

MGC's Responsible Care

ENVIRONMENTAL REPORT

2004 edition



Responsible Care®



MITSUBISHI GAS CHEMICAL COMPANY, INC.

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Scope for Report

Review of Organization : Domestic workplaces described in Profile of MGC

Review of Report : We report laying stress on both the environment/safety activities and the environment performance data in MGC's responsible care

Period under Review : Jan. 1, 2004 ~ Dec. 31, 2004

wherein the environment performance data are those obtained from Apr. 1, 2003 to Mar. 31, 2004.

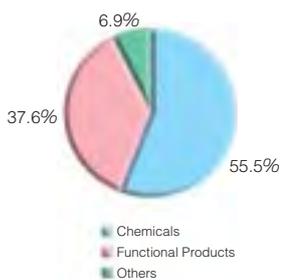
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Transition of Turnover



Sales Ratio per Products Segment

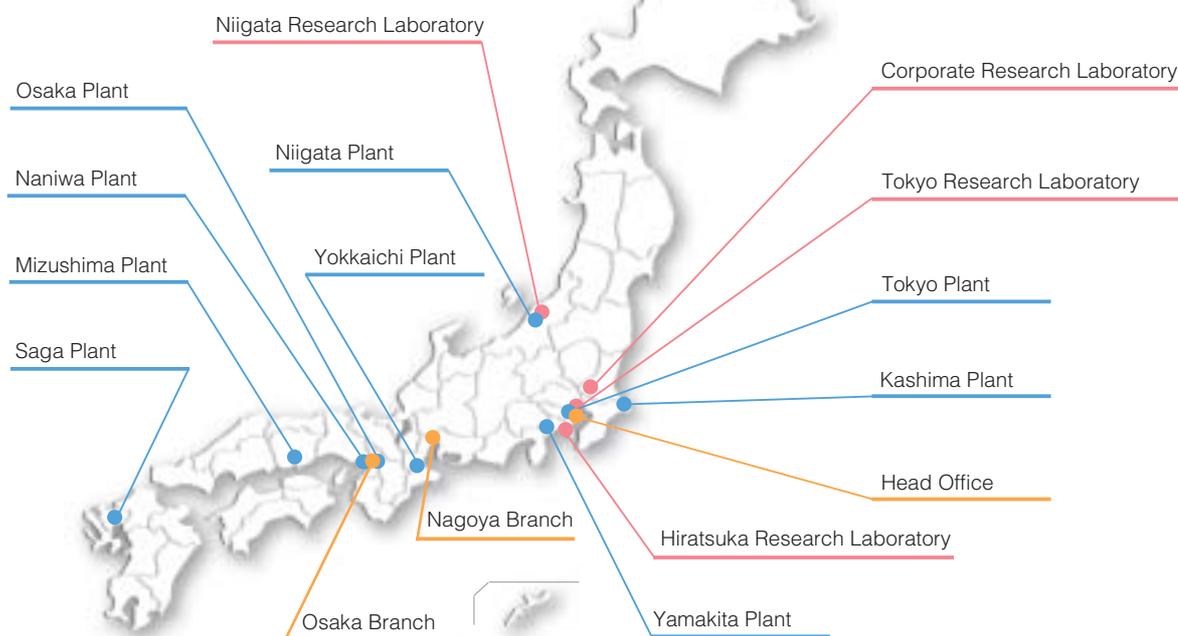


Profile of MGC

Name MITSUBISHI GAS CHEMICAL COMPANY, INC.
 Address Mitsubishi Building, 5-2, Marunouchi 2-chome, Chiyoda-ku, Tokyo 100-8324, Japan
 Established on : April 20, 1951
 Capital : ¥ 41.97 billion
 Annual Turnover : ¥ 240.6 billion (unconsolidated)
 : ¥ 340.7 billion (consolidated)
 Annual Turnover per Products Segment (consolidated)
 Chemicals : ¥ 188.9 billion
 Functional Products : ¥ 127.9 billion
 Others : ¥ 23.7 billion
 Number of Employees : 2,363 (unconsolidated)
 4,537 (consolidated)

Workplaces

● Head Office/Branches ● Plants ● Research Laboratories



Main Products

● NATURAL GAS CHEMICALS COMPANY

Develops business operation on chemicals such as methanol, ammonia, formalin; organic chemicals derived from them and biochemical products.

- Methanol
- Formalin
- Ammonia
- Methylamine
- Methyl methacrylate
- Methacrylates
- Polyols
- Diethylether
- Ubidecarenone
- ASC Super (catalase)
- Hydrogen gas production equipment from methanol
- Various kinds of catalyst

● AROMATIC CHEMICALS COMPANY

Develops business operation on m-xylene, p-xylene and o-xylene prepared by separation and isomerization of mixed xylenes, aromatic chemicals manufactured with the original technologies, etc.

- Xylenes
- Metaxylylene diamine
- 1,3-BAC
- MX Nylon Resin-MXD6
- Metaxylylene sulfonic acid
- Toluic acid
- Aromatic aldehydes
- Trimellitic anhydride
- Pyromellitic dianhydride
- 3,5-xyleneol
- Isophthalonitrile
- Phthalic anhydride

● SPECIALTY CHEMICALS COMPANY

Develops business operation on basic chemicals such as hydrogen peroxide, hydrazine, hydrosulfite, persulfates and engineering plastics such as polycarbonate, etc.

- Hydrogen peroxide
- Hydrazine hydrate
- Sodium percarbonate
- Persulfates
- Hydrosulfite
- Chemicals for electronics industries
- Monomer for plastics lens
- Polycarbonate resin (Iupilon)
- Polyacetal resin (Iupital)
- Modified polyphenylene ether (Iupiace)
- Polyamide MXD6 (Reny)
- Polyamideimide (AI polymer)

● INFORMATION & ADVANCED MATERIALS COMPANY

Develops business operation of processed high functional/highly value added products in anticipation of market needs such as BT resin for electronics industries, oxygen absorber "AGELESS", etc.

- Epoxy · Glass BT resin copper clad laminates
- Materials for multi-layer printed circuit boards
- BT resin
- LE sheet
- AGELESS (Oxygen absorber)
- AGELESS · OMAC
- Anaero Pack
- RP System · RP Agent

Message from the President

In 2004 some large scale disasters occurred in Japan, while in Indonesia a big earthquake happened off the coast of the Island of Sumatra at the end of year and unbelievably many people died because of the huge Tsunami caused by it. I heartily wish all the people in the world will live their lives in peace and equality without such disasters' happening not only in Japan but also anywhere in the world.

We, Mitsubishi Gas Chemical, have been sympathizing with efforts aimed at the construction of societies in which irreplaceable global environments are preserved and all mankind can live safely, that is, “Sustainable Development” and “Structuring of Recycling-Based Society”. Therefore we participated in the establishment of Japan Responsible Care Council (JRCC) in 1995 and joined it at the very beginning. Since then we have always regarded responsible care as an important part of securing environmental safety and we are continuing to make strenuous efforts to promote this even today. This year we are going to celebrate the 10th anniversary of our joining JRCC, and we'd like to make even greater efforts to promote the more strengthened responsible care activity and furthermore to obtain the trust from societies.

In our company we call our participation in these efforts “Integrated Safety Management” whereby we try to secure the environment and safety in all our processes from the development of products to their abandonment through their manufacture, distribution, use and final consumption and we have been carrying out this management under the “Integrated Safety Management Rule” enacted in 1995. Last year we entirely revised this rule and clearly stipulated the contents of the responsible care activity to need to further implement “Integrated Safety Management” mentioned above. Furthermore, we have recognized that it is important to secure the compliance of company activities to obtain the trust from societies we live and work in and last year we put in places a “Compliance Rule” to supplement the “MGC Corporate Activity Guide” instituted in 1997. This leads to the establishment of a whole compliance structure including not only ourselves but also our affiliated companies.

Since we have concretely disclosed our activities for Integrated Safety Management in this “Environmental Report”, it is great honor for us that you will read this Report and give us your honest opinions together with your understanding for our activities.

March 2005



Representative Director & President
Hideki Odaka

Fundamental Polices on Environment and Safety

We, Mitsubishi Gas Chemical Company, Inc. (MGC), are carrying out the corporate activities on the basis of the following “Existence Philosophy” and “Management Philosophy”.

Existence Philosophy

MGC shall contribute to the development and harmony of societies through the creation of wide range of values on the basis of chemistry.

Management Philosophy



In order to implement our existence philosophy and management philosophy, we have been carrying out Integrated Safety Management (it means that we secure the environment and safety in overall life cycles from the development of products to their abandonment through their manufacture, distribution, use and final consumption).

In order to implement Integrated Safety Management, we make up “Environment and Safety Targets” and “Fundamental Policies” as our common environment and safety policies to the whole company. Each of our workplaces has made up the concrete activity plan according to the environment and safety policies and has been steadily carrying it out.

Fundamental Polices on the Environment and Safety

MGC, as an important member of society, well recognizes our responsibility to contribute to the society and to secure the environment and safety, and considers to make our corporate activities harmonize with the protection of global environment under the principle of sustainable development, and makes efforts to get the more increased trust from societies.

Environmental and Safety Targets :

Zero Accident, Zero Occupational Injury and Environmental Preservation

Fundamental Policies :

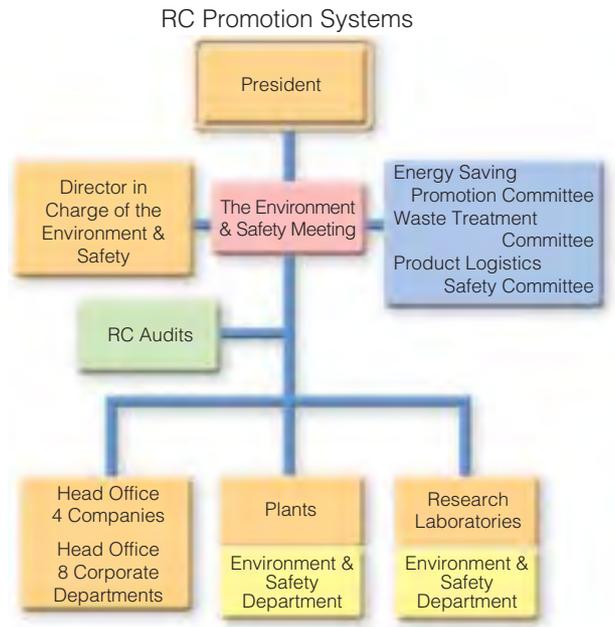
- Security of health and safety in operations
- Reliable security management of facilities and increase of autonomous security technologies
- Reduction of environmental loads in business activities
- Security of safety in use, handling and disposal of products
- Development of environmentally friendly and safety-oriented products and technologies
- Environmental and safety preservation in raw material and product logistics
- Enhancement of society's confidence to us
- Support of RC activities in our subsidiaries and affiliates
- Continuous improvement of our RC management system

We shall obey related domestic laws, international rules and others and shall also cooperate with related international organizations, international and domestic administrative organizations, non-governmental organizations and etc., if necessary.

Responsible Care Promotion Systems

RC Promotion Systems

The highest decision making system on RC activity of MGC is the Environment and Safety Meeting which is chaired by the President and composed of all heads of each company and workplace. In this meeting, they discuss and approve the environmental and safety policies, the fundamental policies, the middle term plans and annual activity plans. Our plants, research laboratories and head office make the annual activity plans based on these policies and carry out the concrete activities. We disclose the contents of RC activities to societies widely through our RC environmental report and our web site.



PDCA Cycle



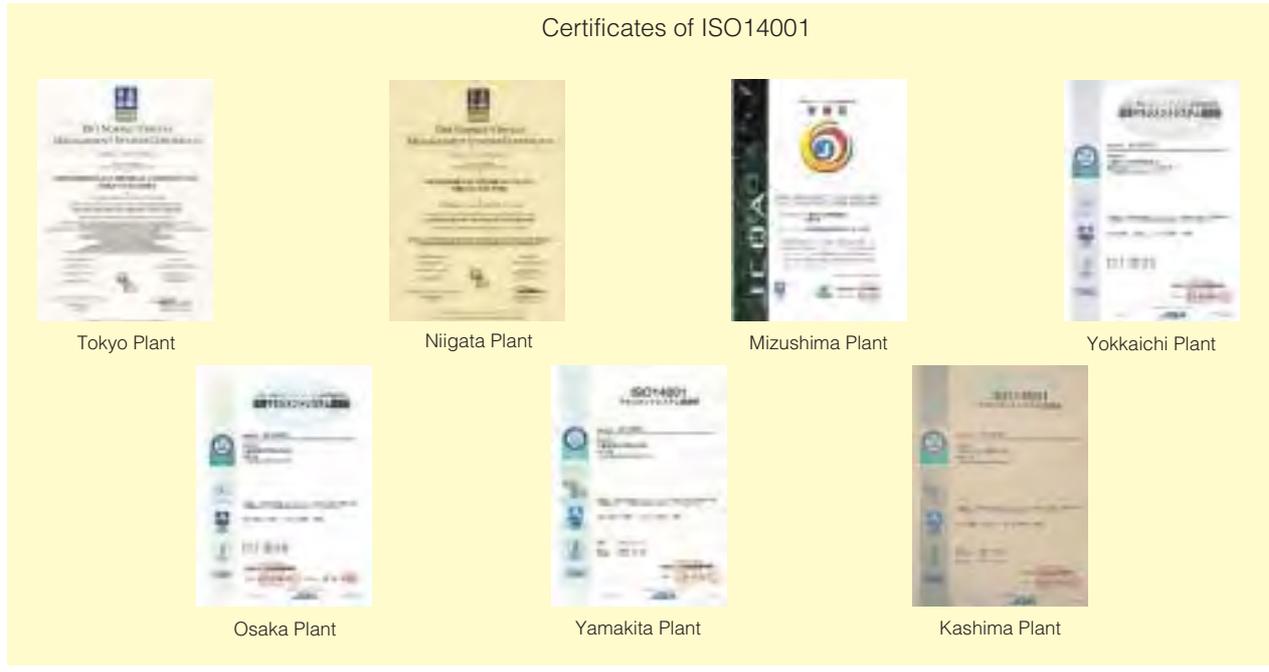
PDCA Cycle for RC Activities

In order to make efforts for the continuous improvement of RC, we make up the activity plans on RC (Plan), do them (Do), audit the results of activities and confirm the future subjects (Check), and summarize the result of activities and reflect them on the next year's activity plans by the management (Act).

Acquisition of ISO 14001 Certification

We have already acquired ISO 14001 and ISO 9001 certification at all of our plants and have been working on improvement of environmental performance and product safety. (Naniwa Plant and Saga Plant are included in Yokkaichi Plant.)

Certificates of ISO14001



Middle Term Targets & Results of Activities in 2004 and Activity Targets in 2005

Remarks



Achievement of targets



Necessity of more efforts

	RC Middle Term Targets (2001 - 2005)	Activity Targets
	Occupational Health & Safety	Attainment of zero accident and zero occupational injury through the year
Process Safety & Disaster Prevention	Improvement of autonomous safety technologies	Acquisition of continual operation certification by our plants located in the industrial complexes
Environmental Preservation	Reduction of raw material quantity used	Grasp of consumption amount of container, packaging materials, etc. Application of green purchase guidelines
	10% reduction of unit energy consumption (bench mark 1999)	1% reduction of unit energy consumption, compared with the year before
	Shift to clean energy	Promotion of the shift to clean energy
	20% reduction of substances specified in PRTR (bench mark 1999)	Reduction of PRTR substances
	Appropriate management of substances with environmental loads	Management of ozone layer depletion materials
	Reduction of final landfill by 75% (bench mark 1995)	Reduction of final landfill by 75%
	Promotion of zero emission	Rationalization of wastes management
		Preparation of zero emission promotion plan
Chemicals Products Safety	Offer of the latest MSDS	Distribution of MSDS (JIS edition)
	Implementation of safety assessment of products	Implementation of safety test for new materials
	Products assessment from the environmental point of view Development of environment-friendly products and technologies	Supply of products satisfying customers' requirement and appropriate purchase of raw materials Development of environment-friendly products and technologies
Distribution Safety	Setting up of targets for reduction of environmental loads in logistics	Grasp of carbon dioxide gas generation in logistics
Social Dialogue	Information disclosure with Environmental Report, etc. Promotion of communication with society	Publication of Environmental Report (2003 edition)
		Participation in activities and events of local communities
RC General	Regularization of information exchange meeting with subsidiaries and affiliates	Inspection of subsidiaries and affiliates inside outside Japan for environment safety

2004		Activity Targets in 2005	Page
Results of Activities	Estimation		
<ul style="list-style-type: none"> ● Preparation of guideline for risk assessment of occupational safety ● Start of activities according to the guideline at workplaces and research laboratories 		Practice of risk assessment of occupational safety Management of working environment in handling of chemical substances	9
<ul style="list-style-type: none"> ● Kashima Plant's acquisition of continual operation certification based on Industrial Safety and Health Law ● Finish of acquisition of continual operation certification by all our plants located in the industrial complexes ● Renewal of Mizushima plant's approval for carrying out inspection of safety countermeasures 		Reconsideration of the guide to investigate measures for environment and safety on planning of establishment and extension of plants Enforcement of autonomous safety management	10 11
<ul style="list-style-type: none"> ● Finish of grasp of their consumption amount both container and packaging materials 		Reduction of raw material quantity used Continuation of reduction of unit energy consumption by 1% Promotion of the shift to clean energy Reduction of discharge of substances specified in PRTR Appropriate management of ozone layer depletion materials, dioxins and PCBs Efforts to achieve the targets for zero emission of wastes Promotion of superior assigee selection for disposal of wastes Promotion of green purchase (articles for offices, etc.)	
<ul style="list-style-type: none"> ● Preparation of guidelines for green purchase 			
<ul style="list-style-type: none"> ● Achievement of the target of 1% reduction in the overall 			
<ul style="list-style-type: none"> ● Conversion of fuel to town gas at Tokyo Plant 			
<ul style="list-style-type: none"> ● Reduction of ethylene oxide discharged into the air by the installation of exceptional facilities 			
<ul style="list-style-type: none"> ● Change to alternate flon, Recovery and decomposition of flon when the apparatus provided with it was disused. 			
<ul style="list-style-type: none"> ● Achievement of the target in the fiscal 2002, Maintenance of the target 			
<ul style="list-style-type: none"> ● Preparation of guide for wastes management, Achievement of company's wastes management system 			
<ul style="list-style-type: none"> ● Setting up of targets and promotion of zero emission at each workplace 			
<ul style="list-style-type: none"> ● Distribution of revised one based on the latest information 			
<ul style="list-style-type: none"> ● Sure implementation of safety test for products on the market 		13	
<ul style="list-style-type: none"> ● Promotion of research of measures for environment by suppliers, research of impurities in raw materials ● Promotion of our measures for environment 		14 15	
<ul style="list-style-type: none"> ● Efforts of the development of low risk products and technologies in consideration of health and safety 		15	
<ul style="list-style-type: none"> ● Start to grasp of carbon dioxide gas generation based on the consumption of fuel by transportation with trucks, etc. 		Continuation of grasp of greenhouse effect gas in logistics Completeness of carrying yellow card	23
<ul style="list-style-type: none"> ● Publication of its Japanese and English version and their disclose on Web. 		Publication of Environmental Report (2004 edition) Disclose of environmental accounting in the fiscal 2004	5
<ul style="list-style-type: none"> ● Participation in fairs and festivals in local communities 		24	
<ul style="list-style-type: none"> ● Reception of trainees for experience and plant visitors 		25	
<ul style="list-style-type: none"> ● Implementation of cleaning around workplaces 		25	
<ul style="list-style-type: none"> ● Implementation of three subsidiaries and affiliates respectively inside and outside Japan 		Promotion of ISO 14001 acquisition Inspection of subsidiaries and affiliates inside and outside Japan	26

Responsible Care Audits

Implementation of Responsible Care Audit

The audits have very important role as the checking function in PDCA cycle. In RC audits, chaired by the director in charge of the environment and safety, the audited workplaces report the implementation status of RC plans and results of internal audits, and are checked, and then, are given the subjects to be improved. The subjects are implemented intentionally by each workplace, and they will report the improvement results in the next audits. The followings were indicated by RC audits in fiscal 2004 as the subjects to be improved.

The Entire Company's Improvement Subjects

- 1. Penetration of RC Activities**
 The activities by small groups such as the near accident suggestions, proposals of items to be improved, etc. are gradually becoming activated.
 To penetrate RC Activities in every day tasks, through creating a splendid atmosphere to stimulate and improve RC activities, and devising the method.
- 2. Promotion of Reduction of CO₂ Generation and Energy Saving**
 The reduction of carbon dioxide generation has become to the national problem to be solved by the effectuation of international treaty for the prevention of global warming.
 To promote the countermeasures containing energy saving as a main item, which also results in the improvement of production cost.

Some of the Improvement Subjects for workplaces and Head Office

Workplaces

1. We appreciate that the long time resting facility was started up safely by the effort of workplace.
And to check the near trouble parts of facilities from the point of view of Preventive Maintenance, supposing long term safety operation.
2. To use more effectively the RC-Activity-Note in each workplace (description of forbidden items, rules, transmission of technologies, etc.)
3. To submit more near accident suggestions by thinking out.
4. To prevent troubles through the strengthening of preventive maintenance.
5. To implement quickly the improvement of recovery ratio of solvents specified by PRTR.
6. To strengthen the education of subsidiaries and affiliates on safety protection

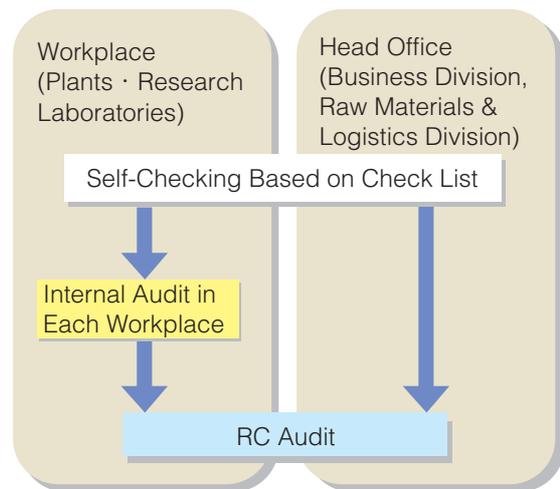
Head Office

1. The management system under the state of emergency is important from the view point of group management.
To put in writing these management systems including the liaison system with the stock points and affiliates in emergency, for example, accidents and natural calamities.
2. To sort the developments of products and technologies and the improvements of processes in relation to environment preservation including the results in past, and to make use practically them in business.

Environment & Safety Division

1. To review and improve the current safety assessment system of facility, taking the opportunity of the accident at the distillation process of solvent of hydrogen peroxide.

Flow Chart of RC Audit



RC Audit at Workplace

Comments by Director in Charge

I thought that RC activities were actively carried out on the basis of the action report and internal audit report at the time of RC audit this year, while I also pointed out the problems to be solved.



Director
Managing Executive officer
Dr. Takao Kawaki

In addition, I was very sorry for us to have a lot of accidents this year. I hope that we review them, reflect them on the next plan together with RC audit results and surely turn PDCA cycle round.

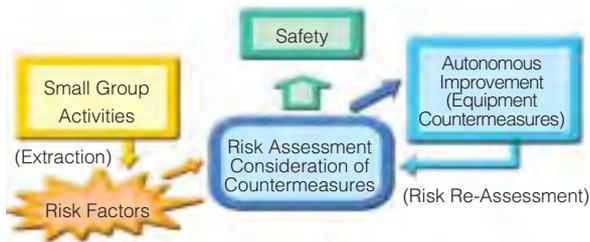
Operation of Occupational Health and Safety

Occupational Safety

MGC is aiming at achieving zero accident and zero occupational injury through autonomous improvement activities based on our RC activities. In all our workplaces, we have been promoting integrated safety activities aiming at employee education and productivity improvement on the basis of small group activities such as 5S activities, "HIYARI-HATTO Activity" (near accident suggestion activities), etc. Increase in "HIYARI-HATTO Activity" showed the enhancement of sensitivity to potential dangers.

Further, as a step forward activity we have introduced the occupational safety risk assessment in all our workplaces, which is a quantitative method to identify the causes of accidents and injuries, and we keep working on safety improvement.

Occupational Safety Risk Assessment



Safety Results

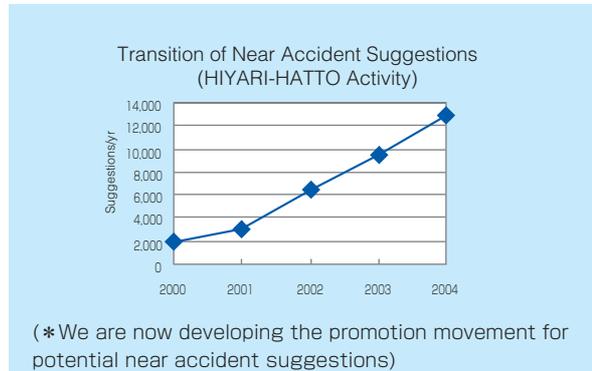
Though we practiced activities under the target "Zero Accident and Zero Occupational Injury", there happened 1 absenteeism and 6 equipment incidents in fiscal 2004, which were regrettable results. In order to prevent accidents and occupational injuries, "Safety Check in Manufacturing Equipment" was carried out in each workplace under the president's instruction. With respect to occupational injury by absenteeism in fiscal 2004, our frequency rate (number of casualties per 1 million labor hours) was 0.28 and severity rate (number of days lost per 1000 labor hours) was 0.002.

Commendations for Safety

Niigata Research Laboratory has been continuing no occupational injury for 18 years. It was admired for its safety activities for many years and was awarded "Safety Effort Prize" by Japan Chemical Industry Association/Japan Responsible Care Council. Moreover, Niigata Research Laboratory answered the external requests such as a lecture at the meeting sponsored by Chemical Society of Japan, a contribution to "Journal of Safety Engineering" and preparation of teaching materials for the teachers of university.



Receiving the prize for efforts to get safety, Safety Symposium (Niigata Research Laboratory)



Effective Use of "HIYARI-HATTO Activity" Cases

We analyze the near accident cases in our company, and both incidents and injuries at inside and outside of our company and effectively use the results of analysis both for the prevention of similar incidents and injuries, and for carrying out safety measures.

Activities of Occupational Safety Risk Assessment

We quantitatively rank the potential dangers on our sites, and carry out the safety measures. We will promote to improve our safety consciousness through the process of identifying dangerous sources.

Working Environment Management and Environment Improvement of Working Places

In order to secure good working environment by removing harmful factors, we have been making efforts to improve working environment and to maintain good one through measuring the conditions in working environment and estimating them. Kashima Plant has been actively doing activities for environment improvement of working places and therefore acquired the approval as the promotion plan for making comfortable working places from the head of labor bureau at Ibaraki Prefecture.



Tight seal of product packaging process (Yokkaichi Plant)



Approval of promotion plan for comfortable workplace (Kashima Plant)



Operation of Process Safety and Disaster Prevention

Process Safety and Disaster Prevention

MGC takes up the security of safety as the first priority target and we are positively making efforts to achieve zero accident and zero occupational injury through the promotion of autonomous safety based on RC activities. Furthermore, we have already constructed the system for disaster prevention in case of accident.

Inspection of Process Safety

We carry out RC audits in each workplace every year and implement audit on process safety and disaster prevention in it. Furthermore, the workplaces acquiring approved qualification on high pressure gas production facility and continual operation of boilers and Pressure Vessel Type 1 have been implementing the inspection of process safety as occasion demands. We strengthened the audits by head office concerning safety management system in each workplace through the review of inspection methods of process safety in this year.

Promotion of Autonomous Process Safety

We are working for the improvement of autonomous process safety technologies around preservation technologies of the high pressure gas production facilities, boilers and Pressure Vessel Type 1. This year Mizushima Plant renewed qualification of the "Certified completion and process safety inspector" based on High Pressure Safety Act for its 5 high pressure gas production facilities. This approval system permits implementation of safety inspection by autonomous management at workplaces, technological and management levels of which are certified as excellent by the Minister of Economy, Trade and Industry. Moreover Kashima Plant also acquired approval qualification for continuous operation of boilers and Pressure Vessel Type 1. This resulted in the acquisition of approval qualification of continuous operation by all our workplaces located in petroleum complexes.

Workplaces with Autonomous Safety Approval for High Pressure Gas

Workplace	Time of Approval	Number of Facilities
Niigata Plant	Dec. 2000	6
	Sept. 2003	5 added
Mizushima Plant	Dec. 2004	5 renewal

Workplaces with Approval for Boilers and Pressure Vessel Type 1

Workplace	Time of Approval	Operation Period
Niigata Plant	Nov. 2002	2-year continuous operation renewed
	Mar. 2003	2-year continuous operation added
	Jan. 2004	4-year continuous operation
	Dec. 2004	2-year continuous operation added
Mizushima Plant	Apr. 2002	2-year and 4-year continuous operation renewed
	Dec. 2003	2-year and 4-year continuous operation Added
Yokkaichi Plant	Aug. 2002	2-year continuous operation renewed
Kashima Plant	Nov. 2004	2-year continuous operation

Education System

In order to carry out safety and accident prevention activities based upon a special technical knowledge, we are stimulating for employees to obtain official titles, such as high pressure gas production safety controller, boiler engineer, nondestructive inspector and equipment maintenance engineer.

For the safety operation of plants, we are promoting the educational activities such as the acquirement of basic technologies on maintenance and instrumentation at the in-house school for maintenance, the acquirement of operation technologies using operation backup tools like operation simulation and so on.

Number of Employees with Main Official Titles

Title	Number	Statutory Number
High pressure gas production and safety controller	987	228
Boiler engineer	776	30
Energy controller	91	29
Pollution controller	183	33
Dangerous materials controller	1973	170
Poisonous materials controller	142	8
Specified industrial waste disposal controller	24	8
Occupational health controller	76	18
Certified environmental measurer	25	5
ISO 14001 internal auditor	155	—
Nondestructive inspector (NDI)	47	—
Equipment maintenance engineer	123	—



In-house school for maintenance (Practice in the course for machinery, Mizushima Plant)



Training for operation simulation (Niigata Plant)

Emergency Management

We have established our accident prevention systems to minimize the damages in cases of accident. Each of our workplaces has set up its accident prevention activity rules and determined the system and activity for emergency. We are also making efforts to prepare and make perfect the apparatus for process safety and materials/ machines for emergency.

Furthermore, Niigata Plant, Mizushima Plant, Yokkaichi Plant and Kashima Plant, to which the "Petroleum Complex Accident Prevention Act" is applied, have entered into "Regional Joint Accident Prevention Agreement" and structured a mutual aid system in case of emergency.

Education and Training for Emergency

Every year we prepare the plan for disaster prevention in every workplace and implement the periodic trainings for disaster prevention such as fire extinguishing, calling out, reporting, etc. Through these trainings, we have been accumulating the education and training to prepare for early stage activities.

In addition to independent trainings by each of our workplaces, we have been implementing trainings for disaster prevention, united with public fire fighters and joint training for disaster prevention with neighboring companies.

Training for Accident Prevention in Workplace

Workplace	Summary of main training
Tokyo Plant	Training for fire extinguishing at the early stage on the assumption that fire breaks out on holiday
Niigata Plant	Training for accident prevention together with public fire fighters and joint accident prevention group
Mizushima Plant	Training for accident prevention together with public fire fighters and joint accident prevention group
Yokkaichi Plant	Training for accident prevention on the assumption of fire broken out with earthquake
Osaka Plant	Joint training for retiring to a safety place with subsidiaries and affiliates
Yamakita Plant	Training for accident prevention on the assumption of leak of chemicals caused by big scale earthquake
Kashima Plant	Training for accident prevention on the assumption of fire caused by big scale earthquake

Re-check on Safety of Production Facilities

We made the re-check on safety of production facilities of all workplaces in addition to clearing up the cause of accidents and disasters happening in 2004 and implementing the countermeasures for them.



Training for accident prevention (Tokyo Plant)



Integrated training for accident prevention (Niigata Plant)



Training for saving sufferers by accident (Yamakita Plant)

Countermeasures for Earthquake

Yamakita Plant located at the area where big scale earthquakes is supposed to happen has been carrying out the countermeasures for them.

We have reviewed the countermeasures for earthquakes after Hanshin Awaji Big Earthquake and made efforts for the improvement of our internal Special Rules for Earthquake Disaster and Accident Prevention and for the fulfillment of materials and machines necessary for emergency measures. Mizushima Plant and Naniwa Plant are located at the area designated by "Special Measure Act for Promotion of Earthquake Disaster and Accident Countermeasures in the Tonankai and Nankai District", enacted newly. We prepared the countermeasure program for tsunami in these plants.



Room of head quarter for plant's accident prevention (Mizushima Plant)



Materials and mechanical equipments for emergency (Kashima Plant)



Pump for fire extinguishing (driven by engine when power failure happens) (Niigata Plant)

Environmentally Friendly Product and Research and Development

Development for Practical Use of Automobile Provided with Engine Driven by DME Fuel

MGC is participating in the project for joint research and development of automobile provided with engine driven by DME (dimethyl ether) as the fuel, sponsored by Japan Oil, Gas and Metals National Corporation (Combination of the former Japan National Oil Corporation and the former Metal Mining Agency of Japan)

DME does not contain carbon-carbon bonds (C-C) which results in the evolution of soot, differing from light oil, so it has the advantage that it does not at all generate black smoke on its burning. But, on the contrary to light oil, it has the imperfection that it tends to cause the sintering at sliding section of pumps, valves, etc. in the fuel supply system.

To overcome this imperfection it was necessary to develop additives to increase lubrication ability of DME fuel and to partly improve a part of the fuel supply system of diesel engine truck available in markets. We are mainly in charge of the development of the most suitable additives in this joint project. Last year the service stations for supplying DME fuel were built in Niigata City, Tsukuba City, etc. for its practical use. After getting approval of Land Transportation Administration, in December the test of long distance run was started on public roads between Niigata and Tsukuba.

Thus, we promote the development for practical use of clean energy.



Truck provided with diesel engine driven with DME

Development of Purification of Soil and Groundwater

Hydrogen peroxide, one of our products, is a clean substance, turning only to oxygen and water after decomposition. Taking advantage of the characteristics, hydrogen peroxide is now widely noticed for a chemical purification agent of soil and groundwater contaminated with harmful substances like petroleum, solvents containing chlorine, etc. Although hydrogen peroxide has so far used for the purification of soil and groundwater overseas, it has just started to be put to practical use in Japan. Furthermore, since persulfates are provided with more increased capability for oxidation than hydrogen peroxide, it is expected as the chemical agency for treating substances whose decomposition is very difficult.

We are going to develop technologies for its practical use in cooperation with manufacturers for facilities, who are provided with various kinds of relating necessary technologies. Through this development, we are going to aim at its spreading.

Development of Low Environmental Load Process for Manufacturing Aromatic Aldehyde

Aromatic aldehydes are useful for raw materials and intermediates in a lot of fields like medicines, agricultural chemicals, additives for plastics, perfumes, agents for coloration, electronic industry materials, etc.

On the contrary to these popular use, it has become the problem that much amount of wastes containing chlorine generates at their manufacturing process.

We developed the completely closed manufacturing process using super strong acid catalysts developed by our own technologies. This process made possible low generation volume of waste containing chlorines compared with the previous process. We recognize this process for clean and excellent, and practical manufacturing process.



Imaged photo for perfumery



AIR-G

Automatic Humidity Controlled Nitrogen Generator AIR-G

The fumigation by methyl bromide which is one of the ozone layer depletion substances has been going to be prohibited by the Montreal Protocol in 2005. For the preservation of cultural properties, we have been proposing environmentally friendly system for insecticidal treatment and fungus resistance, using an oxygen absorber and a high gas barrier bag without chemical agents. But this method has the imperfection that it is difficult for it to be applied to objects whose size is larger than corrugated carton for bulk treatment.

Then we developed the preservation method by the new system. The system consists of two apparatuses, high pure nitrogen generator and humidity compensator. This means that it is designed so as to be able to easily preserve cultural properties necessary for delicate handling.

This apparatus system is highly praised as the one for environmentally friendly and cultural property-friendly method for insecticidal treatment not only in Japan but also abroad.

MGC manufactures a lot of raw materials like methanol, hydrogen peroxide, etc. on the basis of original technologies. We don't have a lot of products directly offered to general consumers however we are making great efforts to develop products and technologies provided with increased safety, considering environment preservation and human health and safety.

Products/Technologies Contributing to Environment Preservation

Products/Technologies	Contribution to Environment Preservation	Items*		
		A	B	C
Methanol, Ammonia, Methylamines, etc	Basic raw materials and fine chemicals manufactured with natural gas	○	○	
Methacrylates	Raw materials for car top coat based on acrylates, which contributes to the reduction of fuel cost	○		
ASQ Super (Catalase)	Enzyme produced by microorganisms, working for the decomposition of hydrogen peroxide and used for the treatment of waste water in the industrial field	○	○	
MGC-MH Process	Process for the production of high purity hydrogen gas from methanol and water		○	
Dimethyl Ether	Research and development for the application to the fuel for automobile as the clean fuel manufactured with natural gas	○	○	
Development of Natural Gas Field Development of Steam Generated by Terrestrial Heat	Development of clean energy and its application to raw material Application to the steam for electric power generation	○	○	
New Production Method for Trimethylol Propane	Production technology that recovers and recycles by-product (sodium formate) as raw material	○		○
Production Method of Methyl Methacrylate	A by-product (ammonium sulfate) less production technology with natural gas as the raw material and new ACH method	○	○	○
MX Nylon Resin	Application to multi-layer PET bottle, with merits of with high gas barrier capability, chlorineless, and low load against environment		○	
High Purity Terephthalic Acid GASKAMIN NE240	Raw material for PET bottle, which contributes to the reduction of wastes by its recycling Reduction of solvent by the application to non-solvent epoxy resin (two liquid type) through the utilization of its low viscosity			○
AR	Application to the capacitor system consists of carbon and aluminum mainly, with merits of long life and of harmful materials less	○	○	
Production Method of Aromatic Aldehydes	Reduction of harmful wastes by the process in which super acid catalyst is completely closed		○	○
Hydrogen Peroxide	Substitute for bleaching agents containing chlorine, used at the paper pulp production process		○	○
Persulfates	Purgation of contaminated underground water and soil		○	
OR-SON (Treatment of Waste Water)	Achievement of the decomposition of not-easily-decomposable organic materials and drastic reduction of the generation of sludge	○	○	○
F-SON (Treatment of Waste Water)	Agent for separation and treatment of fluorine, which can easily reduce the fluorine content 8ppm or less		○	
NEOSOL (Treatment of Waste Water)	Agent to prevent the paint mist including solvent from sticking, that makes easier to recover dispersed paint in the recycled water in painting booth.	○		
NEOPOCK (Treatment of Waste Water)	Chemical agent for effective aggregation and separation of water soluble paint, water soluble polymer, etc. from waste water	○		
DEOPOWER	Deodorant agent to solve the problem of bad smell at sewage disposal plant, etc.		○	
Deslime, Contime	Water treatment agent for recycled cooling water, that makes the life of equipment long and increasing heat efficiency	○	○	
lupilon (Polycarbonate)	It is the resin provided with excellent transparency and contributes to the saving of resources through its durability	○	○	
lupital (Polyacetal)	It is the resin provided with excellent mechanical properties and is used as the substitute of metals in various kind of fields.	○	○	
lupiace (Modified Polyphenylene Ether)	It is mainly used for office automation instrument and equipment and it contributes to the energy saving through its light weight property.	○		
Reny (Polyamide MXD6)	It is mainly used for door mirror stay of automobile and it contributes to the energy saving through its light weight property.	○		
AI Polymer (Polyamideimide)	It contributes to make office automation instrument and equipment light and small sized on the basis of its excellent heat resistance.		○	
Materials for Environment-Friendly Printed Circuit Board	Heat resistant materials for printed circuit board, suitable for lead-free solder		○	
AGELESS	Reduction of abandonment of expired foods through extension of best term by oxygen absorption			○
AGELESS · OMAC	Reduction of weight as the substitute for canned food, Reduction of energy for logistics	○		
RP Preservation System	Preservation of cultural assets without using methyl bromide which depletes ozone layer		○	
AIR-G	Extermination of harmful insects for preservation of cultural assets without using methyl bromide which depletes ozone layer		○	
Alfish	Transportation technology which makes possible the transportation of fresh fish densely packed.	○		
Pharma Keep	Increase of preservation of medicines	○	○	
RDF	Change of industrial waste materials to solidified fuel	○		○
Memory Green Crystal	It is the resin provided with water storage capability and it makes possible maintenance-low tree-planting, using rainwater.	○		

Classification of MGC products and technologies contributive to environmental preservation

- *) A : Energy Saving/Resource Saving : Contributive to resource saving such as energy saving, reduction of water consumption, reduction of raw materials, etc. and the reduction of discharge of carbon dioxide
 B : Low Load against Environment : Contributive to the removal of harmful materials through the reduction of consumption of chemical materials, their reduction of discharge and generation, water treatment, exhaust gas treatment.
 C : Reduction of Wastes : Contributive to the reduction of waste materials through the prevention of generation of waste materials, their recovery and their recycle.

Safety Management of Product

From Raw Material to Product

In the case of putting new products into market, MGC examines on all the processes from the survey of chemical substances contained in their raw materials to the safety of new products manufacturing, their use and their abandonment by customers. Only new product judged fully safe as MGC brand is produced on a commercial base.

We analyze and estimate the risks over all processes in the examination mentioned above. If there is the possibility of risks, we take countermeasures to remove or reduce them as possible as we can, otherwise we investigate the protection methods for the risks. For the risks not enough to be avoided by the above methods, we consider the possibilities of their appropriate risk control, for example, inclusive of providing the information of the risks to the users, etc. We effort to eliminate the risks from all angle.

We put this examination system in practice under the MGC's standard "Product Safety Agreement Standard" determined on the basis of concept on risk management of products. Our concept on risk management of product is shown in the figure on the right side.

We also show the flow chart on the process from the examination to putting products into market in the following figure. As is clear from this figure, MGC's products are offered after passing the each safety check step.



Safety Estimation of Chemical Substance (Hazard Assessment)

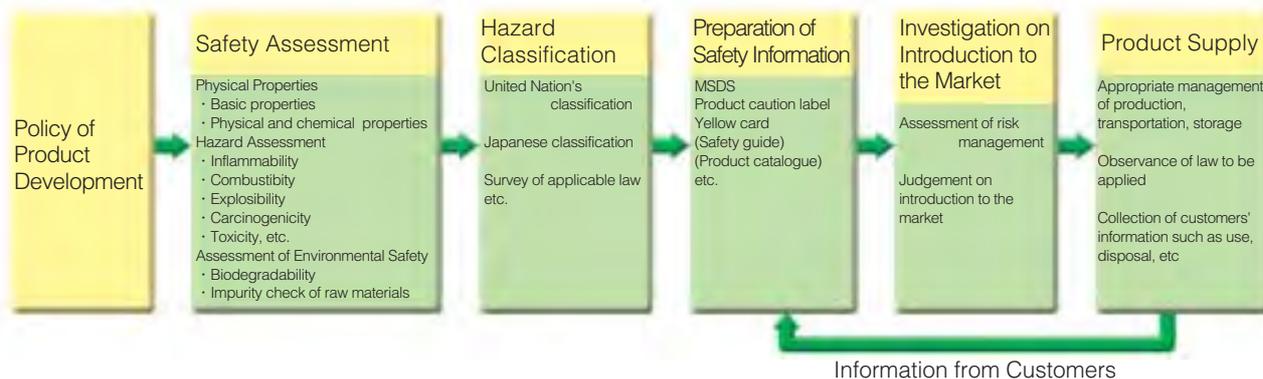
As the items showing the safety of chemical substances, there are estimation on hazard like ignitability, explosibility, toxicity, etc. other than physical properties like basic ones and estimation of impact on environment.

Safety Assessment Carried out in MGC

- Hazard Assessment
 - Test for judgment of hazardous material under the Fire Defense Law
 - Acute toxicity test
 - Skin primary irritation/corrosion behavior/skin sensitivity test
 - Pathogenicity test
 - Mutagenicity test (GLP certified)
- Environmental Impacts Assessment
 - Biodegradability test (GLP certified)

MGC is provided with the officially certified facility (GLP certified facility) on a part of items for chemical substances' safety. We show above the estimation items for us to be able to do. Concerning the other necessary assessment, we place an order outside.

Flowchart of Chemical Substances and Products Safety Assessment



Green Purchase

Concerning impurities in our products, we are making the survey of substances whose employment is prohibited by the Order of RoHS and the survey of substances specified by customers as those having the impact on environment. We are positively answering customers' requirement on green purchase.

Order of RoHS : Order on limitation of employment of specified harmful materials contained in electric and electronic instrument equipment in EU

Items for Survey of Raw Materials' Suppliers Relating to Green Purchase

- "Survey on the Contents of Environment-Concerned Chemical Substances according to Ranks"
 - Substances whose production and import are prohibited by domestic laws
 - Object substances to be surveyed by Japan Green Procurement Survey Standardization Initiative (JGPSSI)
 - Substances whose MSDS is obliged to be offered by domestic law
- "Survey of Response Status to the Environment"
 - Offer of environment information
 - Status of introduction of environment management system
 - Response to environment

Safety Information Service

Safety information we provide comprises Product Warning Label attached on transportation, Container Yellow Card (labeling type) other than MSDS offered by business departments and sales agents, product catalogues, safety guidelines. Furthermore, we distribute Yellow Card for transporters who should carry it on transportation.

Offer of MSDS

For the safe use of our products we prepare MSDS on all of our chemical products and supply them to our customers, sales agents and transporters. We are obliged to offer MSDS on a part of chemical substances by laws like Occupational Health and Safety Law, Pollutants Release and Transfer Register (PRTR) and Hazardous Material Control Law. We prepare MSDS on all of our products containing those having no legal obligation of offer of MSDS and offers it. In addition, we manage MSDS on the intra-net system for its renewal. So, we are ready to offer the last one at any time.

MSDS : Material Safety Data Sheet

Documents in which we describe the necessary information for the safe deal with chemical products.

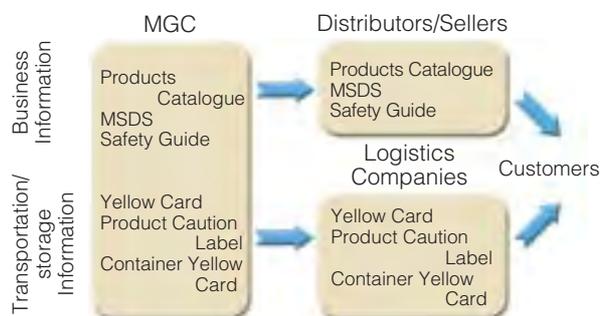
We describe in it the indispensable information like substance name, characteristics, hazard level, countermeasures for safety, countermeasures for emergency, etc.

Yellow Card, Container Yellow Card

Yellow Card is the one colored yellow on which the emergency measures to be done by transporters, fire fighting, police, etc. and the section to be informed or reported are printed as the provision against accidents during transportation of chemical substances. Container Yellow Card is the simplified edition of usual Yellow Card, on which only the United Nations number and guideline number based on "Guideline on Response Measures at an Emergency" are printed so that the appropriate management of accidents can be carried out simply by reporting said number to the Fire Defense Agency.



Flow Chart for Safety Information Services



MGC is participating in HPV Initiatives of ICCA through Japan Chemical Industry Association to offer more detailed information on safety to societies. Furthermore, we are also participating and supporting ICCA's LRI Initiatives.

ICCA's HPV Initiatives

MGC is participating in HPV Initiatives, the voluntary safety assessment activity for existing chemical substances as ICCA being the parent body for activity. Japanese enterprises disclosed the participation in the assessment of about 340 substances as cosponsor companies and 42 substances as lead companies. We carried out the safety assessment of 3 substances as a lead company and OECD has completed the examination on the safety assessment report by us. We are also participating in the assessment of 25 substances as a cosponsor and are offering funds and data.

ICCA (International Council for Chemical Associations)

International council established by Japan Chemical Industry Association together with ACC (The American Chemistry Council), CEFIC (European Council on Chemical Industry Federation), CCPA (Canadian Chemical Producers Association), etc.

HPV : High Production Volume Chemicals

Existing chemical substances whose annual production volume is not less than 1000 tons, which OECD were taken up as the targets for program checking the influence on health and environment

ICCA's LRI Initiatives

As a member of Japan Chemical Industry Association, we are participating in the ICCA's LRI Initiatives. This activity is the one for supporting over a long term the researches of influences on human bodies and environment by chemical substances. In concrete, this activity is supporting the researches by laying down stress on endocrine disrupting substances, toxicity on nerves, chemical carcinogenesis, chemical sensitivity, etc.

LRI : Long-range Research Initiatives

One of the activities in ICCA's Responsible Care Initiatives and long-range-research Initiatives on the impact of chemical substances to human health and environment.

Environmental Loads in Business Operation

MGC takes up “Reduction of Environmental Loads in Business Activities” as the basic policy and is making efforts to promote the reduction of consumption volume of raw materials, energy saving, reduction of emission volume of substances specified by PRTR law and zero emission of wastes. We show the status of environmental loads in fiscal 2003 in the following figure.

Input Items

Energy Consumption :

An aggregate amount of fuels (heavy oil, etc.), purchased steam and purchased electric power consumed in business operations.

Water Consumption :

Total amount of city water, industrial water, etc. used for business operations

Output Items

CO₂ Emission : Volumes of carbon dioxide (CO₂) gas emitted associated with business operations

SO_x Emission : Volumes of SO_x contained in the emitted gas from each combustion facility

NO_x Emission : Volumes of NO_x contained in the emitted gas from each combustion facility

Soot and Dust Emission : Volumes of soot, etc. contained in the emitted gas from each combustion facility

Substances Specified by PRTR Law

Emission into the Air : Emission volumes of the specified 45 substances into the air

Drainage : Volumes released to the public water area after re-treatment of drainage from business operations

COD Emission : Value obtained multiplying volumes of drainage by COD concentration in the drainage

Total Nitrogen Emission : Value obtained multiplying volumes of drainage by nitrogen concentration in the drainage

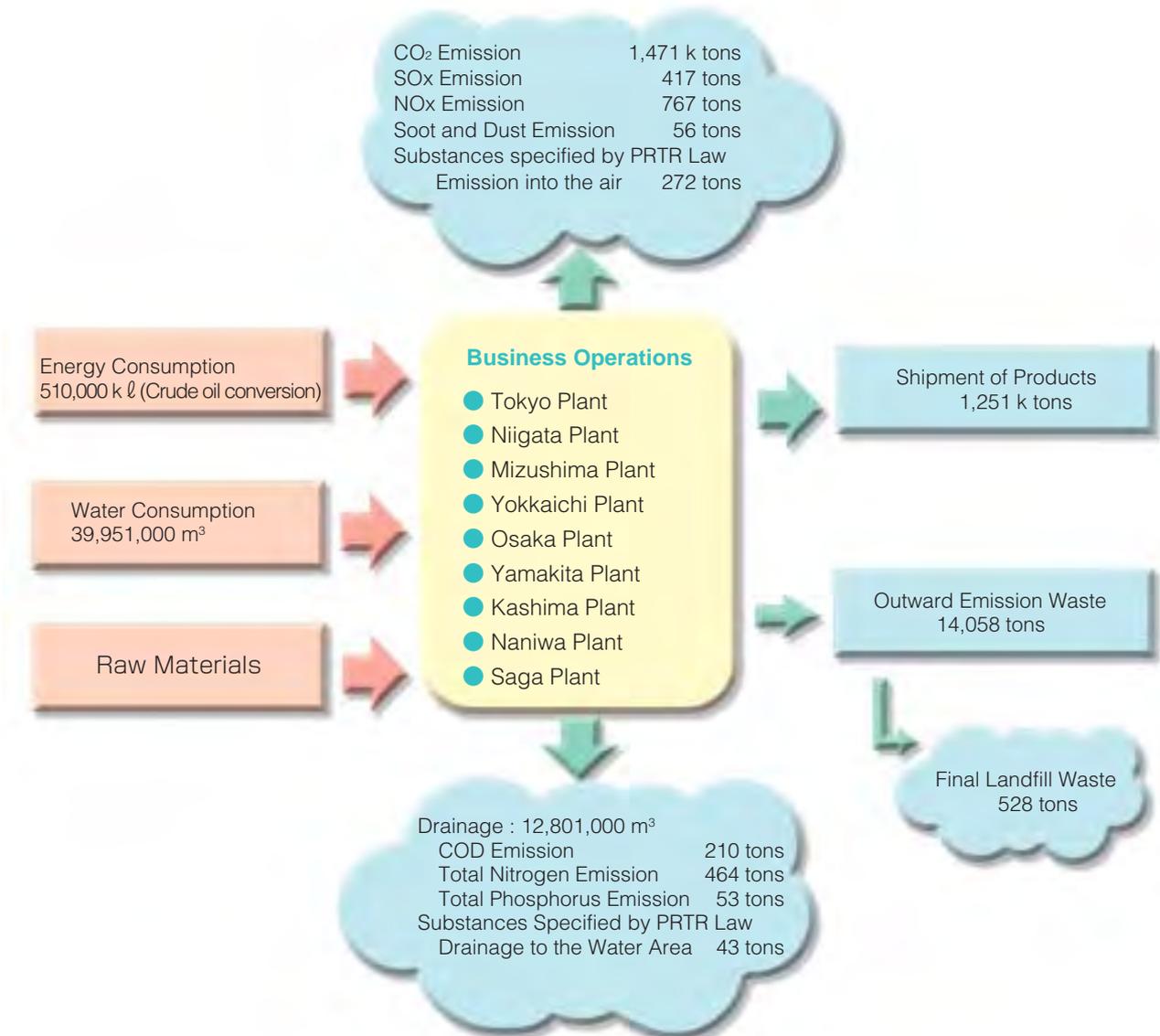
Total Phosphorus Emission : Value obtained multiplying volumes of drainage by phosphorus concentration in the drainage

Substances Specified by PRTR Law

Drainage to the Water Area : Drainage volumes of the specified 45 substances to the public water area

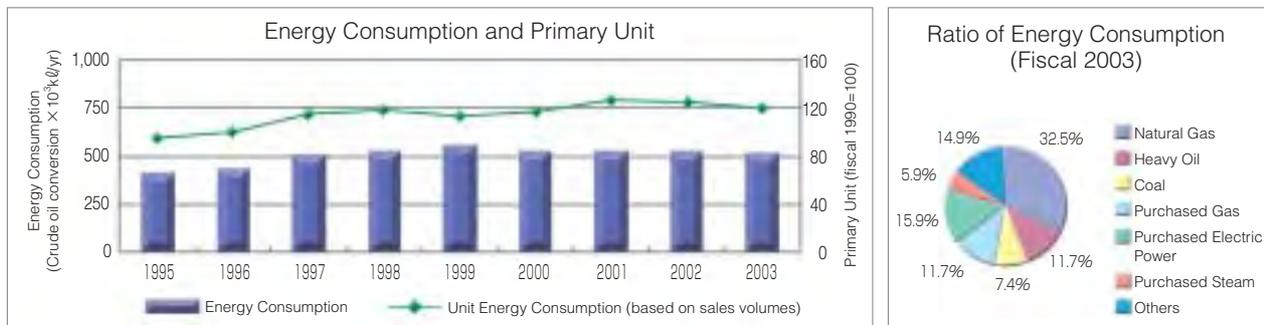
Outward Emission Waste : Volumes transferred for external treatment of the wastes generated by business operations

Final Landfill Wastes : Of the wastes transferred for external treatment, the landfill volumes as final disposal



Efforts for Preventing Global Warming

MGC is putting forward the reduction of emission volume of greenhouse gas promoting global warming through energy saving initiatives.



Activities for Energy Saving

We have implemented, starting with the introduction of co-generation for energy saving, optimization of operating conditions in manufacturing process, waste heat recovery, adoption of high efficiency electric machineries, etc. In addition, we are making best efforts for rationalization of energy consumption as the designated plants for energy management.

In 2003 we determined our target for the reduction of energy consumption as shown below and took the initiatives in energy saving activities.

Target for Fiscal 2003 :

1. Improvement of unit energy consumption by 1%
2. Introduction of energy saving instruments and equipments

In fiscal 2003 we achieved crude oil conversion 27,000 kl of energy saving in the aggregate of all plants through the countermeasures and activities for energy saving. The production volume increased by 3% compared with in the last fiscal year but the total energy consumption was 510,000 kl by crude oil conversion and decreased by 1% compared with in the last fiscal year. This resulted in the improvement of unit energy consumption of 4% compared with in the last fiscal year.

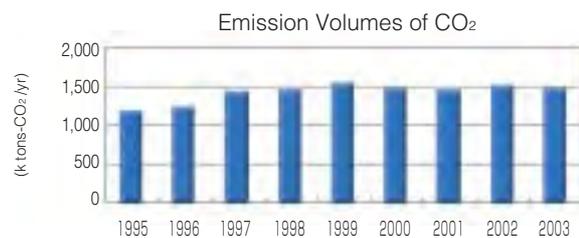
Examples of Countermeasures for Energy Saving and Activity

- Increase of energy efficiency by process improvement
- Setting idle a part of the utility generation facilities as result of utility saving
- Installation of energy saving instruments and equipments such as for pre-heating
- Improvement of unit energy consumption by the improvement of production efficiency
- Reduction of heat energy by making the operational temperature conditions to the best ones
- Saving of electric power for illumination and air conditioning

In fiscal 2004 we are continuously making efforts for pushing forward the countermeasures for energy saving like the improvement of co-generation system and activities relating to them.

Greenhouse Gas

CO₂ generated by fuel consumption accounts for a large portion of total greenhouse gas. Energy consumption in fiscal 2003 decreased by 1% compared with in the last fiscal year, and the total emission volume of CO₂ also decreased by 3%, which equals to 1,471 thousand tons-CO₂.



The emission volume of five kinds of greenhouse gas except for CO₂ in fiscal 2003 was small, compared with the one of CO₂ coming from fuel.

Emission Volumes of Greenhouse Gases (k tons- CO₂ conversion)

CO ₂	1,471
Methane	0.3
Dinitrogen Oxide	2.0
Hydrofluorocarbons	4.2
Perfluorocarbons	0
Sulfur Hexafluoride	0

Clean Energy

The ratio of natural gas was large in the volume of our energy consumption as in the last fiscal year and we furthermore pushed forward the conversion of fuel to city gas (natural gas) successively.

Ozone Layer Depleting Substances

We use flon in the enclosed system as refrigerant for freezers and air-conditioners, which is ozone layer depleting substance. But we are going to take steps to gradually substitute flon with substances provided with lower ozone layer depletion coefficient. In addition, we recover flon and decompose it, when we stop using machinery and equipment using flon.

Efforts against Air/Water/Soil Pollution

Prevention of Air Pollution

MGC is pushing forward with voluntary measures to reduce emission of air pollutant substances such as sulfur oxides (SOx), nitrogen oxides (NOx), soot and dust. We have so far taken measures to meet the requirement for the reduction of emission volume of SOx such as the installation of exhaust gas desulfurization unit, the conversion of fuel to low-sulfur heavy oil and/or city gas (natural gas), etc. We maintain the volume and concentration of exhaust gas enough below the regulated values by law and by agreements with municipalities.

As regards the total emission volume in fiscal 2003, SOx showed 2% decrease and soot and dust showed 10% decrease compared with in the fiscal year before respectively, on the basis of cutting down the use of heavy oil. However NOx showed 6% increase.

In some plants, we measure periodically the concentration of harmful air-pollutant substances at the boundary of the plants, furthermore, confirm the effects of the reduction, having these data jointly with the neighboring companies.



Measurement of Concentration of Air-Pollutants at Boundary of Plant

Prevention of Water Pollution

In order to prevent water pollution caused by effluent to rivers and waterfront areas, each workplace maintains drainage treatment equipment for applying neutralizing treatment, activated sludge process, coagulation treatment, etc. and monitors drainage water quality.

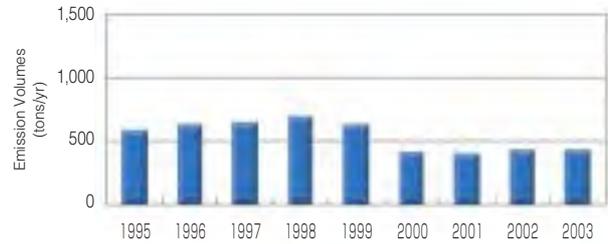
The regulation values of drainage are provided by concentration control or total amount control in the laws or ordinances, and/or the agreements with the regions. While regulation values vary with each region, each of our workplace releases its drainage to the public water area after making it clear such restricted limits.

We cut down the emission volume of COD and total phosphorous, 31% and 15% respectively, compared with in the fiscal year before. Total nitrogen volume showed 22% increase, because of production increase in one factory.

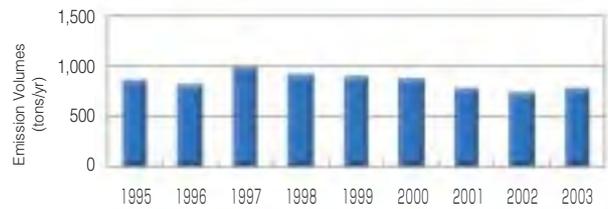
Survey of Contamination of Soil and Underground Water

We survey on the status of handling of hazardous substances during production and using of underground water in the neighborhood of our sites. Pursuant to voluntary management and in compliance with Soil Concentration Countermeasures Law and municipalities' ordinances, we continue to push forward to take measures.

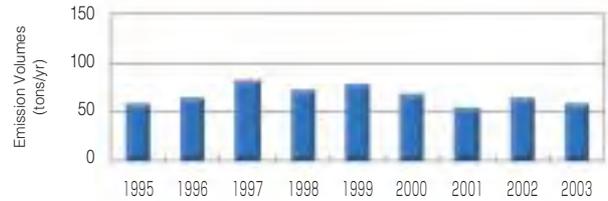
Emission Volumes of SOx



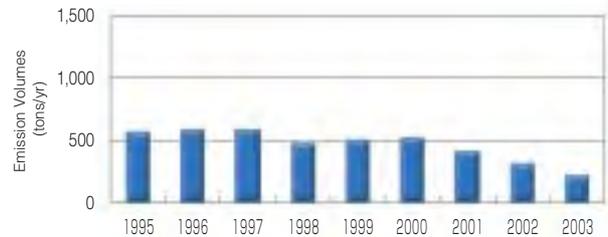
Emission Volumes of NOx



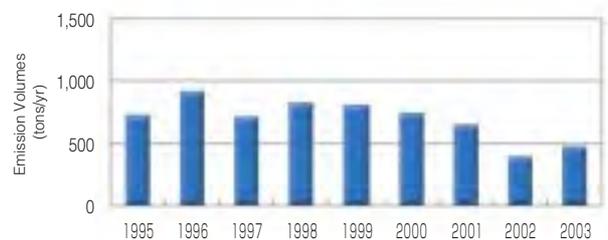
Emission Volumes of Soot & Dust



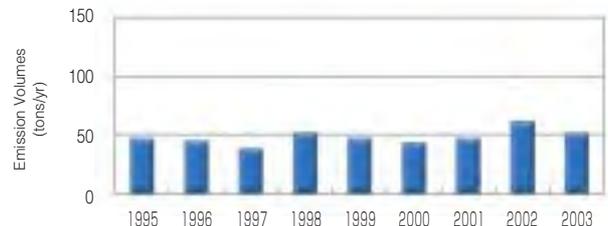
Emission Volumes of COD



Emission Volumes of Total Nitrogen



Emission Volumes of Total Phosphorus



Reduction of PRTR Substances

Survey on Emission Volume of PRTR Substances

Survey by Japan Chemical Industry Association (JCIA)

MGC has been taking the initiative in grasping and reducing the emission volume of the listed substances for PRTR survey by Japan Chemical Industry Association (JCIA) since 1995. We handled 70 substances among 480 JCIA survey substances in fiscal 2003. Total emission volume into the air/water/soil amounted to 517 tons in fiscal 2003. The volume decreased compare with in the fiscal year before for two straight year. Therefore, we have already attained the medium target to be achieved by the end of fiscal 2005.

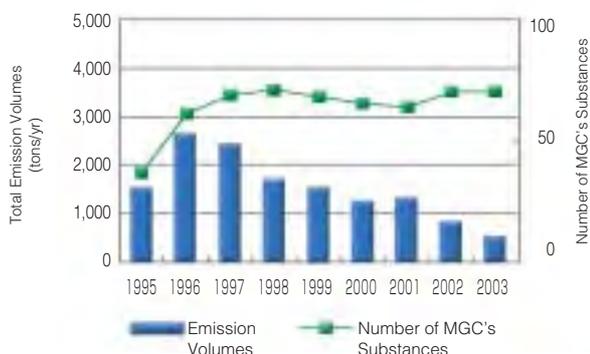
Reporting Data to Government Based on PRTR Law

MGC handled 45 substances among 354 substances specified by PRTR Law in fiscal 2003. Each workplace submitted its report to the government.

The total emission volume amounted to 315 tons, which meant the 40% decrease compared with in the fiscal year before. Emission volume into the air amounted to 272 tons, the one into water amounted to 43 tons and there was no emission into soil. Furthermore, the total volume of waste and transfer volume into sewerage amounted to 465 tons, which meant 13% decrease compared with in the fiscal year before.

The reported volume of emission and transfer of substances specified by PRTR law is shown below.

Total Emission Volumes of JCIA's PRTR Substances



Reduction of PRTR Substances

Medium Term Target

20% Reduction of the emission volumes of PRTR substances by fiscal 2005, compared with those in fiscal 1999.

Results

Achievement of the above mentioned target in fiscal 2002.

Reporting Data to Government Based on PRTR Law

	(Results in Fiscal 2002)	Results in Fiscal 2003
Substances	(43)	45
Emission Volume	(522 tons/yr)	315 tons
Transferred Volume	(536 tons/yr)	465 tons

PRTR Law Specified Chemical Substances (Actual Results In Fiscal 2003)

Unit : tons

Cabinet Order No	Substances	Air	Waters	Soil	Emission Total	Transfer Total
145	Dichloromethane (Methylene Chloride)	171.1	0.0	0.0	171.1	5.1
63	Xylene	72.2	0.0	0.0	72.2	25.4
283	Hydrogen fluoride & its water-soluble salt	0.3	15.0	0.0	15.3	0.6
42	Ethylene Oxide	10.0	0.0	0.0	10.0	0.0
311	Manganese & its compound	0.0	9.1	0.0	9.1	1.7
304	Boron & its compound	0.1	6.2	0.0	6.3	0.2
227	Toluene	6.2	0.0	0.0	6.2	2.6
253	Hydrazine	0.3	5.7	0.0	6.0	0.0
100	Cobalt & its Compound	0.0	5.5	0.0	5.5	1.8
40	Ethylbenzene	5.0	0.0	0.0	5.0	0.4
310	Formaldehyde	0.7	1.4	0.0	2.1	12.0
224	1,3,5-Trimethylbenzene	1.8	0.0	0.0	1.8	6.7
320	Methylmethacrylate	1.2	0.0	0.0	1.2	6.2
299	Benzene	1.2	0.0	0.0	1.2	0.2
99	Vanadium Pentoxide	0.5	0.0	0.0	0.5	4.8
312	Phthalic Anhydride	0.4	0.0	0.0	0.4	4.3
313	Maleic Anhydride	0.3	0.0	0.0	0.3	0.0
172	N,N-Dimethylformamide	0.2	0.0	0.0	0.2	9.4
54	Epichlorohydrin	0.2	0.0	0.0	0.2	0.0
108	Inorganic Cyanide Compound	0.0	0.1	0.0	0.1	0.0
	Other 25 Substances	0.2	0.0	0.0	0.2	383.8
	45 Substances Total	271.9	43.0	0.0	314.9	465.3

Reduction of Harmful Air Pollutants

The chemical industry takes the initiative with a voluntary management plan in reducing emission of Harmful Air Pollutants, 12 substances.

MGC is operating 6 substances, acetaldehyde, dichloromethane, ethylene oxide, 1,3-butadiene, benzene, formaldehyde, of among 12 substances. We are pushing forward reduction of their emissions taking the measures of sealing the facilities hermetically and combustion treatment or strengthening of recovery and / or elimination with cleaning exhaust gas from producing facilities.

In our second term plan, period of fiscal 1999 to 2003, we had continued to reduce emissions of 5 substances except for 1,3-butadiene which we ceased to handle.

Countermeasures Carried Out in Fiscal 2003

Benzene : We withdraw benzene from drain by fractional distillation and recycle it since fiscal 2001. We carried out the optimization of operation conditions.

Dichloromethane : Our efforts for reducing the emission volume by strengthening recovery overcame the increase of manufacturing using dichloromethane, and also we carried out the remarkable improvement of its unit consumption.

Ethylene Oxide : The hazardous substances eliminator was newly established, and is operated in fiscal 2004.



Hazardous Substances Eliminator for Exhaust Gas

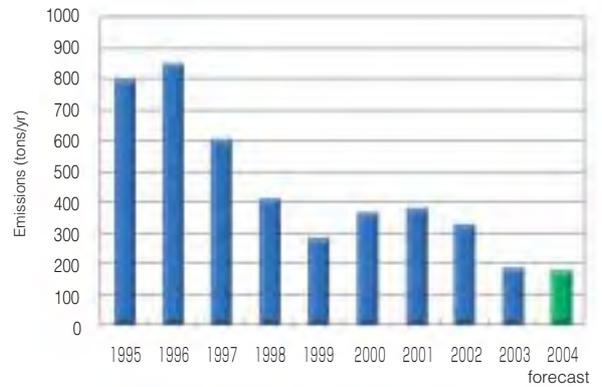
Discharged Amount of Harmful Air Pollutant Substances into the Air (Fiscal 2003)

Dichloromethane	171 tons/yr
Benzene	1.2
Ethylene Oxide	10
Formaldehyde	0.7
Acetaldehyde	0
1,3-Butadiene	(Non-handling)

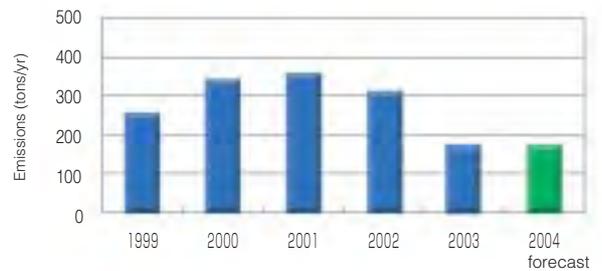
In fiscal 2003, we maintained zero emission of acetaldehyde and decreased emission of other 4 substances.

Finally, we achieved 34% reduction of total emission compared with fiscal 1999. We have already completed our 2nd term target not to increase based on fiscal 1999.

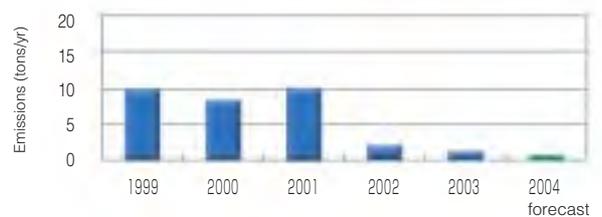
Gross Emission Volumes of Harmful Air Pollutants



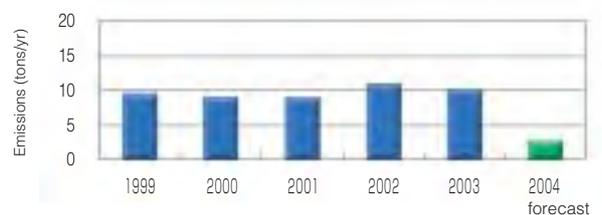
Dichloromethane



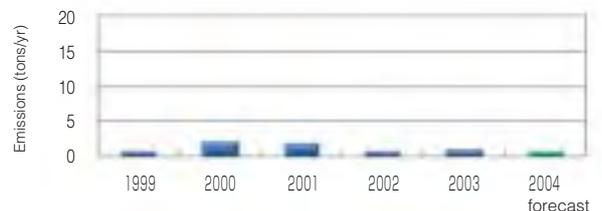
Benzene



Ethylene Oxide



Formaldehyde



Reduction of Waste and Waste Management

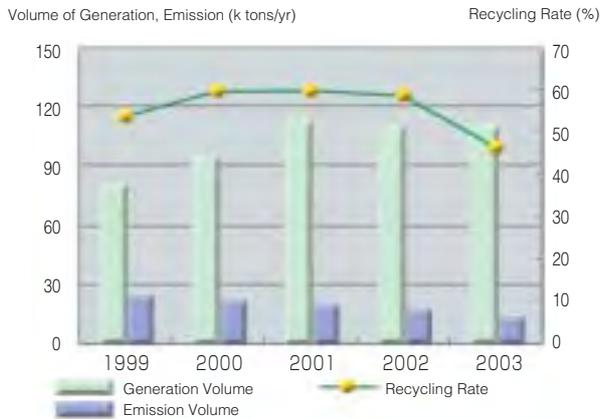
MGC recognizes the issue of waste treatment and its recycle as one of the management subjects. Under the structure of waste management of MGC, we position three items written below as integrated countermeasures for waste.

- (1) Promotion of 3R's of waste (Reduction, Reuse, Recycle)
- (2) Management of proper treatment (Observance of law, Management of consignees for waste treatment)
- (3) Final landfill volume being zero (Promotion of zero emission)

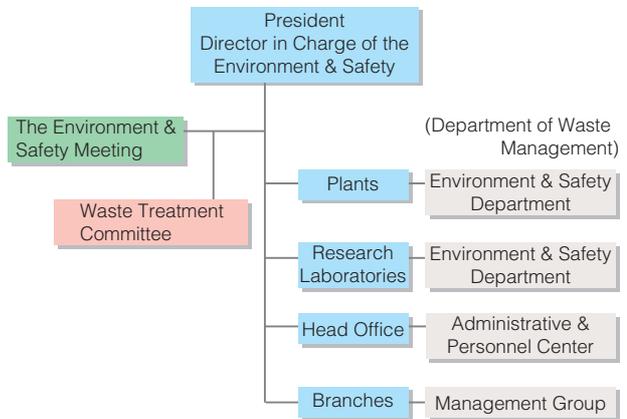
At the committee for countermeasures to waste, we confirm the reduction targets and actual results of all workplaces, the present management status of waste treatment of under takers, making the amendment of law known to everyone and exchange information. Through upper activities, we have been positively promoting the reduction of waste and its proper management.

Furthermore, we aim a more wide and tight connection with the relating companies, cooperative company located in workplaces, suppliers of raw materials and distributors.

Volumes of Generation/Emissions of Waste and Its Recycling Rate



Structure of waste Management

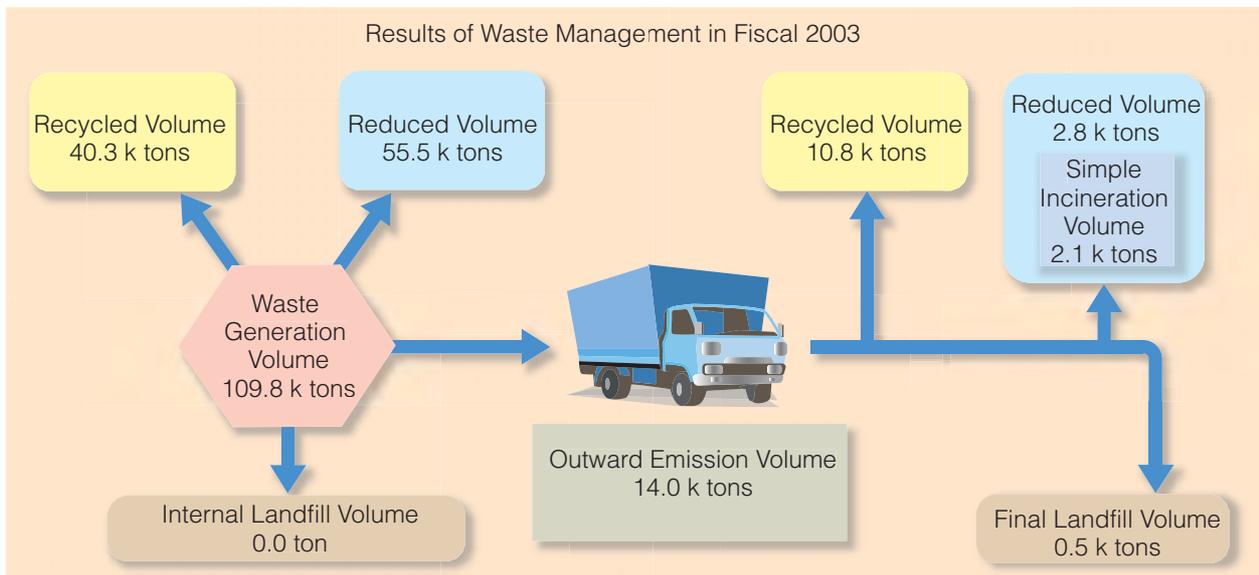


The waste volume generated by the process is 110k tons in fiscal 2003. We were able to reduce the waste volume to less than the one in the year before in spite of the increase of production volume.

The outward emission volume was 14k tons and we were able to have 20% reduction of it compared with the last fiscal year as result of the increase of internal reduction treatment volume (neutralization, dehydration, incineration) and the decrease of coal cinders, alkaline wastes, etc.

The recycling rate (47% = total recycled volume ÷ waste generation volume x 100) decreased compared with year before (59%), as a result mainly of changing the by-product, so far recovered internally as heat, to valuable products, and we are going to strengthen initiatives for separation and enlargement of new use for them.

Results of Waste Management in Fiscal 2003



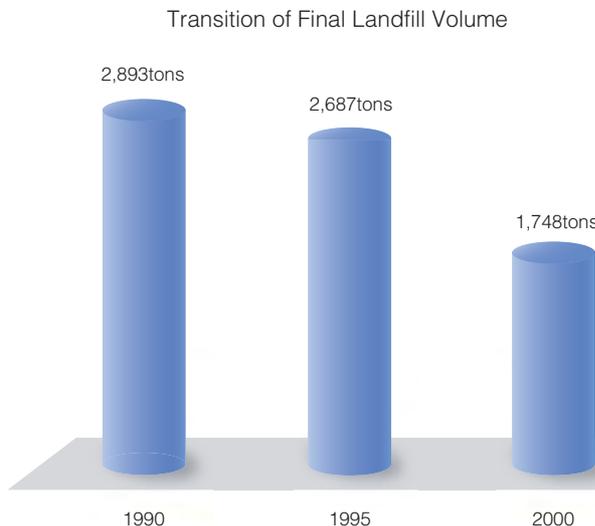
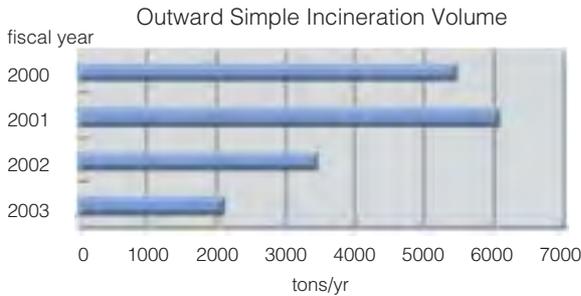
Zero Emission of Waste

Definition of "Zero Emission of Waste"

The 1st Stage Target :
Reduction of the final landfill volume to 1% or less of the outward waste emission volume to outside

The 2nd Stage Target :
Reduction of the final landfill volume to zero

In fiscal 2003 MGC reduced the outward emission waste volume by 20%, while the simple incineration volume was also reduced by 39%, as a result, the final landfill volume was 528 tons same as in the last fiscal year. By the way the ratio of the final landfill volume to the outward emission volume came to 3.7%. Sludge and waste plastics accounted for over 80% of the landfill waste. We strengthened separation of them for recycle use, and then sludge and waste plastics in final landfill waste became to 60% in fiscal 2003. In fiscal 2004 we are going to make more reduction of final landfill volume on the basis of more separation of valuable materials, enlargement of recycle, construction of vessel for dissolving waste plastics, etc.



MGC started in fiscal 2003 the initiatives to achieve zero emission of waste by two-step process together with the suppression of the outward emission volume of wastes and the reduction of the simple incineration not accompanying heat recovery.

Workplaces	Actual Results(%)	Zero Emission
Tokyo Plant	0	Completion of the 2 nd stage target
Niigata Plant	8.2	—
Mizushima Plant	10.9	Completion in the fiscal 2006 (forecast)
Yokkaichi Plant	0.8	Completion of the 1 st stage target
Osaka Plant	3.1	Completion in the fiscal 2005 (forecast)
Naniwa Plant	0	Completion of the 2 nd stage target
Yamakita Plant	4.4	Start of the reduction of simple Incineration
Kashima Plant	10.3	Target fixation of final landfill volume of zero

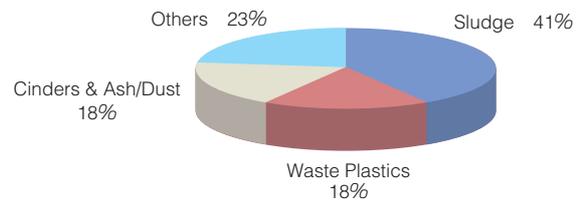
A Word from Plant

Mizushima Plant has been promoting 3R's of waste since the acquisition of ISO 14001 in 2000. The final landfill volume in fiscal 2003 was 200 tons out of the waste generation volume of 30,000 tons. We established the target of the final landfill volume in fiscal 2004 to be 120 tons. We will have to achieve the final landfill volume of zero in fiscal 2006 by the complete recycle of inflammable waste which is made possible by the start of operation of Waste Gasification and Melting Treatment Process in Mizushima Eco-Work Co., Ltd.



Mizushima Plant Environment & Safety Department
Masanobu Moriya

Breakdown of Final Landfill Wastes in Fiscal 2003



Target : Achievement of 1st stage target

Environment and Safety at Distribution

Efficiency of Logistics

MGC is making efforts for environmental preservation at distribution under the cooperation with manufacturers of raw materials, customers of our products and transportation companies.

We have been promoting to establish the new structure for integrated logistics system in which we centralize the many functions of logistics dispersedly belonging to every business department and shipping division in each workplace into "Logistic Center". This results in the unified collection of detail information on freights transported by the combination of great many kinds of transportation method and transportation distance and it furthermore makes classified division possible. For example, it can make the integrated transportation distance shortest and it also can make the allocation of cars reasonable and it finally results in the optimization of the amount and distance of transportation which are the most important factors in logistics.

In addition, it can make possible the more detailed grasp of realities and analysis of so far promoted initiatives such as modal shift, reduction of transportation times by the increase of loadage for one time and reduction of transportation volume by high density packaging and this results in the furthermore promotion of the afore-mentioned initiatives

We will contribute to the reduction of energy for transportation and discharge of carbon dioxide through these initiatives.

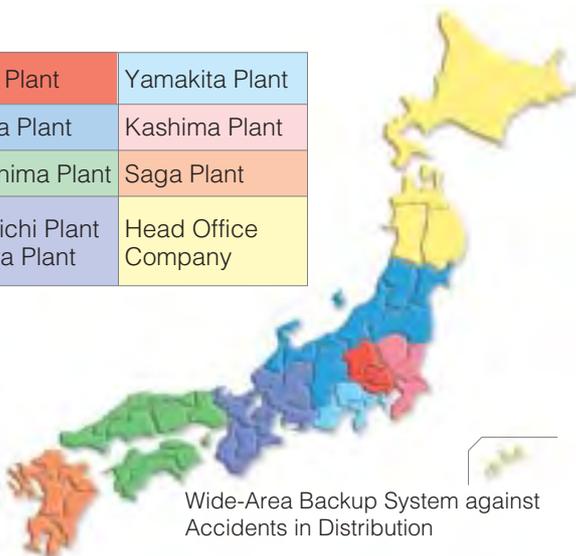
Backup System for Logistics Accidents over Wide Area

Each workplace of MGC is provided with machines and equipment for preventing disasters to deal with accidents on the transportation of products. Furthermore we have already constructed the backup system over wide area, which makes possible the connection among workplaces at the time of accidents happening and backup for emergency.

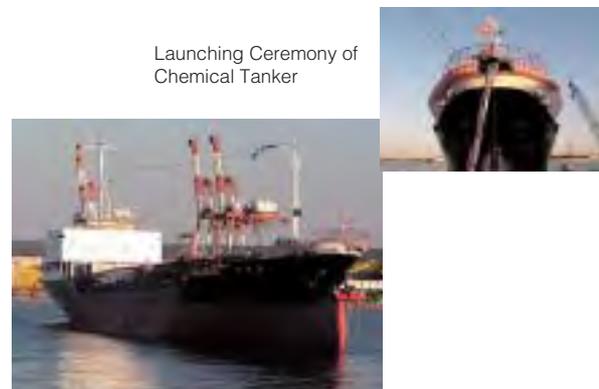
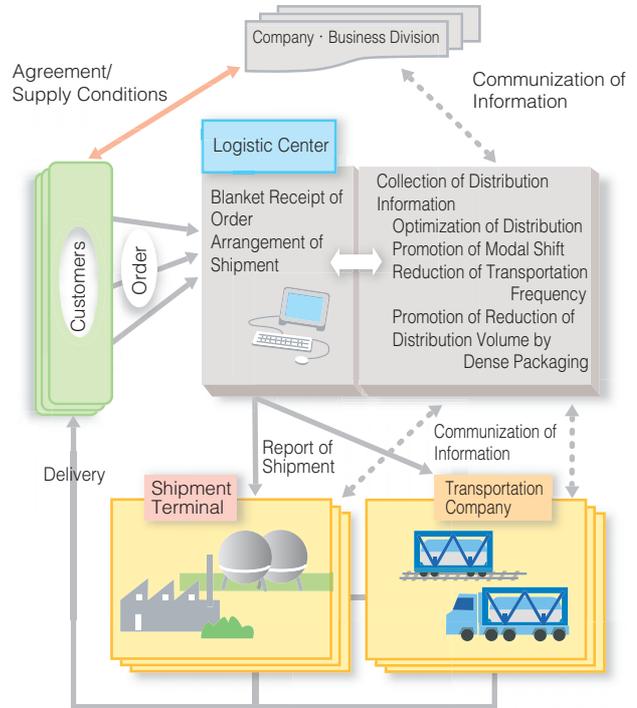
Flow Chart for Connection on Accident's Happening



Tokyo Plant	Yamakita Plant
Niigata Plant	Kashima Plant
Mizushima Plant	Saga Plant
Yokkaichi Plant Naniwa Plant	Head Office Company



Distribution System over Entire Company



Wagon for Machines & Equipment for Prevention of Disasters in Niigata Plant

Communication on the Environment

MGC is making an effort to actively disclose company's information and to contribute societies as a part of Responsible Care Activities.

Publication of Environmental Report of English Edition

We have published the Environmental Report since 2001 to promote our efforts for environment and safety.

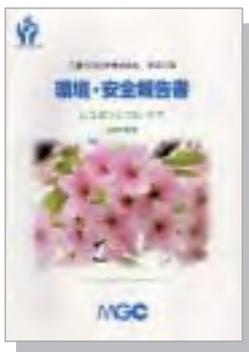
We have started the publication of English edition of this Report since 2003. You could read the Report both of Japanese and English edition on the Web (<http://www.mgc.co.jp>).



Participation to Community Dialogue Meeting on Responsible Care

The 1st community dialogue meeting on responsible care in northern Niigata area was held in March 2004, and Niigata Plant took part in it.

This community dialogue meeting is consisted of the four companies (four plants) located at Niigata City, Shinhatsuda City and Nakajo Town. In spite of the first meeting, there were about 130 participants from resident's self-government associations, NPO groups, related administrative authorities, etc. and the panel discussion, etc. were carried out. Niigata Plant distributed "Environment/Safety Report" originally published by itself since fiscal 2002 edition and make a presentation on our environmental preservation activities.



Environment/Safety Report
(Niigata Plant)

Participation in Exhibition



ECO-Manufacture2004

We together with our subsidiaries and affiliates participated in ECO-Manufacture 2004 (Trade Show for Manufacturing Industry Ecological Solutions) held on November 17-19 in 2004 and exhibited "F-SON[®]" for the separation and treatment of fluorine in waste water, "NEOSOL[®]" and "NEOPOCK[®]" both for the treatment of waste water from the process of painting, deodorant "DEOPOWER[®]" for the treatment of sewage and waste water, "Memory Green Crystal[®]" used for tree planting, technologies in DME fuel useful automobile. (Refer to Page 13 "Products/Technologies Contributing to Environment Preservation")

Contribution to Society

We volunteered for aid for sufferers from earthquakes, etc..

- Support for Damages by Earthquake at Chuetsu District in Niigata
We offered donation and relief goods through Japan Red Cross for the districts damaged by Niigata Chuetsu Earthquake.
In addition to the offer mentioned above, we also offered 300 sets of our product "Alfish[®]", the kit for transportation of colored carp, to back up the comeback of cultivators.
- Support for Damages by Earthquake at Offing of Sumatran Island
We offered donation to the Indonesian Government, the Government of the Kingdom of Thailand and the Red Cross of Japan for the backup of reconstruction.

Each workplace is making efforts to establish close rapport with local community through periodical participation in landscaping activities in the plant surrounding area, cooperation with the leadership for traffic safety, acceptance of workplace visits by local residents and students, opening of our welfare facilities, etc.

Learning Experience for Junior High School Students

Yamakita Plant carried out the learning experience for Yamakita Junior High School students in November. The object of this learning experience make students raise their motivation for professional consciousness consider their way of future life through the experience in actual workplace. Yamakita Plant has continuously accepted this learning since 2001 in response to Junior High School's request. After the explanation of outlines and products of Yamakita Plant, and experience of chemical experiments, they threw eagerly many questions to us.



Learning Experience for Junior High School Students

Landscaping Activities in the Plant Surrounding Area

Each workplace has carried out the periodical cleaning activities in the surrounding areas at settled "Clean Day" on our employee's own. In Yokkaichi Plant, as much as about 100 employees attended to the cleaning of road surrounding the plant.



Cleaning of Road Surrounding Plant

Participation in Events in Local Societies

Niigata Plant took part in the joint training for disaster prevention of Niigata Prefecture and Niigata City held in June. This year is the 40th anniversary of Niigata Earthquake in 1964. As a consequence, the training in this year was carried out in large scale to make the best use of past experiences.



Joint Training for Disaster Prevention of Niigata Prefecture and Niigata City

Yamakita Plant opens refreshment booth every year at the summer festival held by the neighborhood and companies located around here, and this is carried out from 10 years before. Through participation of this fair, we cultivate amity with residents. The proceeds obtained by the booth is donated to the social welfare council in local society.



Summer Festival

Opening Welfare Facilities

We open the grounds and gymnasiums of our workplaces for students of junior and senior high schools and residents in local society.

Niigata Plant opens the yard for residents every year at the time when cherry trees are in full bloom and they use it as a place of recreation and relaxation.



Row of Cherry Trees in the Yard

Environment and Safety Activities in Affiliates

MGC held twice "Information Exchange Meeting in MGC Group" to promote RC activities and also started the inspection on environment and safety of domestic affiliates which had already been carried out in the overseas affiliates.

Information Exchange Meeting

We made great efforts to raise the level of affiliates' capabilities on environmental preservation and occupational health and safety, through information exchange and discussion in the meeting.

We have been pushing forward the acquisition of ISO 14001 certification for the purpose of effective operation of environmental management system and one affiliate acquired this certification this year.

Inspection on Environment and Safety

We carried out the inspection on environment and safety of three affiliates of inside and outside of Japan respectively as the director in charge of the environment and safety being the inspection leader.

The procedure of this inspection for affiliate is as follows:①the explanation by the environment and safety manager of the affiliate on the stance of top management, the management system of health and safety, and the activities for safety and environmental preservation,②questions and answers,③on-the-spot observation,④review and comment by the inspection leader on the whole of the inspection.

Environment/Safety Activities of Each Company

Local Communication
(Eco-Line in Kanuma)
JSP Corporation



Training for Prevention of Disaster
on the Assumption of earthquake
(Preparation of Sandbag)
Japan Circuit Industrial Co., Ltd.



Safety Inspection Patrol of Newly
Installed Facility
Electrotechno Co., Ltd.



Recycle by Apparatus for Classification and Recovery of Wastes
Japan Pionics Co., Ltd.

Making Waste Fluid Harmless by
Incinerator
Japan Hydrazine Co., Inc.



Fire-Drill (Operation of Fire
Extinguisher)
Japan U-PiCA Co., Ltd.



Fire-fighting Exercise
Eiwa Chemical Ind. Co., Ltd.

Cleaning around Plant Yard
Toyo Kagaku Co., Ltd.



Member Company of Information Exchange Meeting

JSP Corporation
Japan Pionics Co., Ltd.
Fudow Co., Ltd.
Electrotechno Co., Ltd.

Japan U-PiCA Co., Ltd.
A. G. International Chemical Co., Inc.
Eiwa Chemical Ind. Co., Ltd.
Japan Circuit Industrial Co., Ltd.

Japan Hydrazine Co., Inc.
Mizushima Aroma Co., Ltd.
Toyo Kagaku Co., Ltd.

Environmental Load Data at Main Plants

Natural Gas Chemicals Company

Niigata Plant

Location : 3500, Matsuhama-cho,
Niigata City, Niigata Pref. 950-3121

Telephone : 025-258-3474

Land Area : 1,200,000m²

Main Products :

- Ammonia
- Formalin
- Methyl Methacrylate



Consumption of Industrial Water	m ³	10,990,000
Discharge of CO ₂	k tons	520
Discharge of NO _x	tons	380
Discharge of SO _x	tons	2
Total Discharge of Water	m ³	7,169,000
Discharge of COD	tons	33
Outward Emission Waste	tons	2,228
Final Landfill Waste	tons	182

Substance Specified by PRTR	Emission (tons)	Transfer (tons)
Ethylene Oxide	10.000	0.000
Methyl Methacrylate	1.200	6.200
Vanadium Pentoxide	0.500	4.800

Aromatic Chemicals Company

Mizushima Plant

Location : 3-10, Mizushima
Kaigandori, Kurashiki City, Okayama
Pref. 712-8525

Telephone : 086-446-3822

Land Area : 540,000 m²

Main Products :

- Xylenes
- Aromatic Aldehydes
- Phthalic Anhydride



Consumption of Industrial Water	m ³	12,612,000
Discharge of CO ₂	k tons	622
Discharge of NO _x	tons	325
Discharge of SO _x	tons	372
Total Discharge of Water	m ³	11,234,000
Discharge of COD	tons	133
Outward Emission Waste	tons	1,869
Final Landfill Waste	tons	204

Substance Specified by PRTR	Emission (tons)	Transfer (tons)
Xylene	67.015	24.000
Hydrogen Fluoride & Its Water Soluble Salt	15.330	0.000
Ethylbenzene	5.002	0.370

Specialty Chemicals Company

Kashima Plant

Location : 35 Higashi Wada,
Kamisu-machi, Kashima-gun,
Ibaraki Pref. 314-0102

Telephone : 0299-96-3121

Land Area : 332,000 m²

Main Products :

- Hydrogen Peroxide
- Polycarbonate



Consumption of Industrial Water	m ³	1,638,000
Discharge of CO ₂	k tons	148
Discharge of NO _x	tons	4
Discharge of SO _x	tons	1
Total Discharge of Water	m ³	1,526,000
Discharge of COD	tons	11
Outward Emission Waste	tons	603
Final Landfill Waste	tons	62

Substance Specified by PRTR	Emission (tons)	Transfer (tons)
Dichloromethane	170.000	0.500
4,4'-Isopropylidene Diphenol	0.000	16.000

Environmental Load Data at Main Plants

Specialty Chemicals Company

Yokkaichi Plant

Location : 4-16, Hinagahigashi

2-chome, Yokkaichi City,

Mie Pref. 510-0886

Telephone : 0593-45-8800

Land Area : 185,000 m²

Main Products :

- Hydrogen Peroxide
- Hydrazine Hydrate
- Polyacetal



Consumption of Industrial Water	m ³	6,888,000
Discharge of CO ₂	k tons	152
Discharge of NO _x	tons	36
Discharge of SO _x	tons	35
Total Discharge of Water	m ³	803,000
Discharge of COD	tons	21
Outward Emission Waste	tons	7,045
Final Landfill Waste	tons	55

Substance Specified by PRTR	Emission (tons)	Transfer (tons)
Hydrazine	3.200	0.000
Boron & Its Compound	2.000	0.000
Formaldehyde	1.670	12.000

Specialty Chemicals Company

Yamakita Plant

Location : 950 Kishi, Yamakita-machi,

Ashigarakami-gun,

Kanagawa Pref. 258-0112

Telephone : 0465-75-1111

Land Area : 63,000 m²

Main Products :

- Ultra-pure Hydrogen Peroxide
- Persulfates
- Chemical Polishing Agents



Consumption of Industrial Water	m ³	7,324,000
Discharge of CO ₂	k tons	13
Discharge of NO _x	tons	11
Discharge of SO _x	tons	6
Total Discharge of Water	m ³	7,061,000
Discharge of COD	tons	13
Outward Emission Waste	tons	407
Final Landfill Waste	tons	18

Substance Specified by PRTR	Emission (tons)	Transfer (tons)
Hydrogen Fluoride & Its Water Soluble Salts	0.000	0.590

Specialty Chemicals Company

Osaka Plant

Location : 2-12, Kamisu-cho,

Toyonaka-city, Osaka 561-0823

Telephone : 06-6333-3121

Land Area : 30,000 m²

Main Product :

- Polycarbonate Sheet



Consumption of Industrial Water	m ³	125,000
Discharge of CO ₂	k tons	7
Discharge of NO _x	tons	0
Discharge of SO _x	tons	0
Total Discharge of Water	m ³	125,000
Discharge of COD	tons	0
Outward Emission Waste	tons	224
Final Landfill Waste	tons	7

Substance Specified by PRTR	Emission (tons)	Transfer (tons)
None		

Information & Advanced Materials Company

Tokyo Plant

Location : 1-1, Niijuku 6-chome,

Katsushika-ku, Tokyo 125-8601

Telephone : 03-3627-9411

Land Area : 120,000 m²

Main Product :

- BT Resin
- Ageless



Tokyo Plant is promoting tree and flower planting on the roof of its building.

Consumption of Industrial Water	m ³	245,000
Discharge of CO ₂	k tons	17
Discharge of NO _x	tons	8
Discharge of SO _x	tons	2
Total Discharge of Water	m ³	258,000
Discharge of COD	tons	2
Outward Emission Waste	tons	1,616
Final Landfill Waste	tons	0

Substance Specified by PRTR	Emission (tons)	Transfer (tons)
N,N-Dimethylformamide	0.231	2.417

Location of Other Plants and Research Laboratories

Natural Gas Chemicals Company

Niigata Research Laboratory

Location : 182, Tayuhama Aza-shinwari,

Niigata-city, Niigata Pref. 950-3112

Telephone : 025-259-8211

Specialty Chemicals Company

Naniwa Plant

Location : 3-27, Funamachi 1-chome,

Taisho-ku, Osaka-city, Osaka 551-0022

Telephone : 06-6551-3371

Saga Plant

Location : 681-45, Aza-nawashirosumoba,

Oaza-Kamikumagawa, Fujimachi, Saga-gun,

Saga Pref. 840-0512

Telephone : 0952-64-2400

Aromatic Chemicals Company

Hiratsuka Research Laboratory

Location : 6-2, Higashiyawata 5-chome,

Hiratsuka-city, Kanagawa Pref. 254-0016

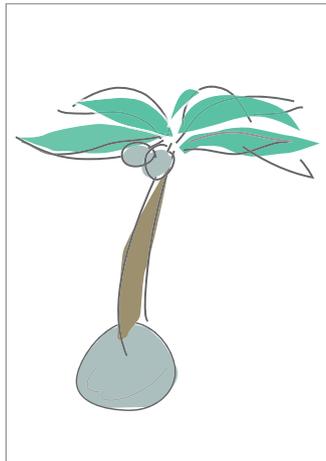
Telephone : 0463-21-8600

Tokyo Research Laboratory

Location : 1-1, Niijuku 6-chome, Katsushika-ku,

Tokyo 125-0051

Telephone : 03-5699-9711



MGC

MITSUBISHI GAS CHEMICAL COMPANY, INC.

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