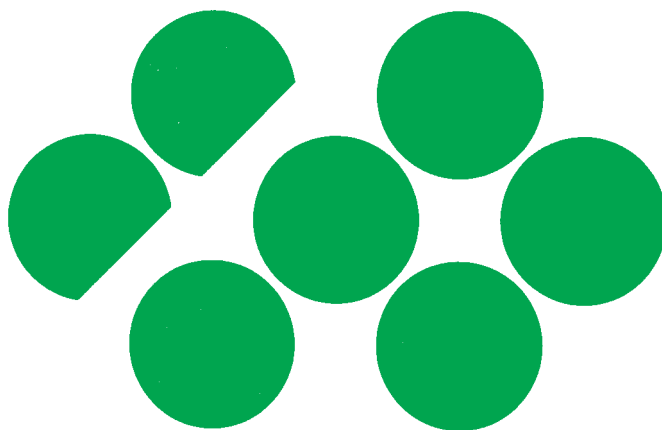


HEALTH, SAFETY, AND THE ENVIRONMENT

2001



KYOWA

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FROM THE PRESIDENT

The 21st century is said to be the century of the environment. Our world, which has allowed mankind to pursue all manner of lifestyles over the ages, is now groaning with the pressure on its once bountiful resources. To pass on a healthy world to future generations, nations and their peoples and enterprises must ensure that business activities and individual lifestyles are compatible with the aims of environmental protection.

The Basic Law for Establishing the Recycling-Based Society, aiming for a society that makes the most efficient possible use of limited energy resources, has been enacted, and structures are steadily being erected to create closed-loop systems in which all resources are reused. As members of society, businesses are now expected to conduct their activities in an environmentally sustainable fashion, instead of encouraging traditional consumption-centric lifestyles. Moreover, they are being asked to give due consideration to the environment across the full life cycle of a product, from the procurement of raw materials to the use and disposal of the finished product.

As a member of society, Kyowa Hakko Kogyo Co., Ltd., regards protecting the global environment as a matter of the utmost importance and actively contributes to the realization of a society that flourishes in harmony with nature. Since our foundation, we have produced fermentation products by recycling agricultural raw materials; thus, it can be said that fermentation-based production is a sustainable production technology. The use of amino acids and enzymes in livestock feed gives these products special value in terms of environmental conservation. Throughout our business operations, we have worked from an early date to recycle the waste liquids resulting from fermentation, which account for more than half of all our waste. You could say that we are one of the originators of today's zero emissions movement. Another example of production processes with low environmental burden—and of the highly promising “green chemistry” in action—are those achieved through our bioproduction technologies, which we have been building up since our foundation.

Our products—pharmaceuticals, liquor and food, biochemicals, and chemicals—are life-giving products. They are products that support healthy, positive lifestyles and are



compatible with sustainable production and services in future. We are proud of the distinctive environmental soundness of these products and intend to go on supplying society with promising products and services using the power of biotechnology in order to contribute to the realization of a society that flourishes in harmony with nature.

This *Health, Safety, and the Environment 2001* report (for the year ended March 31, 2001) gives an overview of what environmental and safety initiatives we are pursuing in our business operations as well as of what we have achieved. We would like to make the environmental and safety philosophy and activities of the Kyowa Hakko Group as widely known as possible. We urge readers to offer their opinions without reservation so that we can improve the quality and results of such activities in the future.

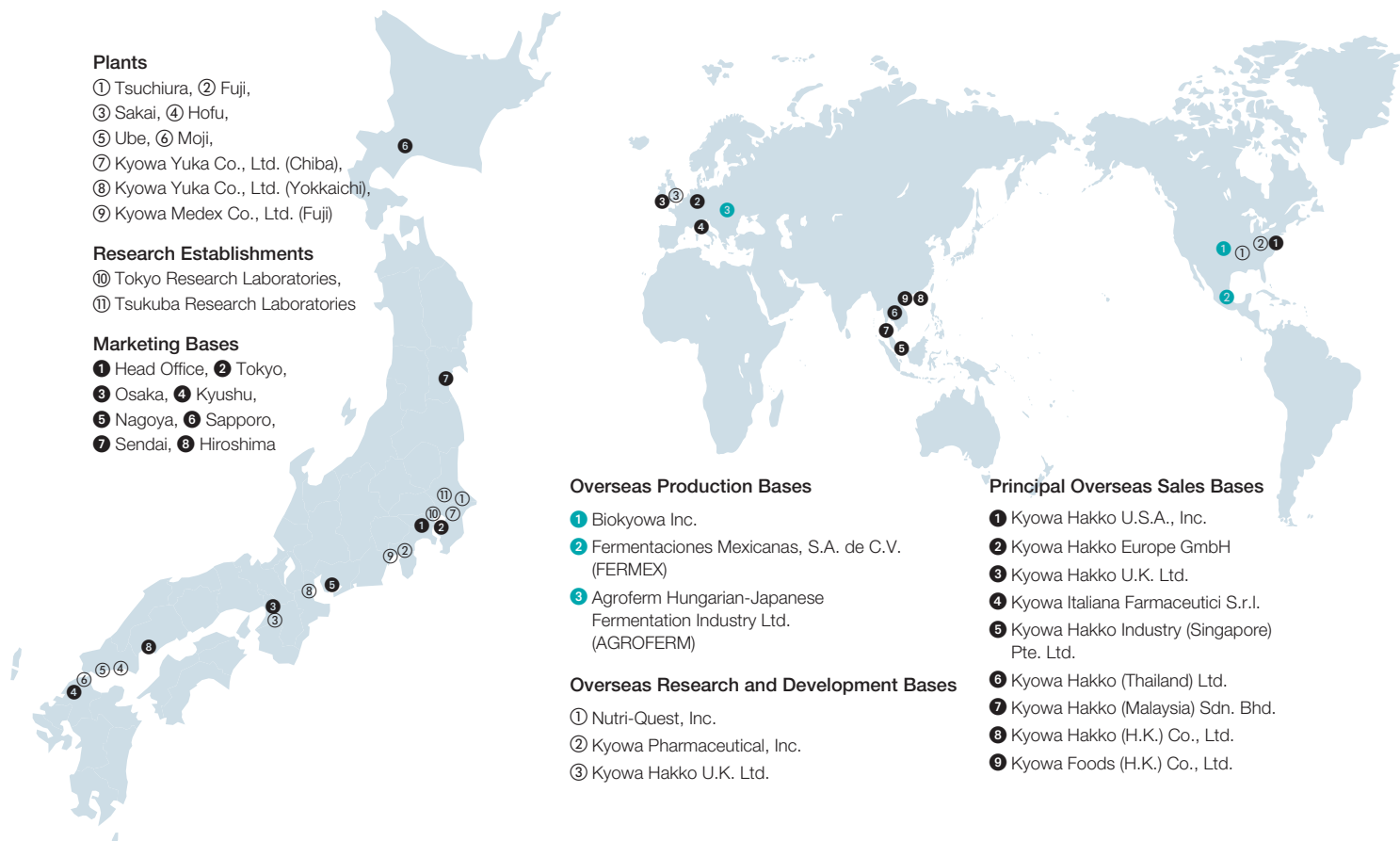
September 2001

A handwritten signature in black ink that reads "Tadashi Hirata". The signature is fluid and cursive, with a long horizontal stroke at the end.

Dr. Tadashi Hirata
President
Kyowa Hakko Kogyo Co., Ltd.

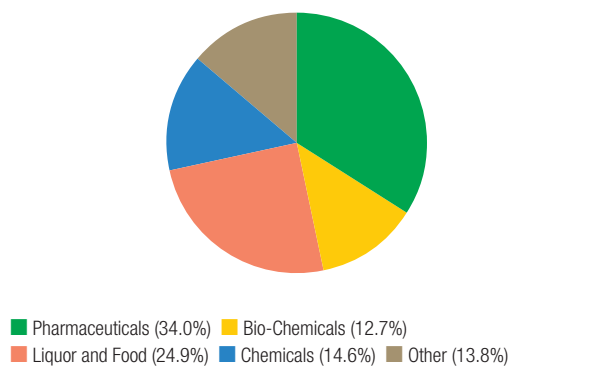
SCOPE OF THIS REPORT

This report deals with the Kyowa Hakko Group's environmental protection activities in fiscal 2000, the period from April 1, 2000 through March 31, 2001. (Certain data for fiscal 2001 is also included.) Data relating to environmental impact and protection activities were gathered at the Kyowa Hakko Group's domestic production, research, and sales bases as well as the overseas production bases as listed below.



COMPANY PROFILE (on a consolidated basis)

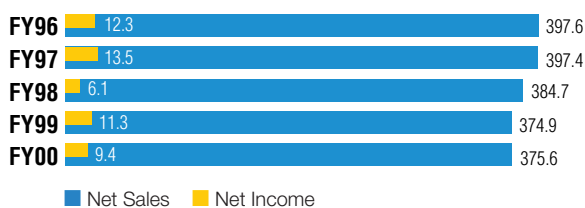
Fiscal 2000 Net Sales by Segment



For the fiscal year ended March 31, 2001

Net Sales and Net Income

(¥ billion)



Paid-in Capital ¥26,745 million

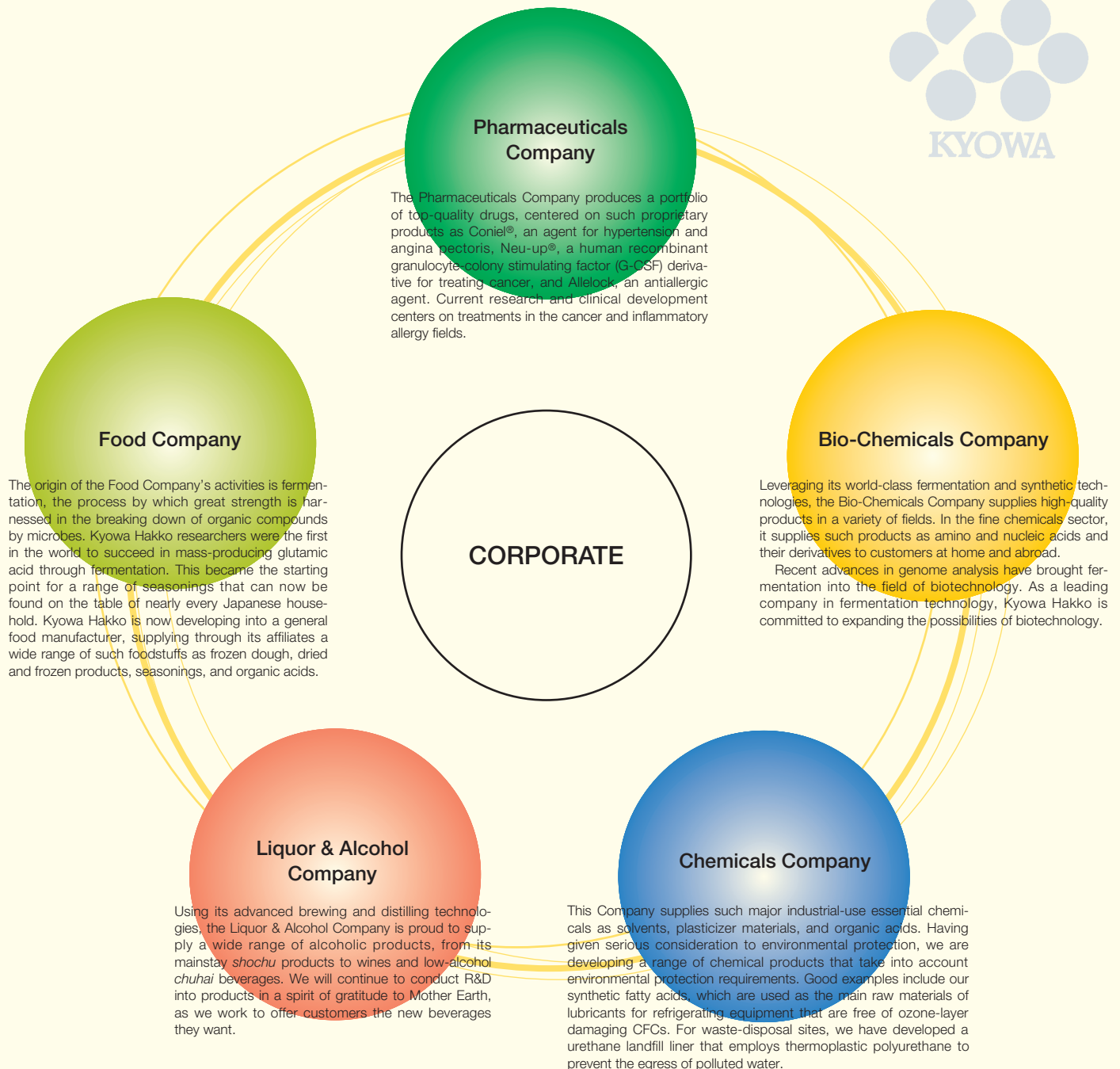
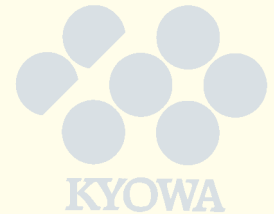
Number of Employees 7,766

Established July 1, 1949

THE KYOWA HAKKO GROUP'S BUSINESS ACTIVITIES

Corporate Philosophy

Kyowa Hakko will contribute to the health and well-being of people worldwide by creating new value with the pursuit of advancements of life science and technology. (Introduced in 1999)



Management Guidelines for Safety and the Environment

"Work to protect the environment and maintain safety and also provide products with consideration of the environment and safety." (Introduced March 1999)

Declaration of the Basic Policies for Health, Safety, the Environment, and Product Safety

We declare that, in accordance with the "Basic Policies for Health, Safety, the Environment, and Product Safety," we will carry out Responsible Care (RC)* activities extensively to preserve health, safety, and the environment as well as step up quality assurance to ensure the safety of consumers in our daily business activities.

*Responsible Care (RC) is a set of self-management principles according to which business operators engaged in the manufacture or handling of chemical substances make a commitment to follow stringent management guidelines. These guidelines are aimed at preserving the environment and ensuring safety at all stages of chemical substance life cycles, from development and manufacturing to distribution, use final consumption, and disposal. RC also calls for the implementation of measures to make improvements in areas related to health, safety, and the environment based on the principle of individual responsibility.



(Declared in April 1996)

Basic Policies on Health, Safety, the Environment, and Product Safety

Kyowa Hakko's policy formulated at its establishment is to "contribute to the health and well-being of people worldwide by creating new value with the pursuit of advancements of life science and technology." Based on this policy, we will exert ourselves to realize an affluent society by conducting business activities with scientific consideration for health, safety, the environment, and product safety throughout the whole life cycle of our products, from research and development through production, marketing, use, and disposal, as well as by making efforts to ensure the quality and safety of our products, taking the safety of consumers as a matter of the greatest importance.

Guidelines for Action

As our first rule, we should strictly control ourselves with profound respect for all living things and with modesty toward science, prove ourselves worthy of public confidence, and contribute to the growth of a healthy and affluent society. Therefore, we should advance our business activities under the following principles, with the protection of human beings and the environment, as well as the safety of consumers, as our first consideration.

- 1) Along with the establishment of the basic policies and control systems for health, safety, the environment, and product safety as our highest principles in the management of Kyowa Hakko, we strive to enhance our employees' consciousness of health, safety, the environment, and product safety by making these principles generally known to them and to advance our activities under these principles from a global standpoint.
- 2) We observe international regulations, as well as domestic laws, rules, regulations, and agreements relevant to health, safety, the environment, and product safety, in cooperation with relevant foreign and domestic agencies and organizations and make efforts to raise our level of control over these principles by observing our self-imposed control standards and utilizing auditing systems.
- 3) Together with our efforts to ensure the safety of our business activities and to reduce negative impact on the environment, we strive to ensure the quality of health, safety, the environment, and product safety throughout the whole life cycle of our products by engaging in overseeing the purchase of raw materials; the production, transportation, and sale of products; and the use and disposal of products by our consumers.
- 4) We carry out assessments of health, safety, the environment, and product safety prior to the development of new technologies and products, the transfer of technologies, and the start of novel businesses. These assessments enable us to ensure our products meet the highest standards with respect to such technologies throughout the whole life cycle of such products commencing in the planning stage.
- 5) We contribute to health, safety, the environment, and product safety on a global scale by working actively toward the development of "earth-friendly" technologies and products as well as toward the development of energy-conservation and resource-conservation technologies.
- 6) We concentrate our efforts on research and development to keep abreast of scientific progress, and we strive to strictly assure the usefulness and safety of our products.

(Introduced January 1996)

Internal Environmental Regulations

Safety and environment basic regulations	Effective from October 1995	Amended September 1999
Regulations for environmental technology and product development	Effective from April 1994	Amended June 1999
Safety management regulations	Effective from April 1975	Amended September 1999
Environmental management regulations	Effective from March 1976	Amended July 1999

"Kyowa Hakko Ethical Principles" Effective from January 1999

"Kyowa Hakko Codes of Ethical Conduct for Employees" Effective from January 1999

Remarks on This Health, Safety, and the Environment Report

As laid down in our Declaration of the Basic Policies for Health, Safety, the Environment, and Product Safety, based on our Environment and Safety Policy, the Company* is committed to addressing health, safety, and environmental issues in accordance with Responsible Care (RC) practices and to improving product quality to ensure customer safety in its daily business activities.

The Company is pursuing RC safety, health, and environmental protection activities comprehensively across the Kyowa Hakko Group. As tools for this effort, we are establishing an Occupational Safety and Health Management System (OSHMS) to complement ISO 14001 certification. Furthermore, as a management policy for the whole Company, we are aggressively pursuing our Kyowa Eco-Project, Green Office Plan, and Green Procurement activities and are enhancing the quality of environmental and safety awareness in our corporate activities through the use of such new methodologies as environmental accounting and life cycle assessments (LCAs).

Below is an outline of achievements and progress in environmental and safety related areas in the year under review. Our overall Action Plan and performance are discussed on the next page along with the status of guidelines for actions and results from the perspectives of the environment and safety at every stage, from research, development, and production through distribution, use, and disposal.

- 1) The Company regards health, safety, and the environment as issues of the utmost importance and is engaged in large-scale environmental protection activities under the direction of senior management. The scope of such activities is being extended year by year from Kyowa Hakko, Kyowa Yuka Co., Ltd., and Kyowa Medex Co., Ltd., to major affiliates, as well as being diversified to encompass global environmental initiatives as well as environmental and safety activities in the office.
- 2) The Company adheres not only to standards set by national government and local government bodies as well as industrial organizations but to even stricter self-imposed control standards regarding the environment and safety. In line with our Action Plan, the Kyowa Eco-Project has contributed to lower production costs as well as reductions in the environmental impact of factories and energy savings.
Last year, a fire and explosion at the Sakai Plant caused considerable distress to local residents. Although nobody was injured in the accident, we are going back to the drawing board with safety procedures to ensure that there is no recurrence.
- 3) In fiscal 2000, we included in our LCAs our mainstay *shochu* products. We reviewed and compared the hidden environmental

impact of these products with their own value. We also applied environmental accounting methods to the material flows of all production processes and focused on internal and external environmental protection costs as well as the attributes of each our businesses to work out cost benefits.



- 4) We upgraded safety and environmental-impact assessment techniques by improving the quality of change management as well as the forecasting and evaluating systems used when we develop new products and technologies. Also, we have made self-initiated inspections based on risk assessment compulsory.
- 5) We are aggressively developing environment-friendly technologies and products, including energy-saving technologies. Efforts thus far include committing ourselves to curtailing the use of chloride solvents. We are promoting greater safety and environmental awareness in R&D divisions, and, based on ISO 14001 standards, are compiling and disclosing in this report both current and historical emission and energy-consumption statistics.
- 6) It is a basic tenet of the Company that all its products should be useful. Also, all our products, including pharmaceutical products, are proprietary. Amino acids and other products for which we constantly work to develop new uses are examples of this approach. The LCAs we have undertaken on our *shochu* products this year truly demonstrate a contribution by our Company to further environmental awareness today.

Based on these activities, we are strengthening disclosure efforts, including those of consolidated affiliated companies, in fiscal 2001. We will make every effort in the future to qualitatively upgrade disclosure to enhance the transparency of our environmental and safety activities.

September 2001

Toyokatsu Munakata

Toyokatsu Munakata
Director,

Corporate Safety and Environmental Management Department
Kyowa Hakko Kogyo Co., Ltd.

*In this report, the Company refers to Kyowa Hakko Kogyo Co., Ltd., Kyowa Yuka Co., Ltd., and Kyowa Medex Co., Ltd.

Action Plan and Performance

Target		Performance
1) Expand the application of environmental management systems		
<ul style="list-style-type: none"> Obtain ISO 14001 certification at the 8 plants operated by Kyowa Hakko and Kyowa Yuka by FY2000 Establish Environmental Management systems for ISO 14001 at consolidated subsidiaries by FY2004 The plant and R&D facility of Kyowa Medex plan to acquire ISO 14001 certification by FY2001 	→	Certification obtained as planned Page 8
	→	Steps to establish ISO 14001 system commenced Page 8
2) Continuous improvement of performance*		
[Production and R&D] <ul style="list-style-type: none"> Reduce emissions of NO_x in FY2001 20% compared with FY1998 Reduce emissions of adverse air pollutants in FY2004 95% compared with FY1996 Prevent pollution of underground water and soil Improve unit energy consumption in FY2001 3% compared with FY1998 Reduce waste disposal at landfill sites in FY2001 50% compared with FY1998 Reduce waste materials in FY2004 50% compared with FY1998 Strive for the complete elimination of environmental, labor, and safety related accidents [Administration (Green Office Plan)] <ul style="list-style-type: none"> Make 100% use of recycled paper and establish targets for paper and electric power usage 	→	Attained a 27% reduction in FY2000 compared with FY1998 Page 19
	→	Attained an 87% reduction in FY2000 compared with FY1996 Page 22
	→	Continuous inspection conducted at plants dealing with designated chemical substances detected no abnormalities Page 21
	→	Although consumption remained flat, achieved energy reductions equivalent to 13,000 kl of crude oil Page 20
	→	Attained a 35% reduction in FY2000 compared with FY1998 Page 18
	→	Reduced waste materials 22% in FY2000 compared with FY1998 Page 18
	→	Recorded no environmental accidents; Recorded three labor/work accidents with absence and one involving an explosion Page 25
	→	In FY2000, used 140 tons of copy paper and consumed 3.25 million kWh of electricity; Also, achieved a recycled copy paper usage rate of 90% Page 24
3) Consider the environment throughout the entire product life cycle		
<ul style="list-style-type: none"> Implement product evaluations using LCAs Upgrade Green Procurement activities 	→	Analysis of Material Balance and implementing LCAs for <i>shochu</i> products Page 14
	→	Inform business partners of our environmental and safety policies and strengthen Green Procurement activities Page 9
4) Upgrade environmental assessments		
<ul style="list-style-type: none"> Thoroughly implement environmental and safety assessment system 	→	Review stipulations and upgrade risk management (prepare for ISO 12100 standard) Strengthen change management and upgrade forecast evaluation system Page 28
5) Develop products and technologies that protect the environment and work to conserve energy		
<ul style="list-style-type: none"> Develop products and technologies that protect the environment and work to conserve energy and resources 	→	Develop a production process without chloride solvents and progress with energy conservation in the distillation process Page 32
6) Product environmental/safety usefulness		
<ul style="list-style-type: none"> Evaluate LCAs for <i>shochu</i> products 	→	It has been confirmed that <i>shochu</i> products are low environmental impact products Page 16

*Aggregate performance results that incorporate environmental accounting evaluations are compiled on page 10.

Note: Each item in the above Action Plan is in accordance with the Guidelines for Action on page 4.

Environmental and Safety Management Structure

1. Organizational Structure

Top management makes decisions relating to environmental and safety issues. The Corporate Safety and Environmental Management Department at Kyowa Hakko's corporate headquarters is the organization responsible for supporting management's decision making as well as for coordinating the safety and environmental management of each in-house company within Kyowa Hakko and the various business bases (plants, R&D facilities, and sales offices) of Kyowa Hakko and its affiliates.

In addition, Safety and Environmental Management departments have been set up at each of our plants to handle environmental and safety activities and deal with local governments and communities.

By combining the forces of all members of our corporate headquarters and in-house companies and various workplaces, we have enhanced our ability to deal appropriately with changes in environmental management and safety conditions.

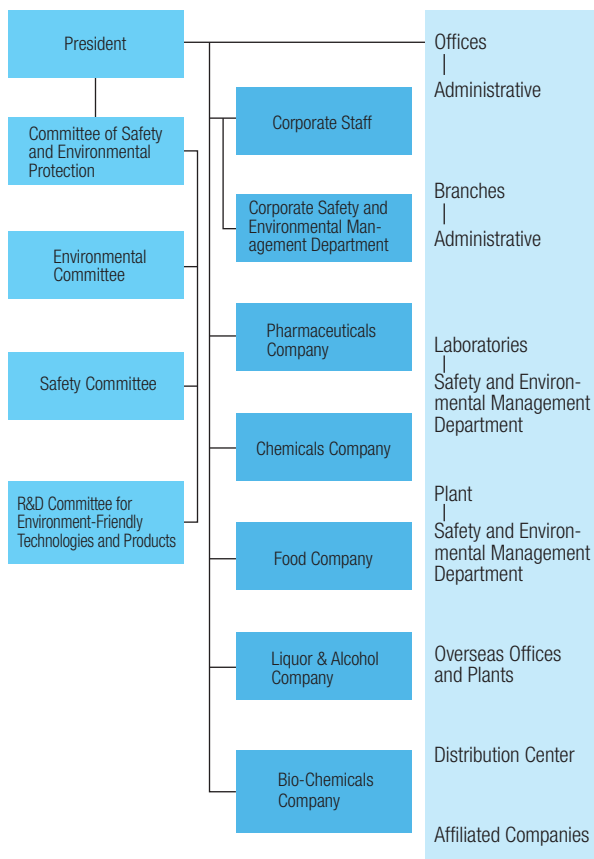
2. Committees and Policy Making

The Committee of Safety and Environmental Protection formulates drafts of basic policies relating to safety and the environment. The committee consists of the in-house company presidents and the executive directors of the parent company and is under the direct supervision of its president. The organizations operating under this structure include the Safety Committee and the Environmental Committee, which include the production chiefs of each in-house company and the general managers of the parent company, as well as the R&D Committee for Environment-Friendly Technologies and Products, which is based at the Research Division and formulates development plans for technologies and creates products that protect the environment.

Acting on the recommendations of the Committee of Safety and Environmental Protection, the president decides on policies to be implemented Companywide. These are publicized at all business bases and a policy for each business base is decided by their respective Environmental committees and Safety and Hygiene committees, which are headed by general managers. These committees integrate the Companywide plan and put it into action.

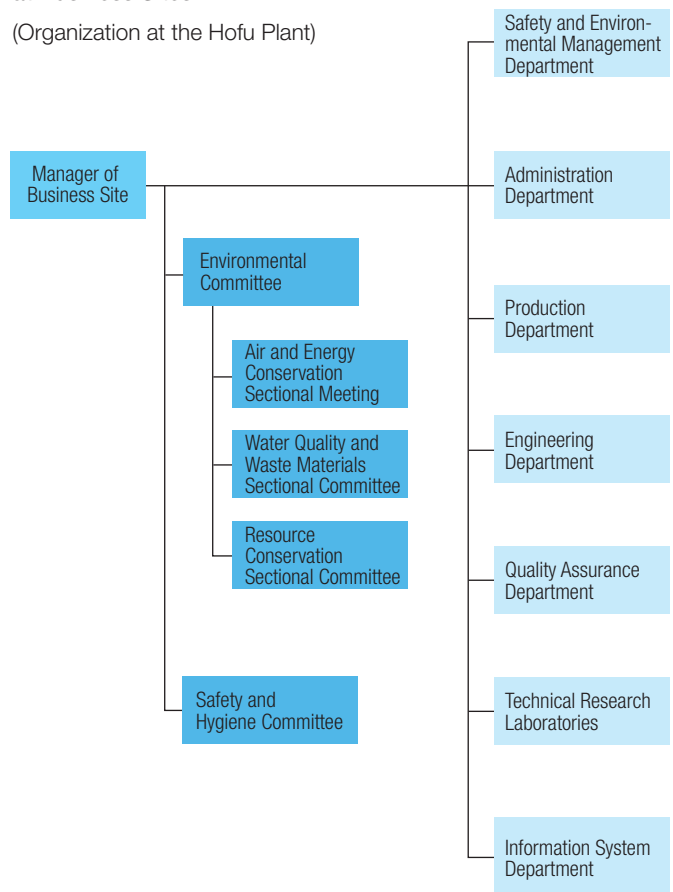
The activities of each plant are detailed on our Web site.

Safety and Environmental Management Organization



Safety and Environmental Management Organization at Business Sites

(Organization at the Hofu Plant)



3. The Establishment of an Environmental Management System

1) ISO 14001

To use ISO 14001 as an RC tool, we set about putting in place an environmental management system with the object of acquiring ISO 14001 certification at all the production bases of Kyowa Hakko and Kyowa Yuka by fiscal 2000. The first plant to acquire certification, in

July 1999, was the Hofu Plant and, by November 2000, all eight domestic production bases had acquired certification on schedule.

We are now preparing an environmental management system for ISO 14001 at consolidated subsidiaries, with a target date of 2004 for process completion.

The plant and R&D facility of Kyowa Medex plan to acquire ISO 14001 certification by 2001.

Dates of Acquisition of ISO 14001 Certification

Plant	Date of acquisition	Certifying body
Hofu	July 26, 1999	Japan Chemical Quality Assurance Co., Ltd.
Tsuchiura	March 21, 2000	Japan Chemical Quality Assurance Co., Ltd.
Fuji	May 29, 2000	Japan Chemical Quality Assurance Co., Ltd.
Yokkaichi	July 23, 2000	International Standards Certification Center Co., Ltd.
Ube	September 11, 2000	Japan Chemical Quality Assurance Co., Ltd.
Sakai	November 27, 2000	Japan Chemical Quality Assurance Co., Ltd.
Moji	November 27, 2000	Japan Chemical Quality Assurance Co., Ltd.
Chiba	November 27, 2000	Japan Chemical Quality Assurance Co., Ltd.



Statements of the Safety and Environmental Management departments of each plant for the acquisition of ISO 14001 certification



The Eco-Project Meeting in June 2001

2) Occupational Safety and Health Management System (OSHMS)

In response to the April 1999 OSHMS guidelines and the May 2000 revision of the new labor safety and hygiene management guidelines of the Japan Chemical Industry Association (JCIA), we decided in fiscal 2000 to adopt OSHMS standards for our own labor safety

and hygiene programs and are setting up appropriate structures. In this system, we are strengthening risk management, including reference to ISO 12100 and other comprehensive standards for machinery safety.

4. Important Activities for Implementing Policies Companywide

The Company's environmental and safety activities can be divided into those that are part of Companywide policy and initiatives undertaken at each business base. Below are activities undertaken on a Companywide basis.

Activities Being Carried Out under Companywide Policies

Activities	Objectives
Kyowa Eco-Project	<p>Since fiscal 1999, Kyowa Hakko and Kyowa Yuka have teamed up to jointly address issues related to energy saving and reducing the disposal of industrial waste, the most important environmental issues that we face.</p> <p>Targets</p> <p>(1) Reduce unit energy consumption 3% by FY2001 compared with FY1998</p> <p>(2) Reduce industrial waste disposal at landfill sites 50% in FY2001 compared with FY1998</p>
Green Office Plan	<p>This project is designed to encourage each business base to save electricity, to undertake green purchasing, and to separate and recover waste.</p> <p>Targets</p> <p>(1) Power conservation Ascertain the volume of electric power usage and establish targets for electric power usage by 2001</p> <p>(2) Green purchasing This program encourages the purchasing of environment-friendly products based on set standards; it covers stationery and office equipment</p> <p>Purchasing standards for stationery and office equipment</p> <ul style="list-style-type: none"> • We require that paper for copiers and fax machines, business cards, envelopes, and attached papers be substituted with at least 70% recycled paper, with a degree of whiteness of 70%. • We are working to ensure that purchases of stationery and office equipment are made in conformity with the designated product list and selection standards of Law on Promoting Green Purchasing. • We are working to purchase toner cartridges only from suppliers of recyclable products. <p>(3) Separation and waste recovery Thoroughly separate and recover waste as a corporate responsibility</p>
Green Procurement	<p>We are asking suppliers of raw materials and packaging materials to join us in efforts to find ways of reducing environmental impact. We communicate with more than 90% of suppliers, inform them of our Green Procurement policy, and cooperate mutually to make progress in lowering environmental impact.</p>

5. Environmental and Safety Education

The Company's managers, floor managers, regular employees, new employees, and transferred employees are provided with environmental and safety awareness education in line with the Safety and Environment Education Standard established in March 1977 and amended in December 1999. The number of staff covered by these programs in fiscal 2000 exceeded 20,000. In addition to these efforts, we provide information about important environmental and safety developments through an in-house newsletter distributed every month to our employees and via our Internet Eco-Page. We promote overall comprehension throughout the Kyowa Hakko Group.

6. Emergency Response Preparedness

We established the Internal Procedures for Handling Major Disasters Response Headquarters in October 1995, with a top manager designated as Head of Responsibilities, and are setting up an emergency center as well as clarifying response coordination and damage repair responsibilities. In addition, we have set up

an internal emergency response structure based on the Emergency Response Standard (enacted in 1978, amended in October 1995) so that we can respond quickly and appropriately to fires, explosions, or environmental crises.

Measures to ensure accident or disaster preparedness include regular training sessions at each business base.

7. Environmental Safety Auditing

In addition to independent verification of our compliance with ISO requirements, the Corporate Safety and Environmental Management Department at the Company's headquarters undertakes annual environmental and safety audits of the eight factories and two research establishments in Japan as well as of the headquarters and seven marketing units. Affiliated companies are also subject to annual audits. Labor union representatives form part of the auditing team at each business base. The results of the audits are reported to top management and reflected in policy.

1. Aggregate Expenditure for Environmental Accounting and Environmental Track Record

Below is a brief overview of the environmental track record of Kyowa Hakko, Kyowa Yuka, and Kyowa Medex.

Our continuous investment in environmental protection has achieved significant reductions in the environmental impact of our activities. There is some room for improvement in energy saving and SO_x and NO_x reduction, but we have made progress with reducing emissions of wastewater, waste materials, and chemicals. Formerly, we disposed of the waste liquid from fermentation processes, an effluent peculiar to our business, as waste; however, we have now found an efficient way of reusing it. In the next report, such waste will be reported on as a by-product.

2. LCAs and Material Balance of Products

This report includes LCAs of *shochu* products, our main consumer-oriented product. *Shochu*, a distilled-alcohol beverage, has been shown to have low environmental impact as well as being an alcoholic beverage that may not cause any lingering aftereffects.

3. Overview of Safety Activities

Kyowa Yuka has operated for 24 years without labor/work accidents with absence. However, the explosion at the Sakai Plant caused significant distress to local residents. We are undertaking drastic measures, including the shift of a pilot production plant, to prevent a recurrence.

Environmental Activities

Area of cost*	Item	FY2000 track record					Target	FY2000 Expense (¥ million)
		Track record	Compared with FY1990	Compared with FY1998	Compared with FY1999	Self-rating		
1) Pollution control	Total volume of wastewater (thousand tons/year)	62,264	75%	94%	103%	○	Efficient usage of water	2,482
	COD levels (tons/year)	1,195	41%	95%	107%	×	1,642 tons/year in FY2000	
	SO _x emissions (tons/year)	1,284	72%	93%	99%	○	2,709 tons/year in FY2000 Increase in use of low-sulfur fuels	
	NO _x emissions (tons/year)	640	82%	73%	66%	◎	20% reduction in FY2001 compared with FY1998	
	Dust emissions (tons/year)	44	34%	50%	88%	◎	419 tons/year in FY2000	
	Chemical substance emissions							
	Adverse air pollutants (tons/year)	55	—	37%	144%	○	50% reduction in FY2004 compared with FY1996	
Global environmental protection	Substances regulated by PRTR/MSDS Law (tons/year)	62.6	—	41%	142%	○	50% reduction in FY2004 compared with FY1996	
	Unit energy consumption (crude-oil basis)**						3% improvement in FY2001 compared with FY1998	524
	Kyowa Hakko (kl/¥100 million of sales)	63.2	80%	100%	104%	×	(18% reduction on an absolute consumption basis from FY1990)	
Kyowa Yuka (l/ton of production)	185.0	92%	98%	100%	○	(Fixation of CO ₂ corresponds to 18% of total emissions)		
Resource recycling	Waste materials	248,097	25%	78%	109%	○	50% reduction in FY2004 compared with FY1998	2,796
	Waste disposal at landfill sites (tons/year)	2,848	0.4%	65%	102%	◎	50% reduction in FY2001 compared with FY1998	
All other environmental protection costs								2,036
Total								7,838

Scope of evaluation: Kyowa Hakko, Kyowa Yuka, and Kyowa Medex

Self-ratings are compared with the average of FY1998 and FY1999. ◎ means there was an improvement of 10% or more, ○ means an improvement of up to 10%, and × means no improvement compared with the average of FY1998 and FY1999

* Compiled in accordance with the Ministry of the Environment's environmental accounting guidelines

** A reduction of 13,000 kl was achieved on a crude-oil basis but unit energy consumption worsened compared with the previous year.

Safety Activities

Fiscal year	Name of award	Plant receiving award
2000	Fire Defense Agency Commissioner's Award (Excellent business facility handling hazardous materials)	Fuji Plant
	Minister of Labour Award (Safety)	Yokkaichi Plant
	Minister of International Trade and Industry Award (Excellent manufacturing facility for high-pressure gas)	Yokkaichi Plant
2001	Minister of Health, Labour and Welfare Award (Group)	Ube Plant, Kyowa Kai
	Fire Defense Agency Commissioner's Award (Contributor to Safety Maintenance Award)	Head Office

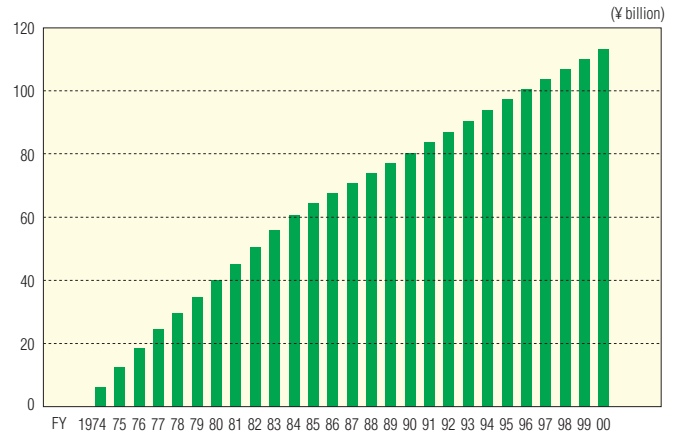
1. Operating Expenses of Environmental Facilities

The graph at right shows the accumulated operating expenses for environmental facilities since fiscal 1974. Breaking down direct environmental expenses per product gave us a new yardstick for making decisions relating to the businesses concerned.

The Company has spent an average of more than ¥3 billion per year on direct operating expenses related to environmental facilities over the past 10 years. Most of these expenses were for facilities for recycling waste fluid and treating wastewater.

The environmental protection costs (investments and expenses) presented in the environmental accounting summary on the following pages are aggregates compiled in accordance with the Ministry of the Environment's Environmental Accounting Guidelines for 2000. They include expenses related to environment-related R&D, the manufacturing and marketing of recycled products, and personnel as well as other costs incurred indirectly through or as part of environmental management activities and a wide range of other indirect items.

Total Accumulated Expenses for the Operation of Environmental Facilities

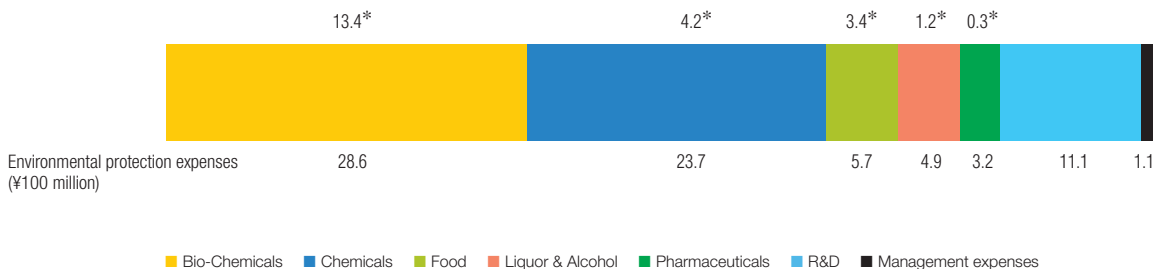


Chemicals also account for a large proportion of environmental protection expenses due to the large scale of production. The manufacture of liquor and alcohol based on the fermentation of grains generates few by-products and residues and has low environmental impact. On the other hand, the manufacture of pharmaceuticals and food, which is based on the processing of pharmaceutical and foodstuff raw materials, has less environmental impact than the operations of the other in-house companies. Accordingly, the Company's environmental protection expenses are concentrated in businesses that produce bulk products in the bio-chemicals and chemicals areas. In its liquor and alcohol and food businesses, the main environmental expenses are those that arise in connection with distribution and the recycling of packaging materials after consumption.

2. Environmental Protection Expenses per In-House Company

The Company manufactures a wide range of pharmaceuticals, bio-chemicals, chemicals, liquors and foods that include bulk materials through final products. Environmental protection expenses in each of these businesses are detailed below. Bio-chemicals is an example of a raw-material based industry in which the desired product must be isolated through a series of complicated reactions that yield many by-products and residues requiring special treatment.

Environmental Protection Expenses by In-House Company and Other Expenses



$$\frac{\text{Environmental protection expenses}}{\text{Sales by Company}} \times 100 (\%)$$

Scope of summary: Kyowa Hakko, Kyowa Yuka, and Kyowa Medex
Time period: April 1, 2000, through March 31, 2001

3. Environmental Accounting

Our environmental accounting is based on guidelines for 2000 issued by the Ministry of the Environment. It mainly concerns fiscal 2000 environmental activities at 11 business bases: the 9 domestic plants of Kyowa Hakko, Kyowa Yuka, and Kyowa Medex and 2 domestic research institutes.

Aggregate environmental protection costs (investments and expenses) and benefits realized so far with regard to such major items with environmental impact as unit energy consumption, waste materials, and sales of resources are detailed below. The compilation of environmental protection costs is made on the basis of our Environmental Accounting Standards and sets out investments and expenses in

		Environmental protection costs (¥ million)		
Classification		Principal activities	Investment (¥ million)	Expense (¥ million)
1) All environmental protection costs incurred in production and service activities within our business premises (in situ operating costs)			1,132	5,802
Breakdown	① Pollution control costs	<ul style="list-style-type: none"> Rebuilding, improvement, and operation/maintenance of wastewater treatment facilities Enhancement of denitration installations and operation/maintenance of desulfurizing and exhaust gas treatment installations Enhancement and operation/maintenance of odor control installations 	410	2,482
	② Global environmental protection costs	<ul style="list-style-type: none"> Purchase and fixation of gaseous CO₂ through the oxo process for use as a raw material Reinforce energy saving by enhancement of distillation columns, improvement of efficiency of compressed-air machinery, partial refitting of gas turbines, etc. 	492	524
	③ Resource recycling costs	<ul style="list-style-type: none"> Investment in and operation/maintenance of waste reduction and recycling equipment Investment in and operation/maintenance of industrial waste processing facilities and cost of outsourcing such treatment Installation of waste gas recovery facilities and operation/maintenance of water-saving facilities 	230	2,796
2) Environmental protection costs, including upstream and downstream stages of production and services (upstream and downstream costs)		<ul style="list-style-type: none"> Provision of environment-friendly products and services Recycling and recovery of packaging materials Outsourcing recycling of packaging materials 	8	264
3) Environmental protection costs incurred at management level (environmental activities costs)		<ul style="list-style-type: none"> Environmental awareness activities and acquisition of ISO 14001 and subsequent measures to maintain compliance Independent analysis of environmental impact Environmental management personnel remuneration 	16	393
4) Environmental protection costs incurred in R&D (R&D costs)		<ul style="list-style-type: none"> R&D of environment-friendly products and services R&D aimed at controlling environmental impact at the production stage 	10	1,049
5) Environmental protection costs incurred in community activities (community activities costs)		<ul style="list-style-type: none"> Environmental improvement, including nature conservation, greening, beautification, and landscaping activities Compiling of environmental information materials for public disclosure Membership in and cooperation with environmental protection and nature conservation groups 	21	181
6) Environmental costs incurred in rectifying environmental damage (environmental damage costs)		<ul style="list-style-type: none"> Pollution load levy 	0	149
Total			1,187	7,838

Item	Action	Amount (¥ million)
Total investment	New construction of drug trial production facilities and expansion of pharmaceutical research facilities	12,182
Total R&D costs	R&D of new products and technologies	28,673
Sales of items related to resource recycling as in 1) ③	Fertilizer containing organic materials, materials enriched with <i>shochu</i> distillate, used catalysts, containers for raw materials, etc.	449
Effect related to saving resources as in 1) ② and ③	Conservation of energy, water, and resources and waste reduction	1,477

Note: Expenses include depreciation, personnel costs, utility fees, costs of materials, costs of repairs, outside contracting costs, and commissions.

detail. At the same time, breakdowns are given of environmental protection costs in each business category, along with the content, scope, and examples of application of principal activities as part of efforts to further standardization.

Environmental accounting includes direct environment-related expenses incurred to date (see page 11) and roughly similar indirect expenses. Indirect expenses consist mainly of resource recycling costs in bulk production operations and environmental protection R&D investment undertaken in accordance with management policy.

- Scope of evaluation: Businesses of Kyowa Hakko, Kyowa Yuka, and Kyowa Medex
- Period covered: April 1, 2000, through March 31, 2001

Focus	Effect		Remarks (future measures)	Criteria
	FY2000	FY1999		Legal standard (self-imposed control standard in FY2000)
Water pollution control				
• Total volume of wastewater	62.3 million tons	1.7 million-ton increase	(Reduce the volume of water used)	—
• COD levels	1,195 tons	75-ton increase	Removed 4,200 tons of COD during the year	4,460 tons (1,642 tons)
Air pollution control				
• SO _x emissions	1,284 tons	14-ton decrease	(Increase use of low-sulfur fuels)	5,491 tons (2,709 tons)
• NO _x emissions	640 tons	325-ton decrease	Enhancement of denitration installations and introduction of low NO _x burners	1,656 tons (20% reduction in FY2001 compared with FY1998)
• Dust emissions	44 tons	6-ton decrease	Ongoing review of boiler operations	706 tons (419 tons)
Unit energy consumption (crude-oil basis)				
• Kyowa Hakko	63.2 kl/	2.2 kl/¥100 million of sales	Unit energy consumption worsened slightly but thanks to energy-saving activities a reduction of 13,000 kl was achieved on a crude-oil basis (about 4% of total amount used; an approximate saving of ¥300 million)	(As of the end of FY2001, unit energy consumption had been reduced 3% compared with FY1998 levels)
• Kyowa Yuka	¥100 million of sales 185 kl/ton of production	worsening 1 kl/ton of production improvement		
CO ₂ use (Kyowa Yuka)	72,000 tons	8,000-ton decrease	Recycled into raw material for oxo alcohol production using the oxo method	—
Waste				
• Waste materials	248,000 tons	20,000-ton increase	(Efforts made through the use of alternative fermentation raw materials and improvement of processes)	50% reduction in FY2004 compared with FY1998
• Waste disposal at landfill sites	2,848 tons	59-ton increase	Continuous efforts made to reduce the generation of waste and promote recycling	50% reduction in FY2001 compared with FY1998
<ul style="list-style-type: none"> • Made recycling of PET bottles for <i>shochu</i> easier by switching from direct printing onto the bottles to the use of transparent labels that can be removed without leaving traces of glue • Undertook continuous reuse, recycle, and reduce activities with regard to glass, for example, recycling 1.8-liter sake bottles and recovering and reusing <i>shochu</i> bottles in certain districts 				
<ul style="list-style-type: none"> • ISO 14001 certification completed at eight domestic plants by end of FY2000 (From FY2001 we began building a system for ISO 14001 at affiliated companies and plan to complete this system in FY2004.) 				
<ul style="list-style-type: none"> • Successfully marketed raw materials for lubricating oil for air conditioners that use alternatives to CFCs, an environment-friendly, non-chloride solvent, and Landfill Liner for waste-disposal sites, which prevents the egress of polluted water • Pursued R&D activities to lower environmental impact 				
<ul style="list-style-type: none"> • Pursued nature conservation, greening, beautification, landscape preservation and other environmental activities • Improved disclosure of environmental and safety activities through the release of second <i>Health, Safety, and the Environment</i> report and the creation of special section on the Web site 				

[Major Successes]

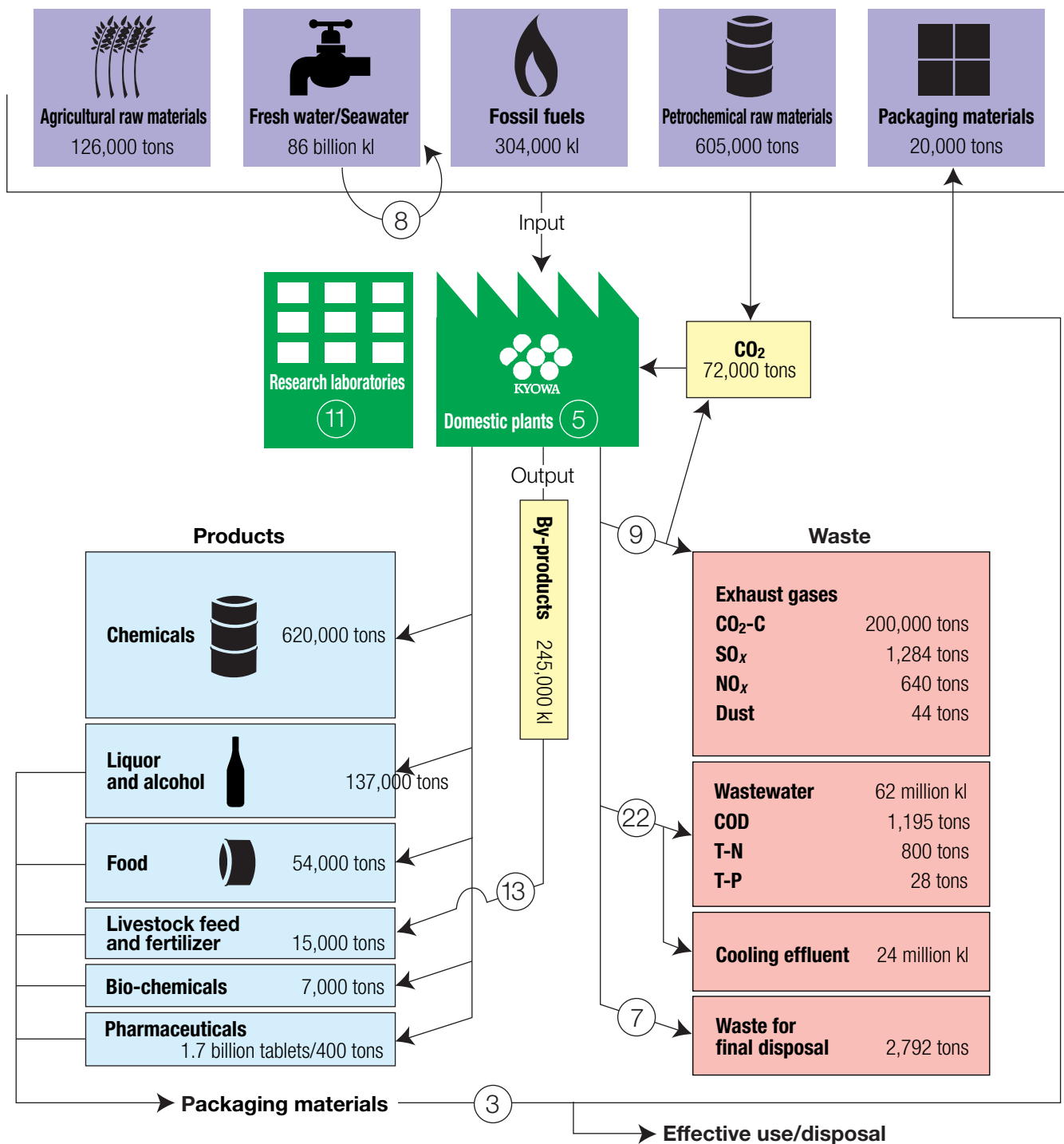
- Since 1997, we have reduced to zero the amount of fermentation mother liquor disposed of in the ocean and continue to recycle virtually all of it.
- By enhancing our denitration facilities and switching to low NO_x burners, we have reduced NO_x emissions 34% compared with the previous fiscal year.
- We have made progress with improving processes, enhancing facilities, and recycling a greater proportion of waste materials under the Kyowa Eco-Project (centered on energy-saving and waste-reduction activities). We reduced energy consumption by 13,000 kl on a crude-oil basis (approximately 4% of all energy used, with a saving of approximately ¥300 million).
- Sales of resources, waste material reduction, and conservation of water and energy were evaluated at approximately ¥1.9 billion.
- Through the adoption of the oxo method, Kyowa Yuka has reduced CO₂ use to just over 70,000 tons. The method has been useful in recovering CO₂. These figures correspond to less than 20% of the total volume of CO₂ emissions.
- We have acquired ISO 14001 environmental management certification for eight domestic plants of Kyowa Hakko and Kyowa Yuka.
- We have begun full-scale operations of enhanced wastewater-treating facilities at fermentation facilities and now are implementing measures to remove and treat nitrate and phosphate emissions.

ENVIRONMENTAL IMPACT OF MATERIAL BALANCE

Material Flows from an Environmental Perspective

Material flows related to production processes at Kyowa Hakko and Kyowa Yuka are substantially as shown below. The diagram includes input that includes raw materials, energy, water, and other

materials and output in the form of finished and other products and wastewater and waste materials emitted into the environment.



○ Figures in circles are the environmental accounting/environmental protection expenses as shown on page 12 (¥100 million).

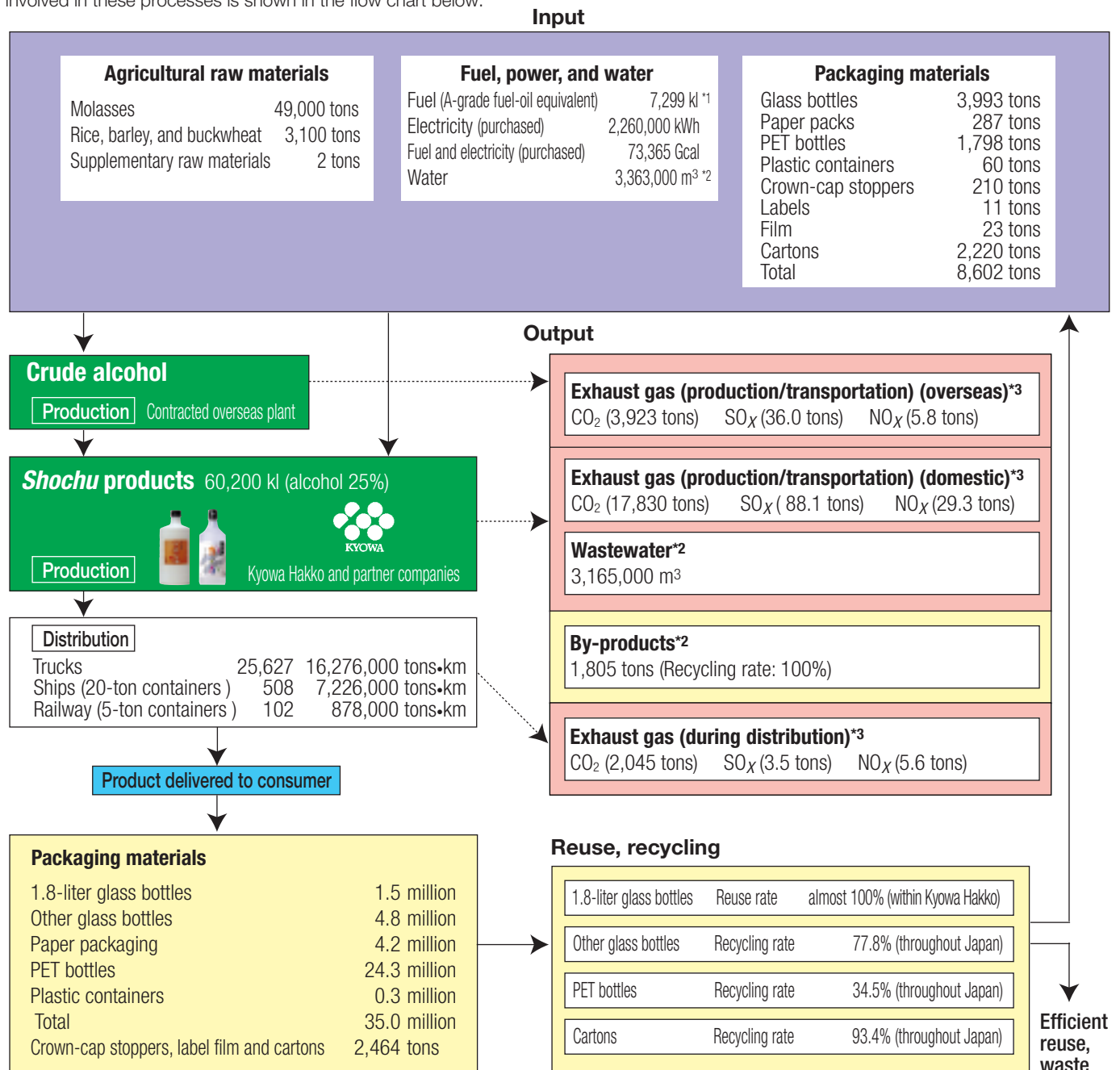
Environmental Impact of Shochu Products

1. Material Flow of Shochu Products

Shochu products are made using *ko*-type *shochu*, Japanese traditional spirits produced by the continuous distillation of alcohol from the fermentation of cane sugar molasses, and *otsu*-type *shochu* produced by the batch distillation of alcohol from the fermentation of mainly rice and barley. The environmental impact of materials involved in these processes is shown in the flow chart below.

Two special features of *shochu* are that, after fermentation, energy is used for the distillation of alcohol and that the final product contains very few ingredients other than alcohol. As a product, it has very few impurities and is a refreshing beverage that generally breaks down very smoothly in the body.

With regard to distribution, trucks account for 67% of all transportation of *shochu* products. The remainder (33%), taken over longer distances, is transported by ships and trains, which emit less CO₂ than automobiles.



*1 Amount of fuel used for crude alcohol overseas production transport to Japan and domestic *shochu* production, including transportation between factories

*2 References to water, wastewater, and by-products relate to domestic manufacturing processes. Statistics from partner companies that process raw alcohol are not included.

*3 Emission volumes of CO₂ from fossil fuel combustion into the environment

2. Life Cycle Assessments (LCAs) of Shochu Products

The information on these pages details the energy consumption and environmental impact of Kyowa Hakko's main liquor product *shochu* in fiscal 2000, based on cumulative data. The assessment covers all processes prior to marketing—the production of molasses and crude alcohol at overseas plants, transportation to Japan, raw grain production, the manufacture of *ko*-type *shochu* and *otsu*-type *shochu* at domestic factories, including transportation between factories and bottling—as well as distribution for retail. The calculation of the environmental impact of *shochu* products was carried out under the guidance and supervision of the Research Center for Life Cycle Assessment of the National Institute of Advanced Industrial Science and Technology.

Energy consumption and environmental impact during raw material production and *shochu* manufacture and transportation are shown in Table 1. Raw material production and *shochu* manufacture and transportation accounted for 92% of all energy used, with the remaining 8% accounted for by product distribution activities. CO₂ emissions follow a similar pattern. This points to the efficiency of our energy-conservation efforts in the production and transportation of spirits and other items between factories as well as in distribution.

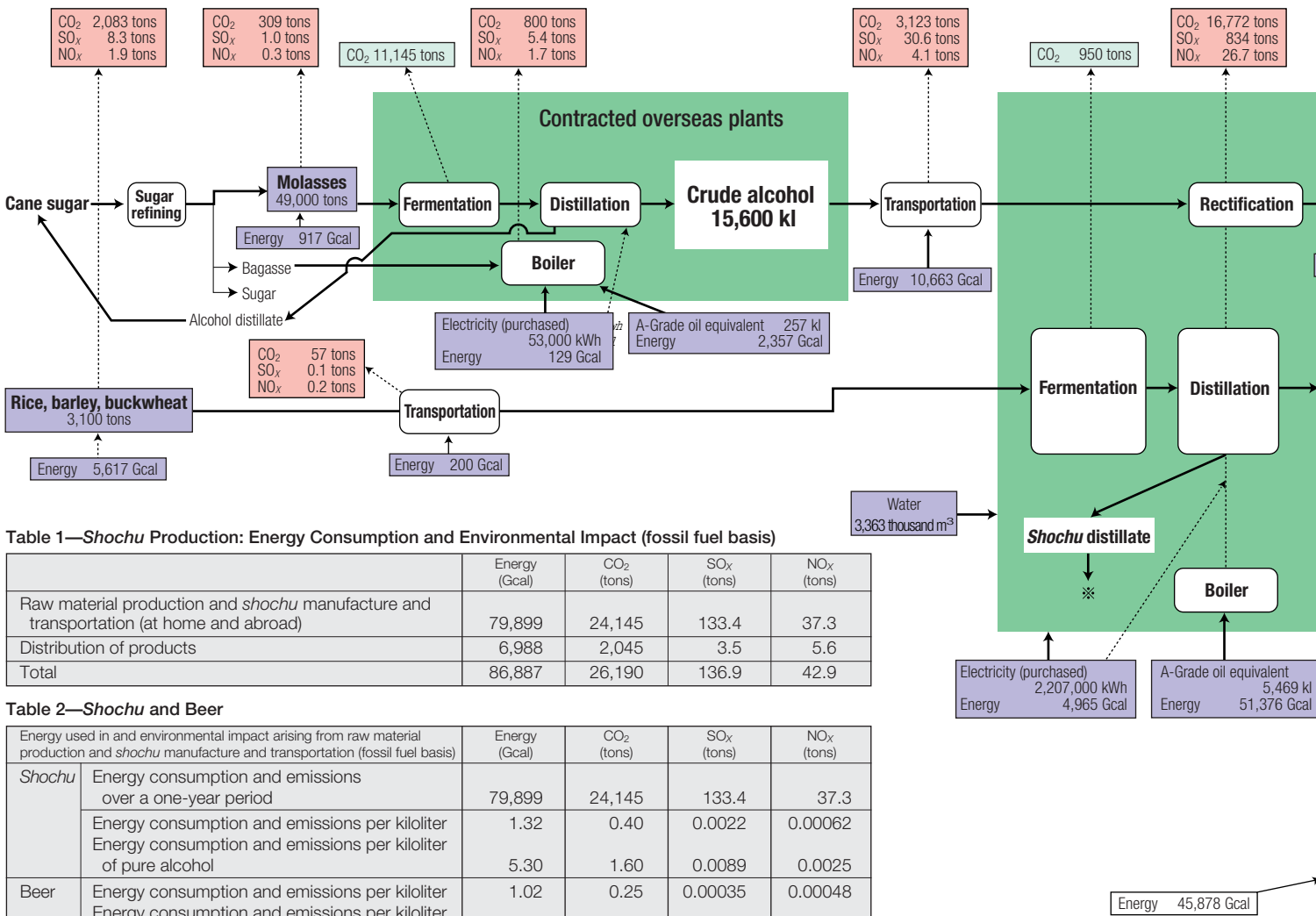


Table 1—*Shochu* Production: Energy Consumption and Environmental Impact (fossil fuel basis)

	Energy (Gcal)	CO ₂ (tons)	SO _x (tons)	NO _x (tons)
Raw material production and <i>shochu</i> manufacture and transportation (at home and abroad)	79,899	24,145	133.4	37.3
Distribution of products	6,988	2,045	3.5	5.6
Total	86,887	26,190	136.9	42.9

Table 2—*Shochu* and Beer

Energy used in and environmental impact arising from raw material production and <i>shochu</i> manufacture and transportation (fossil fuel basis)		Energy (Gcal)	CO ₂ (tons)	SO _x (tons)	NO _x (tons)
<i>Shochu</i>	Energy consumption and emissions over a one-year period	79,899	24,145	133.4	37.3
	Energy consumption and emissions per kiloliter of pure alcohol	1.32	0.40	0.0022	0.00062
	Energy consumption and emissions per kiloliter of pure alcohol	5.30	1.60	0.0089	0.0025
Beer	Energy consumption and emissions per kiloliter of pure alcohol	1.02	0.25	0.00035	0.00048
	Energy consumption and emissions per kiloliter of pure alcohol	22.60	5.66	0.0078	0.0107

Note: Energy-use and emission data related to beer is taken from the environmental reports of three beer makers, and alcohol content was assumed to be 4.5%.

Table 3—*Shochu* and Beer: Assessment of Products, Including Bottles

Environmental impact including that related to bottles (fossil fuel basis)		<i>Shochu</i>		Beer	
		Non-reusable glass bottles	PET bottles	Bottles (recycled 5 times)	Bottles (recycled 20 times)
Product	CO ₂ g/l	400	400	255	255
	SO _x g/l	2.21	2.21	0.35	0.35
	NO _x g/l	0.62	0.62	0.48	0.48
Including bottles	CO ₂ g/l	655	589	333	303
	SO _x g/l	2.73	2.63	0.52	0.46
	NO _x g/l	0.84	0.83	0.56	0.54
	CO ₂ g/l (pure alcohol basis)	2,600	2,400	7,400	6,700
	SO _x g/l (pure alcohol basis)	10.9	10.5	11.6	10.2
	NO _x g/l (pure alcohol basis)	3.4	3.3	12.4	12.0

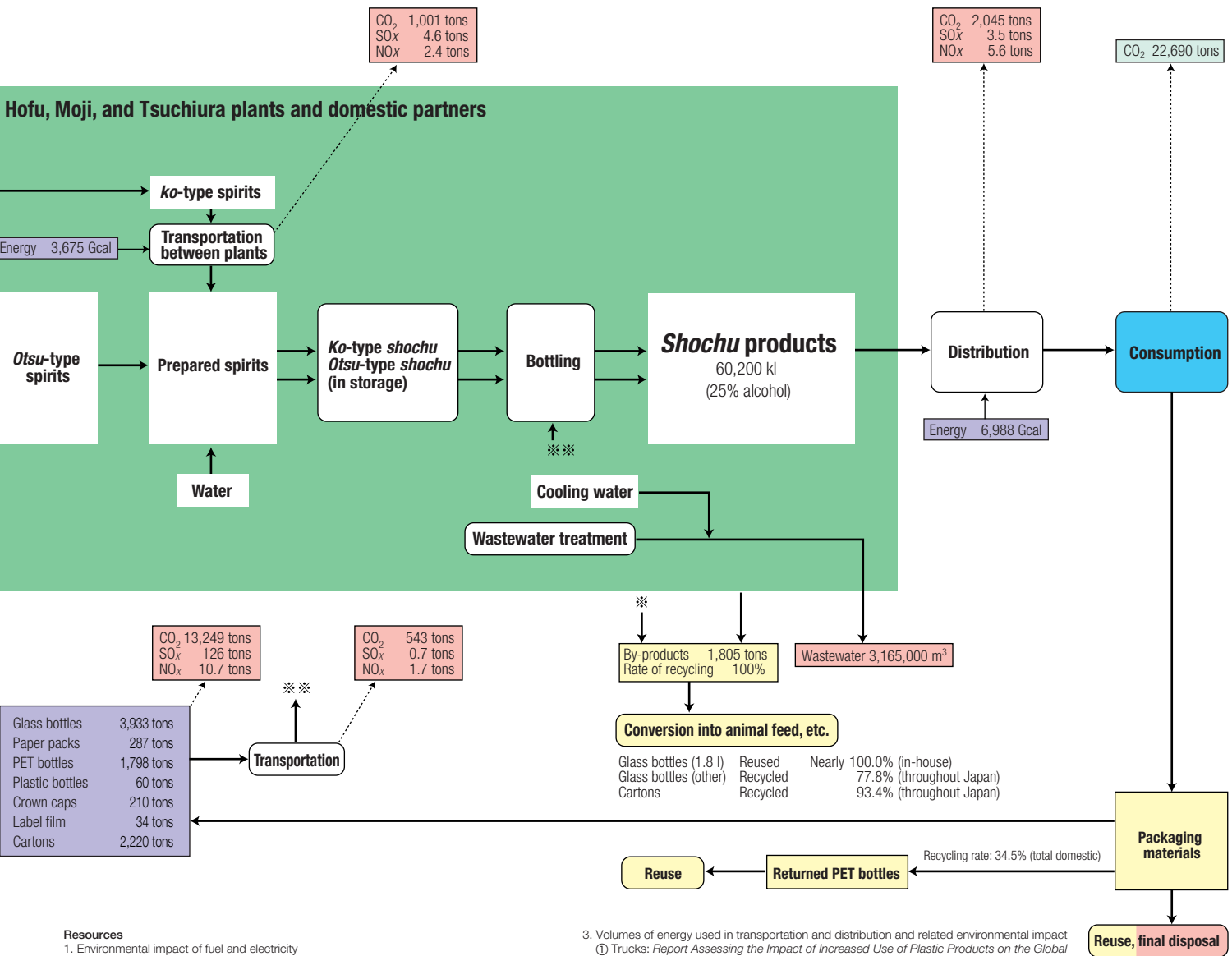
- Notes: 1. Emissions in red are fossil fuel derived, and those in light green are from agricultural sources.
 2. Calculations of energy consumed and emissions released during the manufacture of packaging materials refers to glass bottles, paper packs, PET bottles, and cartons. Emissions from the transportation of packaging materials refers to glass bottles, PET bottles, and cartons.
 3. Water, wastewater, and by-product data is related only to the Company and does not include the manufacture of *otsu*-type spirits at partner companies.

Shochu is distilled during manufacture to remove impurities generated during the alcohol fermentation stage. The production of *shochu* consumes 1.3 times as much energy per unit of production volume as the production of beer, a ratio that remains the same on a CO₂ calculation basis.

At the same time, the alcohol content of *shochu* products averages a high 25%, more than five times that of beer (4.5%). Thus, when the beverages are compared in terms of pure alcohol regarding energy consumed in production and the volume of CO₂ released, the figures applying to *shochu* are less than one-third those of beer. On this basis, it can be said that *shochu* products are alcoholic products with relatively low environmental impact.

Regarding the packaging used for *shochu* products, the volume of CO₂ emitted during the manufacture, transportation, and disposal of nonreusable glass bottles and PET bottles is greater than that released when employing reusable beer containers recycled 20 times (5.3 times greater for nonreusable bottles and 3.9 times for PET bottles). However, the CO₂ emissions of *shochu* production, including bottles, are only 2.1 times higher than those for beer per unit of product volume for nonreusable glass bottles and 1.9 times for PET bottles.

In pure alcohol terms, *shochu* production results in less than half the level of CO₂ emissions as beer and approximately the same level of SO_x emissions. It seems, therefore, to be an environment-friendly product.



Resources

- Environmental impact of fuel and electricity
 - Fuel energy volumes: *Alcohol Handbook*, 9th edition (Ministry of International Trade and Industry, Primary Industry Section, Alcohol Office, and the Alcohol Association and Bio Industry Association, September 1997)
 - Electricity consumption volumes: *Life Cycle Inventory Analysis Guide* (Ministry of the Environment, Planning and Adjustment Section, Environmental Research and Technology Office, the Environmental Information Center, September 1998)
 - Environmental impact relating to fuel and electricity: *JEMAI-LCA Life Cycle Assessment Software*, JEMAI's LCA standards and comments (Japan Environmental Management Association for Industry (JEMAI), 2000)
 - The Company's figures for SO_x and NO_x emission volumes from fuel use are based on an actual survey.
- Volumes of energy used in raw material production and environmental impact of molasses and grain-based materials

LCA Practical Introduction—Environmental Load of 4,000 Social Stocks (JEMAI, August 1998)

- Volumes of energy used in transportation and distribution and related environmental impact
 - Trucks: *Report Assessing the Impact of Increased Use of Plastic Products on the Global Environment*, revised edition (Plastic Recycling Promotion Association, July 1993)
 - Shipping: *JEMAI-LCA Life Cycle Assessment Software* (JEMAI's LCA standards and comments; JEMAI 2000)
 - Railways: *Overview of Energy Requirements in Transportation*, 2000 edition (General Policy Office, Information Management Department of the Ministry of Land, Infrastructure and Transport, March 2001)
- Energy consumption in connection with packaging and volume of environmental impact
 - Environmental Impact Assessments (LCAs) of Packaging Made of Plastic or Similar Materials* (Plastic Recycling Promotion Association, March 1995)
 - A Comparison of Packaging Materials Based on LCA Methods* (report by Packaging Materials Comparison Research Association, May 2000)
- Recycling of packaging materials, recycling rate
 - Records for 2000 of the Glass Bottle Recycling Association
 - Records for 2000 of the PET Bottle Recycling Promotion Association
 - Japan Cardboard Industrial Association, records of the Cardboard Recycling Council for 2000

To reduce the environmental impact of its operations, the Company not only strictly adheres to environment-related laws and the regulations of national and local government bodies as well as industrial organizations but also formulates self-imposed management standards at each business site for air, water quality, and industrial waste that are even more stringent than prevailing laws and regulations. At the same time, the Company carries out environmental protection activities based on ISO 14001, the international standard for environmental management systems. In addition, as part of the Kyowa Eco-Project, we have established uniform Companywide goals for conserving energy and reducing waste materials, which are crucial to environmental protection.

1. Approach to Reducing Waste Materials

Reducing waste materials is a vital issue at the Company. As part of the Kyowa Eco-Project, the Company has progressed with the recycling of waste materials with the aim of “reducing the volume of waste disposal at landfill sites 50% by the end of 2001 compared with the amount in fiscal 1998.” Through these efforts, the Company was able to achieve a 35% reduction in the volume of such waste in fiscal 2000 compared with fiscal 1998. The Company is continuing with activities to reduce the volume of waste disposal at landfill sites. The Company is now focusing such efforts on all types of waste materials generated and has set a new target of cutting the volume of all waste materials 50% in fiscal 2004 compared with fiscal 1998 and has commenced efforts to restrict the volume of such waste generated, having reduced waste materials generated 22% in fiscal 2000 compared with fiscal 1998. Specifically, the Company is carrying out the activities shown at right that include substituting fermentation raw materials, improving production processes, and recycling waste as reusable resources for internal processes. Fermentation waste is a by-product that contains numerous useful substances. Thus, as will be detailed later, we are striving to raise the resource recycling rate of such waste materials to 99% by the end of fiscal 2004 for the entire Kyowa Hakko Group, including resource recycling at overseas business operations.

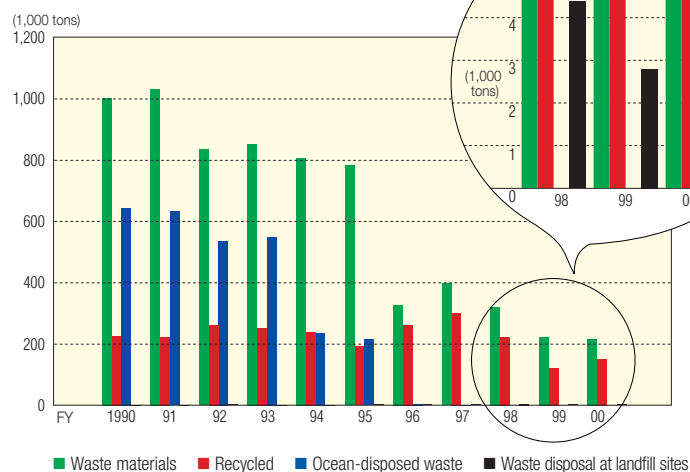
Previous Actions

The Company previously carried out the ocean disposal of fermented waste that was not recycled into resources. From fiscal 1994, however, we began to incrementally reduce the ocean disposal of such fermented waste liquid, and in summer 1997 we became the first company in the industry to completely terminate such disposal. In addition, we have also reduced the amount of waste disposal at landfill sites 99% compared with fiscal 1990. For the remaining 1% of such waste, which is equivalent to over 4,000 tons of other waste disposal at landfill sites, we have set targets that focus on waste disposal at landfill sites or reducing amounts of waste material generated, as we work to further reduce waste with the aim of achieving zero emissions.

2. Approach to Preventing Water Pollution (COD Reduction)

In fiscal 2000, the Company's volume of chemical oxygen demand (COD) rose 7% from the fiscal 1999 level. Nevertheless, COD emissions in fiscal 2000 were 59% below the level of fiscal 1990. Since the 1970s, the Company has been removing COD as well as nitrogen and phosphorous from wastewater. The Company revamped the

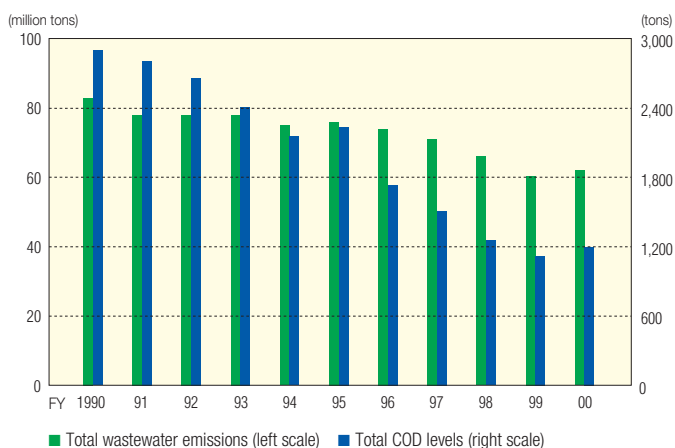
Yearly Changes in the Volume of Industrial Waste



Waste Material Countermeasures Introduced in Fiscal 2000

- Restriction of the volume of sludge (waste cake) by using reverse osmosis (RO) membranes and converting some sludge generated into fertilizers (Hofu and Ube plants)
- Reuse of waste oil (waste solvents) (Sakai Plant)
- Use of high-purity fermentation raw materials (Hofu Plant)
- Conversion of waste activated carbon into resources (Chiba Plant)
- Reduction of packaging materials by using simple packaging (Pharmaceuticals Company)
- Implementation of the material recycling of waste plastics as well as the recycling these plastics into steel and cement raw materials (Tsuchiura and Fuji plants)
- Recycling of incinerated ash from regular combustibles and sludge into cement raw materials (Hofu and Ube plants)
- Recycling of organic residue waste into fertilizers and feed (Hofu, Ube, and Moji plants)

Yearly Changes in the Total Volume of Wastewater and COD Levels



wastewater treatment facilities at its Ube Plant at the end of 1999 to further reduce these levels in wastewater. Regarding the Company's achievements in fiscal 2000, the Company removed approximately 4,200 tons of COD, 1,000 tons of nitrogen, and 100 tons of phosphorous from wastewater. Besides wastewater treatment, as source countermeasures, the Company has taken such actions as shifting to the use of other fermentation raw materials, improving production processes, and recycling within the production process.

3. Prevention of Air Pollution

SO_x, NO_x, and dust emissions by the Company are managed under self-imposed standards that set emission levels below those stipulated by laws and regulations.

1) SO_x Emissions

In fiscal 2000, the volume of sulfur oxide (SO_x) emissions by the Company remained at the same level as fiscal 1999 but represented a 27% reduction from fiscal 1990. As specific countermeasures for reducing SO_x emissions, the Company installs equipment to remove sulfur from exhaust gas and uses heavy fuel oil with a low sulfur content. In addition, the Company is progressing with efforts to diversify its use of fuels, including such fuels as LNG. The Company will continue to implement various countermeasures, including using fuels with low sulfur content.

2) NO_x Emissions

In fiscal 2000, the Company reduced the volume of NO_x emissions from boilers 34% compared with fiscal 1999 and surpassed its target of reducing NO_x emissions 20% from the fiscal 1998 level by fiscal 2001, well ahead of schedule. In fiscal 2000, the Yokkaichi Plant strengthened its denitrification facilities while the Hofu Plant adopted low NO_x burners.

3) Dust Emissions

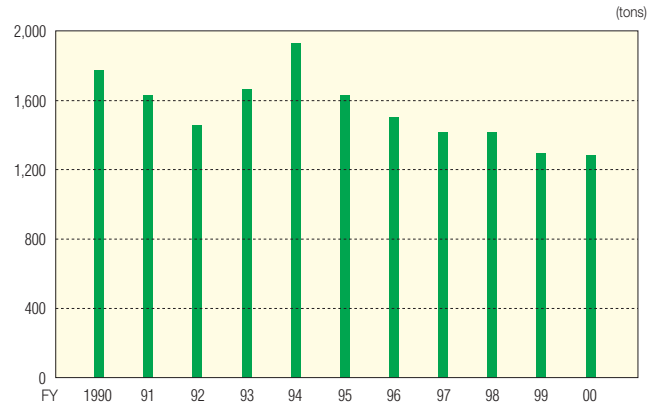
In fiscal 2000, the Company achieved a 12% reduction in the volume of dust emissions compared with fiscal 1999, a 66% reduction from fiscal 1990. As specific countermeasures, the Company is removing dust through the use of ash collectors and carefully managing the operation of its boilers.

4) Dioxin Emissions

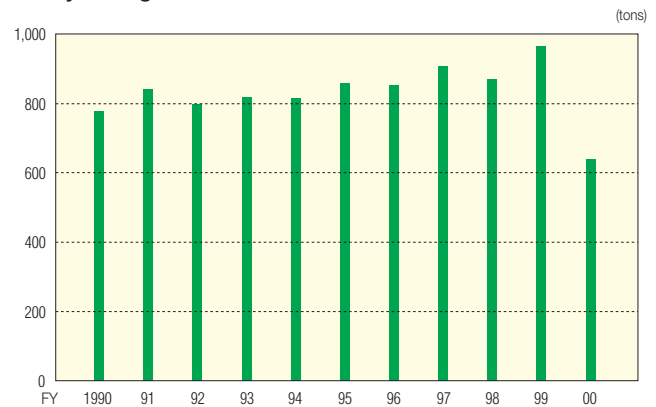
The Company monitors the amounts of dioxin emissions in exhaust gas from all its incinerators that are subject to emission restrictions and has confirmed that its incinerators at all nine plants complied with the emission standards values that will be in effect from 2002.

We are proceeding with a planned response to the upcoming implementation of standards for facilities from December 2002. Accordingly, we already ceased operating 7 of the 17 incinerators in operation as of the end of 2000. By modifying existing incinerators and introducing new incinerators, we plan to reduce the total number of incinerators in operation to 7 by the end of 2002. We will implement environmental assessments for newly introduced incinerators and will communicate with the local governments and residents in areas near our plants. (Please refer to our Regional Activities & Communications on page 31.)

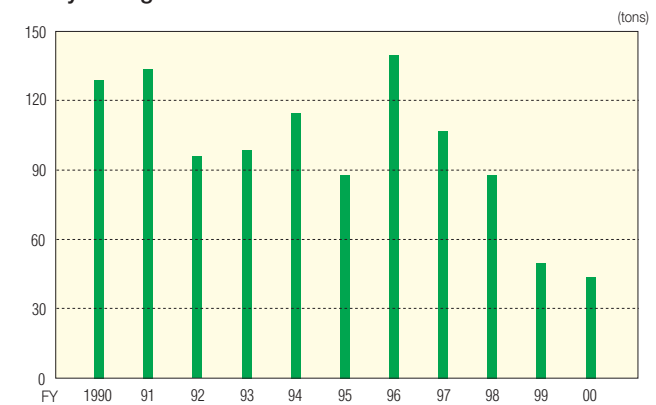
Yearly Changes in the Volume of SO_x Emissions



Yearly Changes in the Volume of NO_x Emissions



Yearly Changes in the Volume of Dust Emissions



5) Limiting the Use of Substances that Damage the Ozone Layer

The Company's utilization of CFCs, which damage the ozone layer, is limited to coolants packed in such equipment as air conditioners and freezing equipment. From the check and control of the quantity supplied to such equipment, the use of these CFCs by the Company is at a level that does not have an adverse influence on the ozone layer. To prevent the leakage of CFCs, the Company has formulated strict management standards and implements regularly scheduled, self-imposed inspections.

4. Reducing CO₂ (Approach to Energy Conservation)

Kyowa Hakko and Kyowa Medex are implementing energy conservation countermeasures aimed at helping prevent global warming. Kyowa Hakko made steady progress toward its target of attaining a 20% reduction in unit energy consumption* by fiscal 2010 compared with the fiscal 1990 level and achieved this objective in fiscal 2000. During the same period, Kyowa Hakko achieved an 18% reduction in the volume of energy (absolute volume) consumed.

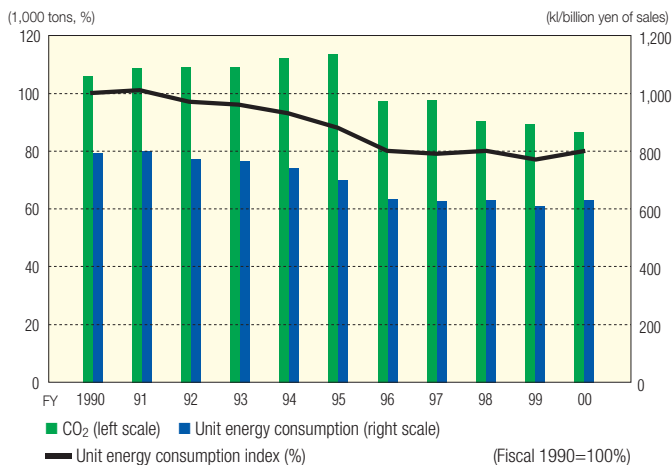
On the other hand, Kyowa Yuka, a subsidiary that manufactures chemical products, was able to achieve an 8% improvement in unit energy consumption in fiscal 2000 compared with the fiscal 1990 level. We strive to improve more than 1% a year on average in regard to unit energy consumption. Kyowa Yuka plans to introduce LNG in 2002 as a countermeasure aimed at CO₂ reduction. In its oxo alcohol business, Kyowa Yuka is reusing CO₂, a gas that leads to global warming, and in fiscal 2000 it recycled 72,000 tons of CO₂, which converts into 20,000 tons of carbon. These figures correspond to a little less than 20% of total volume of CO₂ emissions by Kyowa Yuka.

Together, Kyowa Hakko, Kyowa Yuka, and Kyowa Medex are aiming to reduce unit energy consumption 3% from the fiscal 1998 level by the end of fiscal 2001 and all the plants operated by these companies are vigorously proceeding with energy conservation measures.

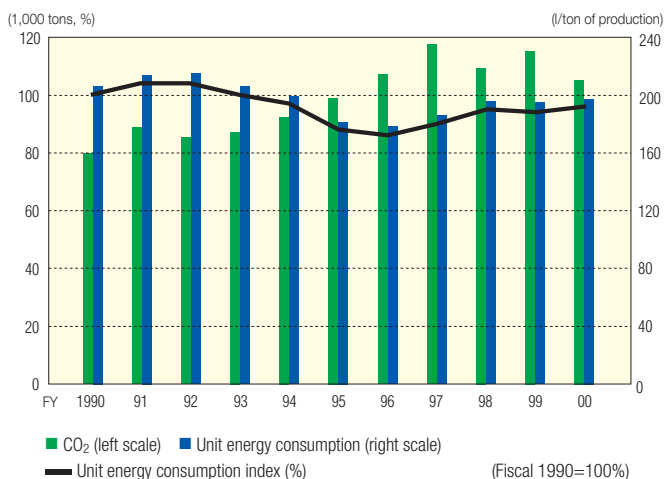
Because unit energy consumption is easily influenced by such factors as product price and manufacturing volume, unit energy consumption worsened slightly in fiscal 2000 compared with fiscal 1999. Nevertheless, by implementing the energy conservation countermeasures listed at right, the Company was able to achieve an actual reduction equivalent to 13,000 kl of crude oil (approximately 4% of total energy consumed).

* Energy consumption per unit of production is expressed on a crude-oil-conversion basis. It is not possible to make a uniform comparison of the amount of basic energy units used by Kyowa Hakko and Kyowa Medex, which engage in the small-volume production of pharmaceuticals and other products, and Kyowa Yuka, which is involved in the production of chemical products. Therefore, the amounts of unit energy consumption by Kyowa Hakko and Kyowa Medex and those of Kyowa Yuka are listed separately.

Yearly Changes in Unit Energy Consumption (Kyowa Hakko and Kyowa Medex)*



Yearly Changes in Unit Energy Consumption (Kyowa Yuka)*



Energy Conservation Countermeasures Progressing in Fiscal 2000

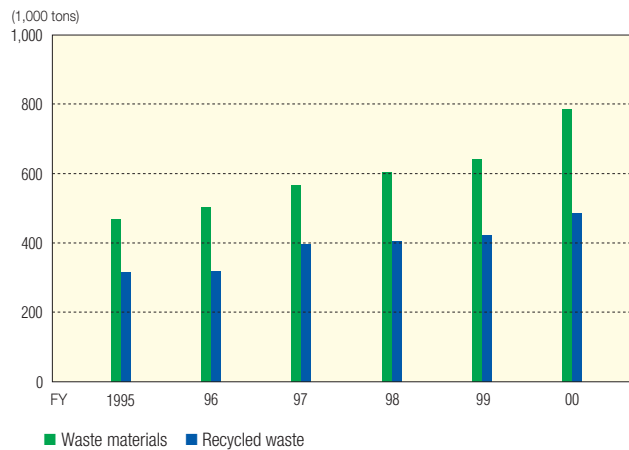
- Promote energy saving in the distillation process (Yokkaichi Plant)
- Rationalize air compressors (Chiba Plant)
- Improve the energy management of buildings (Ube and Fuji plants)
- Enhance heat efficiency through improvements in the steam transport system (Hofu Plant)
- Take energy countermeasures by preventing scaling (Yokkaichi Plant)
- Strengthen the monitoring and management of the volume of energy consumed

5. Environmental Countermeasures at Three Overseas Plants

Like its domestic plants, Kyowa Hakko's overseas plants work to ensure safety and environmental protection, drawing on environment-friendly technologies that are developed at Kyowa Hakko's domestic plants. Serving as production bases for feed-grade amino acids, Kyowa Hakko's three overseas plants carry out production activities in close proximity to both raw materials suppliers and customers. As a fundamental environmental degradation countermeasure, these plants recycle waste to manufacture fertilizer and livestock feed. In fiscal 2000, Kyowa Hakko's three plants recycled 62% of fermentation waste (fermentation mother liquor*) resulting from fermentation and treated the remainder as wastewater.

Fermentation mother liquor (condensed molasses soluble) is a useful resource. Thus, from the perspective of energy efficiency, resource recycling facilities that integrate technologies used in Japan are being installed overseas even for the treatment of low-density fermentation mother liquor. By the end of 2003, we plan to recycle almost 100% of fermentation mother liquor into fertilizer and livestock feed. The amount of energy consumed by our three overseas plants is 38% of the total amounts consumed in Japan. We plan to expand our efforts to further rationalize the use of energy and water resources as a goal for the entire Kyowa Hakko Group.

Yearly Changes in the Volume of Industrial Waste at Three Overseas Plants



Dispersing of fermentation mother liquor in a field (U.S. state of Missouri)

* Fermentation mother liquor, which is generated during the fermentation process, is a waste material that contains a high density of organic substances. Fermentation mother liquor contains useful ingredients that are derived from raw materials as well as from the fermentation process.

6. Management of Equipment Containing PCBs

In the past, the Company has utilized condensers and transformers that used polychlorinated biphenyls (PCBs) as an insulating oil. At present, this equipment is being stored in warehouses to prevent corrosion. The total volume of PCBs being stored at all business sites is less than two tons. The Company makes periodic inspections to ascertain the state of storage and to confirm that there is no leakage of PCBs. In the future, the Company intends to carry out appropriate handling in accordance with a national plan for handling facilities containing PCBs.

7. Monitoring of Soil and Underground Water

The supervising division at Company headquarters is obliged to implement pollution risk surveys when purchasing new land. In addition, all business sites carry out regularly scheduled analyses of soil and underground water as well as risk management for soil.

No abnormalities have been detected in these regular analyses.

8. Complaints

In fiscal 2000, our business sites collectively received a total of nine complaints due to the inconveniencing of residents in areas near our plants. These complaints mainly related to odors and noise (see below). We will give increased consideration to various odor and noise countermeasures. We are strengthening our responses to complaints concerning odors, including installing facilities for minimizing odors at our Fuji and Moji plants and carrying out continual monitoring at our Hofu and Sakai plants through the introduction of odor sensors.

Complaints in Fiscal 2000

- Noise due to deliveries and plant construction (Tsuchiura and Fuji plants): Five complaints
- Odors that accompanied operations (Fuji, Moji, and Sakai plants): Three complaints
- Electrical wave frequency interference by a building (Fuji Plant): One complaint



Harvesttime in a cornfield where fermentation mother liquor has been dispersed (Hungary)

9. Restricting Emissions of Chemical Substances

1) Emissions of 12 Adverse Air Pollutants Selected by the JCIA

The Company handles and releases 6 of the 12 adverse air pollutants* (chemical substances) that the Japan Chemical Industry Association (JCIA) has placed priority on reducing emissions of with the aim of protecting the atmosphere. Annual changes in emissions of these substances by the Company are shown in the graphs below. Emission volumes of these substances by plant are also shown below. In fiscal 2000, although the total volume of emissions of these substances increased 44% from fiscal 1999, the Company achieved an 87% reduction from the fiscal 1996 level. The Company has also placed high priority on cutting emissions of benzene and acetaldehyde, and vigorous efforts in this area enabled a 50% reduction in emissions of these substances. However, because of the spot usage of dichloromethane, emissions of that

chemical amounted to 32 tons despite the use of removal equipment. This was the reason underlying the increase in total emission volumes of 6 of the substances prescribed by JCIA.

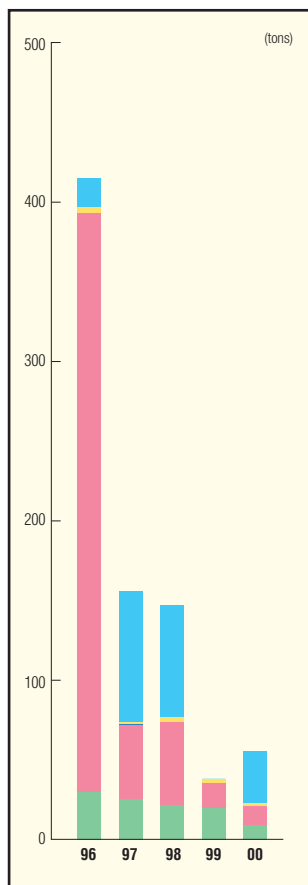
We are presently developing processes that obviate the need to use dichloromethane and have obtained approval for these changes. As a result, the Company will generate no dichloromethane emissions in the future. The Company plans to further tighten restrictions on the emission of 12 chemical substances as it works to reduce such emissions 95% from the fiscal 1996 levels by fiscal 2004.

* The 12 chemical substances are those chemicals that the JCIA is voluntarily restricting emissions of as an immediate countermeasure under international cooperation agreements. These substances are among those chemicals designated by the OECD as adverse air pollutants that have been determined to pose high health risk and that have been put on the "Priority Chemical Reduction List."

Ongoing Countermeasures to Restrict Emissions Implemented in Fiscal 2000

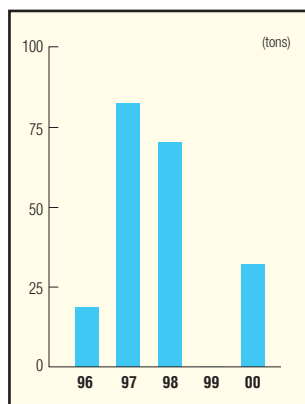
- Establish processes that do not involve the use of chloride solvents through process improvements (Restrict emission of dichloromethane (Hofu Plant))
- Restrict emissions through such measures as installing removal equipment (i.e., benzene, Chiba Plant; acetaldehyde, Yokkaichi Plant)

Total Emissions of 12 Chemical Substances

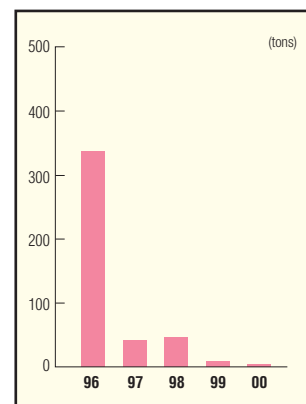


■ Hofu Plant
 ■ Fuji Plant
 ■ Sakai Plant
 ■ Yokkaichi Plant
 ■ Chiba Plant

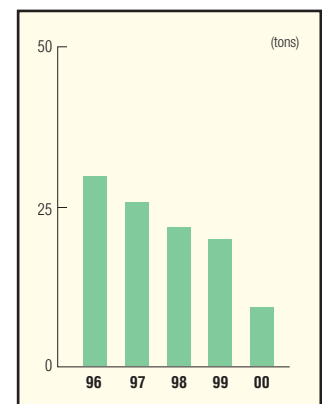
Dichloromethane



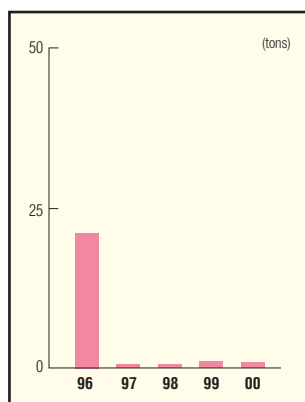
Acetaldehyde



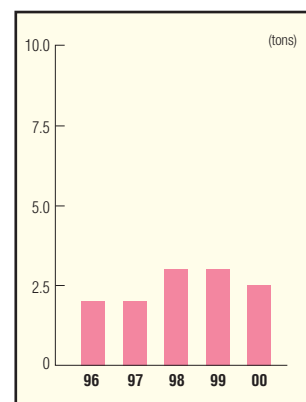
Benzene



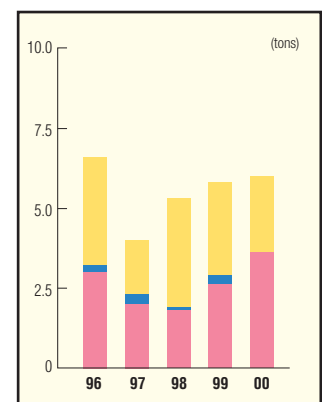
Formaldehyde



Ethylene Oxide



Chloroform



2) Emissions of PRTR/MSDS Law Class I Chemical Substances

The Company handles and releases 30 Class I chemical substances covered by the Law on Improvement in the Management and Control of Emissions of Selected Substances (PRTR/MSDS Law). The number of such substances handled and released by the Company increased from the previous fiscal year.

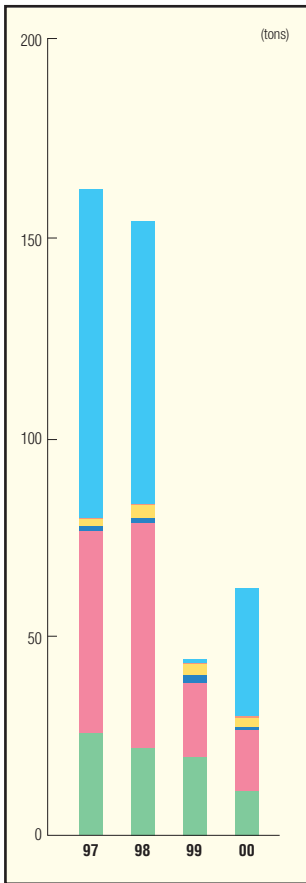
In fiscal 2000, emissions of PRTR/MSDS Law Class I chemical substances increased 42% from fiscal 1999 due to the same reasons as mentioned in the previous section. However, emissions of these chemical substances declined 62%, to 63 tons, from fiscal 1997.

The Company releases more than 100 kg per year of 15 of the 30 Class I chemical substances that it handles. Because 6 of

these 15 substances are also adverse air pollutants, only the remaining 9 are shown in the graphs below. The Company recycles all of the heavy metal catalysts included in the remaining substances. Ethanolamine and zinc chloride became subject to the PRTR/MSDS Law in the previous fiscal year and were added to the list of chemical substances surveyed. We will report on these substances accordingly.

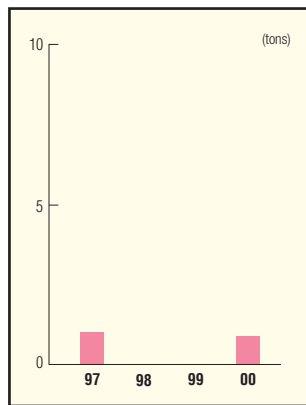
* Class I chemical substances are defined by the PRTR/MSDS Law as substances that may have an adverse effect on health and ecosystems in production, transport, or use in a wide environment. The Company does not handle PRTR/MSDS Class II substances.

Total Emissions of Class I Chemical Substances

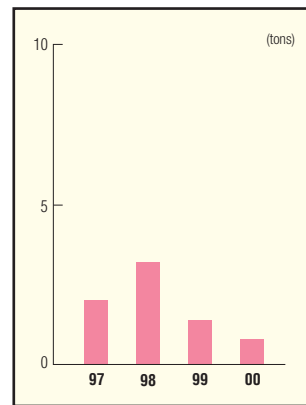


- Hofu Plant
- Ube Plant
- Fuji Plant
- Sakai Plant
- Yokkaichi Plant
- Chiba Plant

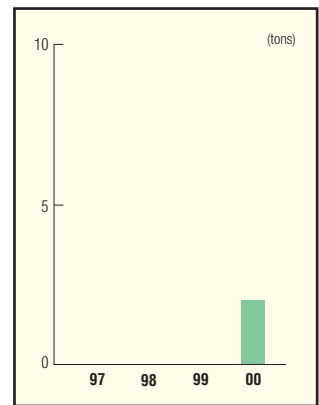
Maleic Anhydride



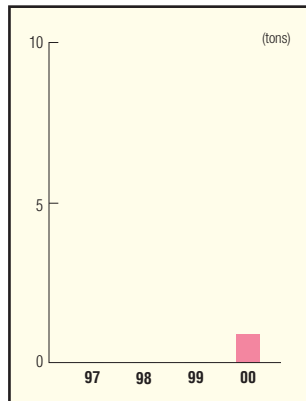
Phthalic Anhydride



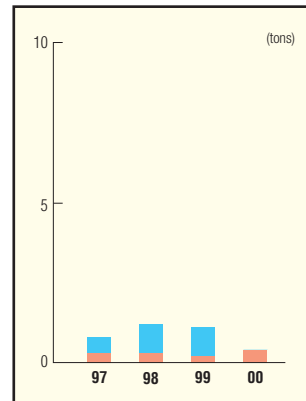
Ethanolamine



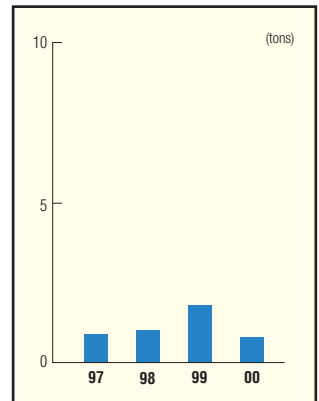
Zinc Chloride



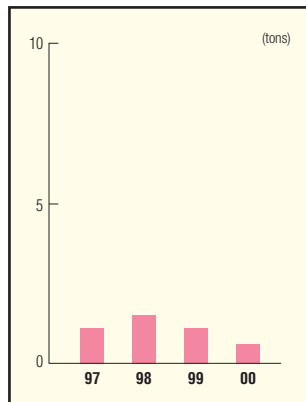
Xylene



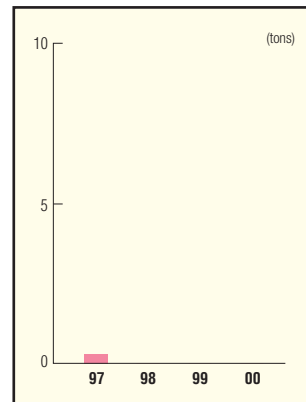
Toluene



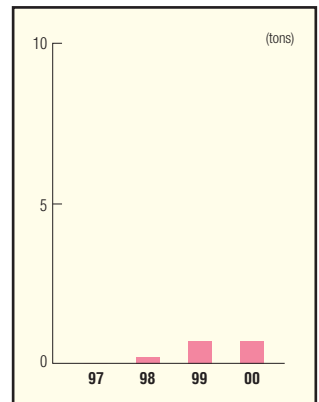
Dibutyl Phthalate



Diocetyl Phthalate (DEHP)



N, N-Dimethylformamide



10. Green Office Plan (GOP)

The Company is progressing with its Green Office Plan (GOP), which aims to reduce the environmental impact imposed by the Company's administrative departments. In fiscal 2000, we promoted Green Purchasing, confirmed the implementation of GOP-related activities, and ascertained the state of electric power consumption as well as the volume of copy paper and percentage of recycled paper used.

In fiscal 2000, the total annual volume of electric power consumed at our offices was 3.25 million kWh, which is equivalent to 340 tons of CO₂ (carbon conversion basis). These figures correspond to less than 2% of both all electric power consumed and the CO₂ equivalent at production sites. Cumulatively, the Company's business sites consumed a total of 140 tons of copy paper. The Company has established targets for electric power consumption and the use of copy paper and will carry out related activities to meet these targets. At present, the Company's recycled copy paper usage rate is approximately 90%. In 2001, the Company will strive to substitute at least 70% of the various kinds of paper it uses with recycled paper.

11. Green Procurement

The Company informs suppliers of its Green Procurement policy and is asking suppliers of raw materials and packaging materials



Shown here is the word *kin-on*—an appreciation for small forms of life (microorganisms)—as expressed by Dr. Benzaburo Kato, founder of Kyowa Hakko. (Hofu Plant)

to join us in efforts to find ways of reducing environmental impact. We intend to communicate with more than 90% of suppliers. In 2000, this amounted to 94% of the value of procurements and 99% of the weight of these procurements.

12. Auditing Results

Since the 1970s, the Corporate Safety and Environmental Management Department at Kyowa Hakko's headquarters has implemented environmental and safety audits at the Company's business sites. Over the most recent five-year period, these audits turned up no deficiencies that actually violated environment- and safety-related laws. However, these audits uncovered the key issues listed below and improvements are being made to address these issues.

In addition to examining the manufacturing and research facilities mentioned previously, environmental and safety auditors from the Corporate Safety and Environmental Management Department are in charge of investigating 8 sales bases, including the headquarters, and over 15 affiliates.

At the sales bases, auditing activities cover such items as Green Office Plan initiatives, office hygiene, traffic safety, and earthquake preparedness. We also promote the environment-friendliness of sales-use vehicles.

At affiliates, environmental and safety auditing covers such items as environmental and safety management organization, the extent and status of documentation, adherence to laws and regulations, and environment and safety track records. When problems of environmental management are detected at some affiliates, the adoption of remedial measures that comply with the ISO 14001 environmental management system is encouraged.

1) Environmental Audits (examples of countermeasures being taken to respond to the deficiencies uncovered by the audits)

- Achieve optimal operation of wastewater treatment facilities (Fuji Plant)
- Implement countermeasures to reduce nitrogen in wastewater (Ube Plant)
- Make further progress in restricting the volume of emissions of chemical substances that are covered by the PRTR/MSDS Law (Hofu, Ube, Yokkaichi, Chiba, and Sakai plants)
- Consider technologies for recovering resources (Chiba Plant)

2) Safety Audits

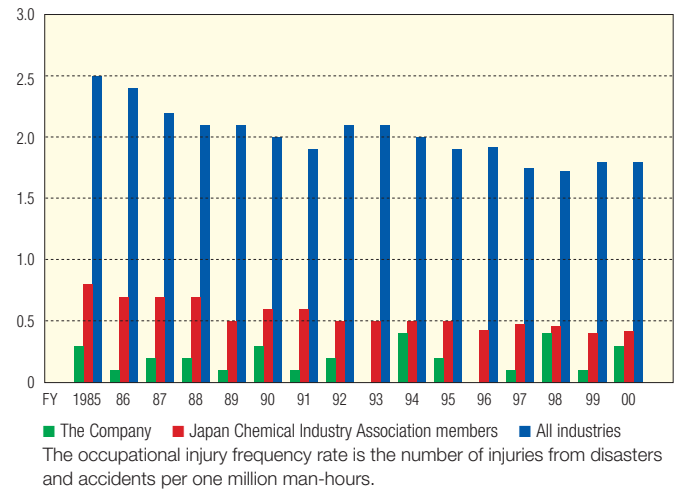
- Continually review various types of manuals with the aim of sharing information (all business bases)
- Upgrade the application of safety assessments (Hofu, Tsuchiura, Fuji, and Moji plants)
- Devise countermeasures for human error in the operation of facilities (Tsuchiura Plant)
- Upgrade change management (all business bases)

The Company has declared “safety as the foundation of its operations.” Accordingly, the Company implements thorough safety policies and works to maintain health and safety using safety technologies that it has developed over its long years of operation. The Company strives to maintain an effective balance between such top-down safety measures as adopting thorough safety policies, requiring a safety evaluation system when commencing new business activities and improving existing facilities, introducing the Occupational Safety and Health Management System (OSHMS), safety education, safety auditing, and safety patrols, and implementing such bottom-up measures as zero accident activities as well as facility improvement plans and the KY (risk-detection) system.

As shown in the graph at right, the Company’s occupational injury frequency rate ranks among the best in the chemical industry. The table below lists some of the major safety and health awards that the Company has received since 1995. In fiscal 1999, the Yokkaichi Plant won the Ministry of Labour Award for achieving a level five safety record and in fiscal 2000 extended its record to 24 years of labor/work accident-free operations. In 2001, the Kyowa Kai, comprising companies affiliated with the Ube Plant, received the Minister of Health, Labour and Welfare Group Award.

On the other hand, in December 2000 there was an accident at the Sakai Plant involving the explosion of a wastewater tank that occurred along with construction work. This event inconvenienced local residents. Overseas, a fire occurred at Biokyoowa Inc., a subsidiary in the United States. But both accidents did not result in injuries to people. To prevent a repetition of such an accident, the Company reviewed its safety confirmation system.

Yearly Changes in the Occupational Injury Frequency Rate



Participation in accident-prevention training for all citizens (Yokkaichi Plant)

Principal Health and Safety Awards Received Since 1995

Fiscal year	Name of award	Plant receiving award
1995	Ministry of Labour, level one (6.2 million man-hours accident-free safety record)	Ube Plant
1995	Minister of International Trade and Industry Award (Excellent manufacturing facility for high-pressure gas)	Ube Plant
1998	Minister of Labour Award (Safety)	Ube Plant
1998	Minister of International Trade and Industry Award (Excellent manufacturing facility for high-pressure gas)	Yokkaichi Plant
1998	Japan Chemical Industry Association Safety Award	Yokkaichi Plant
1999	Ministry of Labour Award, level two (9.3 million man-hours accident-free safety record)	Ube Plant
1999	Ministry of Labour Award, level five (18.0 million man-hours accident-free safety record)	Yokkaichi Plant
1999	Ministry of Labour Award, level one (6.2 million man-hours accident-free safety record)	Fuji Plant
1999	Fire Defense Agency Commissioner’s Award (Excellent business facility handling hazardous materials)	Ube Plant
2000	Fire Defense Agency Commissioner’s Award (Excellent business facility handling hazardous materials)	Fuji Plant
2000	Minister of Labour Award (Safety)	Yokkaichi Plant
2000	Minister of International Trade and Industry Award (Excellent manufacturing facility for high-pressure gas)	Yokkaichi Plant
2001	Minister of Health, Labour and Welfare Group Award	Ube Plant, Kyowa Kai
2001	Fire Defense Agency Commissioner’s Award (Contributor to Safety Maintenance Award)	Headquarters

Confirmation of Product Safety

In accordance with Company Management Guidelines, to offer products that provide customer satisfaction, the Company has created a quality assurance system and is continually making improvements to its product development, production, and supply structure. Maintaining product safety is fundamental to quality assurance and is considered one of the most important aspects of operations. To maintain and make further improvements to quality assurance, which also encompasses safety, we have implemented optimum quality assurance systems at each plant. These systems are centered mainly on Good Manufacturing Practices (GMP) in the production of pharmaceuticals (Fuji, Ube, Hofu, Sakai, and Yokkaichi plants) as well as Hazard Analysis Critical Control Point (HACCP) for food and beverage production (Tsuchiura, Moji, and Hofu plants) and ISO 9002 general standards, for which five plants (Chiba, Yokkaichi, Hofu, Ube, and Moji plants) have been certified. We are working to further raise the efficiency of the operations of these systems.

As shown in the table below, the Company conducts especially strict safety and efficacy checks during the development of pharmaceuticals in accordance with steps and systems dictated by law. Regarding products in other categories, to ensure safety the Company employs such strict independent change management systems as in-house quality assessments when developing new products and altering processes and materials. When necessary, Kyowa Hakko's Safety Research Laboratory conducts safety research using animals to test and evaluate the safety of its products to guarantee the highest levels of safety in products supplied to customers. Furthermore, the Company complies with such legal regulations as the provision of Material Safety Data Sheets (MSDSs) and furnishes the information necessary for the safe use and handling of pharmaceuticals by both doctors and patients.

New Drug Development Process

A newly created candidate compound must go through the steps illustrated below before being approved as a new drug for general use. As there remain many diseases of unknown cause, drug discovery research is mostly based on a trial-and-error approach. In order for a candidate compound discovered through these efforts to reach the market, rigorous animal studies and clinical trials

should be carried out to provide adequate scientific evidence supporting safety and efficacy.

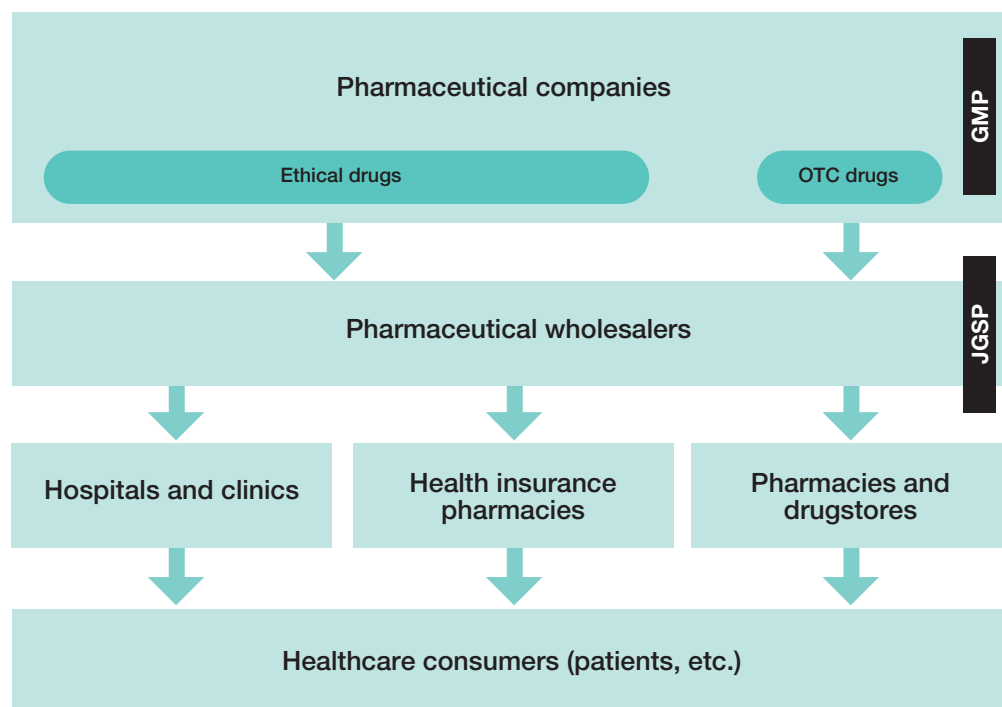
Allelock, a new antiallergic agent approved in December 2000, was successfully launched into the market after fulfilling all these requirements. It is used for the treatment of various allergic diseases and, particularly in spring, prescribed for patients with pollinosis.



Manufacturing and Distribution Processes for Pharmaceutical Products

Since pharmaceutical products directly affect human life and health, they undergo rigorous quality control before release from production plants. Pharmaceuticals manufactured at plants are distributed to medical institutions and health insurance pharmacies through wholesalers.

Many pharmaceuticals are susceptible to temperature or humidity changes and sunlight. The most careful attention is therefore devoted to every detail of the manufacturing and distribution processes, such as the optimization of storage conditions and temperature, protection from light, and the use of refrigerated transportation.



*Edited by the Japan Pharmaceutical Manufacturers Association (JPMA); Cited from the JPMA guidelines with some additions. (Abbreviations are listed on page 37.)

Experiments Using Animals and Animal Welfare

The Company uses animals for research purposes and product assessments at several trial and research facilities. At each facility, the Company has compiled guidelines based on relevant legislation and expert opinions and set up an in-house committee to promote good practices. We ensure that the research staff involved in these activities are fully apprised of and adhere to guidelines related to

such matters as the safety, morality, and relevance of experiments. For example, we encourage researchers to avoid conducting unnecessary animal experiments, follow appropriate procedures when selecting species for experimental use, set appropriate scales for testing, and tend to the needs of the animals involved with the goal of causing no unnecessary suffering.

Assessment System for New Business

1. Estimation System for Research & Development and New Business

Safety and Environmental Assessments

The Company implements safety and environmental assessments (SEAs, disclosed in the *Environment and Safety Report* available on the Internet) before commencing new business or undertaking major upgrades of facilities in order to maintain safety and protect the environment in carrying out its business. These assessments serve as a crucial set of standards for decision making in the business commercialization process and are one of the means used during the product commercialization process for determining the usefulness and environmental impact of products and services offered by a business. Under these assessments, safety assurance and environmental protection are stringently maintained in all phases of the product life cycle, including raw material procurement and as well as product manufacturing, use, and disposal.

These assessments follow a procedure unique to the Company and include the following points.

Bio-Assessments

The Company is progressing with the development of even safer manufacturing processes that employ recombinant DNA technologies and has adopted stringent management standards that strengthen government guidelines covering the use of such technologies.

Chemical Assessments

The Company has developed a sophisticated prior assessment system for volatile reactions. In addition, the Company determines usage and waste disposal processes for new chemical substances based on biodegradability, toxicity, and other data as it strives to maintain safety.

2. Chemical Substance Safety Evaluation

Assurance of Product Safety

Safety evaluations of chemical substances are being carried out on a global scale in cooperation with various countries and companies based on a framework set up under the OECD. Besides its own evaluations, the Company carries out evaluations of product safety in cooperation with the JCIA and the Japan Plasticizer Industry Association (JPIA). As an example of these activities, the Company is currently participating in the International Council of Chemical Associations' (ICCA) inspection program for existing high production volume (HPV) chemical substances and, as the leader company, is in charge of preparing related evaluation reports for two product

evaluations. The Company has also carried out evaluations of 16 products as a cooperating company.

Also, DEHP and DINP, chemical substances that are strongly connected to the Company's operations, have become the subject of debate for being endocrine disruptors. To respond to this problem, the Company has established an in-house project team that gathers related information as well as holds communication meetings internally and externally on the results of various safety confirmation tests, including independent measurement studies of estrogen activity of the Company's products.

Regarding DINP, which has become a problem because of its use in toys, the Company independently commissioned the U.K.-based contract research organization Huntingdon Life Sciences Limited to perform tests on DINP using monkeys (marmosets), and these tests confirmed that the likelihood of any problem being caused by DINP was low. The results of these tests* were published in a toxicology journal and used in 2000 as crucial safety evaluation data in the United States and Europe.

* Hall, M. et al., *J. Tox. Sci.* 24 (3) 237 (1999)

Gathering and Providing Product Safety Information

Regarding products produced by the Bio-Chemicals, Chemicals, Liquor & Alcohol, and Food in-house companies, as a matter of course, we take into consideration the safety of ordinary chemical products and other chemical products covered by legal requirements with regard to the parties who handle them. Specifically, the Company places top priority on providing safety information notifications for the handling of products, including amino acids, enzymes, and bulk pharmaceuticals. The Company has prepared Material Safety Data Sheets (MSDSs) and furnishes these to users. In response to the PRTR/MSDS Law, the Company has established internal regulations and furnishes these to users of chemical substances while working to increase the safety knowledge of employees at all work sites. The Company is engaged in ongoing efforts to accumulate further data and supply even more detailed information to users.

Environmental and Safety Considerations in Distribution

The Company has established a 24-hour-a-day emergency response system for maintaining the distribution safety of its mainstay general-use products, including chemicals and alcohol products. In addition, the Company has adopted the yellow-card system promoted by the JCIA and is providing education to those involved in the transportation of chemical products. Also, the Company is progressing with a model shift and is placing emphasis on safety and the environment during the distribution.

We are engaged in a variety of both Japanese- and English-language information disclosure activities. We have published 8,000 copies of our *Health, Safety, and the Environment* report, with text in both Japanese and English, for a wide variety of interested parties, such as government ministries and agencies, local authorities, prefectural and municipal pollution control bodies, and other public institutions. In addition, we disclose our *Health, Safety, and the Environment* report in Japanese and English online at our Web site. Furthermore, as outlined below, we accept trainees from China, the Association of Southeast Asian Nations, and South America in environmental technology cooperation programs. Moreover, we engage in joint safety and disaster response exercises with local authorities and communities and forums for the exchange of opinions regarding the environment as well as host the public at events staged in our plants and participate in local events.

Research Funding

✿ Support of Research in the Basic Field of Bioscience

The Kato Memorial Bioscience Foundation, established by Kyowa Hakko in recognition of its founder, Dr. Benzaburo Kato, provides financial support to researchers for innovative research in the basic field of bioscience. In addition, the foundation has sponsored public symposia once a year based on bioscience-related themes since 1988.



The Kato Memorial Bioscience Foundation

Nurturing Children's Interest in Science

✿ Bio Adventure Bus for Touring Primary Schools

In January 2000, Kyowa Hakko's Bio Adventure bus, containing microscopes and other scientific equipment, began visiting primary schools around the Tokyo suburb of Machida City, where the Tokyo Research Laboratories are located. By letting children study microbes in this way, we hope to nurture their interest in science and living organisms.



An article in *The Chemical Daily*



An experiment at a primary school



The Bio Adventure bus

✿ Summer Science School

Kyowa Hakko's Ube Plant organizes a half-day science school for primary schoolchildren in Yamaguchi Prefecture in the summer holidays. This was the 12th summer the plant's halls have uncharacteristically echoed with the happy voices of children.



Summer school at Ube Plant



✿ **The Asahi Young Session**

Kyowa Hakko has supported the Asahi Young Session, a special annual lecture series that provides a forum for leaders from various fields to deliver their messages to young people. The contents of these lectures are printed in booklets for distribution to anyone desiring a copy.



The lecture hall



Professor Takeshi Yohroh, a well-known authority on culture

✿ **Eco-Products Exhibition**

We exhibited our sulfite-free organic wines at the Eco-Products Exhibition in December 2000.



Eco-Products Exhibition



International Technological Cooperation

- ✿ Participation in global preservation activities under a friendship agreement between Shandong Province, China, and Yamaguchi Prefecture (plant wastewater treatment technology training)*
- ✿ Cooperation in environmental technology meetings between Korea and Japan regarding sea channels and coastlines
- ✿ Partnership with Kita Kyushu International Techno-Cooperative Association in sponsoring an environmental workshop held by the Japan International Cooperation Agency (JICA)
- ✿ Cooperation in training programs of the International Center for Environmental Technology Transfers
- ✿ Cooperation in environmental technology with Chinese petrochemical industry
- ✿ Cooperation with the Philippine government in environmental technology**

Cooperation in Initiatives to Protect Nature

- ✿ Donations to Forest Giants Protection Fund for Beautifying the Nation
- ✿ Donations to Keidanren Natural Conservation Fund
- ✿ Donations to the World Wildlife Fund Japan
- ✿ Participation in Japan Association of Environment and Society for the 21st Century (NPO Activities)



*Technology cooperation with Shandong Province, China



**Technology cooperation with the Philippine government

Regional Activities & Communications

- ✿ Pollution control liaison meetings with local governments
- ✿ Participation in meetings with neighborhood residents
- ✿ Participation in local communities' accident training
- ✿ Participation in zero emission activities
- ✿ Participation in Love Hofu activities

- ✿ An explanation of the refurbishment of the incinerator at the Fuji Plant in Shizuoka Prefecture for a meeting with local residents

H13年3月22日

帖藪区各位

協和発酵工業株式会社富士工場
執行役員工場長 石井真三

焼却炉建替えに係る説明会のご案内

平素は当工場の事業活動に格別のご理解、ご高配を賜り厚く御礼申し上げます。
さて、この度、当工場におきましては、「廃棄物の処理および清掃に関する法律」および「大気汚染防止法」の改正に伴う焼却炉の構造基準、維持管理基準、排ガス中のダイオキシン濃度規制強化に対応する為、既存の焼却炉3基を廃止し、これに替えて新規に焼却炉1基の建設を計画いたしております。

新設の焼却炉につきましては、関係法令および行政当局の指導に従い公害防止に十分に配慮いたしますと共に、廃棄物につきましても資源としての活用、生ゴミの分解処理等の対策を講じ、焼却量を現在の年間約360tから半分程度に低減いたす所存で御座います。

本計画につきまして県条例に従い、下記の通り近隣の皆様方に説明会を開催させていただきますので、ご出席頂きますようお願い申し上げます。

記

日 時 : 平成13年4月17日(火) 19時より

会 場 : 協和発酵 富士工場 研修室
*正門を入ってすぐ右側の食堂の2階です。

以上

(参考) 現有設備と新規設備の比較およびダイオキシン類の濃度基準

	現有設備	計画中の新規設備
焼却炉の規模 (燃焼室容積)	3基合計 18.6立米	15.0立米
排ガス中のダイオキシン類濃度の基準	80ngTEQ/N立米 (平成14年11月30日まで)	5ngTEQ/N立米

- ✿ The Company undertakes beautification and cleanup initiatives around its plants.



Sakai Plant



Tsuchiura Plant



Hofu Plant

- ✿ Communications for local residents

Every summer, the Moji Plant in Kita Kyushu, Fukuoka Prefecture, stages the Summer Festival, providing a fun time for local residents.



Summer Festival at the Moji Plant

The Company has continually offered numerous environment-friendly products and technologies in life science related fields, fields of strength in which the Company applies its expertise in biotechnology. The Company set up the R&D Committee for Environment-Friendly Technology and Products within its Research Division as part of its efforts to develop technologies and products that contribute to the protection of the environment. The Company is also vigorously promoting its environment-friendly technologies externally, including its accumulated technologies for recycling organic sludge as well as its water-treatment technologies for removing nitrogen and phosphorous.

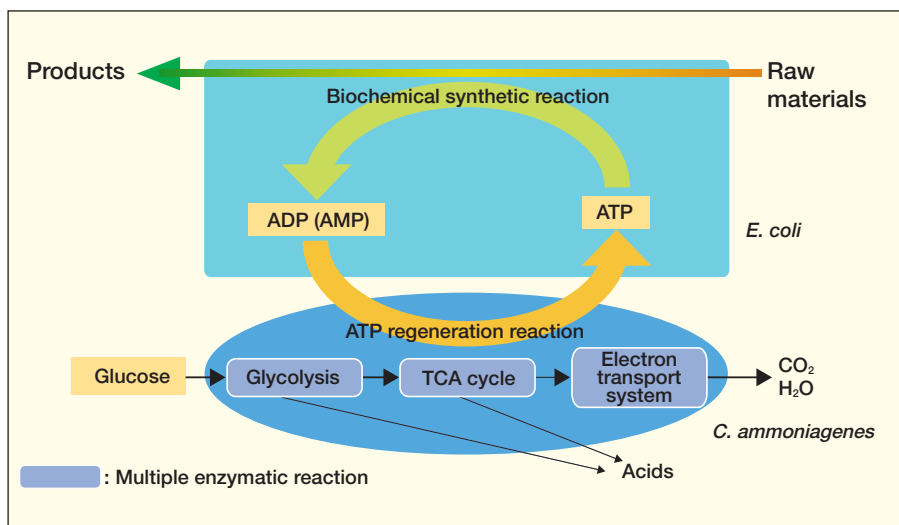
1. Green Chemistry

Representing a revolutionary new direction in technology with high expectations worldwide, green chemistry proposes safe processes that use recyclable raw materials to avoid the recurrence of the environmental and safety problems that have been faced by the chemical industry up to the present. The Company's fermentation technologies, which have been cultivated over the years, serve as the foundation of green chemistry. The first characteristic of fermentation technologies is that fermentation causes little depletion

of resources and the second feature is that the chemical reactions involved take place within biorganisms under normal temperature and pressure conditions. The Company has already developed and applied a technology for advanced adenosine triphosphate (ATP) (adenosine 3 phosphorous) regenerative reactions to the manufacturing of pharmaceuticals and other products. ATP is a nucleic acid used in the complex reactions involved in the synthesis of chemical substances.



A corporate newspaper advertisement



ATP regeneration system utilizing sugar energy

✿ Citicoline

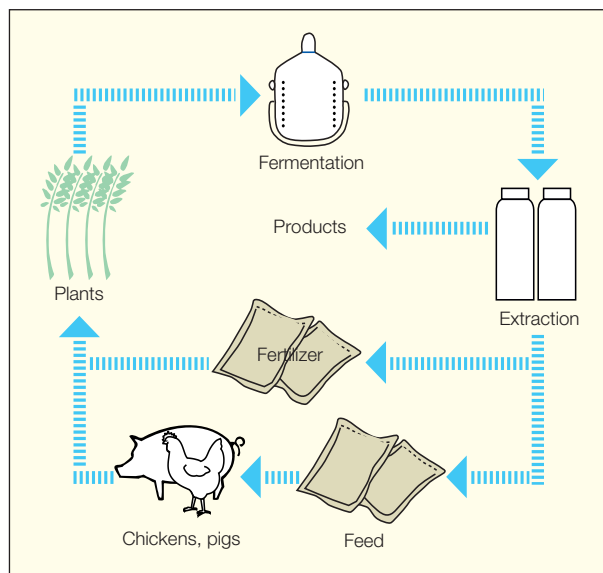
This is a bulk pharmaceutical raw material used in ethical pharmaceuticals. This product is produced using the above-mentioned ATP regenerative technology.

✿ Hydroxyproline

Hydroxyproline obviates the need for animal collagen as a raw material through a fermentation process using sugarcane raw materials, a quality that gives it a minimal environmental impact. Hydroxyproline allows the production of useful pharmaceutical raw materials.

✿ Production of Various Amino Acids Using Fermentation Technologies

Fermentation technologies allow the low-cost and efficient production of numerous types of amino acids from sugarcane raw materials, which are recyclable agricultural products.



Closed system flow

2. Working toward Efficient Recycling

1) Improving the Environment for Feed Additives

For 30 years, the Bio-Chemicals Company's amino acids for feed-additives business has been meeting worldwide the needs of the livestock farming industry, its main customer, which is responding to rising demand for meat and poultry. Due to modern livestock breeding, nutrient sources in animal feed are not completely utilized, resulting in emissions of nitrogen and phosphorous as well as the generation of organic substances that are a source of environmental impact. This problem has become a major environmental issue worldwide. Since the 1970s, lysine and other amino acids developed and supplied by Kyowa Hakko have been increasingly employed in animal feeds to counter this problem by raising the rate of nitrogen utilization. Feed-additive amino acids and enzymes have raised the efficiency of low-grade feeds, which are being used for their lower environmental impact. In 1996, Kyowa Hakko began supplying feed additives containing phytase, an enzyme that promotes the digestion of phytin in feed and thereby controls phosphorous emissions. Kyowa Hakko's technologies in this field contribute to improved digestive and assimilative efficiency and a reduction in the environmental impact of waste, namely the eutrophic and organic impact of the nitrogen and phosphorous contained in animal excrement. Interest in these technologies has been rising.



Information on environment-friendly products for the livestock industry

2) *Shochu* Distillate and Condensed Molasses Soluble Recycling Plants

A basic feature of the fermentation process is that the liquids produced are used to create raw materials. In the brewing of *shochu*, *otsu*-type spirits are distilled from fermented raw materials such as rice and barley. Kyowa Hakko dries the entire volume of by-products resulting from the fermentation process for recycling as livestock feed. Enzymes added during this process improve the digestibility and the appeal of this feed, and the feed has elicited a favorable response from farmers.

In the manufacturing of amino acids and bread yeast, the waste liquid resulting from fermentation is produced as a by-product—condensed molasses soluble (fermentation mother liquor). As shown by the diagram (see page 32) and in the photograph at right of a field trial, since the 1960s Kyowa Hakko has been recycling such by-products. The closed system used in this recycling effort won the first Director General of the Environment Agency Award in 1977.



Concentration plant for *shochu* distillate



Feeding of *shochu* distillate



(left) Using condensed molasses soluble (right) Using chemical fertilizer
Field trial of condensed molasses soluble in Mexico

3. Considering the Environment in Product Packaging

Based on the belief that packaging is fundamental to the preservation of quality in each in-house company, several years ago the Company began working to simplify packaging and is continuing with these efforts today.

- 1) **Bio-Chemicals:** While maintaining quality, we have conserved resources and achieved a reduction in waste materials through packaging designs that enable the elimination of metal can packaging.
- 2) **Pharmaceuticals:** We discontinued the use of external boxes. While maintaining quality, we have conserved resources and achieved reductions in waste materials (from 2000) by simplifying packaging for shipping.
- 3) **Food:** We are conserving resources and reducing waste materials by discontinuing the use of packaging trays for freeze-dried soups.
- 4) **Liquor & Alcohol:** We offer numerous liquor products for consumers. The main types of packaging materials for these products are traditional glass bottles and aluminum cans as well as PET bottles. We are taking the following approach as we give environmental consideration to these packaging materials.

PET bottles: Recycle PET bottles and use easily removed labels.

Caps: Giving consideration to safety, we have shifted from the use of aluminum caps for PET bottles to the use of plastic caps. When these caps are opened, there is no danger of injury from cutting.

Bottle: We are shifting away from the use of colored wine bottles toward the use of clear bottles. We are also utilizing recyclable bottles that turn transparent when heated.

Paper packs: We are using paper packs with a thinner coating of aluminum to reduce the volume of aluminum used.

Eco-Friendly Containers: We are reusing plastic containers repeatedly instead of earthenware pots for the transportation of *Shao Hsing Chiew* (Chinese liquor).



An easy-to-recycle PET bottle



Lightweight packaging for freeze-dried products



Easy-to-recycle materials and a change in shape



Recyclable glass bottle with a ceramic look



New container used for imports

Previous container used for imports

Eco-friendly container for the transportation of *Shao Hsing Chiew* and traditionally used earthenware pots

4. Environmental Proposals by the Chemicals Company

✿ Use of CO₂ by Utilizing the Oxo Method

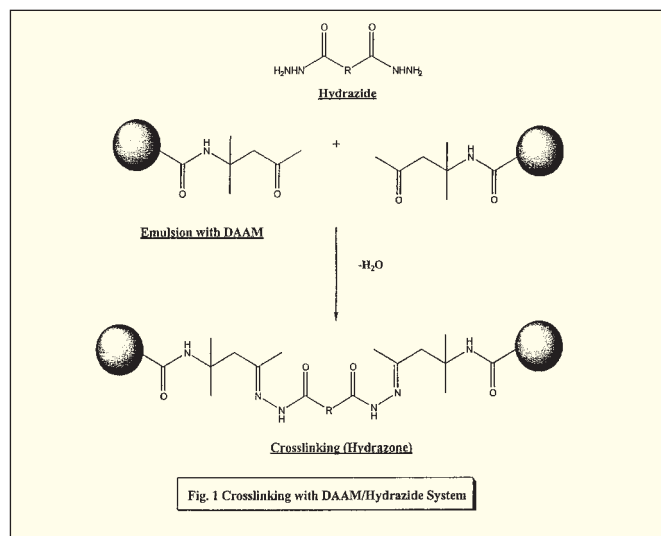
From the 1970s, the Yokkaichi Plant and the Chiba Plant have used the oxo method, which enables the use of CO₂ in the manufacture of oxo alcohol. Oxo alcohol is used in the manufacture of such products as plasticizers and solvents. In fiscal 2000 alone, the total volume of CO₂ used amounted to more than 70,000 tons. The volume of CO₂ recovered accounts for 10% of the total volume of emissions of the Company in Japan, and it is vigorously working to effectively use resources and prevent global warming.

✿ Lubricant Raw Materials for Use as CFC Alternatives that Do Not Damage the Ozone Layer (PVE, synthetic fatty acids)

CFCs, which have been widely used as refrigerants in freezers, cause significant damage to the ozone layer. This has led to growing demand for CFC substitutes. The Company has developed synthetic fatty acids and PVE that serve as principal raw materials of lubricants for refrigerants used as CFC substitutes.

✿ Cross-Linking Agent for Emulsion Paint

Aqueous emulsion paint has been substituted for traditional solvent-based paint to address environmental problems. We are supplying a cross-linking agent (DAAM/hydrazide) for aqueous emulsion paint, which enables the formation of a strong paint film by undergoing a cross-linking reaction during drying.



Cross-linking reaction by DAAM

✿ Substitutes for CFCs and Chloride Detergents

Because of their combustion-resistant properties and stability, halogen-based solvents have been widely hailed as easy-to-handle detergents. On the other hand, because they are difficult to dissolve, these solvents' use has led to various environmental problems, including the destruction of the ozone layer and the accumulation of residual POPS (Persistent Organic Pollutants). As an alternative, the Company offers Kyowasol, a safe and environment-friendly detergent.

✿ Landfill Liner for Waste-Disposal Site

The Landfill Liner for waste-disposal sites, made using thermal plastic polyurethane and related technologies offered by the Chemicals Company, represents a technology that supports the operation of managed landfill sites. This liner, integrating leakage detection systems, is outstanding in terms of repair and maintenance and is effective in preventing various problems at landfill sites.



Landfill Liner for waste-disposal site

PRINCIPAL ENVIRONMENTAL MANAGEMENT ACTIVITIES

1964	Production of organic fertilizer using recycled fermentation mother liquor at the Hofu Plant
1968	Wastewater treatment facility introduced at the Hofu Plant
1971	Wastewater combustion facility introduced at the Yokkaichi Plant
1973	Creation of Companywide Safety and Environmental Management System Acetaldehyde removal facility introduced at the Yokkaichi Plant
1975	Wastewater treatment facility introduced at all plants Flue gas desulfurization equipment introduced at the Yokkaichi Plant
1977	Kyowa Hakko won first Director General of the Environment Agency Award
1979	Introduction of biodenitrification and dephosphorization process to wastewater treatment facilities
1981	Under a Companywide energy conservation project, Kyowa Hakko achieved a 20% reduction in energy use
1992	Responded to London Convention on ocean dumping of industrial waste
1993	Formulation of policies for environmental protection
1996	Implementation of Responsible Care
1997	Recycling of <i>shochu</i> distillate begun at the Moji Plant, Kyowa Hakko ended ocean dumping
1998	Vast reduction of COD levels in wastewater Installation of cogenerator at the Chiba Plant
1999	Implementation of deodorizing facilities at the Hofu Plant ISO 14001 enforcement at all plants Publication of the <i>Health, Safety, and the Environment</i> report Installation of new organic fertilizer production facility under the energy-saving and environmental protection systems
2000	Implementation of the Kyowa Eco-Project and the Green Office Plan Received ISO 14001 certification at eight plants

PRINCIPAL ACHIEVEMENTS IN PRODUCT AND TECHNOLOGY DEVELOPMENT

1970	Contributed to meat production with amino acid additives for stock feed Used an oxo process to recover CO ₂
1970	Developed and commercialized an environment-friendly water-soluble polymer
1976	Commenced manufacture and sales of DAAM
1981–1986	Participated in a MITI-sponsored national research project on converting unused biomass into fuel oil
1993	Developed and commercialized Landfill Liner, polyurethane sheets for final waste disposal sites Developed and commercialized cleaner and new raw lubricant for refrigerant used as CFC substitute
1996	Developed and commercialized phytase, an enzyme used in feed additives to prevent environmental damage caused by the livestock industry
1997	Commercialized a new manufacturing method for hydroxyproline, an amino acid that uses no collagen and causes little environmental damage Simplified and reduced the amount of packaging used for pharmaceuticals and foods
1998	Through joint research with Tsuji Oil Co., Ltd., developed and commercialized a process that converts <i>shochu</i> distillate into animal feed
1999	The Japan Scientific Feeds Association presented Kyowa Hakko with the Technology Award in recognition of the Company's efforts, through its business activities in amino acids and enzymes for feed additives, to promote the development and wide usage of feeds that reduce environmental impact. Implemented Companywide measures for packaging materials, such as conversion to a simplified method for recycling PET bottles for <i>shochu</i> products Promoted elimination of metal cans by the Bio-Chemicals Company
2000	Marketed an organic wine with no additives Promoted environment-conscious packaging, such as that eliminating outer packaging materials for medical products

GLOSSARY

Waste disposal

- at landfill sites** Process where waste is reduced as much as possible and ultimately deposited as landfill
- Resource recycling** To use waste products as materials or resources through reuse, material recycling, or thermal recycling
- Industrial waste** Of the waste products generated through business activities, those that are specified under the Waste Disposal and Public Cleansing Law
- Wastewater** Refers to wastewater produced at plants or offices
- CO₂** (Carbon Dioxide)
Released when electricity or gas fuel is consumed
- COD** (Chemical Oxygen Demand)
Amount of oxygen required to chemically oxidize organic pollutants in wastewater using an oxidizing agent
- GCP** (Good Clinical Practices)
Standards for conducting clinical testing of medical products
- GLP** (Good Laboratory Practices)
Standards for conducting non-clinical studies regarding the safety of medical products
- GMP** (Good Manufacturing Practices)
Standards for manufacturing management and quality control management for medical products
- GPMS** (Good Post-Marketing Surveillance Practices)
Post-marketing study and evaluation standards for medical products
- HACCP** (Hazard Analysis Critical Control Point)
- JGSP** (Japanese Good Supplying Practices)
Standards for practices for the supply and quality control management of medical products
- LCA** (Life Cycle Assessment)
Analysis and general assessment of impact on the environment as a result of the entire process from procurement of raw materials to manufacture, use, and disposal of a product
- MSDS** (Material Safety Data Sheet)
- NO_x** (Nitrogen Oxide)
Released when gas fuel or fuel is consumed
- OSHMS** (Occupational Safety and Health Management System)
A management system designed to reduce the risks associated with worker health and safety
- PRTR** (Pollutant Release and Transfer Register)
System where data related to the release and transfer of pollutants (chemical substances) into the air, water, or soil is collected, recorded and organized, and made public
- SO_x** (Sulfur Oxides)
Released when fuel containing sulfur is consumed

For further information, please contact:

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The report is printed on 100% recycled paper.
October 2001
Printed in Japan

We want to hear your opinions and impressions concerning this report

Every year, Kyowa Hakko publishes its *Health, Safety, and the Environment* report with the aim of publicizing its environmental protection achievements as widely as possible. To foster a deeper understanding of these activities, we take pains to ensure that the contents of the report are easily comprehensible but recognize that areas for improvement remain.

In that connection, we would be very grateful if readers of this report would take the time to submit their opinions and impressions of it. Such input would be useful in our future activities and serve as a reference point as we enhance the disclosure of our environmental activities.

We would therefore be very grateful if you could fill in the questionnaire on the reverse of this sheet and fax it to Kyowa Hakko's Corporate Safety and Environmental Management Department.

September 2001

Kyowa Hakko
Corporate Safety and Environmental Management Department
Fax: 81-3-3282-0030

Some responses to the questionnaire for the fiscal 2000 *Health, Safety, and the Environment* report

Overall impressions (ease of comprehension)

Very easy—0 respondents
Easy—21 respondents
Average—0 respondents
Other—1 respondent

Principal shortcomings and areas needing further improvement—some comments

- Bearing in mind the need for a return on investment and expenses, some way should be found for clearly quantifying the benefits of environmental protection measures.
- Further explanation of measures to reduce industrial waste would have been appreciated.
- When I lived in Hofu, I was troubled by the powerful odors given off by the plant there. That stink had vanished completely when I went there recently. I was satisfied with the report. But what was the cause of the bad smell? Why did it take so long to complete facilities for removing odors?
- The report would have been enhanced by a single-page glossary of technical terms.
- Thanks to environmental accounting, it is also easy to gain an understanding of the environmental impact.

We would like to thank everybody who helped us by responding to this questionnaire.

Questionnaire

Q1. How did you hear of the Kyowa Hakko *Health, Safety, and the Environment* report? (Please circle as appropriate)

- | | |
|--------------------------------|----------------------------------|
| 1. Newspaper article | 5. At a seminar or similar event |
| 2. Magazine article | 6. From a friend or acquaintance |
| 3. Kyowa Hakko home page | 7. Other (please specify) |
| 4. From a Kyowa Hakko employee | |

Q2. In this year's report, we included more information and enhanced transparency and accuracy compared with last year.

● Please indicate how successful we were in making this year's report easier to understand.

- | | | | |
|--------------|---------------|------------|--------------|
| 1. Very easy | 2. Quite easy | 3. Average | 4. Difficult |
|--------------|---------------|------------|--------------|

For those who read last year's report:

● How did this year's report compare? (Please circle only one of the following options)

- | | |
|---------------------------|----------------------------------|
| 1. Covered everything | 4. Last year's was better |
| 2. Somewhat more detailed | 5. Could not tell the difference |
| 3. Covered same ground | |

Q3. Did any item in particular strike you?

Q4. Please indicate what aspects of this report you thought good, inadequate, or in need of further improvement.

1. What was good about it?

2. What was wrong, and what areas could be further improved?

Q5. In what ways do you expect us to improve our environmental protection activities and safety management?

Please be specific.

Thank you for your cooperation.

To further help us with this questionnaire, could we ask you to supply the following personal details?

Name

Place of work (organization)

Would you prefer to be contacted at home or at work?

Telephone No.

Fax No.

E-mail address

E-mail: corporate-communications@kyowa.co.jp

Fax: 81-3-3282-0030

Corporate Safety and Environmental Management Department

Kyowa Hakko Kogyo Co., Ltd.