


4. PRODUCTION

4. Production

 Global environmental problems

Global environmental problems	Global warming, destruction of the ozone layer, depletion of earth's resources
Environmental problems over a wide area	Acid rain, photochemical smog
Local environmental problems	Air, water and soil pollution, noise, vibration, bad smells, ground subsidence

Automobile production activities have a bearing on everything from environmental problems at the local level to global environmental concerns. Because of this, MMC recognizes the importance of comprehensive action to constantly reduce the impact of its activities on the environment.

 Environmental protection at the production stage

MMC produces various kinds of vehicles, such as passenger cars, commercial vehicles, minicars, small, medium and large-sized trucks and buses, at its four plants in Japan. Many components are sourced from specialist makers, while processing and overall assembly of the main engine, transmission and chassis parts take place in-house.

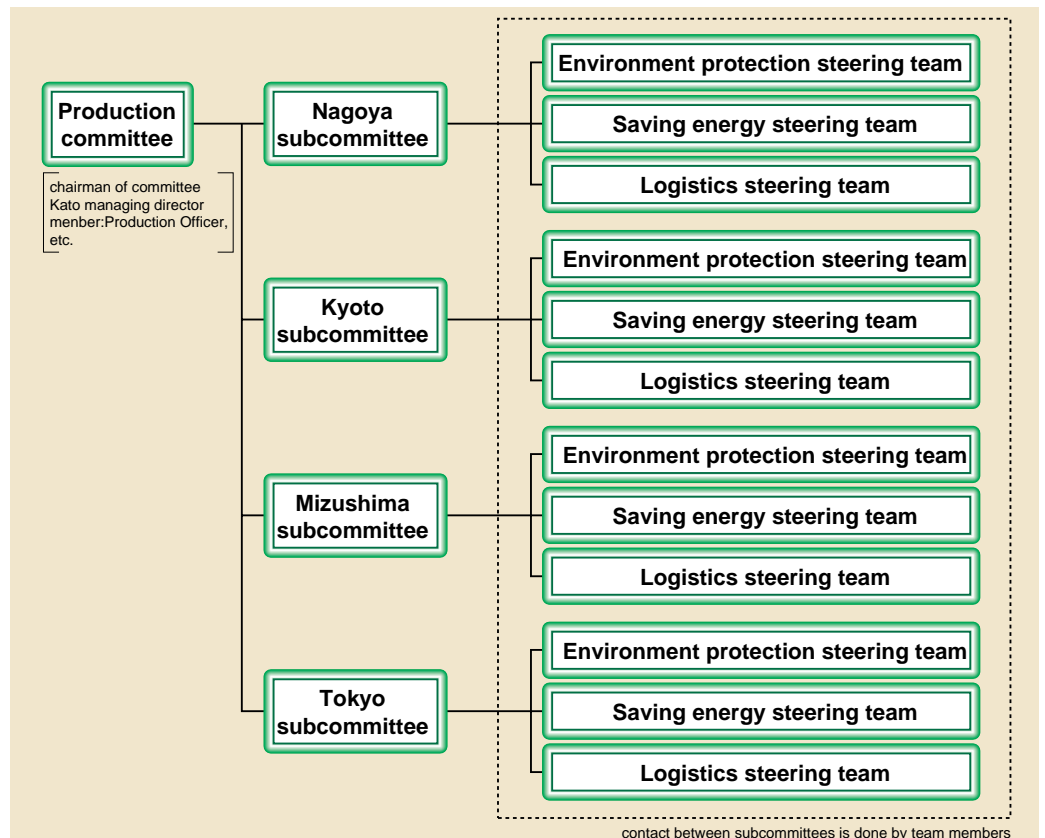
In addition to different models being produced at each plant, production also consists of a number of processes, such as casting, forging, machining, plastic molding, stamping, welding, painting and assembly.

With different models being produced in different locations through a number of production processes, ISO14001-compliant environmental management practices are being introduced to ensure that the entire company-every office, plant, product and part-is made more environmentally friendly. Every possibly effort is being made to tackle environmental problems, and some of the activities now being pursued by the Environmental Council's Production Committee include:

- Environmental impact reducing production processes
- Prevention of global warming through conservation of energy
- Reduction of waste and effective use of the earth's resources
- Concern for the environment when locating and building new facilities
- Improvement of logistics
- Cooperation with affiliates in Japan and overseas,etc.

Composition of the Environmental Council's Production Committee

Environmental problems related to production



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Models produced by MMC

plant		Mainproducts
Nagoya works	Oye plant	DEBONAIR DIAMANTE GTO L300 (export car) CHALLENGER PAJERO IO SMALL BUS
	Okazaki plant	GALANT ASPIRE LEGNUM CHARIOT GRANDIS RVR
Mizushima works		MIRAGE ASTI LANCER MIRAGE DINGO FTO LIBERO LIBERO CARGO DELICA STAR WAGON DELICA TRACK DELICA SPACE GEAR MINICA TOPPO BJ TOPPO BJ WIDE TOWN BOX TOWN BOX WIDE MINICAB MINICAB TRACK PAJERO MINI
Tokyo works	Kawasaki plant	Large-sized Truck Medium-sized Truck Small-sized Truck Special Large-sized Truck
	Nakatsu plant	Small-sized Truck

Models produced by Main affiliates

- Mitsubishi Automotive Bus Manufacturing Co.,Ltd.
Large-sized Bus/Medium-sized Bus
- Pabco Co., Ltd.
Large-sized Truck/Medium-sized Truck/Small-sized Truck
- Pajero Manufacturing Co.,Ltd.
PAJERO
- Mizushima Processing Co.,Ltd.
DELICA Truck/MINICAB Truck

Environmental problems related to production

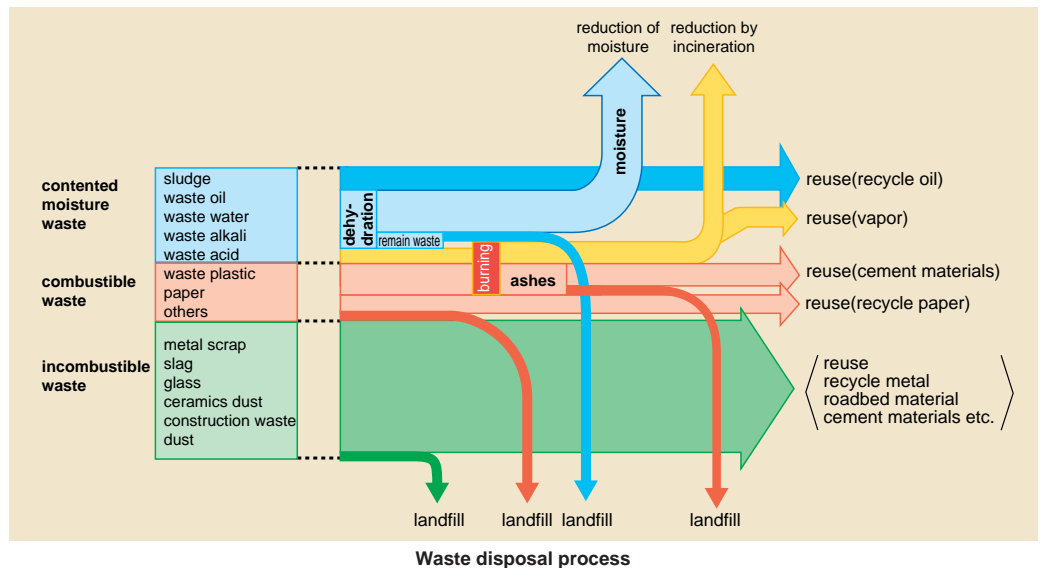
plant		main products	production process
Nagoya Works	Oye plant	passenger car, commercial vehicle, small-size bus	machining, resin forming, stamping, welding, painting, assembling
	Okazaki plant	passenger car	stamping, welding, painting, assembling
Kyoto Works	Kyoto plant	passenger car engine and transmission, industrial engine	casting, machining
	Shiga plant	passenger car engine	machining
Mizushima works		passenger car, commercial vehicle, mini-sized car, mini-saized car engine and transmission	casting, forging, machining, stamping, welding, painting, assembling
Tokyo works	Kawasaki plant	large-sized truck, medium-sized truck, small-sized truck, special large-size truck, engine for truck and bus	casting, machining, stamping, welding, painting, assembling
	Maruko plant	transmission for truck and bus	machining
	Nakatsu plant	industrial engine, small-sized truck	assembling

Measures to protect the environment

Approach to waste disposal

A priority in relation to waste disposal at the production stage is reduction of landfill waste through development of production processes that minimize the amount of waste generated, and greater recycling and reuse of resources.

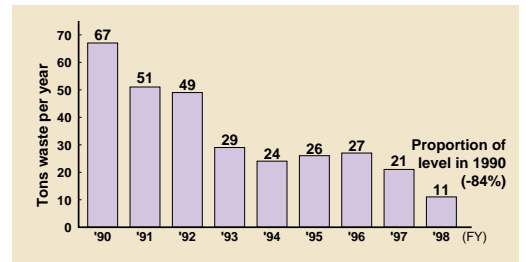
The sort of waste generated during production includes things such as scrap metal, slag (waste casting sand, etc.), sludge, waste plastic, and paper. The first step is to reduce the amount generated in the first place by improving process and extraction of materials. Waste that is still generated should then be recycled and reused as much as possible. Where this is not feasible, the volume should be reduced though intermediate treatment methods, such as dehydration, concentration and incineration, and the remainder disposed of in landfills.



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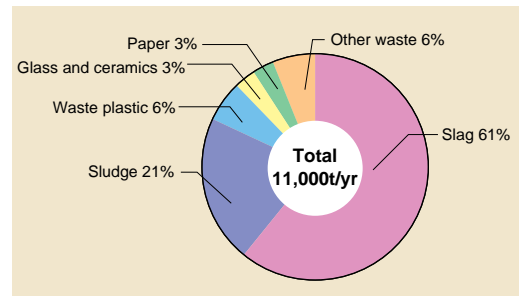
■ Reduction of waste

We aim to reduce the volume of waste for landfill by at least 80% compared with that of fiscal 1990 by the end of fiscal 2000, and by increasing reuse of waste casting sand for cement aggregate and expanding its use as a modifier for blast furnaces, we reduced landfill waste by 10,000 tons from fiscal 1997 to 11,000 tons in fiscal 1998. This is equivalent to a reduction of 84% in comparison with fiscal 1990.



Amount of landfill waste generated per year, FY1990-98

As it will likely become increasingly difficult to find landfill sites in the future, we are working toward eliminating landfill waste altogether by, for example, further reducing the volume of waste generated, expanding recycling and reuse, and compacting waste.



Breakdown of waste for landfill, FY1998

Recycling

MMC is promoting recycling of waste casting sand for cement materials, compacting of paint sludge, and compacting and recycling of waste paper generated by MMC offices.

In addition, energy is recovered from combustibles such as paper, waste wood and waste plastic by incinerating them in a waste heat boiler, and steam used at our plants in the interests of thermal recycling.

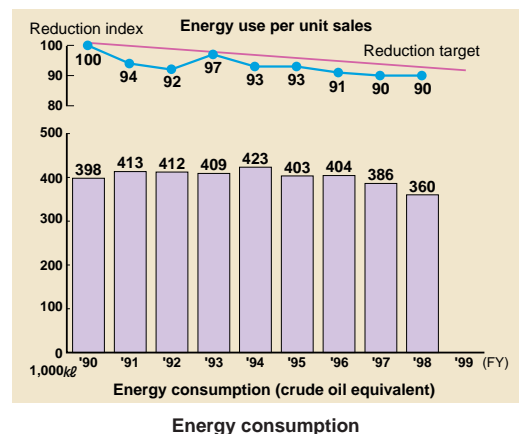
generate source	kinds of waste	recycle case
casting shop	waste casting sand	cement materials, roadbed material, iron material
stamping shop	metal scrap	casting material
painting line	chemical sludge	cement materials
	paint sludge	oil absorption material, fuel
	washing thinner	recycle thinner, fuel
whole plants	waste oil	recycle oil, fuel
	plastic waste	plastic material, fuel
	dust	cement materials
office	paper	recycle paper

■ Energy conservation

Various sources of energy, such as electricity, city gas, oil and coke, are used to meet the energy demands of the production processes outlined above and power facilities such as compressors and boilers.

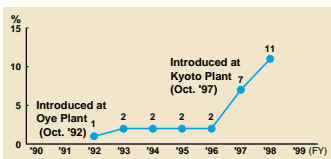
Our energy conservation target is to reduce energy use per unit sales in fiscal 2000 to 10% of what it was in fiscal 1990, and as a result of the activities of the Energy Conservation Team, we were already within sight of this target in fiscal 1998.

Other measures so far taken to save energy include the introduction of cogeneration systems, insulation of industrial furnaces, switching to use of more energy efficient equipment and facilities, use of energy-saving raw materials, and lowering of processing (control) temperatures.



Introduction of cogeneration systems

Cogeneration systems are gas-turbine powered heat and electricity generating facilities that emit 40% less CO₂ than conventional methods of supplying energy.



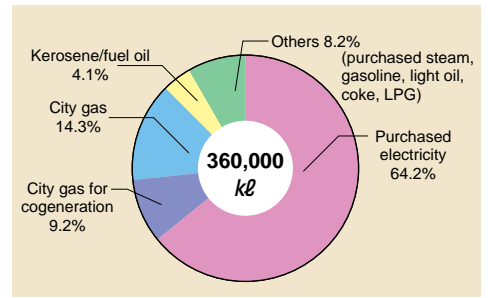
Percentage of electricity needs supplied in-house (whole company)



Cogeneration facility at Oye Plant

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Because of the rising trend in energy consumption in recent years due to factors such as greater automation, improvement of the working environment, and the increase in equipment and facilities accompanying the improvement in performance and range of functions of products, we aim to save energy at every stage of plant planning, and monitor actual energy consumption each month to ensure targets set twice yearly are being met.



Breakdown of energy consumption, FY1998 (crude oil equivalent)

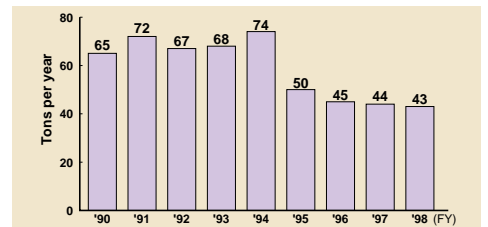
■ Protection of the ozone layer

Use of two ozone-depleting substances-CFC¹ used to foam urethane products and 1.1.1-trichloroethane used for cleaning heat-treated parts-was completely halted in 1995.

■ Prevention of air pollution

SOx

The shift since the seventies to use of cleaner energy sources containing less sulfur, such as kerosene and city gas, for use as fuels for combustion facilities such as boilers and industrial furnaces, has enabled SOx emissions to be kept extraordinarily low.



SOx

NOx

We have made every effort to minimize NOx emissions, such as by installing low NOx boilers, and using low NOx burners and clean energy sources such as kerosene and city gas, and will continue taking active steps to conserve energy and cut fuel use and NOx emissions in the future too.

At some of our plants, NOx emissions are constantly monitored and continuous data on emissions regularly transmitted to the municipal authorities.

Dust

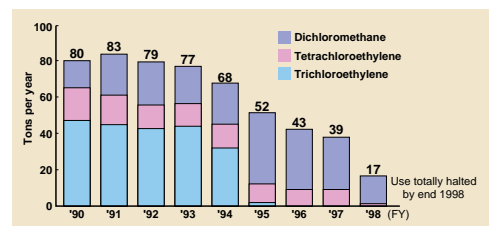
We are working to cut emissions of dust generated by casting facilities, boilers and waste incinerators, etc. by capturing dust with high-performance dust collectors such as bag filters and removing it using afterburners, and also limit emissions by proper maintenance and control of combustion.

VOC²⁾

Emissions of VOCs in the painting process are being reduced by, for example, painting cars using equipment that applies paint more effectively, recovering thinner used to clean paint guns, taking steps to reduce emissions of gases from paint ovens, and using water-based and powdered paints for painting parts.

Chlorine-based cleaning agents

Use of trichloroethylene, tetrachloroethylene and dichloromethane for cleaning parts was gradually reduced by altering cleaning methods and using water-based cleaning agents instead (see below). Use of all three substances was totally halted by the end of FY 1998.



Use of chlorine-based cleaning agents



1) CFC

Chlorofluorocarbon



2) VOC

Volatile organic compound

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1) COD

Chemical oxygen demand: used as a measure of water pollution

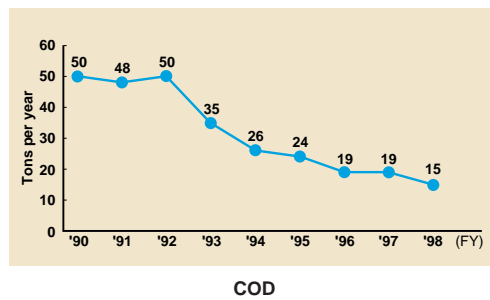
■ Prevention of water pollution

Sources of water pollution at plants include process wastewater generated during production processes such as painting, and domestic-grade wastewater from cafeterias and toilets. As the pollution load varies depending on the process, the wastewater from each process is first put through appropriate primary and secondary treatment before going through advanced wastewater treatment (such as activated carbon filtration) in a general wastewater treatment facility.

The quality of water discharged into public bodies of water is controlled in accordance with voluntary standards that are stricter than legal requirements. The quality of discharges is constantly monitored using colored carp and goldfish and by automatically measuring COD.¹⁾ We have also taken every possible precaution to deal with emergencies, such as installing emergency water tanks.



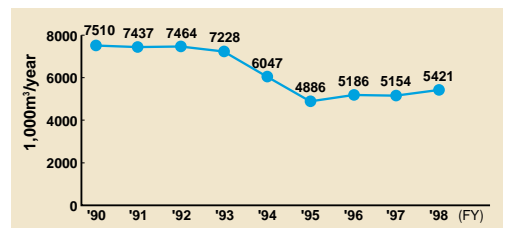
Colored carp raised on plant wastewater are given to elementary schools every year.



General wastewater treatment facility

Rationalization of water use

The water used during production includes groundwater, industrial water and municipal water. In order to help conserve resources, we always seek to rationalize water consumption through cutting use by making use of water at multiple stages and changing production methods, and by using cooling towers to recycle coolant and water used for temperature control. Treated plant wastewater is also reused for sprinkling some of the green areas around our plants.



Volume of water discharged into public bodies of water



2) Eutrophication

Oversupply of nutrients such as nitrogen and phosphorus in enclosed bodies of water such as lakes, marshes and bays results in an abnormal proliferation of plankton and the occurrence of red and blue tide, which harms the fishing industry and reduces water quality by causing it to smell.

Action to prevent eutrophication²⁾

In order to cut discharges of nitrogen and phosphorus, which are a cause of eutrophication, we use nitrogen and phosphorus-free subsidiary materials and denitrify wastewater in our wastewater treatment systems.

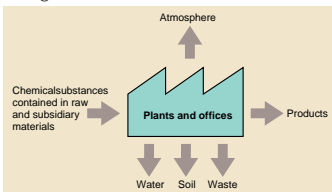
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1) PRTR

Pollutant release and transfer register

PRTR is a system whereby businesses monitor release and transfer of certain chemical substances from plants and offices themselves, and report their findings to the authorities, who then aggregate and publish them along with data on harmfulness.



■ **Prevention of noise and vibrations**

In order to reduce the impact on localities around plants from main sources of noise and vibrations, such as stamping, compressors, blowers and engine test sites, we are making increasing use of quiet, non-vibrating equipment, improving layout and improving sound insulation of buildings, and soundproofing and vibration-proofing of production facilities.

When establishing new facilities, we also conduct simulations of noise and vibration levels off-site to enable appropriate countermeasures.

■ **Reduction of bad odors**

Casting shops, painting lines, wastewater treatment facilities and waste incinerators etc. are all sources of bad odors. These smells are dealt with in various ways depending on their individual properties. Solutions include activated carbon adsorption, afterburning (direct and catalytic combustion) and deodorization by chemical dosing.

■ **Chemical substances management**

In fiscal 1997/8, MCC's Okazaki Plant (in Aichi Prefecture) and Kawasaki Plant (in Kanagawa Prefecture) took part in the Environmental Agency's pilot PRTR¹⁾ project. All eight plants also participated in Keidanren's own voluntary trial PRTR program in order to keep track of use, release and transfer of chemical substances and increase the accuracy of monitoring.

Data obtained in the course of these PRTR programs will be used to help ensure proper handling of chemical substances and limit their use. And in addition to the current system of prior investigation of the harmfulness of new chemicals, we are also developing a system for aggregating chemical substances.

■ **Dioxins**

We are working to limit emissions of dioxins by taking comprehensive action to, for example, improve waste incinerator facilities and ensure proper combustion control and disposal of incinerated substances (e.g. by sorting waste containing chlorine and compacting incinerated materials). Also in order to cut dioxin emissions, we are making increasing use of non-chlorine-based cutting oil for machining.

■ **Cooperation with affiliates**

The Mitsubishi Motors Group Plant Environment Liaison Council, comprising representatives of the five main members of the Mitsubishi Motors Group, meets twice a year, and MMC uses these occasions to share information with its affiliates and urge them to take environmental action on a par with its own.

We also publish the biannual "Mitsubishi Motors Environmental Topics", which is distributed to 119 affiliates (including the above five) and other companies with which we do business, and provide information about national and industry trends and developments and steps being taken by the company to tackle environmental problems.

4. PRODUCTION

TOPICS

Learning from our predecessors

"Neither destroy good fields nor disturb the peace of the community."



The advice of Koyata Iwasaki carved in stone at the Mizushima Works



Koyata Iwasaki

Born 1879, Mitsubishi's fourth president was motivated by a strong desire to serve society and the nation through business.

Kurashiki, home to MMC's Mizushima Works, is a historic city with a rich cultural past, and is set amid beautiful natural surroundings facing onto the scenic Seto Inland Sea National Park. The Mizushima area on the coast is one of Japan's leading industrial complexes, and numerous other companies have located there as well as MMC. Many years ago when MMC's forerunner, Mitsubishi Heavy Industries, became one of the first firms to move into the area, the then president, Koyata Iwasaki, looked around at the green sea of rice paddies and ordered "Do not destroy good fields". And that is how the Mizushima Works came to be located where it now is.

Since then, MMC has held fast to this principle, and has constantly sought to protect the natural environment and maintain its close ties with the local community.

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Environmental data on individual plants

Emission levels and main indices for air and water pollution at each plant are as follows. (Ceilings indicate the strictest limits as required by law, ordinance or the Antipollution Agreement. Emission levels are the highest levels reached according to data for fiscal 1998.)

- COD:** Chemical Oxygen Demand
- BOD:** Biochemical Oxygen Demand
- SS:** Suspended Solid
- ND:** Not Detected

Oye Plant



Employees: 2,382

Nagoya Works Oye Plant

The air

Substances	Equipment	Unit	Regulation	Actual value
Nitrogen oxide	Boiler	ppm	64	59
	Oven	ppm	25	22
	Incinerator	ppm	74	69
	Gas Turbine	ppm	39	34
Dust	Boiler	g/Nm ³	0.2	0.002
	Oven	g/Nm ³	0.2	0.001
	Incinerator	g/Nm ³	0.4	0.091
	Gas Turbine	g/Nm ³	0.04	0.001
Sulfur oxide(sulfur rate in fuel)	wt %	0.05	0.003	

The water

Substances	Unit	Regulation	Actual value
BOD	mg/l	20	5.4
SS	mg/l	20	14
Oil	mg/l	5	1.5
Total nitrogen	mg/l	15	8.4
Total phosphate	mg/l	2	0.63
Copper	mg/l	1	0.18
Total chrome	mg/l	2	0.1
Lead	mg/l	0.1	0.02
Manganese	mg/l	10	0.3

Okazaki Plant



Employees: 1,399

Nagoya Works Okazaki Plant

The air

Substances	Equipment	Unit	Regulation	Actual value
Nitrogen oxide	Small boiler	ppm	120	42
	Boiler	ppm	100	59
	Oven	ppm	250	99
	Incinerator	ppm	200	140
Dust	Small boiler	g/Nm ³	0.1	0.001
	Boiler	g/Nm ³	0.1	0.001
	Oven	g/Nm ³	0.1	0.001
	Incinerator	g/Nm ³	0.1	0.09
Sulfur oxide(sulfur rate in fuel)	wt %	1	0.003	

The water

Substances	Unit	Regulation	Actual value
BOD	mg/l	10	3.2
COD	mg/l	10	4.6
SS	mg/l	10	1.2
Oil	mg/l	2	0.7
Total nitrogen	mg/l	15	4.8
Total phosphate	mg/l	2	0.1
Copper	mg/l	0.5	0.01
Total chrome	mg/l	0.1	0.02
Lead	mg/l	0.1	0.005
Manganese	mg/l	3	0.5

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Kyoto Plant



Employees: 2,937

Kyoto Works Kyoto Plant

The air

Substances	Equipment	Unit	Regulation	Actual value
Nitrogen oxide	Boiler	ppm	150	49
	Melting furnace	ppm	200	13
	Oven	ppm	230	45
	Incinerator	ppm	250	59
	Gas Turbine	ppm	70	40
Dust	Boiler	g/Nm ³	0.1	0.001
	Melting furnace	g/Nm ³	0.1	0.002
	Oven	g/Nm ³	0.2	0.026
	Incinerator	g/Nm ³	0.5	0.055
Sulfur oxide(sulfur rate in fuel)		wt %	0.5	0.022

The water

Substances	Unit	Regulation	Actual value
BOD	mg/l	20	3.8
COD	mg/l	20	2.1
SS	mg/l	70	2.6
Oil	mg/l	5	1.3
Total nitrogen	mg/l	60	0.3
Total phosphate	mg/l	8	0.3
Copper	mg/l	3	0.05
Total chrome	mg/l	2	0.02
Manganese	mg/l	10	0.03
Zinc	mg/l	5	0.08

Shiga Plant



Employees: 544

Kyoto Works Shiga Plant

The air

Substances	Equipment	Unit	Regulation	Actual value
Nitrogen oxide	Boiler	ppm	150	64
Dust	Boiler	g/Nm ³	0.1	0.004

The water

Substances	Unit	Regulation	Actual value
BOD	mg/l	20	1.4
COD	mg/l	20	1.9
SS	mg/l	20	1.3
Oil	mg/l	5	0.5
Total nitrogen	mg/l	8	2.9
Total phosphate	mg/l	0.6	0.1
Copper	mg/l	1	0.001
Total chrome	mg/l	0.1	0.01
Manganese	mg/l	10	0.1
zinc	mg/l	1	0.08

Mizushima Plant



Employees: 4,262

Mizushima Works

The air

Substances	Equipment	Unit	Regulation	Actual value
Nitrogen oxide	Boiler	ppm	150	66
	Oven	ppm	230	46
	Incinerator	ppm	250	86
Dust	Boiler	g/Nm ³	0.1	0.001
	Oven	g/Nm ³	0.1	0.001
	Incinerator	g/Nm ³	0.1	0.058
Sulfur oxide(sulfur rate in fuel)		wt %	0.5	0.089

The water

Substances	Unit	Regulation	Actual value
BOD	mg/l	20	10
COD	mg/l	20	10
SS	mg/l	20	3.3
Oil	mg/l	1	0.4
Total nitrogen	mg/l	60	5.6
Total phosphate	mg/l	8	5.5
Copper	mg/l	3	0.02
Total chrome	mg/l	0.5	ND
Lead	mg/l	1	0.04
Manganese	mg/l	10	0.49
zinc	mg/l	5	0.24

4. PRODUCTION

Kawasaki Plant



Employees: 2,720

Maruko Plant



Employees: 567

Nakatsu Plant



Employees: 39

Tokyo Works Kawasaki Plant

The air

Substances	Equipment	Unit	Regulation	Actual value
Nitrogen oxide	Boiler	ppm	130	39
	Heating system	ppm	150	71
	Oven	ppm	250	18
Dust	Boiler	g/Nm ³	0.05	0.006
	Heating system	g/Nm ³	0.05	ND
	Oven	g/Nm ³	0.2	0.006
	Incinerator	g/Nm ³	0.4	0.17

The water

Substances	Unit	Regulation	Actual value
BOD	mg/l	300	79
SS	mg/l	300	76
Oil	mg/l	5	4.7
Total nitrogen	mg/l	150	7.5
Total phosphate	mg/l	20	2.7
Copper	mg/l	3	0.1
Manganese	mg/l	1	0.37
zinc	mg/l	3	0.17

Drain: Drainage

Tokyo Works Maruko Plant

The air

Substances	Equipment	Unit	Regulation	Actual value
Nitrogen oxide	Boiler	ppm	150	97
	Heating furnace	ppm	200	81
Dust	Boiler	g/Nm ³	0.2	ND
	Heating furnace	g/Nm ³	0.2	0.012

The water

Substances	Unit	Regulation	Actual value
BOD	mg/l	300	23
SS	mg/l	300	10
Oil	mg/l	5	4.1
Total nitrogen	mg/l	150	7.3
Total phosphate	mg/l	20	0.19
Copper	mg/l	3	0.1
Manganese	mg/l	1	0.15
zinc	mg/l	3	0.05

Drain: Drainage

Tokyo Works Nakatsu Plant

The air

Substances	Equipment	Unit	Regulation	Actual value
Nitrogen oxide	Boiler	ppm	250	71
Dust	Boiler	g/Nm ³	0.3	ND

The water

Substances	Unit	Regulation	Actual value
BOD	mg/l	300	10
SS	mg/l	300	25
Oil	mg/l	5	3.4
Total nitrogen	mg/l	150	0.47
Total phosphate	mg/l	20	0.1
Copper	mg/l	3	0.1
Manganese	mg/l	1	0.1
zinc	mg/l	3	0.05

Drain: Drainage