, performing a clean-up campaign in cooperation with local residents and participating in operations to plant flowers.

## Year-on-year resin consumption reduced by 4% following expansion of friction plates with segmented facings

We have systematically reduced and found substitutes for PRTR-designated substances following the execution of the PRTR Law in 1999. NSK-Warner K.K. originally used 21 designated substances. In FY2002, however, we substituted three of them with low-hazard substances not designated under the Law. Furthermore, we reduced our year-on-year consumption of resin by 4% through greater use of the friction plates with segmented facings, which improves the yield of friction materials.

## Achieved zero emissions

We improved our recycling ratio by recycling grinding sludge and dewatering sludge when cutting metal parts. We also reused cardboard sheets used as packaging material. All of these efforts helped us achieve zero emissions. Furthermore, as a measure against global warming, we managed to exceed our targets for CO<sub>2</sub> emissions per production unit and energy consumption per production unit. In the future, we will look to further improve our environmental performance.

Environmental Management Representative:  
Shigemitsu Omura

## Water quality

Item	Regulatory requirements	NSK requirements	Actual value
pH	5.8 – 8.6	5.8 – 8.6	7.0
BOD (mg/l)	25	20	4.4
COD (mg/l)	—	—	11.9
Suspended solids (mg/l)	50	30	4.9
Oils (mg/l)	5	—	0.5

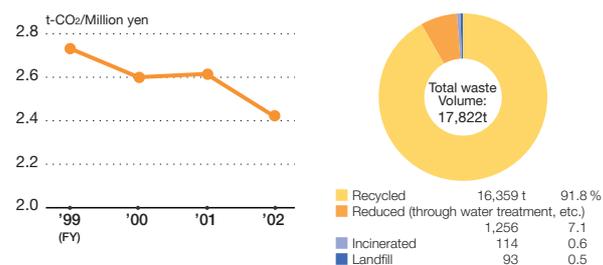
• Discharge point: River (Saka River)

## Air quality

Item	Facility	Regulatory requirements	NSK requirements	Actual value
NOx (ppm)	Boiler	180	—	80
	Metal furnace	—	No such facility	—
Soot & dust (g/m <sup>3</sup> N)	Boiler	0.3	—	Less than 0.01
	Metal furnace	—	No such facility	—
SOx (m <sup>3</sup> N/hr)	Boiler	2.95	—	Less than 0.005
	Metal furnace	—	No such facility	—

Actual value for NOx, Soot & dust, SOx is the maximum value recorded from a number of applicable facilities.

## CO<sub>2</sub> emissions per production unit Breakdown of wastes



## Release & transfer volume of PRTR-designated substances

Substance no.	Substance name	Handled volume	Released to the atmosphere	Transferred to sewer	Consumed
			Released into water	Transferred as waste	
16	2-aminoethanol	4,438	0	0	3,196
			355	887	0
30	Bisphenol A	6,906	0	0	6,610
			0	296	0
47	Ethylene diamine	1,968	0	0	0
	tetra acetic acid		0	1,968	0
63	Xylene	43,528	1,420	0	41,806
			0	301	0
67	Cresol	2,149	1,950	0	106
			0	93	0
227	Toluene	30,937	29,121	0	505
			0	1,312	0
266	Phenol	86,151	1,735	0	80,731
			0	3,684	0
309	Poly (oxyethylene) nonylphenyl ether	3,388	0	0	1,443
			160	1,844	0

# NSK Kyushu Co., Ltd.

## Overview:

Location:	774 Nissei, Furukawa, Ukiha-machi, Ukiha-gun, Fukuoka
Site area:	152,000m <sup>2</sup>
Number of Employees:	320 (As of March 31, 2003)
Products:	Precision machinery & parts (ball screws) Parts for automobile steering systems
ISO 14001 Certified:	October 2000



### Summary of environmental efforts

The environmental impact of NSK Kyushu Co., Ltd. has increased significantly with the increase in energy consumption following an expansion in production. We have made a proper evaluation of our environmental impact, and have implemented conservation measures with regard to our surroundings, which are rich in greenery and water resources.

In April 2001, a co-generation system was installed for operating plant equipment and the heat and steam from the generator were used to condition the air of our thermostatic rooms. All of these efforts help to reduce our CO<sub>2</sub> emissions.

### Installation of compressor drain wastewater treatment equipment enables waste liquid to be disposed of as wastewater

In 2002, we installed equipment for compressed air drain and equipment for neutralizing the wastewater from blower of our air-conditioning-use boilers. The wastewater of the compressed air drain contains oil. The Water Pollution Control Law sets stringent standards for concentrations of oil in discharge water, no more than 5mg/l. Given the difficulty in reaching such a standard, we always had an outside contractor treat this. After implementing new equipment, however, we managed to reduce the oil content of our compressor wastewater to less than 0.5mg/l, allowing it to be treated as ordinary wastewater. These efforts also brought about significant reductions in drain wastewater treatment costs.

### Continual pH control by automatic control system

Our boiler flow wastewater system neutralizes wastewater by piping in and mixing carbonic acid gas normally used with welding equipment. Not using strong acids such as hydrochloric acid or sulfuric acid, the system is very safe. Furthermore, being automatically operated, it is possible to control the pH level on a continuous basis.

### Centralized management of emissions per production unit

NSK Kyushu Co., Ltd. performs active conservation efforts. Our challenge for the future is to reduce environmental impact through improved environmental management and to develop a centralized management system that merges control of emissions per production unit with target values.

Environmental Management Representative:  
Masahiko Kataharada

### Water quality

Item	Regulatory requirements	NSK requirements	Actual value
pH	5.8 – 8.6	5.9 – 8.5	7.5
BOD (mg/l)	45	20	6.5
COD (mg/l)	45	20	6.1
Suspended solids (mg/l)	100	60	2.0
Oils (mg/l)	5	4	0.5
Nitrogen (mg/l)	120	100	17.0
Phosphorus (mg/l)	16	14	1.5

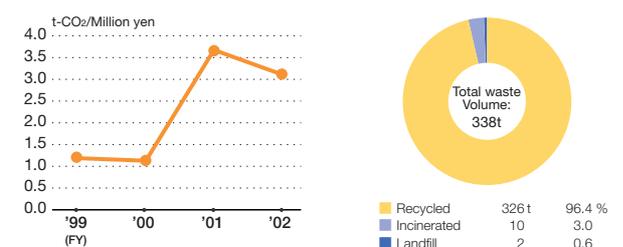
• Discharge point: River (Shinta River)

### Air quality

Item	Facility	Regulatory requirements	NSK requirements	Actual value
NOx (ppm)	Boiler	180	160	100
	Diesel engine	950	—	880
Soot & dust (g/m <sup>3</sup> N)	Boiler	0.3	—	0.01
	Diesel engine	0.1	—	0.025
SOx (m <sup>3</sup> N/hr)	Boiler	17.5	13	0.66
	Diesel engine	17.5	—	0.36

Actual value for NOx, Soot & dust, SOx is the maximum value recorded from a number of applicable facilities.

### CO<sub>2</sub> emissions per production unit Breakdown of wastes



### Release & transfer volume of PRTR-designated substances

The plant did not handle any PRTR-designated substances in excess of 1 ton/year, in accordance with our own voluntary standards.

# Shinnippon Koukyu Co., Ltd.

## Overview:

Location:	12 Kirihara-cho, Fujisawa-shi, Kanagawa
Site area:	18,200m <sup>2</sup>
Number of Employees:	109 (As of March 31, 2003)
Products:	Manufacture of steel balls for use in ball bearings
ISO 14001 Certified:	September 2001



## Promote recycling and reduction of electricity and water consumption

The following is a summary of our fundamental environmental efforts:

- 1. Reduction of electricity consumption:** We improved the insulation of our heat treatment facilities by using materials with better insulation properties, leading to significant reduction in electricity consumption.
- 2. Reduction of water consumption:** We installed coolant cooling equipment in the trimming process, which prevents the liquid from becoming too hot during processing and substantially reducing the need to replenish water lost through evaporation.
- 3. Promotion of recycling:** We made efforts to promote recycling, transforming four types of waste, including oil, into valuable waste and separating waste into 15 types. As a result, we achieved a recycling ratio of 99.3%.
- 4. Participation in community activities:** We actively participate in community activities, cleaning the footpaths around the company once a month and participating in beach clean-ups near the mouth of the Hikichi River, which runs near the plant.

Environmental Management Representative:  
Hideo Nakada

## Summary of environmental efforts

Located in Fujisawa, known locally as the "town of greenery, sunshine & sea breezes," Shinnippon Koukyu Co., Ltd. specializes in manufacture of steel balls in ball bearings and was established as a joint venture between NSK Ltd. and Amatsuji Steel Ball Mfg. Co., Ltd. Being close to a perfect sphere in shape, the steel balls facilitate friction-free rotation, making a significant contribution to energy and resource conservation. The company maintains a proactive stance towards promotion of conservation, establishing an environmental management system to ensure harmony with the environment. Shinnippon Koukyu Co., Ltd. obtained ISO14001 certification in September 2001.

# Shinwa Seiko Co., Ltd.

## Overview:

	Kutsuki Plant (Head Office)	Shinasahi Plant
Location:	921 Miyamaebou, Kutsuki-mura, Takashima-gun, Shiga	1288-1 Shinjiyo, Shinasahi-cho, Takashima-gun, Shiga
Site area:	18,723 m <sup>2</sup>	17,540m <sup>2</sup>
Number of Employees:	74 (As of March 31, 2003)	88 (As of March 31, 2003)
Products:	Processing (Turning of inner & outer rings of ball bearings)	Processing (Turning of inner & outer rings of bearings)
ISO 14001 Certified:	December 2002	



## ISO14001 certified in December 2002

In line with the Environmental Management Guidelines for NSK Subsidiaries, Shinwa Seiko Co., Ltd. began development of an environmental management system (EMS), and made our first attempt to acquire ISO14001 in May 2001. The company eventually certified in December 2002, six months later than initially scheduled. We performed multiple trial runs of its EMS in an effort to gain a better interpretation and understanding of ISO 14001, as well as to fine-tune the system to the conditions and circumstances of Shinwa Seiko Co., Ltd.. In the future, we will strive for ongoing development, completing the P-D-C-A cycle of EMS in accordance with the objectives of the NSK Group.

## To improve the hard and soft aspects of efforts against river pollution

Shinwa Seiko Co., Ltd. is located in beautiful surroundings, flanked by forests, fields and rivers, and close to Lake Biwa. Given this natural environment, the company's environmental management policy has placed priority on river pollution prevention. Accordingly, in its first year of operation, the environmental management program has placed special emphasis on efforts to prevent accidental discharges due to problems with the grinding coolant filtering system at the Kutsuki plant, as seen over the past year, as well as discharges of waste oil-water mixtures from the turning and grinding waste collection system in the Shinasahi plant. These and other efforts have also helped to improve the environmental awareness of our employees.

Environmental Management Representative:  
Kenji Niwa

## Summary of environmental efforts

Aiming to be a reputable and trusted company, Shinwa Seiko Co., Ltd., pursues a program of continual improvement regarding QCD (quality, cost, delivery) and the environment. The company specializes in processing the inner and outer rings of bearings, including forging, cold rolling and turning.

# NSK Machinery Co., Ltd.

## Overview:

Location:	5 Shouwanuma, Shoubu-machi, Minami-saitama gun, Saitama
Site area:	18,974 m <sup>2</sup>
Number of Employees:	123 (As of March 31, 2003)
Products:	Manufacture of precision machinery (grinding machine tools, etc.) and parts (spindles) etc.
ISO 14001 Certified:	March 2003



oil leakages are not overlooked. In addition, in March 2003, the company acquired ISO14001, which had been on the company agenda since FY2001.

### Year-on-year recycling ratio improved by 3.6% to reach 96.5%

NSK Machinery Co., Ltd. currently separates its waste into 22 categories and recycles this waste into reusable resources. In FY2002, we treated water-soluble liquid waste with an oil-water separation system, and succeeded in recycling the leftover sludge as a raw material in cement making. Furthermore, we managed to recycle used grinding stones as a road surfacing material for zero emissions. To further improve our recycling ratio, we are also working to ensure full awareness of our waste separation practices, which we monitor through daily inspections. As a result, we improved our year-on-year recycling ratio by 3.6% to reach 96.5% in FY2002.

### Summary of environmental efforts

Located in the east of Saitama Prefecture, rich in greenery and water resources at the base of Kukishoubu Park and known as the home of irises and lavenders, NSK Machinery Co., Ltd. specializes in the manufacture of precision machinery and parts while maintaining harmony with the local environment. Being located near the Shouwa marsh, any spillage of oil or grinding coolant would pollute the marsh ponds. In order to prevent such types of accidents from occurring, NSK Machinery Co., Ltd. not only performs daily inspections of the oil-water separation tank at the final discharge outlet, but conducts detailed monitoring operations to ensure that even small

### Performance of emergency drills in preparation for unlikely event of an oil spillage

In the day-to-day production activities, the type of accident posing the greatest environmental risk is an oil spillage. In order to address this situation, we have installed a gutter around our collection area for grinding swarf, which is covered in waste oil, waste water and oil. The gutter is connected to an oil pit, such that the liquid will be retained in the pit in the unlikely event of an oil leakage. In addition, we performed emergency response drills involving all staff on facilities in which oil leaks are likely to occur in event of an earthquake to ensure rapid response in event of an emergency.

Environmental Management Representative: Yoshikazu Sato

# NSK Logistics Co., Ltd.

## Overview:

Location:	1-6-3 Ohsaki, Shinagawa-ku, Tokyo, Nissei Building
Number of Employees:	214 (As of March 31, 2003)
Business:	Logistics (Transportation, storage, cargo handling, packaging, etc.)
Business licenses:	Utility transport, warehousing

## Logistics bases:

Kanto LC:	12 Kirihara-cho, Fujisawa-shi, Kanagawa
Chubu LC:	88-4 Nishisenzoku Nagasawa, Otowa-cho, Hoi-gun, Aichi
Kansai LC:	1-1-15, Fujinosato, Ibaraki-shi, Osaka
Maebashi LC:	78 Toriba-machi, Maebashi-shi, Gunma (within NSK Precision Maebashi Plant)
Saitama LC:	1-1555 Onuma Hanyu-shi, Saitama (within NSK, Saitama Plant)



### Reducing negative environmental impact through merging and/or abolishing delivery routes and recycling packaging materials

The distribution process causes environmental impact through emissions of CO<sub>2</sub>, NO<sub>x</sub> and PM, as well as the disposal of packaging materials. Acutely aware of these problems, NSK Logistics Co., Ltd. is making an active effort to reduce its environmental impact, positioning improvement in environmental performance at the forefront of its management policy. These efforts include merging and/or abolishing certain delivery routes and improving loading ratios through cooperation with the NSK Environmental Logistics Subcommittee, and a comprehensive effort to reduce waste through promotion of reuse and recycling through stringent separation of packaging materials returned from customers, repair and reuse of damaged pallets, and an increase in the number of recycled plastic boxes.

### Summary of environmental efforts

NSK Logistics Co., Ltd. was established in October 1999 after being separated from the NSK Product Distribution Division, the first division to be made independent in accordance with a company policy to separate and reestablish divisions with specific functions. With distribution bases established in Gunma, Saitama, Kanagawa, Aichi and Osaka, the company now performs transportation and delivery of products to customers of the NSK Group of companies.

### Establishment of environmental management system for ISO14001 certification at the Kanto LC (Logistics Center) and other LCs in October 2003

In order to further enhance the efficiency of these efforts, we have prepared to acquire ISO14001. Being located within the NSK Maebashi and Saitama plants, the Maebashi LC and the Saitama LC already developed the system. Preparations include the establishment of an Environmental Management Committee and the development of an environmental management system. Through these and other preparations, we hope to acquire certification for the Kanto LC, Chubu LC and Kansai LC, each independent companies, in October 2003.

Environmental Management Representative:  
Hiroshi Fujii

# NSK Brazil LTDA, Suzano Plant

## Overview:

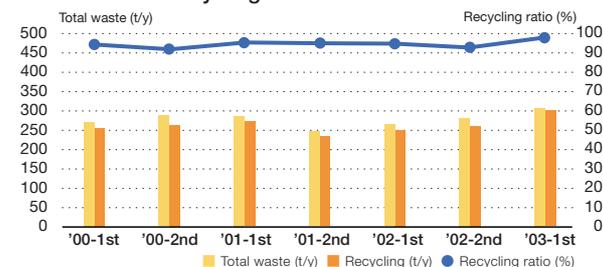
Location:	Suzano, São Paulo, Brazil
Site area:	180,000 m <sup>2</sup>
Number of Employees:	525 (As of March 31, 2003)
Products:	Manufacture of bearings for automobiles, motors and home appliances
ISO 14001 Certified:	January 2000



## Recycling ratio in FY2002: 92.6%—aiming to achieve 98% by 2010

A variety of wastes are emitted from the plant, including grinding swarf, plastic, waste oil, scrap steel, paper and cardboard. The plant is active in promoting recycling of grinding swarf and scrap steel through a third party to a steelmaker, where it is reused as raw materials. In FY2002, we achieved a recycling ratio of 92.6%, and have set targets to increase this to 95% in FY2003 and 98% in FY2010.

### Total waste and recycling ratio



### Summary of environmental efforts

The Suzano Plant is located in an urban area of Suzano, a city of 250,000 people located 50km from the center of São Paulo. Since its construction in 1972, the plant has engaged in bearing manufacture. The Suzano plant was the first NSK plant to be established overseas.

At the time of its construction, few houses could be seen around the plant. Over the last 30 years, however, rows of houses have appeared close to the plant. Accordingly, we have had to place even greater considerations towards environmental matters.

### ISO14001 certified in FY2000

Since operations began, we have always held an interest in conservation and have sought to achieve a harmony with the environment in our manufacturing activities. Furthermore, in order to promote a systematic approach to conservation, we began preparations for ISO14001 certification in February 1999, managing to acquire it in January 2000.

### Eliminating waste through energy-saving activities

The electricity purchased by the Suzano plant is hydroelectric electricity, which creates little CO<sub>2</sub> emissions. We also use low-impact natural gas for the heat treatment process. Furthermore, we strive to make efficient use of the energy we consume, performing energy-conservation activities that eliminating waste, based on the policy of the Energy Conservation Committee.

### Refrigerant carrier of air conditioners being switched to non-ozone depleting gas

Conventionally, we had used 1.1.1-trichloroethane as a bearing cleaning agent, but abolished the use in 1992 before the law came into effect. Furthermore, we separate fluorescent lamps and batteries, which contained hazardous substances, and treat and recycle them by a specialized waste disposal method. In an effort to discontinue use of ozone-depleting substances, we are also replacing the refrigerant carrier in our air conditioners with a non-ozone depleting gas.

### Management of environmental risks

We performed an analysis of risks to the environment using our environmental management system, and developed measures to minimize such risks. To prevent oil leakages or spillages, we installed gutter systems in places where there is a high risk of spillage and performed modifications so that leaked or spilled oil would collect in a special tank. Furthermore, we established a special storage facility for hazardous wastes in order to prevent such waste from becoming mixed up with ordinary waste, and to prevent accidental release of such waste into the air. We have been fortunate that there have been no environment accidents.

### Environmental education of local students through eco-tours

We organize eco-tours for local student as events at local universities and government offices, to view local water treatment facilities, as well as tours of Suzano Plant. The tours are intended to help the community understand our environmental efforts and develop a closer relationship with the local population.



Environmental Representative: Mauro Batista

# Reference Data

Results of tests on the quality of discharge water, tests for soot & smoke emissions on facilities, release and transfer volume of PRTR-designated substances in FY2002

## • NSK and Newly Spun-off Subsidiary Plants

### Fujisawa Plant / Technology Department

#### Water quality

Item	Regulatory requirements	NSK requirements	Actual value
pH	5 – 9	5.3 – 8.8	7.6
BOD (mg/l)	600	540	23.8

• Discharge point: Sewer

Note: Company does not discharge into any river

#### Air quality

Item	Facility	Regulatory requirements	NSK requirements	Actual value
NOx (ppm)	Boiler	150	135	91
	Metal furnace	200	180	122
Soot & dust (g/m <sup>3</sup> N)	Boiler	0.3	0.27	0.0012
	Metal furnace	0.25	0.225	0.0154
SOx (m <sup>3</sup> N/hr)	Boiler	3.11	2.8	Less than 0.03
	Metal furnace	1.02	0.92	Less than 0.01

Actual value for NOx, Soot & dust, SOx is the maximum value recorded from a number of applicable facilities.

#### Release & transfer volume of PRTR-designated substances (Kg)

Substance no.	Substance name	Handled volume	Released to the atmosphere	Transferred to sewer	Consumed
			Released into water	Transferred as waste	Recycled
16	2-aminoethanol	1,014	0	5	0
63	Xylene	40,506	2,612	0	36,898
			0	1,009	996
227	Toluene	5,820	51	0	5,769
			0	0	0

### NSK Fukushima Co., Ltd.

#### Water quality

Item	Regulatory requirements	NSK requirements	Actual value
pH	5.8 – 8.6	6.0 – 8.4	7.2
BOD (mg/l)	20	18	7.3
Suspended solids (mg/l)	50	45	4.8
Oils (mg/l)	5	4.5	0.8
Nitrogen (mg/l)	60	30	5.9
Phosphorus (mg/l)	8	4	0.5

• Discharge point: River (Yashiro River)

#### Air quality

Item	Facility	Regulatory requirements	NSK requirements	Actual value
NOx (ppm)	Boiler	180	135	95
	Metal furnace		No such facility	
Soot & dust (g/m <sup>3</sup> N)	Boiler	0.3	0.05	0.01
	Metal furnace		No such facility	
SOx (K value)	Boiler	17.5	1.5	0.28
	Metal furnace		No such facility	

Actual value for NOx, Soot & dust, SOx is the maximum value recorded from a number of applicable facilities.

#### Release & transfer volume of PRTR-designated substances (Kg)

Substance no.	Substance name	Handled volume	Released to the atmosphere	Transferred to sewer	Consumed
			Released into water	Transferred as waste	Recycled
63	Xylene	3,011	1,555	0	791
			0	0	665

### Shiga Manufacturing Division, Otsu Plant

#### Water quality

Item	Regulatory requirements	NSK requirements	Actual value
pH	6.0 – 8.5	6.3 – 8.0	7.2
BOD (mg/l)	70	25	7.4
COD (mg/l)	70	25	6.8
Suspended solids (mg/l)	90	30	1.5
Oils (mg/l)	5	4	0.7
Nitrogen (mg/l)	40	20	4.1
Phosphorus (mg/l)	2	1.6	0.1

• Discharge point: River (Morikoshi River)

#### Air quality

Item	Facility	Regulatory requirements	NSK requirements	Actual value
NOx (ppm)	Boiler	150	120	89
	Metal furnace		No such facility	
Soot & dust (g/m <sup>3</sup> N)	Boiler	0.3	0.05	0.017
	Metal furnace		No such facility	
SOx (K value)	Boiler	8.76	5	0.03
	Metal furnace		No such facility	

Actual value for NOx, Soot & dust, SOx is the maximum value recorded from a number of applicable facilities.

#### Release & transfer volume of PRTR-designated substances (Kg)

Substance no.	Substance name	Handled volume	Released to the atmosphere	Transferred to sewer	Consumed
			Released into water	Transferred as waste	Recycled
63	Xylene	12,650	2,441	0	9,184
			0	0	1,025

### NSK Precision Co., Ltd., Maebashi Precision Machinery & Parts Plant

#### Water quality

Item	Regulatory requirements	NSK requirements	Actual value
pH	5.8 – 8.6	5.9 – 8.5	7.7
BOD (mg/l)	25	24	1.0
COD (mg/l)	25	24	2.8
Suspended solids (mg/l)	50	45	2.0
Oils (mg/l)	5	4	1.0
Nitrogen (mg/l)	120	100	0.6
Phosphorus (mg/l)	16	14	0.2

• Discharge point: River (Someya River)

#### Air quality

Item	Facility	Regulatory requirements	NSK requirements	Actual value
NOx (ppm)	Boiler	180	150	120
	Metal furnace		No such facility	
Soot & dust (g/m <sup>3</sup> N)	Boiler	0.3	0.2	Less than 0.01
	Metal furnace		No such facility	
SOx (m <sup>3</sup> N/hr)	Boiler	0.9	0.7	Less than 0.02
	Metal furnace		No such facility	

Actual value for NOx, Soot & dust, SOx is the maximum value recorded from a number of applicable facilities.

#### Release & transfer volume of PRTR-designated substances (Kg)

Substance no.	Substance name	Handled volume	Released to the atmosphere	Transferred to sewer	Consumed
			Released into water	Transferred as waste	Recycled
16	2-aminoethanol	1,033	0	5	0
			0	1,028	0
63	Xylene	3,657	276	0	3,361
			0	20	0
227	Toluene	2,963	1,346	0	1,574
			0	43	0

#### Notes on Terminology

**pH:** Hydrogen-ion concentration  
**BOD:** Biochemical oxygen demand. Used as an indicator to determine the density of organic water pollutants and indicates the oxygen consumed in order to oxidize the pollutants contained in the water using microbes.  
**COD:** Chemical oxygen demand. Used as an indicator to determine the density of organic water pollutants and indicates the oxygen in the oxidant con-

sumed in order to oxidize the pollutants contained in the water.  
**Soot & dust:** Emitted with the burning of fuel, etc.  
**SOx:** Sulfur oxides, including sulfur dioxide and sulfur trioxide. Emitted when fuels containing sulfur are burned.  
**NOx:** Nitrogen oxides, including nitrogen monoxide and nitrogen dioxide. Such substances are emitted when fuel is burned in boilers, etc.

• Subsidiary Companies

**NSK Needle Bearings Co., Ltd. Takasaki Plant**

**Water quality**

Item	Regulatory requirements	NSK requirements	Actual value
pH	5 – 9	5.9 – 8.5	7.4
BOD (mg/l)	600	500	21.0
Cyanides (mg/l)	1	1	0.1

• Discharge point: Sewer  
 Note: Only rainwater discharged

**Air quality**

Item	Facility	Regulatory requirements	NSK requirements	Actual value
NOx (ppm)	Boiler	150	140	102
	Diesel engine	950	900	590
Soot & dust (g/m <sup>3</sup> N)	Boiler	0.1	0.09	Less than 0.003
	Diesel engine	0.1	0.09	0.014
SOx (K value)	Boiler	17.5	5	Less than 0.1
	Diesel engine	17.5	5	Less than 0.11

Actual value for NOx, Soot & dust, SOx is the maximum value recorded from a number of applicable facilities.

**Release & transfer volume of PRTR-designated substances (Kg)**

Substance no.	Substance name	Handled volume	Released to the atmosphere	Transferred to sewer	Consumed
			Released into water	Transferred as waste	Recycled
16	2-aminoethanol	1,947	0	746	0
63	Xylene	9,469	5,380	0	1,201
			0	0	2,306
108	Inorganic cyanide compound	3,802	0	0	0
			0	3,802	0
227	Toluene	2,512	0	0	2,512
			0	0	0

**NSK Needle Bearings Co., Ltd. Haruna Plant**

**Water quality**

Item	Regulatory requirements	NSK requirements	Actual value
pH	5.8 – 8.6	5.9 – 8.5	7.7
BOD (mg/l)	25	24	2.0
COD (mg/l)	25	24	4.0
Suspended solids (mg/l)	50	45	2.3
Oils (mg/l)	5	4	1.2
Nitrogen (mg/l)	120	100	23.0
Phosphorus (mg/l)	16	14	0.6

• Discharge point: River (Mukai River)

**Air quality**

Item	Facility	Regulatory requirements	NSK requirements	Actual value
NOx (ppm)	Boiler	150	140	84
	Diesel engine	950	900	608
Soot & dust (g/m <sup>3</sup> N)	Boiler	0.1	0.09	0.004
	Diesel engine	0.1	0.09	0.005
SOx (K value)	Boiler	17.5	7	Less than 0.1
	Diesel engine	17.5	7	2.1

Actual value for NOx, Soot & dust, SOx is the maximum value recorded from a number of applicable facilities.

**Release & transfer volume of PRTR-designated substances (Kg)**

Substance no.	Substance name	Handled volume	Released to the atmosphere	Transferred to sewer	Consumed
			Released into water	Transferred as waste	Recycled
16	2-aminoethanol	7,285	0	0	0
			2,914	0	4,371
63	Xylene	6,610	2,276	0	3,353
			0	0	981
224	1,3,5-trimethyl benzene	2,193	1,316	0	338
			0	0	539
227	Toluene	4,925	0	0	4,925
			0	0	0

**NSK Micro Precision Co., Ltd.**

**Water quality**

Item	Regulatory requirements	NSK requirements	Actual value
pH	5.8 – 8.6	5.8 – 8.5	7.7
BOD (mg/l)	60	58	8.6
COD (mg/l)	60	58	12.7
Suspended solids (mg/l)	90	88	3.3
Oils (mg/l)	5	4.5	1.0

• Discharge point: River (Kashio River)

**Air quality**

Item	Facility	Regulatory requirements	NSK requirements	Actual value
NOx (ppm)	Boiler			
	Metal furnace			
Soot & dust (g/m <sup>3</sup> N)	Boiler			No such facility
	Metal furnace			
SOx (m <sup>3</sup> N/hr)	Boiler			
	Metal furnace			

**Release & transfer volume of PRTR-designated substances (Kg)**

Substance no.	Substance name	Handled volume	Released to the atmosphere	Transferred to sewer	Consumed
			Released into water	Transferred as waste	Recycled
145	Dichloromethane	3,397	2,981	0	0
			0	416	0

**Inoue Jikuuko Kogyo Co., Ltd.**

**Water quality**

Item	Regulatory requirements	NSK requirements	Actual value
pH	5.8 – 8.6	6.0 – 8.3	7.3
BOD (mg/l)	150	100	22.7
COD (mg/l)	150	100	17.6
Suspended solids (mg/l)	200	120	2.4
Oils (mg/l)	4	3	1.3
Nitrogen (mg/l)	60	—	27.4
Phosphorus (mg/l)	8	—	1.2

• Discharge point: River (Unada River)

**Air quality**

Item	Facility	Regulatory requirements	NSK requirements	Actual value
NOx (ppm)	Boiler			
	Metal furnace			
Soot & dust (g/m <sup>3</sup> N)	Boiler			No such facility
	Metal furnace			
SOx (m <sup>3</sup> N/hr)	Boiler			
	Metal furnace			

**Release & transfer volume of PRTR-designated substances (Kg)**

Substance no.	Substance name	Handled volume	Released to the atmosphere	Transferred to sewer	Consumed
			Released into water	Transferred as waste	Recycled
63	Xylene	1,315	594	0	467
			0	0	254
145	Dichloromethane	11,934	8,619	0	0
			0	3,315	0

## Related Information

Our environmental activities can also be viewed at the NSK website:

- URL: <http://www.nsk.com>

Other information in connection with our activities can be found in the following booklets. If you would like to obtain a copy, please make a request at the addresses listed below.

- Company Overview (Available in Japanese, English and Chinese)
- Annual Report 2003 (Available in Japanese, English and Chinese)
- Technical Journal "Environmental Special" (Available in Japanese and English)
- Environmental Report 2001 (Available in Japanese & English)
- Environmental Report 2002 (Available in Japanese & English)

## Scope of This Report

The NSK Environmental Report 2003 covers NSK Ltd. and newly spun-off subsidiaries and manufacturing subsidiaries in which NSK owns a stake of at least 50%, subsidiaries that manufacture NSK-brand products, subsidiaries that perform pre-processing such as machining of bearing parts, subsidiaries that manufacture steel balls, and subsidiaries that manufacture machinery. While these companies are relatively small, we believe that it is important to make environmental efforts that include the activities of every company associated with the NSK Group. Furthermore, in an effort to promote environmental soundness in our logistics operations, as of FY2002, we included NSK Logistics Co., Ltd. in the scope of our report.

The report does not cover the environmental activities of NSK Autoliv Co., Ltd. now that the company's stake in this company has fallen to less than 50% following the gradual transfer of our share in the automobile seatbelt businesses.

### 1. Companies in which environmental management is practiced:

NSK Ltd.

Newly spun-off subsidiaries

- NSK Precision Co., Ltd.<sup>\*1</sup>
- NSK Steering Systems Co., Ltd.<sup>\*2</sup>
- NSK Fukushima Co., Ltd.<sup>\*3</sup>

Subsidiaries that manufacture NSK-brand products

- NSK Micro Precision Co. Ltd.
- Inoue Jikuuke Kogyo Co., Ltd.
- NSK Needle Bearings Co., Ltd.<sup>\*4</sup>
- NSK Warner Kabushiki Kaisha<sup>\*3</sup>

Subsidiaries that Perform Pre-processing

- Chitose Sangyo Co., Ltd.
- Asahi Seiki Co., Ltd.
- Shinwa Seiko Co., Ltd.

Steel Ball Manufacturing Subsidiary

- Shinnippon Koukyu Co., Ltd.

Machinery Manufacturing Subsidiary

- NSK Machinery Co., Ltd.

Logistics Subsidiary

- NSK Logistics Co., Ltd.

\*1 In October 2002, NSK separated its precision machinery businesses, establishing NSK Precision Co., Ltd. (Formerly the Maebashi Plant, Kirihara Plant and Saitama Plant)

\*2 In October we merged our automobile steering systems businesses (formerly, the Soja Plant) with NSK Steering Systems, established in 2001.

\*3 In 2002 we abandoned use of Katakana lettering when writing NSK in Japanese, using the letters "NSK" instead.

\*4 In July 2003 we transformed NSK Torrington Co., Ltd. into a subsidiary, changing the name to NSK Needle Bearings Co., Ltd.

### 2. Scope of Performance Data concerning Voluntary Action Plan

Since the initiation of our Voluntary Action Plan in 1993, we have taken care to ensure the continuity of data. Companies that have been separated from NSK are treated as NSK plants and included in data aggregates accordingly.

NSK Ltd.

- Fujisawa Plant
- Shiga Manufacturing Division (Otsu Plant, Ishibe Plant)
- Saitama Plant

NSK Precision Co., Ltd.

- Maebashi Precision Machinery and Parts Plant
- Kirihara Precision Machinery and Parts Plant
- Saitama Precision Machinery and Parts Plant<sup>\*5</sup>

\*5 Being located within the same site, the data for the Saitama Precision Machinery and Parts Plant is included with that for the Saitama Plant.

NSK Steering Systems Co., Ltd.

NSK Fukushima Co., Ltd.

### Note from the Editor

Based on the opinions that we received from our readers last year, the most important issues were to improve the overall comprehensibility of the report, to explain in easy terms the effects our products—machine parts that one does not normally see in one's day-to-day life—have on the environment, and to ensure that our readers appreciate our efforts to improve the environmental soundness of such parts. Accordingly, this year, special attention was paid to design, a special feature was added at the beginning of the report on the relationship between our products, technologies and the environment, and extra effort was made to convey our activities in a straight-forward, easy-to-understand manner.

Receiving opinions and suggestions helps us improve the quality of this report and is one of the easier ways to contribute to a recycle-oriented society. Your comments and opinions are always greatly appreciated.

### Contact:

NSK Ltd. Environment Control Department

Nissei Bldg. 1-6-3 Ohsaki, Shinagawa-ku, Tokyo, Japan  
141-8560

TEL: +81-3-3779-7170

FAX: +81-3-3779-7445

e-mail: [eco@nsk.com](mailto:eco@nsk.com)



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