2000

Mitsubishi Motors
Environmental Report

MITSUBISHI MOTORS CORPORATION

CONTENTS

About the Environmental Report

This is the second of our annual environmental reports published to give the public a better understanding of the steps being taken by Mitsubishi Motors to protect the environment. It covers the 1999 fiscal year (from April 1, 1999 to March 31, 2000) focusing on environmental activities in Japan. To give the reader a clearer understanding of our efforts to protect the environment, we have made as much use of quantitative data as possible.

This report will continue to be published on an annual basis in the interests of active disclosure of environmental data and to raise awareness of Mitsubishi Motor's environmental activities both in the community and in society at large.

Corporate profile

Company name
MITSUBISHI MOTORS CORPORATION

Date of establishment
April 22, 1970

President & CEO (Representative Director)
Takashi Sonobe

Head office
5-33-8, Shiba, Minato-ku, Tokyo 108-8410, Japan

Stocks
Authorized stock: 2,814,160,000 (March 31, 2000)
Outstanding stock: 970,307,624 (March 31, 2000)
Number of stockholders: 38,614 (March 31, 2000)

Capital
¥150,730,455,926 (March 31, 2000)

Employees
25,846 (March 31, 2000)

Turnover
¥2,106,522,000,000 (FY1999)

Main lines of business
1) To develop, design, manufacture, assemble, sell or purchase, export and import and otherwise deal in motor vehicles and components thereof and replacement parts and accessories therefor.
2) To develop, design, manufacture, assemble, sell or purchase, export and import and otherwise deal in agricultural machinery and industrial engines, etc., and components thereof and replacement parts and accessories therefor.
3) To sell or purchase used motor vehicles and components thereof and replacement parts and accessories therefor.
4) To sell test-machines, meters, gauges, etc.
5) To carry out an agent's business of non-life insurance and insurance conformed to the Automobile Accident Compensation Security Act.
6) To carry out any business incidental or relating to any of the foregoing.

Introduction

The 21st Century - The century of the environment

As we stand now on the verge of the 21st century, concern about environmental problems is growing around the world. It is no exaggeration to say that protecting the environment is one of the biggest challenges ever faced by humankind, requiring a shift from the mass production, mass consumption and mass generation of waste that typified the 20th century, to the creation in the 21st century of a sustainable society based on recycling.

For our part at Mitsubishi Motors, we have made "making good products that last for a long time" a core corporate goal as part of moves to protect the global environment. At every stage of our activities, from the development and production to the sale and servicing of motor vehicles, we seek to minimize the impact on the environment. We are also working to minimize the effect on the environment of our vehicles themselves and to recycle as much of their content as possible after use, and are focusing on greater disclosure to give the public a better picture of the ways, such as these, in which we are helping to protect the environment.

Our gasoline direct injection (GDI) engines, which came onto the market in 1996, offer excellent fuel efficiency and low CO_2 emissions, winning them wide acclaim for their contribution to the fight against global warming. With regard to direct injection diesel engines for trucks and buses, we are continuing to make improvements to fuel efficiency, while at the same time actively developing new technologies in order to combat the problem of exhaust fumes and particulate matter (PM) in large urban areas.

In our production operations, we are continuously working to protect the environment in and around our plants, save energy, and reduce waste emissions through ISO14001-compliant environmental management of all of our plants.

By using the Internet and producing pamphlets and other publications, we aim to keep the publication up to date with our activities to protect the environment.

And I can promise you that Mitsubishi Motors will continue to take voluntary action to protect the global environment for the benefit of future generations.

Takashi Sonobe
President & CEO

On the publication of the 2000 Environmental Report

Protection of the global environment has become a major priority for both society and private enterprises. We must constantly keep one eye on the future, and adapt swiftly to changing circumstances.

With the internal spin-off of the truck and bus division in April 2000, Mitsubishi Motors revised the structure of its Environmental Council to set up a fourth committee covering trucks and buses and so further enhance its environmental activities.

We have made concern for the environment a key pillar of corporate policy, taking ecology consciousness and smart design as our watchwords in auto manufacturing. At the same time, we are developing clean energy vehicles such as the GDI Sigma series, fuel cell cars, electric vehicles, CNG vehicles and hybrid cars, and are also working to reduce emissions of environmentally harmful substances (such as lead) and to recycle a greater proportion of the content of end-of-life vehicles (ELVs).

As for our production operations, the acquisition of ISO14001 certification by our Tokyo plant in December 1999 means that all Mitsubishi Motor plants in Japan are now ISO14001 compliant. Overseas, NedCar in the Netherlands received ISO14001 certification last September, and we plan to continue to increase ISO14001 registration of affiliated companies in Japan and overseas. With regard to the final disposal of waste, the targets for 2000 were achieved ahead of schedule in 1998, and we are now working on eliminating emissions entirely.

Through our policy of green procurement and green purchasing, we are actively cooperating with affiliates and suppliers in promoting protection of the environment.

The purpose of Environmental Report 2000 is to introduce our stakeholders and the public in general to steps such as these that we are taking to combat environmental problems. We shall continue with our efforts to protect the environment, and look forward to receiving any comments our readers may have concerning how to make our activities more environmentally friendly.

Kensaku Miyake
Environmental Officer & SEO

1. Environmental Management

In order to actively protect the environment at every stage of the car lifecycle, MMC is expanding and improving its environmental management system.

MMC's environmental guidelines

In order to clarify group policy on the environmental protection, the basic philosophy described in MMC's Environmental Plan drawn up in March 1993 was replaced in August 1999 by "MMC's Environmental Guidelines".

These guidelines reflect the corporate policy[1)] adopted in 1998 of "iimono nagaku", and provide detailed coverage of fresh environmental challenges, such as how the company can contribute to the development of an environmentally friendly, resource recycling society.

The guidelines consist of two parts: one on basic policy and the other on behavioral standards. In the section on basic policy, environmental protection is recognized as a priority, and ongoing, all-out measures to protect the environment are outlined. The section on behavioral standards, on the other hand, describes more specific measures for implementing basic policy.

This year, MMC has also adopted a new catch phrase Heart-Beat Motors, Mitsubishi Motors and adopted three core values for incorporation into all products, services and corporate activities. These core values are:

- Earth technology (Technology to bring the pleasure of being one with the Earth)
- Industrial beauty (Authentic beauty derives from craftsmanship)
- Next frontier (Creativity that cultures the coming age)

The adoption of "earth technology" as a core value makes environmental protection showing concern for the global environment a top priority.

MMC is taking action to protect the environment and build a resource-recycling society by, for example, pursuing the three Rs (reducing, reusing and recycling) in line with these Environmental Guidelines.

1) Corporate policy

In March 1998, "iimono nagaku" was made a central plank of the Mitsubishi Motors Group's corporate policy. This means building long lasting ties with our customers by constantly providing good products and services.

ENVIRONMENTAL GUIDELINES OF MITSUBISHI MOTORS CORPORATION

Basic Policy

Mitsubishi Motors recognizes that protection of the global environment is a priority for humankind and as such makes the following undertakings:

(1) From a global viewpoint, we are committed to continual reduction of negative environmental impact of our corporate activities with all our strength, these including development, procurement, production, sales, and after-sale servicing activities related to automobiles.

(2) As a good corporate citizen, we are committed to action to protect the environment at the level of local communities and society as a whole.

Behavioral standards

(1) We will endeavor to protect the environment by forecasting and assessing the environmental impact of our products at all stages in their life cycle.
Priority is given to the following areas:
- **Prevention of global warming by reducing emissions of greenhouse gasses**
- **Prevention of pollution by restricting emissions of substances harmful to the environment**
- **Reduction of waste and maximizing efficient use of resources by promoting conservation of resources and recycling.**

(2) We will endeavor to improve our environment management practices as part of ongoing efforts to ameliorate the environment.

(3) We will comply with environment regulations and agreements, and will work to protect the environment by establishing voluntary management targets.

(4) We will encourage our affiliates and suppliers, both in Japan and overseas, to cooperate in working to protect the environment.

(5) We will actively disclose environment-related information and will seek the understanding of local communities and of society at large.

Development of environmental measures and organization

In order to promote environmental protection throughout the company, MMC established an Environmental Council chaired by the president in 1993.

The council's functions are to determine basic corporate policy on the environmental protection, to deliberate and formulate plans to implement such policy, and to assess the implementation of these plans. Implementation of these plans and any necessary correctional measures are delegated to a number of committees.

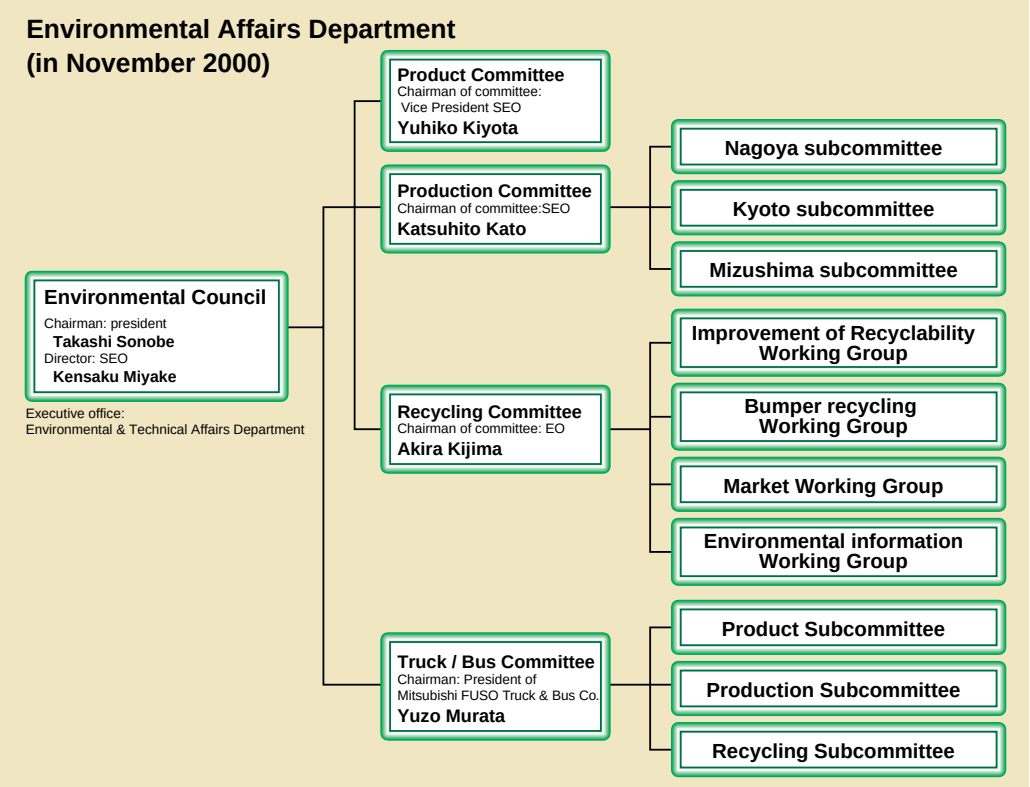
The Environmental Council was previously made up of a Product Committee, Production Committee, Recycling Committee and General Affairs Committee. In the interests of streamlining organization and improving aspects of practical administration, however, the General Affairs Committee was merged into the Recycling Committee. This Recycling Committee is consequently now also responsible for general environmental matters, such as disclosure of information on the environment and expanding sales of clean energy vehicles. Marketing and disclosure working groups were also established under the Recycling Committee.

In April 2000, with the internal spin-off of the truck and bus division, a fourth Truck and Bus Committee was set up to promote concerted action to protect the environment in relation to truck and bus operations.

Then in June 2000, the Dismantling Technology Working Group under the Recycling Committee was reorganized to form the Improvement of Recyclability Working Group to enhance measures to improve recyclability.

Each of these committees is taking positive action covering a broad range of issues, and their activities are listed on the following page.

In order to further increase the scope and quality of the company's environmental activities, an Environmental Affairs Department with special responsibility for the environment was established in May 1999. It was renamed the Environmental & Technical Affairs Department in April 2000 and the number of staff increased to boost the effectiveness of its activities. This department is responsible for determining the overall direction of the company's environmental activities, and also serves as a secretariat for the Environmental Council and its committees.



Environmental council committees

Product Committee

- Improvement of fuel efficiency
- Reduction of exhaust emissions
- Reduction of automobile noise
- Development of clean-energy vehicles
- Improvement of traffic flow

Production Committee

- Protection of plant environment
- Reduction of emissions of industrial waste
- Energy conservation
- Rationalization of logistics
- Improvement of production processes
- Correspond to PRTR scheme
- Expansion of environmental activities of affiliated domestic manufacturers
- Concern for the environment in overseas business activities

Recycling Committee

- Improvement of recyclability of new vehicles
- Reduced use of environmentally harmful substances
- Greater use of recycled materials in new vehicles
- Improvement of environmental management system
- Disclosure of information on environmental matters
- Promotion of environmental management at dealers
- Greater use of used / recycled parts
- Green procurement policy
- Expansion of sales of clean energy vehicles

Truck & Bus Committee

- Product-related measures
  : Improvement of fuel efficiency, reduction of exhaust emissions, reduction of automobile noise, etc.
- Production-related measures
  : Protection of Plant environment, reduction of emissions of industrial waste, energy onservation, etc.
- Recycling-related measures
  : Improvement of recyclability of new vehicles, reduction of use and emission of environmentally harmful substances, etc.

1) ISO14001

An international standard for environmental management systems established by the International Organization for Standardization (ISO).

ISO14001 certification[1)]

In order to increase transparency and raise confidence in its measures to conserve the environmental protection, MMC actively seeks to obtain ISO14001 certification (the international standard for environmental management) for its various observations.

With the acquisition of ISO14001 certification by the Tokyo Plant in December 1999, all MMC's plants in Japan are now ISO14001 compliant.

Our main affiliates in Japan and overseas are also all expected to be registered ISO14001 compliant during 2001.

Works in Japan	
Nagoya Plant	**'98/11**
Mizushima Plant	**'98/12**
Kyoto Plant	**'98/12**
Tokyo Plant	**'99/12**
Overseas affiliates	
NedCar (Netherlands)	**'99/9**
Domestic affiliates	
Pajero Manufacturing Co., Ltd.	**'99/7**
Mitsubishi Automotive Engineering Co., Ltd.	**'00/2**
Pabco Co., Ltd.	**'00/6**

State of ISO14001 registration

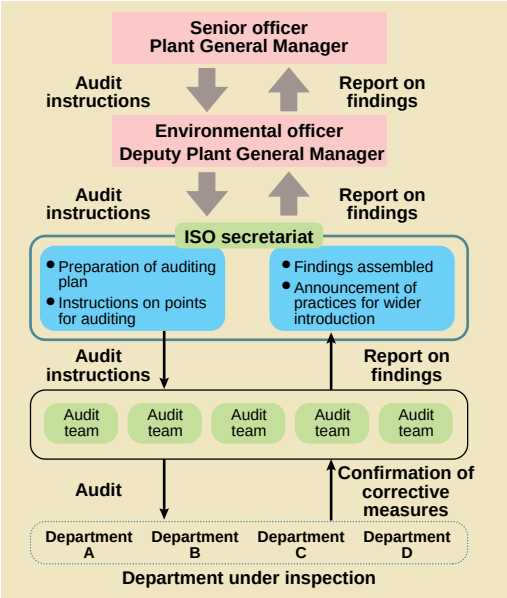
Environmental auditing

Internal environmental audits of individual plants are conducted twice a year by MMC to confirm that their environmental management systems are functioning properly.

Internal environmental audits are conducted by teams of certified auditors who have been trained within and outside the firm under the internal auditor certification system.

Internal environmental audits take the form of inspections based on a check list consisting of some 600~700 items. Any problems that are identified are reported to those in charge, and the necessary corrective measures taken.

Particularly outstanding environmental measures in the division under inspection are identified for introduction by other divisions.



System for internal environmental auditing of each of MMC's Plants

*Teams made up of 3~4 members

Emergency measures

MMC constantly strives to maintain the safety and stability of production operations at its plants in line with appropriate operational and work standards to ensure safety and reduce the impact of its activities on the environment. In order to be able to cope in the best possible way with natural disasters such as earthquakes and emergency situations that could foreseeably arise during everyday operations, the company has established guidelines to be followed in an emergency, and in addition conducts regular training exercises.

Education / personal development

To ensure that steps to protect the environment are properly implemented and a system for coping with emergencies permeates every part of the company, we believe that it is important that each and every employee understands the relationship between business activities and the environment. Education on the environment is consequently a constantly ongoing process at MMC.

■ Education of employees of all levels

Stressing the importance of protecting and maintaining the environment and raising awareness of involvement in activities to protect the environment, education is provided every year for employees of all levels.[1)]

Training and education are also provided for employees in each division in the form of on-the-job training (OJT) as and when necessary. Staff in the environmental division in addition provide environmental education on an ongoing basis for mid-level sales staff and service staff at MMC dealers.

Fiscal year	FY1998	FY1999
No. of participants	1250	1317

1) Employee education

Level	Frequency (times per year)
New employees	1
Middle management	1
New Assistant Manager	1
New Manager	2
New General Manager	1
New Assistant Foreman New foremen Foremen Health & safety directors	2~4

■ Parsonal development

Pamphlets and other materials are published and circulated to raise employees' awareness of environmental matters. A "Plant Environmental Topics" newsletter is also published to provide information on the environment in and around plants for distribution both within the company and to affiliated companies.

Type of activity	Details
Awareness raising	1.Raising of awareness of Environmental Guidelines (cards distributed to all employees and posters put up) 2.Raising of awareness of environmental action taken by MMC (environmental leaflets distributed to all departments) 3.Provision of information on the environment (publication of articles on the environment in company newsletters in all regions, provision of information via company intranet) 4.Publication of "Plant Environmental Topics" for distribution within the company and to affiliates

■ Employees with public environment-related qualifications

	Pollution control manager	Energy manager
No. of qualified employees at MMC	178	46

Environmental publications

■ Environment month activities (FY1999)

Type of activity	Details
Educational	1. Publication in company newsletter of articles on environment month 2. Educational posters and signs about the environment
Practical	1. Inspection patrols of environmental facilities 2. Inspection of waste disposal contractors
Other	1. Inspection of trees and other greenery on company property 2. Participation in lectures and talks

2. Measures to reduce environmental impact

2-1. Targets and Performance

MMC has set specific targets for environmental management, R&D, production and recycling, and is steadily working toward achieving these targets.

■ **Environmental targets and performance in FY1999**

environmental targets	performance in FY1999	state of progress
Improvement of fuel efficiency ● Achievement of domestic 2010 fuel efficiency standards by 2005 - Expansion of use of GDI engines - Development and promotion of use of GDI SIGMA series - Reduction of drive train loss, drag and weight	● 85% of all GDI-powered vehicles met 2010 fuel efficiency standards [1)] - Development of new 1.1ℓ, 2.0ℓ, 2.5ℓ and 4.5ℓ GDI engines for use in new models - Development of Pistachio fitted with automatic idling-stop system - Commercial development of CVT	○
Reduction of exhaust emissions ● Early compliance with tightened emission standards around the world	● Four new models that went on sale in FY1999 already compliant with 2000 emission regulations	○
Development of clean-energy vehicles ● Development of fuel efficent hybrid cars ● Development of fuel cell vehicles ● Development and sale of CNG (natural gas) powered vehicles	● Trial production, assessment and modification of GDI-HEV ● Load layout design and factor testing ● Launch of sale of CNG car based on new-standard minicar and CNG non-step low-floor city bus	○
Improvement of recyclability ● Achieve potential recoverability [2)] rate of over 90% in New Models in or after 2000 ◊ Design of vehicles to improve recycling rate[3)]	● Two models 90% recyclable	○
Reduction of lead use ● Lead use to be reduced to under half of 1996 level in new models from 2000 ● Lead use to be reduced to under third of 1996 level in new models from 2005	● Two models to meet target by 2000 ● Six models to meet target by 2005	○
Reduction of use of air-conditioner refrigerant ● Increased use of air conditioners requiring less refrigerant [4)]	● Used in five new models launched in FY1999	○
Reduced waste emissions at plants ● Landfill volume of waste to be reduced by at least 80% from 1990 level in 2000 ◊ Volume of landfill waste to be reduced to zero at all works by end of March 2002	● Reduced by 88% from 1990	○
Energy conservation at plants ● Stabilization of CO_2 emissions in FY2000 at FY1990 level	● Emissions reduced by 10% from FY1990	○
Rationalization of logistics ● Reduction in proportion of use of wooden cases ● Reduction in number of trucks used by increasing loading efficiency and expanding joint delivery, etc.	● 18% reduction from previous year ● 9% reduction from previous year	○
ISO14001 environmental management certification ● One truck plant to be certified in FY1999	● One truck plant certified (all domestic plants now certified)	○

◊ indicates new environmental targets

1) Compliance with domestic fuel efficiency standards for 2010

As of the end of March 2000, 111 of the 131 models powered by GDI engines met the new fuel efficiency standards.

2) Recoverability

Design improvement target. Quantified by a unique method developed by MMC that also takes into account economical efficiency.

3) Recycling efficiency

The recycling rate to be met by related industries as a whole. The target set by the Japan Automobile Manufacturers Association (JAMA) is 95% from 2015.

4) Refrigerant-saving air conditioners

Use 20% less refrigerant than conventional air conditioners.

2-2. Research and Development

Global warming, air pollution, acid rain, automobile noise, waste, exhaustion of resources... The car, an indispensable part of modern society, is also a contributor to environmental problems such as these. At MMC, however, we are making steady progress, one step at a time, toward making our products more environmentally friendly.

Environmental protection at the R&D stage

MMC's watchwords in auto manufacturing are ecology consciousness and smart design, and concern for the environment is a central pillar of our R&D policy.

In the interests of better environmental management, MMC has set targets in a variety of fields concerning, for example, fuel efficiency, exhaust emissions, automobile noise and recycling, to guide the development of new technology and products. At the same time, the Environmental Council deliberates policy at regular intervals and monitors attainment of targets.

Measures to make passenger cars more environmentally friendly include expanding the use of GDI engines,[1)] introducing the use of GDI SIGMA series [2)] GDI-ASG, GDI-CVT, GDI turbo and direct injection diesel engines, voluntarily meeting exhaust controls ahead of schedule, reducing lead use, and expanding the use of recycled materials.

With regard to our truck and bus division, vehicles are manufactured to comply with the long-term exhaust emission regulations for 1998 and 1999. We have in addition introduced new diesel engines offering higher output and better fuel efficiency, further reduced noise audible from outside the vehicle, and developed clean energy vehicles.

In the future, too, MMC will focus its technological resources on research into environmental technology and the development of greener products.

1) GDI engine

A highly fuel efficient engine that utilizes MMC's proprietary stratified air-fuel combustion technology based on use of a vertical vortex in the cylinder to achieve ultra-lean combustion.

2) GDI SIGMA series

See p.11 for details of the GDI SIGMA series and GDI-ASG.

Integrated control of GDI and CVT (continuously variable transmission) gives the GDI-CVT 10% better fuel efficiency than conventional A/T vehicles. Used for the Lancer-Sedia that went on sale in May 2000.

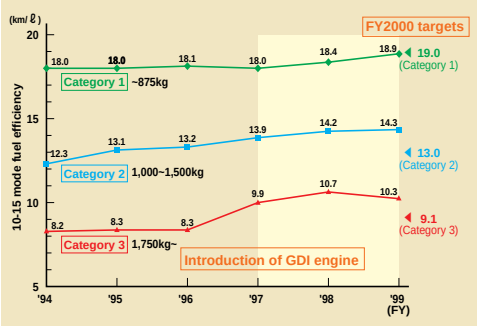
GDI turbo engines take full advantage of the outstanding anti-knocking properties of GDI engines, and at the same time offer better response and fuel efficiency than conventional turbo engines. A GDI turbo engine was adopted for the Pajero io in July 2000, which not only cleared the 2000 exhaust controls, but was also the first turbo car to pass the 2010 fuel efficiency standards.

Main measures in fiscal 1999

Prevention of global warming

To combat global warming, it is necessary to improve the fuel efficiency of cars and cut emissions of CO_2, which is a greenhouse gas. At MMC, we are continuously working to improve fuel efficiency by, for example, expanding the use of fuel-efficient engines such as GDI engines, and reducing drive train loss, weight and drag. We are also actively reducing the use of greenhouse gas air-conditioner refrigerants.

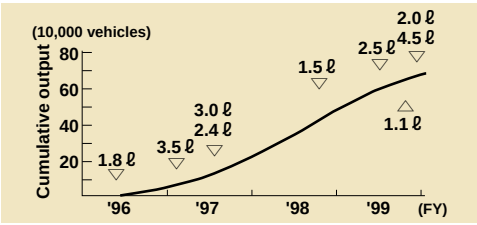
Already 85% of MMC's GDI-powered vehicles (111 out of 131 models) and over half (51%) of all gasoline-powered vehicles meet the domestic 2010 fuel efficiency standards.



Trends in average fuel efficiency by vehicle weight category (gasoline-powered passenger cars)

■ GDI engines

In fiscal 1999, new 1.1 ℓ , 2.0 ℓ , 2.5 ℓ and 4.5 ℓ GDI engines were developed and adopted for use in new models. Nine kinds of GDI engines have hit the market between 1996, when MMC became the first company in the world to mass produce GDI engines, and March 2000, and total output had reached 700,000 units by February 2000.



Timing of introduction of GDI engines and cumulative output

■ GDI SIGMA series

The GDI SIGMA series powertrain takes full advantage of the outstanding advantages of GDI engines,[1)] and incorporates new drive technology and other related technology (such as auxiliary power units) to achieve dramatically improved fuel efficiency. In accordance with plans unveiled in March 1999, the first step toward commercial production of GDI SIGMA series was taken with the launch of the GDI-ASG in fiscal 1999.

GDI SIGMA series

■ GDI-ASG [2)]

The GDI-ASG combines a 1.1 ℓ GDI engine with an automatic idling-stop system. This engine was used for the Pistachio launched in December 1999, which achieves excellent fuel efficiency of 30km/ ℓ (10-15 mode fuel efficiency).

We decided to initially limit sales to 50 M/T vehicles for sale to entities such as local governments and public-service corporations playing a leading role in environmental protection, but are also pressing ahead with development of automatic vehicles, such as A/T and CVT vehicles, powered by the GDI-ASG.

Pistachio

1) Properties of GDI engines

GDI engines inject fuel (gasoline) directly inside the cylinder. In addition to better fuel efficiency, they also offer outstanding response and starting properties and superior torque management, and minimize knocking.

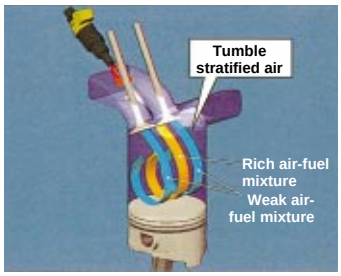
2) GDI-ASG

Fuel consumption due to idling in the 10-15 mode fuel efficiency range is 15% in the case of normal engines and 10% in the case of GDI engines. Shutting down the engine can consequently have a considerable impact on fuel consumption. With conventional engines, however, there is a noticeable lag between stopping and starting, and many problems had to be overcome to reduce idling without discomforting the driver.

GDI-ASG offers the excellent starting properties of GDI engines, and prevents idling through minute control.

1) MVV engine

The MVV engine is a low-cost engine for minicars that provides improved fuel efficiency without the need for any special additional equipment. It was developed by applying technology developed in the process of creating the GDI engine, and is now the standard engine used for all minicars.



MVV engine

2) Direct injection diesel engine

Durable and fuel efficient, the diesel engine has long been used to power heavy duty vehicles such as trucks and buses. Now, however, direct-injection diesel engines are being increasingly widely used for passenger cars because of their improved fuel efficiency and lower exhaust emissions.

3) 6-cylinder 6M7 and 6M6 engines

6M7: 12.9 ℓ turbo engine
6M6: 7.5 ℓ turbo engine
8.2 ℓ NA engine

4) MIQCS (See p.14.)
(Mitsubishi Innovative Quiescent Combustion System)

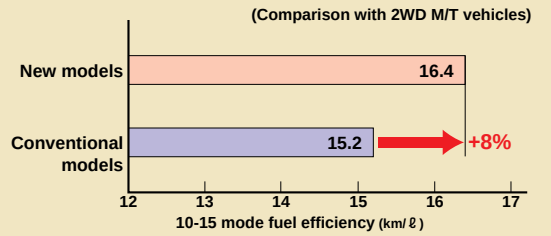
Used for the 6M7 engine.

5) INOMAT
(Intelligent & Innovative Mechanical Automatic Transmission)

Gear changes are performed automatically when driving and the clutch only operated when setting the vehicle in motion, thus improving fuel efficiency and at the same time reducing driver fatigue. Initially used in 1996-model year large-sized trucks, it was subsequently also adopted for 1998-model year tractors and large sightseeing coaches.

■ MVV Engine [1)]

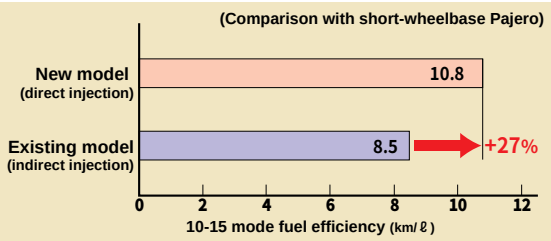
The lean-burn MVV engine for minicars, used for the new-standard minicar series that went on sale in October 1998, was also adopted for the Town Box launched in April 1999, dramatically improving the vehicle's fuel efficiency.



Fuel efficiency of Town Box

■ Direct injection diesel engine [2)]

Two new types of direct injection diesel engine were developed in fiscal 1999: the 6M7 series [3)] for large-sized trucks and buses, and the 6M6 series for medium-sized trucks and buses. These engines have a four-valve SOHC structure and EGR. The turbo engines incorporate a VG turbo charger, common-rail fuel injection system and new MIQCS [4)] combustion system, resulting in improvements in fuel efficiency and also meeting the FY1998/9 long-term exhaust emission regulations.



Fuel efficiency of new Pajero

For passenger cars, MMC has developed a new 3.2 ℓ direct injection diesel engine, which was used for the new Pajero model released in September 1999. This new type of engine realizes dramatically improved fuel efficiency combined with increased output due to the optimal design of the high-pressure fuel injection system and combustion chamber and adoption of a DOHC four-valve system.

■ Idling stop systems for heavy duty vehicles

An idling stop system automatically stopping the engine when not in motion was made an optional extra for Super Great (large-sized truck) trucks that went on sale in February 2000. Use of idling stop systems continues to be expanded in fiscal 2000.

A cold-energy accumulating rear cooler capable of conveying cool air to the bed section when the engine is off was introduced in 1996, and Super Great (large-sized truck) trucks have since February 2000 featured an instantaneous heater to provide heating even when the engine is off, thus combining comfort and concern for the environment.

■ Intelligent and innovative mechanical automatic transmission (INOMAT) [5)]

Taking full advantage of the engine performance of heavy duty vehicles, MMC has developed a fuzzy control mechanical automatic transmission system combining the comfort of an automatic and improved fuel efficiency in 1996.

This was used in fiscal 1999 for the Fighter medium-sized truck. Use was then dramatically expanded when it was adopted for vehicles as large as tractors with 16 speed transmission in the Super Great large-sized truck range. CAN communication has in addition been used for inter-ECU communication from 1999-model year vehicles onward, improving control speed and precision and realizing improved fuel efficiency and drive comfort.

■ High fuel-efficiency drive line

Use of high fuel-efficiency drive lines was expanded to include "Super Great" large-sized truck that went on sale in February 2000. These are equipped with MMC's proprietary direct seven speed transmission and low final-gear technology in combination with high fuel-efficiency tires, resulting in better fuel efficiency at high speeds.

■ Weight reduction

We are reducing vehicle weight in all kinds of ways, such as by switching to use of lighter materials and using computers to optimize construction.

The new Pajero that went on sale in fiscal 1999, for example, is some 100kg lighter [1)] than conventional models, despite being larger. This is because of the drastic improvements made to the body structure.

MMC has also developed a resin intake manifold for GDI engines, which has been used since the RVR that went on sale in October 2000. Around 35% lighter than aluminum intake manifolds, resin intake manifolds have never in the past been used in the auto industry for GDI engines, which take in large amounts of high-temperature EGR (exhaust gas recirculation) gas.

Although tougher specifications and the need to meet long-term exhaust emission regulations and medium-term safety brake regulations resulted in weight increases to trucks launched in fiscal 1999, these were offset by reductions in the weight of engines, cabs and chassis parts, and chassis with cabs are now lighter than those of past models.

1) Long-wheelbase Pajero Exceed
(comparison with 3.5ℓ GDI model)

■ Reduction of aerodynamic drag

A world best Cd [2)] of 0.44 has been achieved for Super Great large-sized truck, resulting in massive increases in fuel efficiency impossible to attain from improvements to engines and drive lines alone.

In the case of new passenger cars, steady improvements to fuel efficiency are being made by adopting various fuel-efficiency improving technologies. Many types of RVs, however, such as the Dion, Town Box and new Pajero, place a premium on in-car comfort and space, making them larger aerodymaics drag than sedans. Our designers and aerodynamics researchers are therefore working together on RV R&D to produce stylish designs that at the same time offer less drag.

Truck wind tunnel testing

SUW Advance Cd = 0.28 [2)]

Design studio for the next line of compact cars

2) Cd: Drag coefficient

■ Reduced use of air-conditioner refrigerant

Action has been taken to reduce use of HFC-134a [3)] air-conditioner coolant, a greenhouse gas, since the 1997-model year.

In fiscal 1999, refrigerant use in five new models (including the Dion) was reduced by around 20%. Level of use has also been kept at the same level as in the past in the case of some new models with greatly increased interior capacity due to model changes.

In the case of the non-stop low-floor CNG city bus that went on sale in February 2000, use of duct-in evaporators and new condensers has enabled reductions of 7% compared with existing vehicles. MMC is not resting on its laurels, however, and will continue to strive to reduce coolant use in the future.

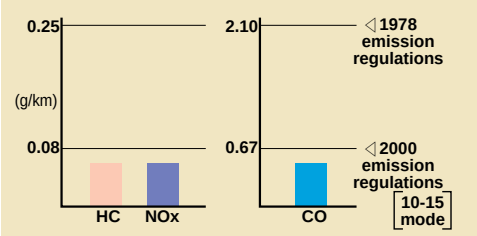
3) Air-conditioner refrigerant

CFC-12, the ozone-layer destroying refrigerant normally used in air conditioners, was dropped from all new models in 1994, and a total switch made to a new refrigerant, HFC-134a. As HFC-134a has a greater greenhouse effect than CO_2, however, it is important that it should be used less and be removed properly from ELVs.

Prevention of air pollution

■ Reduction of gasoline engine exhaust emissions

MMC is phasing in compliance with the planned domestic 2000 exhaust emission regulations,[1)] starting with new passenger car models going on sale in September 1999. The Pajero, Pistachio, Dion, Proudia and Dignity models that went on sale in fiscal 1999 already meet the new regulations.



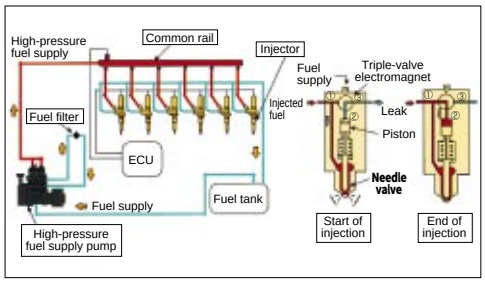
Emission performance of Dion [2)]

■ Reduction of diesel engine exhaust emissions

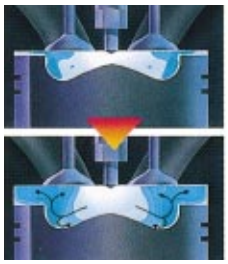
Advanced technology, such as common-rail fuel injection systems and MMC's original new MIQCS [3)] combustion system, is used to make truck and bus emissions cleaner and to improve fuel efficiency. In addition, all engines employ EGR.

In fiscal 1999, the Canter Small-sized truck, Fighter Medium-sized truck, Super-Great large-sized truck, Rosa small-sized bus and Aeromidi medium-sized bus were compliant with 1998 and 1999 exhaust emission regulations. Some Canter, Fighter and Rosa models were also newly certified under the low-emission vehicle certification systems run by seven local governments in the Kanto region and six local governments in the Kansai region.

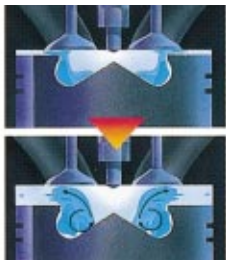
All passenger car models were also compliant with 1998 exhaust emission regulations by September 1999.



Common-rail fuel injection system



MIQCS combustion



Conventional combustion

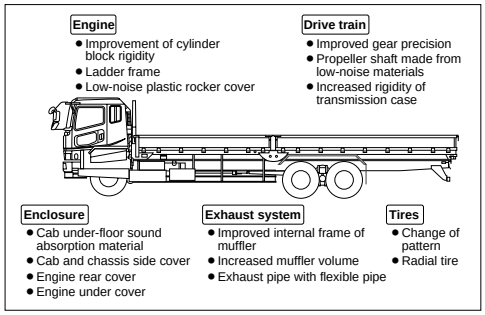
MIQCS combustion

MMC will continue to research and develop new ways of further reducing exhaust emissions in the future, such as by improving combustion chambers and injection systems, NOx catalysts and DPF.[4)]

Reduction of automobile noise

MMC is working to cut the amount of noise generated by vehicles by, for example, improving engine construction and tires, positioning sound absorbing and soundproofing materials more effectively, and shielding engine room more efficiently.

A 2dB tightening of regulations on acceleration noise emitted by passenger cars, small commercial vehicles and large-sized buses has been phased in since October 1998. In fiscal 1999, five models (including large-sized buses) were made compliant with the new regulations. Passenger cars too were all compliant with the 1998 controls by September 1999.



Measures to reduce noise generated by trucks

1) 2000 exhaust emission regulations

From October 2000, new gasoline-powered passenger cars' CO, HC and NOx emissions will be required to be some 70% lower than under current government controls. The durability requirement will in addition be raised to 80,000km.

2) Exhaust compliance of the Dion

The Dion is already 25% inside the 2000 exhaust emission regulations.

MMC also plans to acquire certification for the each models under the low emission vehicle certification system launched in April 2000.

3) MIQCS
(Mitsubishi Innovative Quiescent Combustion System)

Fuel injection in this system is optimized by widening the aperture of the piston combustion chamber in combination with the use of high-pressure injection and multiple injection nozzles. This results in cleaner exhaust emissions and better fuel efficiency due to reduced NOx and particulate matter emissions.

4) DPF
(Diesel Particulate Filter)

Filter for removing particulate matter (PM) contained in exhaust gas.

Reduction of use of environmentally harmful substances

MMC is expanding use of lead-free radiator cores, heater cores and fuel tanks for passenger cars. In fiscal 1999, new lead-free parts such as harnesses, hoses, glass ceramic prints were developed for use in new models. As a result, all new passenger car models that went on sale in fiscal 1999 met MMC's voluntary target [1)] for lead use in 2000, and some models, such as the Dion, even meet the target for 2005.

Lead use in trucks, too, has been reduced. In the 1999-model year Fighter medium-sized truck, for example, aluminum is used instead of lead for the heater core.

Practically no mercury or cadmium was used in new models in fiscal 1999 (only being used in minute quantities for cold cathode tubes), while no sodium azide is used as an airbag gas generator.

1) Voluntary targets for reduced lead use
(for new models)

From 2000:
1/2 of 1996 level or under
From 2005:
1/3 of 1996 level or under

Promotion of recycling

■ Increased use of easy-to-recycle materials

MMC is increasingly using thermoplastics in place of hard to recycle rubber parts, and is also shifting to and standardizing the use of thermoplastics in multi-layered components comprised of a number of different materials, such as instrument panels and head lining.

The following easy-to-recycle materials were used in the Dion that went on sale in January 2000.

- **◆Rubber replaced with thermoplastics**
  High-pressure fuel hoses
  Hood weather strip
- **◆Standardization of use of thermoplastics for multi-layered components**
  Head lining, carpets
- **◆Use of naturally colored materials that are recyclable as they are**
  Interior trimmings, delta garnish, quarter window garnish

Use of easy-to-recycle materials (Dion)

■ Easy-to-dismantle construction [2)]

In order to determine the time required to recycle ELVs, MMC continued to conduct dismantling tests on vehicles that are already on the market in 1999. Ease of dismantling is measured in accordance with standards drawn up by MMC, and the results obtained incorporated into guidelines for the development of the next line of vehicles.

By constructing vehicles so as to be easier to dismantle and by making greater use of easy-to-recycle materials, models such as the Dion and Plaudia that went on sale in fiscal 1999 met the voluntary target for potential recoverability that MMC has set for itself.

2) Easy-to-dismantle construction

Encouraging more recycling of ELVs on the market requires not only the use of recyclable materials, but also the adoption of designs that can be quickly and easily dismantled.

So that materials can be easily distinguished for recycling, all plastic parts weighing 100g or more are marked with an identifying code.

■ Increased use of recyclable materials

We have been collecting used polypropylene bumpers repaired and replaced by dealers since 1997 for recycling into battery sheets, wheelhouse covers and other parts. In fiscal 1999, recycled materials were used for the undercover of the Challenger, and use is being further expanded in fiscal 2000.

Use is also made of waste materials from other industries. In addition to increasing use of air cleaner cases [3)] containing waste paper (which began on a commercial scale in 1998), MMC has developed engine covers made from recycled PET bottles, and mass production began at the end of fiscal 1999.

Engine cover made from recycled PET bottles

3) Recycled paper air-cleaner case

Made of a mix of plastic and at least 50% waste paper, recycled paper air-cleaner cases both provide a use for waste paper and can be disposed of by incineration.

■ Longer life oils [4)]

Genuine MMC engine oil used in the Fighter medium-sized truck from the 1999-model year onward is designed to last 1.5 times the distance as conventional oil.

4) Longer life oils

To make more effective use of limited resources and reduce the amount of waste generated, MMC is working to develop longer life oils for vehicles. In 1991, for instance, MMC developed and began using passenger car coolant and brake oil that only has to be replaced every two safety inspections, and in 1994, MMC starting using transmission oil that does not have to be replaced until the vehicle has at least 100,000km on the clock.

Research and development of clean-energy vehicles

■ CNG vehicles [1)]

CNG vehicles emit less CO_2 than gasoline-driven vehicles and also emit no soot, and so have considerable potential as clean energy vehicles. MMC has developed and is marketing various types of CNG vehicles, ranging from minicars to large-sized vehicles.

Two-step bus Stepless bus

Large CNG city buses

In fiscal 1999, a new non-step low-floor city bus was added to the CNG Aerostar (large city bus) range that hit the market in 1998. We have also developed and are marketing CNG passenger cars based on the new-standard minicars and minicabs launched in 1998.

■ Liquefied petroleum gas (LPG) trucks

LPG generates less NOx emissions than diesel, and also produces no soot. MMC markets LPG-powered Canter small-sized trucks with a pay load of 1.5~3.0 tons.

LPG Canter

■ Electric vehicles

Since our first electric vehicle, based on the Libero, went on sale in 1994, we have been developing various technologies for parts such as batteries and motors.

In fiscal 1999, MMC succeeded in developing a manganese lithium-ion battery offering greatly improved range on one charge and reduced recharging time. Recharging time is 65% lower than that required for nickel-hydrogen batteries, and range on one charge is 10% better, offering world-class performance. This battery was used to power the FTO-EV used in our successful attempt to travel 2,000km in an electric vehicle in just 24 hours. [2)] (See "Topics" on p.19 for details.)

Experimental FTO-EV

MMC has produced an experimental next-generation super-small electric vehicle for urban use, the MEEV-II,[3)] which was exhibited at the Exhibition of Ultra-Small Vehicles organized by the Japanese Ministry of Transport.

MEEV-II

1) Compressed natural gas (CNG) vehicles

There were some 5,000 CNG vehicles on Japan's roads at the end of March 2000. For them to be used more widely, however, there is a need for more refueling stations.

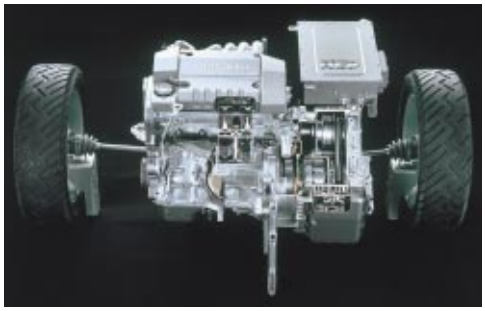
2) 2,000km in 24 hours

A record-breaking attempt made by Car Research & Development Center in December 1999. See "Topics" on p.19 for more details of the event.

3) MEEV-II (Mitsubishi Eco Electric Vehicle-II)

The MEEV-II is an experimental vehicle designed for research into overcoming environmental and energy problems, traffic congestion, and the demands of an aging population. In addition to its light, small aluminum body, it also is equipped with ITS technology allowing shared use of the vehicle in specific areas.

■ Hybrid electric vehicles



Hybrid system (GDI-HEV)

The key to the success of hybrid electric vehicles, which combine an engine and motor/generator to offer greatly improved fuel efficiency, is to reduce the cost of parts such as the motor/generator and battery.

Taking advantage of the outstanding starting qualities and freedom of torque control of the GDI engine, we are developing a GDI-HEV passenger car incorporating a small motor/generator and battery system. Following the unveiling of a test vehicle in March 1999, test vehicles based on the Lancer Sedia were produced in fiscal 1999. Evoluation and modification of these vehicles are now in progress.

With regard to trucks, a Canter HEV aerial platform truck was developed and exhibited at a low-emission vehicle fair in June 1999. A problem with such trucks is that they are used in a stationary position in built-up areas for extended periods, impinging on the surrounding environment because of the noise and exhaust they generate. The Canter HEV's engine generates electricity and the vehicle can also run on its motor, enabling it to travel short distances in residential districts without running its power-generating engine. Moreover, when in use the hydraulic pump can be powered by the electricity from the battery alone, thus minimizing the impact on the surrounding environment.

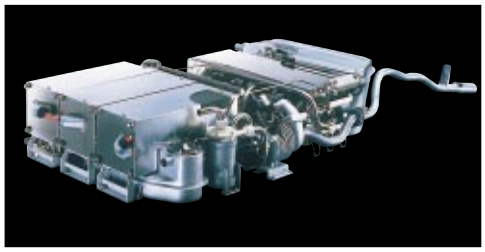
As part of a MITI project, [1)] MMC is also working on the development of a hybrid truck powered by a CNG engine.

1) ACE Project

MMC is a participant in MITI's ACE Project for researching and developing high-efficiency clean energy vehicles, and is now in the middle of a seven-year research program that began in 1997. This pioneering project ranks alongside projects between the public and private sectors in Europe and North America, such as the Car of Tomorrow and PNGV programs.

Canter HEV

■ Fuel cell electric vehicles



Fuel cell system

Fuel cell electric vehicles are powered by the electricity produced by reacting hydrogen and oxygen. They offer high energy efficiency and also generate low emissions, and so have great future potential for use as clean energy vehicles.

Working in cooperation with other members of the Mitsubishi Group, MMC aims to have a fuel cell electric vehicle ready for commercial production by 2005. Development of a fuel cell system with a reformer is underway in collaboration with Mitsubishi Heavy Industries, and MMC is also cooperating with Mitsubishi Electric on a vehicle control system. In fiscal 1999, a fuel-cell-powered test model was exhibited at the Tokyo Motor Show.

Layout study model

1) Hybrid vehicles

City bus fitted with MBECS (motor vehicle brake energy conservation system)

Kinetic energy when the vehicle is braking is converted into pressure by a hydraulic pump, stored, and converted into drive force when the vehicle starts to move or accelerates in order to assist the engine.

2) LEV Certification System for Seven Local Governments
(7LG LEV Certification System)

A system operated by seven local governments in the Kanto region (the municipality of Tokyo, the three prefectures of Kanagawa, Saitama and Chiba, and three cities of Yokohama, Kawasaki and Chiba) for the assessment and certification of vehicles based on Environmental Agency guidelines on LEV exhaust technology.

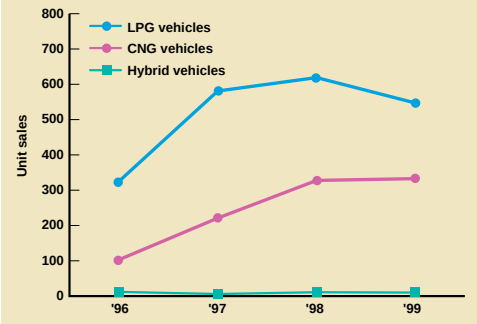
3) Low NOx Emission Vehicle Certification System for Six Local Governments
(6LG LEV Certification System)

A system similar to the 7LG LEV Certification System run by six local governments in the Kansai region (the municipality of Osaka, the two prefectures of Kyoto and Hyogo, and the three cities of Kobe, Osaka and Kyoto).

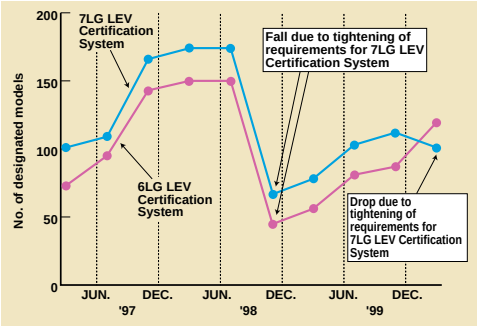
■ Spread of clean energy vehicles

MMC is actively responding to and encouraging demand for clean energy vehicles, such as LPG and CNG-powered vehicles.

In fiscal 1999, MMC sold 547 LPG vehicles, 315 CNG vehicles and 10 hybrid vehicles.[1)] Many models also comply with the systems for certifying clean energy vehicles operated by local governments in the Kanto and Kansai regions. At the end of March 2000, a total of 104 models-38 passenger car models and 66 truck and bus models-were certified under the 7LG LEV Certification System,[2)] and 120 models were certified under the 6LG LEV Certification System.[3)] MMC also plans to make many models compliant under the Ministry of Transport's LEV Certification System, launched by the Ministry of Transport in fiscal 2000.



Sales of clean energy vehicles



Number of models certified under clean energy vehicle certification systems

TOPICS

Challenge to electric vehicle travels 2,000km in 24 hours

New lithium-ion battery

Society faces a range of energy and environmental problems, such as global warming, air pollution, acid rain, and the exhaustion of petroleum and other fossil fuel resources. At present, automakers the world over are working to protect the environment by, for example, reducing exhaust emissions and improving the fuel efficiency of conventional internal combustion engines. At the same time, however, there is an urgent need for the development of next-generation power trains to reduce dependence on the internal combustion engine.

MMC is attempting to solve this problem in a number of ways. One is by developing higher performance electric vehicles.

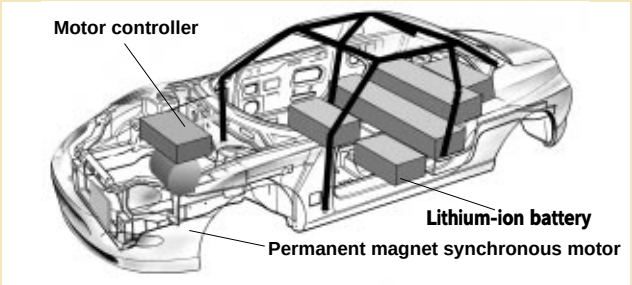
The traditional drawbacks with electric vehicles have been the limited range on one charge and the amount of time required to recharge. MMC is working on ways of overcoming these problems, however. Working in cooperation with Japan Storage Battery, for example, we succeeded in December 1999 in developing a manganese lithium-ion battery for electric vehicles offering greatly improved performance.

To confirm just how well this new lithium-ion battery could perform, we planned an attempt to break the world record for the distance traveled in 24 hours to see how far an electric vehicle could travel in one day if repeatedly recharged (using rapid recharge) and driven. With the new millenium just around the corner, we adopted a target of at least 2000km.

The vehicle used was a modified FTO. It was modified to carry two persons, with part of the rear seat and cargo space being used for the battery. To cope with the rapid charge, a high-power connector was used.

	Lithium-ion battery	Nickel-hydrogen battery	Lead battery
Battery capacity (kWh)	27	26	17
Max. charge current (A)	240	100	240
Base voltage (V)	148 x 23 units	12 x 24 units	12 x 24 units
Charge time (min.)	20	55	25
Weight (kg)	360	440	490

Comparison of performance of batteries when fitted to FTO-EV (rapid charge)



FTO-EV layout

Driving schedule

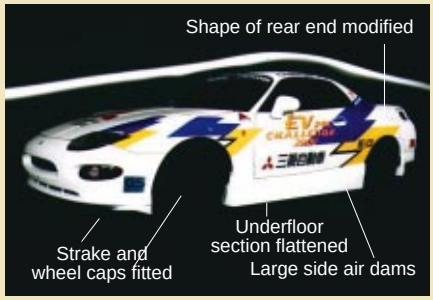
Repeated computer simulations were conducted to determine whether the target of 2,000km in 24 hours could be achieved, and what recharge times and cruise speed should be (as the stops for recharging had to be made during the 24-hour period). The driving schedule also had to be designed to ensure continuous safe driving bearing in mind the demands on the drivers.

To achieve the target, it was essential to reduce drag. It was estimated that by reducing rolling drag on the tires (which added 34km) and improving aerodynamism (producing a Cd of 0.22), the vehicle could travel around 2,030km (just in excess of the target). Simulating optimal charge times and frequency and assuming a cruising speed of 130km/h, it was forecast that the vehicle could travel approximately 2,120 km in a day, or more than 100km in excess of the target.

Type		Modified E-DE3A
Dimensions	Length	4,365mm
	Width	1,735mm
	Height	1,300mm
Performance	Max. speed	180km/h
	Range/ charge	200km (10-15 mode)
Motor	Type	Permanent magnet synchronous motor
	Max. output	70kW
	Max. torque	147Nm

Control system		Inverter control
Drive system		Front wheel drive
Battery	Type	Lithium ion
	Capacity	90Ah
	No.	23
	Total voltage	340V
Rapid charge	Current	240A
	Time	20 min.

Main specifications of FTO-EV



Modifications to improve aerodynamism

TOPICS

Breaking the record

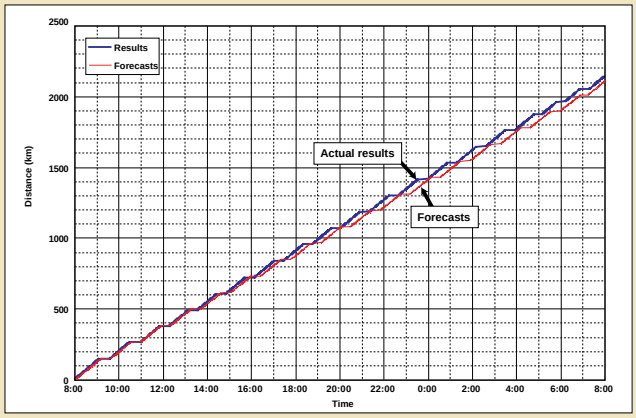
Following simulations and trial runs, the attempt began at 8:00am on December 19 at Car Research & Development Center's test circuit in Okazaki, Aichi Prefecture.

Four drivers drove the car in shifts for 24 hours, the car being recharged for 20 minutes after every 50 minutes on the road.

24 hours later, at 8:00am on December 20, the car had done 899 circuits and traveled a total of 2142.3km, breaking the unofficial world record of 1,700km.

The average speed of 129.4km/h was slightly less than trials had suggested. A better than expected result was achieved, however, because of the reduced time required for movement to the recharging site (which was not included in the distance traveled) and the shorter time required to prepare for recharging.

The record-breaking attempt in progress



Total distance traveled

The future

The development of a high-performance manganese lithium-ion battery with dramatically improved rapid charging performance made it possible to travel over 2,000km in 24 hours. Because of the contribution to protection of the environment that this demonstrates high-performance electric vehicles can make, we will continue to research ways of further improving the performance of electric vehicles.

Development staff

Environmental data on new models launched in FY1999

1) Environmental data on passenger cars

Only data on the main, high-selling models launched in fiscal 1999 are given in these tables.

Environmental data on passenger cars[1)]

Name				Town Box	Town Box (wide)	Pajero (short wheelbase)	Pajero (long wheelbase)
Start of sales				April 1999	June 1999	September 1999	October 1999
Seating capacity				4	6	5	7
Model				GF-U61W	GF-U65W	KH-V68W	GH-V75W
Engine	Model			3G83 (MVV)	4A31	4M41 (DI T/C)	6G74 (GDI)
	Displacement (ℓ)			0.657	1.094	3.200	3.496
	Type			SOHC 12V 3 cylinder	SOHC 16V 4 cylinder	SOHC 16V 4 cylinder	SOHC 24V V6 cylinders
	Fuel			Unleaded gasoline	Unleaded gasoline	Light oil	Unleaded gasoline
	Fuel supply system			ECI multi (electronic control)	ECI mult (electronic control)	Electronic control distributed fuel injection pump/direct fuel injection	Direct injection
	Max. output (net) (kW (PS)/rpm)			(48)/6000	(75)/6000	(175)/3,800	(220)/5,500
	Max. torque (net) (N.m(kg.m)/rpm)			(6.3)/6000	(10.2)/6000	(39.0)/2,000	(35.5)/3,750
Drive train	Drive system			2WD	2WD	4WD	4WD
	Transmission			4A/T	4A/T	4A/T	4A/T
Vehicle weight(kg)				900	990	1940	2020
Environmental information	Fuel consumption rate	10-15 mode fuel efficiency (km/ℓ)		15.4	15.0	10.8	8.7
		CO_2 (g/km)		153	157	246	271
		Additional data		–	–	2005 new fuel standard compliance	2010 new fuel standard compliance
	Exhaust emissions	Compliance level 10-15 mode controls (g/km)		1978 controls	1978 controls	1998 controls	2000 controls
			CO	2.10	2.10	2.10	0.67
			HC	0.25	0.25	0.40	0.08
			NOx	0.25	0.25	0.40	0.08
			PM	–	–	0.08	–
		Additional data		6LG Certified LEV	6LG Certified LEV	–	7/6LG Certified LEV
	Noise	Noise compliance level		1998 controls	1998 controls	1998 controls	1998 controls
	HFC134a air-conditioner refrigarents (g)			410	410	500	780
	Lead use			JAMA targets for 2005 (1/3 level in 1996) achieved	JAMA targets for 2005 (1/3 level in 1996) achieved	JAMA target for 2005 (1/3 1996 level) achieved	JAMA target for 2005 (1/3 1996 level) achieved
	Parts made from easy-to-recycle materials			Bumpers, carpets, etc.	Bumpers, carpets, etc.	Bumpers, carpets, etc.	Bumpers, carpets, etc.
	Use of recycled materials			Air cleaner case, sound absorbing and soundproofing materials, floor carpets, etc.	Air cleaner case, sound absorbing and soundproofing materials, floor carpets, etc.	Sound absorbing and soundproofing materials, floor carpets, etc.	Sound absorbing and soundproofing materials, floor carpets, etc.

Environmental data on passenger cars

Name				Delica Van	Pistachio	Dion	Proudia
Start of sales				November 1999	December 1999	January 2000	February 2000
Seating capacity				3[6]	4	7	5
Model				GC-SK82VM	GH-H44A	GH-CR9W	GH-S32A
Engine	Model			F8-E	4A31 (GDI-ASG)	4G63 (GDI)	6G74 (GDI)
	Displacement (ℓ)			1.789	1.094	1.997	3.496
	Type			SOHC 12V 4 cylinder	DOHC 16V 4 cylinder	DOHC 16V 4 cylinder	DOHC 24V V6 cylinder
	Fuel			Unleaded gasoline	Unleaded gasoline	Unleaded gasoline	Unleaded gasoline
	Fuel supply system			ECI multi (electronic control)	Direct injection	Direct injection	Direct injection
	Max. output (net) (kW (PS)/rpm)			66(90)/5,000	54(74)/6,000	99(135)/5,800	177(240)/5,500
	Max. torque (net) (N.m(kg.m)/rpm)			135(13.8)/2,500	100(10.2)/4,000	183(18.7)/3,500	343(35.0)/2,500
Drive train	Drive system			2WD	2WD	2WD	2WD
	Transmission			5M/T	5M/T	4A/T	5A/T
Vehicle weight(kg)				1,300	700	1,390	1950
Environmental information	Fuel consumption rate	10-15 mode fuel efficiency (km/ℓ)		10.0	30.0	13.0	9.0
		CO_2 (g/km)		236	79	181	262
		Additional data		–	2010 fuel standards compliant	2010 fuel standard compliant	2010 new fuel standard compliant
	Exhaust emissions	Compliance level 10-15 mode controls (g/km)		1998 controls	2000 controls	2000 controls	2000 controls
			CO	6.50	0.67	0.67	0.67
			HC	0.25	0.08	0.08	0.08
			NOx	0.40	0.08	0.08	0.08
			PM	–	–	–	–
		Additional data		7/6 LG Certified LEV	7/6LG Certified LEV	7/6LG Certified LEV	7/6LG Certified LEV
	Noise	Noise compliance level		1998 controls	1998 controls	1998 controls	1998 controls
	HFC134a air-conditioner refrigerants (g)			700	410	720	725
	Lead use			JAMA target for 2000 (1/2 1996 level) achieved	JAMA target for 2005 (1/3 1996 level) achieved	JAMA target for 2005 (1/3 1996 level) achieved	JAMA target for 2000 (1/2 1996 level) achieved
	Parts made from easy-to-recycle materials			Bumpers, instrument panels, etc.	Bumpers, carpets, etc.	Bumpers, carpets, etc.	Bumpers, carpets, etc.
	Use of recycled materials				Air cleaner cases, sound absorption and soundproofing materials, floor carpets, etc.	Air cleaner cases, sound absorption and soundproofing materials, floor carpets, etc.	Air cleaner cases, sound absorption and soundproofing materials, floor carpets, etc.

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

Models produced by MMC

plant		Mainproducts
Nagoya plant	Oye	PROUDIA DIAMANTE GTO STRADA (export only) CHALENGER PAJERO IO SMALL BUS
	Okazaki	GALANT ASPIRE LEGNUM CHARIOT GRANDIS RVR
Mizushima plant		DION LANCER SEDIA MIRAGE LANCER MIRAGE DINGO FTO LIBERO LIBERO CARGO DELICA STAR WAGON DELICA SPACE GEAR MINICA TOPPO BJ TOWN BOX MINICAB PAJERO MINI
Tokyo plant	Kawasaki	Heavy Truck (GVW: 20t class) Medium Truck (GVW: 8t class) Heavy Light Truck (GVW: 5t class) Special Heavy Truck

Models produced by Main affiliates

- **Mitsubishi Automotive Bus Manufacturing Co., Ltd.**
  Large-sized Bus/Medium-sized Bus
- **Pabco Co., Ltd.**
  Heavy Truck/Medium Truck/Heavy Light Truck
- **Pajero Manufacturing Co., Ltd.**
  PAJERO
- **Mizushima Industries Co., Ltd.**
  DELICA Truck/MINICAB Truck

2-3. Production

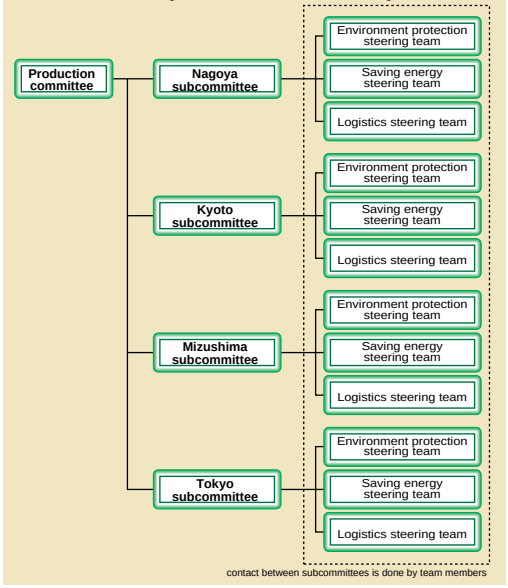
Automobile production activities have a bearing on everything from environmental problems at the local level to global environmental concerns. Recognizing this, MMC is taking concerted action to continuously reduce the impact on the environment.

Environmental protection at the production stage

The Production Committee of the Environmental Council has identified the following areas for proactive measures to prevent and reduce the impact on the environment.

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

Environmental problems related to production



Note: The Tokyo Subcommittee was reorganized under the Truck & Bus Committee in April 2000.

■ MMC plants

MMC produces all kinds of vehicles, including passenger cars, commercial vehicles, minicars, and trucks and buses of all sizes, at four plants in Japan. Engines, transmissions and main body parts are manufactured internally, while other components are supplied by specialist makers for assembly.

A number of production processes take place at plants, including casting, forging, machining, heat treating, resin forming, stamping, welding, painting and assembly.

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

Note: Production at the Tokyo Plant-Nakatsu was transferred to the Tokyo Plant-Kawasaki in September 1999.

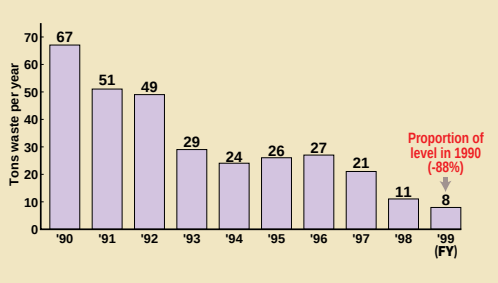
Measures to protect the environment

■ Reduction of waste emissions (Measures to eliminate landfill waste)

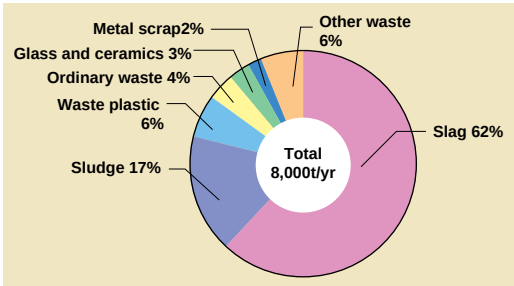
A priority in relation to waste disposal at the production stage is reduction of landfill waste through "development of production processes that minimize the amount of waste generated", and "greater recycling and reuse of resources."

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 processes 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 through intermediate treatment methods, such as incineration and dehydration, and the remainder disposed of in landfills.

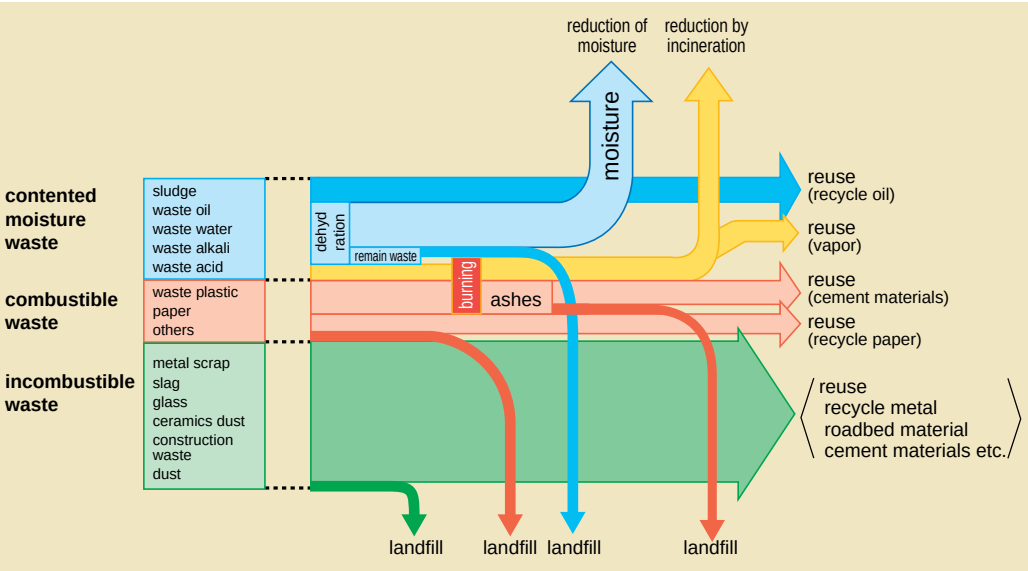
MMC's goal is to reduce landfill waste emissions in fiscal 2000 by 80% compared with fiscal 1990. Landfill waste emissions in fiscal 1999 were reduced by 3,000 tons from the previous year to 8,000 tons by increasing use of waste casting sand, cinders and fireproof materials as adjustment materials for blast furnaces, and expanding their reuse for roadbeds. This is equivalent to an 88% reduction from the level in fiscal 1990.



Amount of landfill waste generated per year, FY 1990~99



Breakdown of waste for landfill, FY 1999

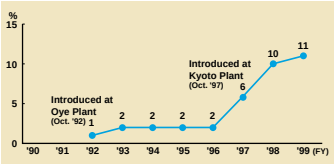


Waste disposal process

Introduction of cogeneration systems

Cogeneration systems are gas-turbine powered heat and electricity generating facilities that emit 40% less CO_2 than conventional methods of supplying energy.

Cogeneration facility at Nagoya Plant-Oya



Percentage of total electricity output generated by cogeneration (whole company)

■ 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.

MMC is also making increasing use of thermal recycling by recovering energy from combustibles, such as paper and wood shavings, that are incinerated in waste heat boilers to generate steam for use at plants.

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 materials, 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

■ Measures to eliminate landfill waste

It is expected to become increasingly difficult in the future to find suitable landfill sites. MMC is therefore taking steps to limit emissions of waste, increase reuse, and compact waste to as to eliminate the quantity of waste requiring landfill disposal.

The aim is to eliminate landfill waste emissions throughout the company by the end of March 2002. Serving as a model for this is the Nagoya Works, where the plan is to generate zero emissions by the end of March 2001.

■ Energy conservation

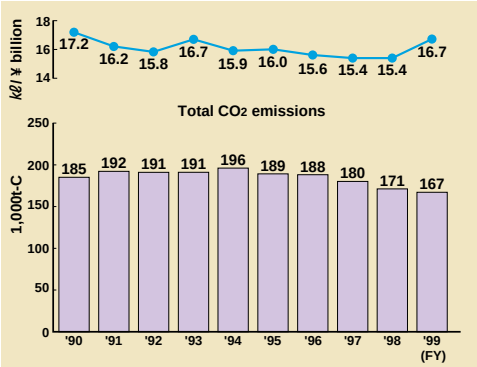
Various sources of energy, such as electricity, city gas, oil and coke, are used to meet the energy demands of the production processes outlined above and power facilities such as compressors and boilers.

The goal is "to keep total CO2 emissions in fiscal 2000 at the level they were at in fiscal 1990", and "to reduce energy consumption per unit sales in fiscal 2000 by 10% compared with fiscal 1990." Energy conservation teams have been established at each of MMC's works, and they are leading the way in promoting energy conservation in each division.

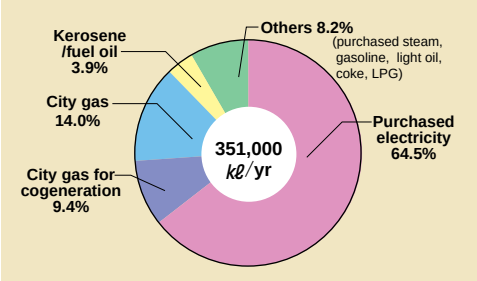
Up until now, MMC has promoted energy conservation through a broad range of measures covering facilities, production processes and management. These have included the introduction and expansion of use of cogeneration systems, insulation of industrial furnaces, use of energy-saving raw materials, and lowering of processing (base) temperatures.

CO_2 emissions in fiscal 1999 were 10% lower than in fiscal 1990.

MMC has responded to the fall in unit output by rationalizing its operations. Work on a number of production lines and at some facilities has been partially suspended, and a switch has been made from a system of two shifts day and night to a continuous two-shift system. The closure and merger of production lines is also under review.



Trend in energy consumption

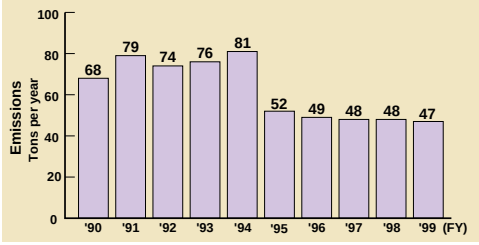


Breakdown of energy consumption, FY1999 (crude oil equivalent)

■ Prevention of air pollution

Sulfur oxides (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. MMC will continue to take steps to reduce SOx emissions by reducing fuel consumption through energy-saving measures in the future.



Trend in SOx emissions

✻Last year's figures have been adjusted due to the recalculation of trends in SOx emissions.

Nitrogen oxides (NOx)

We have made every effort in the past 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 bug filters and removing it using afterburners, and also limit emissions by proper maintenance and control of combustion.

1) VOC

Volatile organic compound

VOC[1)]

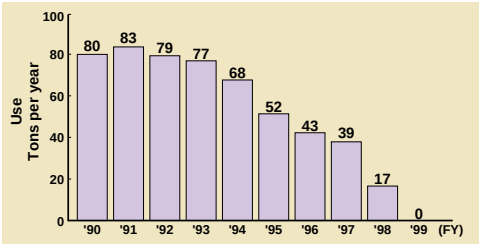
Use of solvents in the body painting process is being reduced by the introduction of environmentally friendlier production processes, such as the use of equipment that applies paint more effectively, the use of new painting methods, and the use of cleaning methods requiring less solvent to clean paint guns when changing colors.

We are also reducing emissions of solvents by fitting ovens with waste gas treatment systems and increasing the use of thinner recovered from the cleaning process.

At the machine component painting stage, use is made of water-based and powdered paints using practically no solvents, and used paint is recovered and reused, thus dramatically reducing waste emissions.

Chlorine-based cleaning agents

Trichloroethylene and tetrachloroethylene and dichloromethane used to be used for cleaning parts, but water-based cleaning agents were introduced and cleaning methods altered so as to eliminate their use altogether by March 2000. As a result, use of all three substances was totally halted ahead of schedule by March 1999.



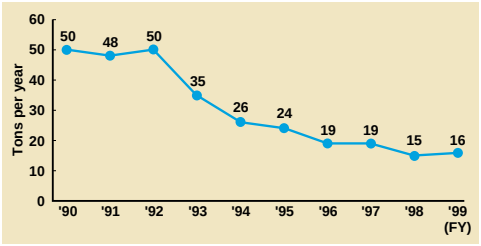
Trend in use of chlorine-based cleaning agents

■ Protection of the ozone layer

MMC formerly used two CFCs considered to be harmful to the ozone layer. CFCs were used in the urethane product foaming process, and 1.1.1-trichloroethane was used for washing products such as plastic bumpers and heat treated parts. However, use of both was entirely halted in 1995.

■ 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.



Change in COD

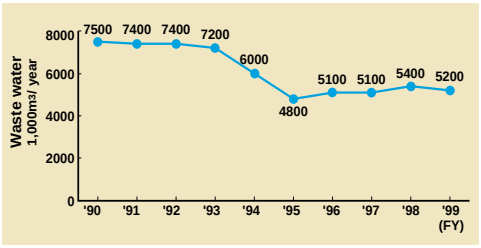
The quality of water discharged into public bodies of water is controlled in accordance with voluntary standards that are stricter than legal requirements. The quality of discharges is constantly monitored using colored carp and goldfish and by automatically measuring COD.[1)] We have also taken every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

1) COD

Chemical oxygen demand: used as a measure of water pollution.

■ 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

■ Action to prevent eutrophication [2)]

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.

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.

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

General wastewater treatment facility

■ 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.

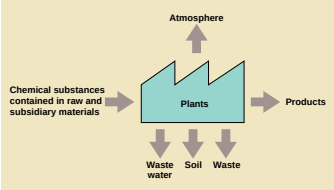
■ Dioxins

Measures to limit emissions from waste incinerators: 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).

Measures to make machining cutting lubricant chlorine free: Working teams have been established throughout the company in order to make existing machining lines chlorine free by the end of March 2001. The machining line at the new CVT plant (the Kyoto Works' Yagi Plant), meanwhile, has been chlorine free ever since it entered operation.

1) PRTR
Pollutant release and transfer register

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



2) MSDS
(material safety data sheet)

Sheet for entering details concerning the handling and content of chemical products.

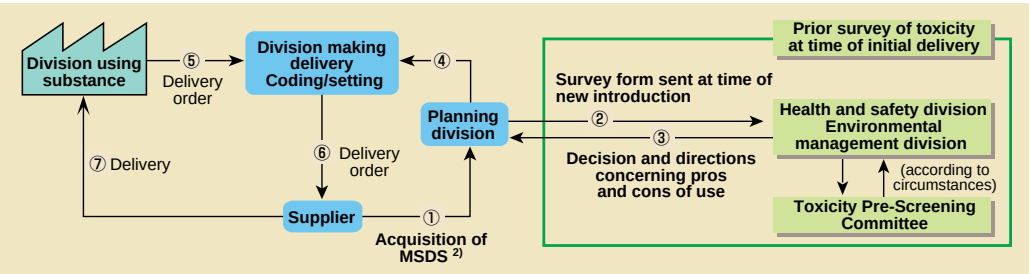
■ Chemical substances management

Two of MMC's plants have been involved in the Environmental Agency's pilot PRTR[1)] project since fiscal 1997, and all plants have been involved in Keidanren's voluntary PRTR program. MMC is currently developing a database of chemical components, and is monitoring emissions and movements of chemical substances.

As well as examining the pros and cons of the use of chemical substances before their actual introduction under a "system of screening for toxicity of chemical substances" as in the past, MMC is also taking positive action to control chemical substances by, for example, limiting emissions of harmful chemical substances.

The PRTR survey results for fiscal 1998 were as shown in the table below.

Of the 172 substances covered by Keidanren's PRTR survey program, 23 are handled by MMC. 43% of the amount used is emitted into the environment, 4% is moved as waste, and the remaining 53% is recycled, consumed or eliminated.



System for pre-screening of toxicity of chemical substances

Emissions and movements of PRTR environmental pollutants (FY1998)

Substance	Name of chemical substance	Toxicity level	Quantity used	Emissions			Movements	Other		
				Air	Water	Soil	Waste	Recycled	Consumed	Eliminated
1	Zinc compounds	B	51.27	0.00	1.27	0.00	10.57	0.00	39.45	0.00
21	Xylene	D	3,081.77	2,101.04	0.00	0.00	27.34	388.92	532.17	32.29
25	Chromium compounds (except hexavalent compounds)	A	0.31	0.00	0.00	0.00	0.31	0.00	0.00	0.00
50	Dichloromethane	B	15.76	14.62	0.00	0.00	1.14	0.00	0.00	0.00
58	Dimethyl-formamido	B	0.36	0.27	0.00	0.00	0.00	0.09	0.00	0.00
66	Tetrachloroethylene	B	1.56	0.71	0.00	0.00	0.85	0.00	0.00	0.00
79	Toluene	D	3,965.81	1,328.30	0.00	0.00	129.81	423.15	1,697.92	386.63
80	Lead compounds	B	22.32	0.00	0.01	0.00	1.18	0.00	21.14	0.00
81	Nickel compounds	A	7.77	0.00	0.63	0.00	4.64	0.00	2.50	0.00
86	Barium	B	0.11	0.00	0.00	0.00	0.01	0.00	0.09	0.00
88	Hydrated hydrazine	B	4.15	0.00	0.00	0.00	0.00	0.00	4.15	0.00
93	Diethylhexyl phthalate	B	1.59	0.00	0.00	0.00	0.05	0.00	1.55	0.00
96	Fluorine compounds	C	8.30	0.05	4.69	0.00	3.36	0.00	0.20	0.00
100	Benzene	A	160.98	0.57	0.00	0.00	0.21	0.00	160.20	0.00
104	Boron and boron compounds	B	1.66	0.00	0.15	0.00	0.79	0.00	0.72	0.00
105	Formaldehyde	B	7.06	3.88	0.00	0.00	0.00	0.00	0.00	3.18
107	Manganese compounds	B	30.24	0.00	1.67	0.00	10.29	0.00	18.28	0.00
114	Diethylhexyl adipate	C	36.53	0.00	0.00	0.00	1.10	0.00	35.42	0.01
118	Aluminum compounds	C	120.09	0.00	0.00	0.00	120.09	0.00	0.00	0.00
121	Monoethanolamine	C	33.55	0.00	12.38	0.00	1.75	19.36	0.06	0.00
123	Ethyl benzene	C	301.15	210.08	0.00	0.00	0.11	0.00	90.96	0.00
146	Zirconium compounds	C	20.90	0.00	0.00	0.00	20.90	0.00	0.00	0.00
147	Silicon carbide	C	670.46	0.00	0.00	0.00	5.36	32.91	632.19	0.00
Total			8,543.68	3,659.52	20.79	0.00	339.82	864.43	3,237.00	422.12

Note: Substance number indicates the number on the list of substances covered by the Keidanren PRTR survey. **(t/year)**

Cooperation with affiliates

■ Domestic 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.

A newsletter entitled "MMC Plant Environment Topics" is published twice a year for 110 companies, including these companies, providing information on trends in Japan and industry, and measures being taken by MMC to combat environmental problems.

Plant Environment Topics

■ Measures at overseas plants

MMC is actively tackling environmental problems not only in Japan, but also at its plants overseas, which each have a mother plant in Japan that provides full backup. These plants work in cooperation with their mother plants to reduce the environmental impact of their activities, and regular follow-up surveys are performed as in the case of domestic plants to determine progress toward attaining environmental goals.

PRTR technology and skills are also shared so that know-how and effective measures at pioneering overseas plants can be incorporated into the operation of other plants in the future.

■ Acquisition of ISO14001 and EMAS [1] certification by NedCar [2]

NedCar places a priority on environmental protection, and acquired EMAS certification (in addition to ISO14001 certification) in September 1999.

1) EMAS

Eco Management and Audit Scheme

2) Netherlands Car B.V. (NedCar) was established in December 1991 to serve as MMC's production base in Europe. Models such as the Charisma and Space Star powered by environmentally friendly GDI engines are made by the company.
NedCar had some 5,600 employees in December 1999, and produced around 260,000 vehicles in 1999.

TOPICS

Kyoto Plant-Yagi – green and people friendly

The Kyoto Plant-Yagi Plant is located some 30km northwest of Kyoto. CVTs (continuously variable transmissions) are mass produced at the plant, which entered operation in April 2000. The aim right from the design stage was to make the plant as ecologically sound as possible, setting it amid woods and lakes to make it both environmentally friendly and people friendly.

The plant is involved in the town of Yagi's tourism plans, and is well equipped with elevators and toilet facilities for the disabled and routes for visitors.

The environmentally friendly features of Kyoto Plant-Yagi include:

- Unique assessment of environmental impact by Yagi and MMC
- Use of recycled waste water for sprinklers and melting snow
- Regulating reservoir for storage of stormwater
- Use of chlorine-free cutting lubricant
- Use of dry cut hob and limitation of use of cutting oil for gear cutting
- Energy conservation in buildings

  Roof insulation, natural lighting, introduction of natural ventilation

Exterior designed to harmonize with appearance of Mongaku Lake Park

Cafetaria overlooking Mongaku Lake

Well-furnished visitor facilities
Visitors' lobby, visitor routes and hall, and elevators and toilets for the disabled

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. Figures for atmospheric emissions indicate maximums.)

COD: Chemical Oxygen Demand
BOD: Biochemical Oxygen Demand
NOx: Nitrogen oxides
SOx: Sulfur oxides

Oye

Employees: 2,600

Nagoya Plant - Oye

The air

Substances	Equipment	Unit	Regulation	Actual value
Nitrogen oxide	Boiler	ppm	64	62
	Oven	ppm	25	23
	Incinerator	ppm	74	58
	Gas Turbine	ppm	39	37
Dust	Boiler	g/Nm^3	0.2	0.070
	Oven	g/Nm^3	0.2	0.000
	Incinerator	g/Nm^3	0.4	0.160
	Gas Turbine	g/Nm^3	0.04	0.000
Sulfur oxide (sulfur rate in fuel)		wt %	0.05	0.005

The water

Substances	Unit	Regulation	Max.	Min.	Average
BOD	mg/l	20	17.0	1.0	5.3
SS	mg/l	20	17.0	3.0	7.8
Oil	mg/l	5	2.1	0.5	0.6
Total nitrogen	mg/l	15	5.30	0.2	3.9
Total phosphate	mg/l	2	0.85	0.03	0.39
Copper	mg/l	1	ND	ND	ND
Manganese	mg/l	2	0.1	0.04	0.07
Total chrome	mg/l	0.1	ND	ND	ND
Lead	mg/l	10	0.20	0.10	0.15

Okazaki

Employees: 1,700

Nagoya Plant - Okazaki

The air

Substances	Equipment	Unit	Regulation	Actual value
Nitrogen oxide	Small boiler	ppm	120	46
	Boiler	ppm	100	59
	Oven	ppm	250	57
	Incinerator	ppm	200	130
Dust	Small boiler	g/Nm^3	0.1	0.001
	Boiler	g/Nm^3	0.1	0.010
	Oven	g/Nm^3	0.1	0.001
	Incinerator	g/Nm^3	0.1	0.070
Sulfur oxide (sulfur rate in fuel)		wt %	1	0.006

The water

Substances	Unit	Regulation	Max.	Min.	Average
BOD	mg/l	10	6.9	0.6	1.9
COD	mg/l	10	7.5	1.4	3.5
SS	mg/l	10	2.3	0.5	0.8
Oil	mg/l	2	0.8	0.5	0.5
Total nitrogen	mg/l	15	8.3	2.2	4.4
Total phosphate	mg/l	2	0.06	0.01	0.03
Copper	mg/l	0.5	0.01	0.01	0.01
Manganese	mg/l	3	0.3	0.1	0.17
Total chrome	mg/l	0.1	0.02	0.01	0.015
Lead	mg/l	0.1	0.005	0.005	0.005

Kyoto

Employees: 3,200

Kyoto Plant - Kyoto

The air

Substances	Equipment	Unit	Regulation	Actual value
Nitrogen oxide	Boiler	ppm	150	49
	Melting furnace	ppm	200	39
	Heating furnace	ppm	180	43
	Oven	ppm	230	29
	Incinerator	ppm	250	112
	Gas Turbine	ppm	70	38
Dust	Boiler	g/Nm^3	0.1	0.001
	Heating furnace	g/Nm^3	0.1	0.004
	Oven	g/Nm^3	0.2	0.010
	Incinerator	g/Nm^3	0.2	0.018
	Gas Turbine	g/Nm^3	0.5	0.057
Sulfur oxide (sulfur rate in fuel)		wt %	0.5	0.022

The water

Substances	Unit	Regulation	Max.	Min.	Average
BOD	mg/l	20	8.5	3.5	3.7
COD	mg/l	20	6.9	1	1.8
SS	mg/l	70	5.4	2	2.6
Oil	mg/l	5	2.1	1	1.1
Total nitrogen	mg/l	60	10.8	0.2	0.9
Total phosphate	mg/l	8	0.83	0.07	0.2

Shiga

Employees: 500

Kyoto Plant - Shiga

The air

Substances	Equipment	Unit	Regulation	Actual value
Nitrogen oxide	Boiler	ppm	150	72
Dust	Boiler	g/Nm^3	0.1	0.004

The water

Substances	Unit	Regulation	Max.	Min.	Average
BOD	mg/l	20	12.5	1	2.7
COD	mg/l	20	13.7	2.3	4.4
SS	mg/l	20	2.5	0.5	1.3
Oil	mg/l	5	1.3	0.5	0.6
Total nitrogen	mg/l	8	5.4	2.9	2.35
Total phosphate	mg/l	0.6	0.4	0.1	0.125
Copper	mg/l	1	0.01	0.01	0.01
Zinc	mg/l	1	0.1	0.06	0.08
Manganese	mg/l	10	0.01	0.01	0.01
Total chrome	mg/l	0.1	0.01	0.01	0.01

Mizushima

Employees: 3,800

Mizushima Plant

The air

Substances	Equipment	Unit	Regulation	Actual value
Nitrogen oxide	Boiler	ppm	150	78
	Melting furnace	ppm	230	52
	Heating furnace	ppm	250	90
Dust	Boiler	g/Nm^3	0.1	0.002
	Melting furnace	g/Nm^3	0.1	0.001
	Heating furnace	g/Nm^3	0.1	0.066
Sulfur oxide (sulfur rate in fuel)		wt %	0.5	0.089

The water

Substances	Unit	Regulation	Max.	Min.	Average
BOD	mg/l	20	17	2	6.6
COD	mg/l	20	13	3.8	7.4
SS	mg/l	20	18	0.3	3.8
Oil	mg/l	1	0.8	0.3	0.5
Total nitrogen	mg/l	60	7.4	4.7	6.2
Total phosphate	mg/l	8	7.8	0.54	4.3
Copper	mg/l	3	ND	ND	ND
Zinc	mg/l	5	0.07	0.06	0.07
Manganese	mg/l	10	0.19	0.11	0.15
Total chrome	mg/l	0.5	ND	ND	ND
Lead	mg/l	0.1	ND	ND	ND

ND: Non-detected

Kawasaki

Employees: 3,200

Tokyo Plant - Kawasaki

The air

Substances	Equipment	Unit	Regulation	Actual value
Nitrogen oxide	Boiler	ppm	130	85
	Heating system	ppm	150	72
	Oven	ppm	250	15
Dust	Boiler	g/Nm^3	0.05	0.001
	Heating system	g/Nm^3	0.05	0.002
	Oven	g/Nm^3	0.2	0.001
	Incinerator	g/Nm^3	0.4	0.058

The water

Substances	Unit	Regulation	Max.	Min.	Average
BOD	mg/l	300	178	9.4	48.6
SS	mg/l	300	59	3.7	23.4
Oil	mg/l	5	4.8	0.1	3.6
Total nitrogen	mg/l	150	25	3.2	10.2
Total phosphate	mg/l	20	10	ND	2.8
Copper	mg/l	3	ND	ND	ND
Zinc	mg/l	3	0.11	ND	0.07
Manganese	mg/l	1	0.25	ND	0.13

Note: Discharged into sewerage system

Maruko

Employees: 670

Tokyo Plant - Maruko

The air

Substances	Equipment	Unit	Regulation	Actual value
Nitrogen oxide	Boiler	ppm	150	49
Dust	Boiler	g/Nm^3	0.2	ND

The water

Substances	Unit	Regulation	Max.	Min.	Average
BOD	mg/l	300	12.9	2.8	7.7
SS	mg/l	300	12	3.3	9.1
Oil	mg/l	5	4.8	0.4	3.1
Total nitrogen	mg/l	150	18	9.6	13.8
Total phosphate	mg/l	20	0.37	0.11	0.24
Copper	mg/l	3	ND	ND	ND
Zinc	mg/l	3	ND	ND	ND
Manganese	mg/l	1	ND	ND	ND

Note: Discharged into sewerage system

Nakatsu

Employees: 10

Tokyo Plant - Nakatsu

The air

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

The water

Substances	Unit	Regulation	Max.	Min.	Average
BOD	mg/l	300	1.4	0.1	0.8
SS	mg/l	300	7	0.1	0.6
Oil	mg/l	5	4.3	0.1	1.5
Total nitrogen	mg/l	150	1.1	0.69	0.9
Total phosphate	mg/l	20	ND	ND	ND
Copper	mg/l	3	ND	ND	ND
Zinc	mg/l	3	ND	ND	ND
Manganese	mg/l	1	ND	ND	ND

Note: Discharged into sewerage system

2-4. Logistics

At MMC, we recognize the importance of cutting use of packing materials and improving transport efficiency at the production, distribution and servicing stages in order to combat global warming and protect the environment, and are actively developing a low environmental impact logistics system.

Measures to increase transport efficiency (reduction of CO_2 emissions)

As a result of active steps to reduce emissions of CO_2, which is one cause of global warming, the amount of CO_2 emitted per vehicle during the transport of passenger cars in Japan in fiscal 1999 was reduced by 9% from fiscal 1998 to 19.6kg/vehicle(CO_2 weight equivalent). One major reason for the fall was the increased use of marine transport, and measures such as this are being further expanded in fiscal 2000.

1) Modal shift

The switch to use of rail and marine transport instead of mainly trucks in order to reduce the impact on the environment and cut costs.

■ Modal shift [1)]

In order to develop an efficient transport system utilizing multiple means of transport-trucks, ships and rail-we are promoting the switch from a mainly land-based transport system to a marine one. Transport policy was changed in fiscal 1999 so that 100% of passenger cars that can be transported by sea are now transported by sea.

Marine transport is being used more for trucks, too, and in the case of land transport of small-sized trucks, we are switching from the existing system of using the trucks themselves to transport them to loading them onto transporters for transport like passenger cars.

Rail, meanwhile, is starting to be used in certain regions where improvements in efficiency can thus be obtained.

■ Use of trailers and more efficient routes

In viewing the transportation equipment, Mitsubishi promotes the loading of vehicles over the top of car transporter tractor units in accordance with relaxations; in order to improve loading efficiency. The introduction of full trailers [2)] is an additional measure taken to improve transportation efficiency by increasing the number of vehicles loaded per trailer. We are also actively pursuing measures to prevent idling and encourage more ecological driving.

2) Rear trailer, full trailer

■ Sharing transport with other companies

Sharing land-based means of transport enables companies to make use of each other's return journeys. Use of shared transport accounted for 10% of all transport in fiscal 1999, and this figure will rise further in fiscal 2000.

Measures to cut use of packing and packaging materials

In order to reduce the use of packing and packaging materials used in transporting parts for production and other supplies to affiliated producers and distributors overseas, we are taking a variety of steps, such as making greater use of returnable steel racks and returnable boxes, simplifying packing specifications, using stretch film packing, and replacing wooden packing cases with steel ones.

■ Introduction of returnable steel racks and returnable boxes

Packing for products bound for North America (MMMA), the Netherlands (NedCar) and Italy (IPF) used to be made from wood and plywood and disposed of at the destination by incineration. However, we are now phasing out the use of such packing materials, and introducing returnable steel racks in their place. Returnable plastic boxes [3)] are in addition used for shipments to MMC's new affiliate in Thailand (MSC).

We are also switching to the use of returnable racks for shipments of supplies to Europe (MMSE), the Middle East (MMGF) and North America (MFTA).

Because of the energy and cost savings generated by the transition to returnable racks and boxes, increasing use will be made of them in the future.

■ Reduction of use of wooden packing cases

By promoting the use of steel cases and simplifying packing, the amount used per unit sales of wooden packing cases in fiscal 1999 was reduced by 18% from fiscal 1998.

3) Returnable plastic boxes

Parts are shipped from Japan packed in returnable boxes. These are then folded up to a quarter of their size at their destination after unloading and returned to Japan. Boxes of this kind can be reused just under a dozen times.

2-5. Sales (support for environmental action by dealers)

Dealers have an important contribution to make to environmental production by disposing of industrial waste and ELVs properly and recovering and recycling parts. MMC works alongside its dealers to actively protect the environment.

Environmental protection by dealers

■ Appropriate disposal of industrial waste(Manifest[1)] system)

In December 1998, the amended Waste Disposal Law [2)] expanded the scope of the manifest system-a system whereby companies collecting, transporting and disposing of waste are issued with manifests to enable businesses to confirm that their waste is disposed of appropriately-to cover all kinds of industrial waste, thus requiring compliance by dealers as well. MMC distributed manuals to dealers when the manifest system was introduced, and promotes more appropriate disposal of, among other things, waste parts, metal and oil produced by repair shops.

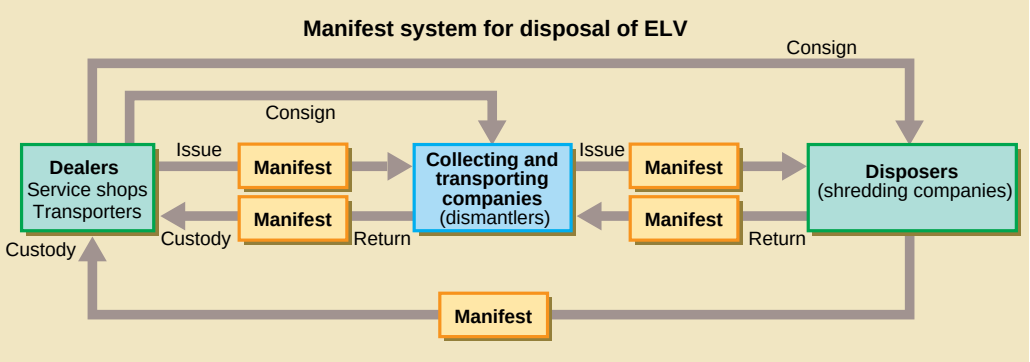
■ Prevention of dioxin emissions and water pollution (Dioxin Control Law) [3)]

In order to prevent emissions of dioxins, which have become a major social problem in recent years, MMC has ordered its dealers to use specialist waste disposal contractors. (Dealers had previously disposed of waste using incinerators.) Another way in which dealers are protecting the environment relates to the waste water produced when removing the paint protecting wax on new vehicles. Until now, this had been treated in order to preserve water quality, but in May 2000, a paint protecting film that does not require waste water to be treated was introduced.

Proper processing of ELV

■ Manifest system

A manifest system like that for industrial waste was introduced for ELVs too in December 1998. MMC has made sure that dealers are fully aware of the details of the system, and is promoting the appropriate disposal of .



Manifest system for disposal of ELV

1) Manifests

In this instance, the documents issued when one business contracts another to transport and/or dispose of its waste. Manifests contain details of the type of waste and the contractor(s) involved .

2) Waste Disposal Law

Officially known as the Waste Disposal and Public Cleaning Law, the Waste Disposal Law comes under the jurisdiction of the Ministry of Health and Welfare. A 1991 amendment made a manifest system of transport and disposal mandatory for certain types of industrial waste. A further amendment in June 1997 expanded the manifest system to cover all types of industrial waste in order to make businesses more aware of their responsibility for their waste and ensure appropriate disposal of waste. In May 2000, the liability of waste producers for the appropriate disposal of waste was increased further.

3) Dioxin Control Law

Known officially as the Law Concerning Special Measures against Dioxins, the Dioxin Control Law was introduced in January 2000 to prevent air, water and soil pollution by dioxins. Businesses with certain facilities are required to comply with emission standards, measure dioxin emissions, and report to the governor of their prefecture (or mayor in the case of ordinance-designated cities).

As incineration of waste can also generate dioxins, small incinerators used by dealers are also subject to controls.

Comparison of greenhouse effects (CO_2 = 1)

CO_2	1
Methane	21
N_2O	310
CFC substitute (HFC-134a)	1,300
CFC (CFC-12)	7,100

Source: IPPC report (1995)

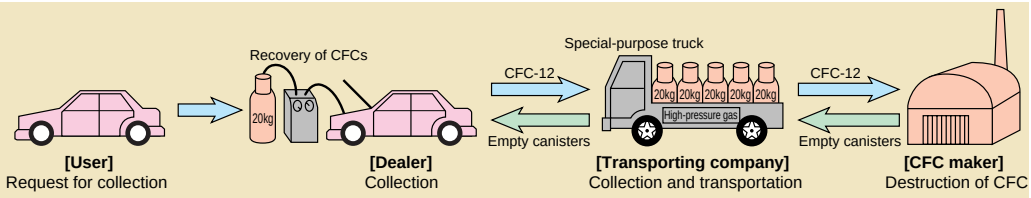
Airbag inflators

Devices for generating the gas to inflate airbags. The sodium azide used in them could, it is feared, harm the environment if cars are disposed of without their airbags having been deployed.

■ Collection and destruction of CFC-12 for air conditioners

As CFC-12 causes destruction of the ozone layer, its use in MMC vehicles was completely stopped by January 1994. MMC has provided all dealers with equipment to collect and recycle CFC-12, and has promoted its collection and reuse. As a result of the spread of vehicles using new HFC134a coolant, demand for recycled CFC-12 has declined, creating a considerable surplus of CFC-12. In order to properly destroy and dispose of this excess supply of CFC-12, we developed a CFC-12 collection and destruction system in collaboration with other firms in related industries, and this system was in place nationwide by October 1998.

Although HFC-134a does not destroy the ozone layer, it is a greenhouse gas. Thus in order to combat global warming, we are fitting our cars with air conditioners designed to minimize use of refrigerants, and are encouraging dealers to collect and reuse HFC-134a just like older types of refrigerant.



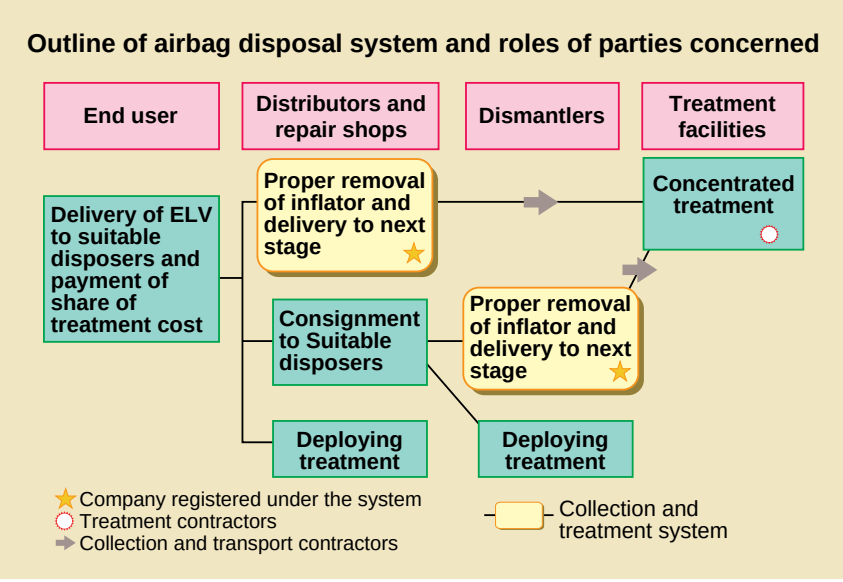
CFC-12 collection/destruction system

■ Disposal of airbags

Practically almost all passenger cars on sale are now fitted with airbags, and over half of all ELVs are expected to have airbags from 2005.

In 1996, in order to ensure the safe disposal of ELV, the Japan Automobile Manufacturers' Association drew up a manual stipulating that airbags should be deployed prior to disposal, and this was distributed to service shops and used car dealers.

In October 1999, MMC joined the Japan Auto Parts Industries Association in trials to develop a safer system for removal, collection and processing of airbag inflators.



Collection and reuse of parts

■ Collection and recycling of used bumpers

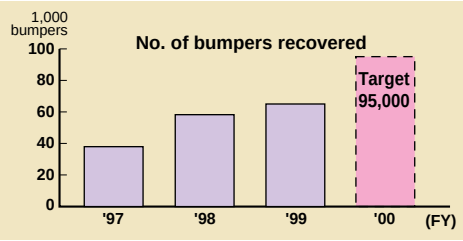
Since May 1997, MMC has been collecting and material recycling used polypropylene bumpers replaced by dealers. Bumpers replaced when cars are repaired were in the past disposed of in landfills. Collecting and recycling them, however, reduces the amount of waste generated by dealers, and also enables more effective use of resources. Up until the summer of 1999, old bumpers (numbering around 4,000 a month) had only been collected in the Kanto, Chubu and Kinki regions. The expansion of the system to cover the entire nation in the autumn of 1999 increased the number of bumpers recovered per year to 61,600, though, and 95,000 are expected to be collected in fiscal 2000.

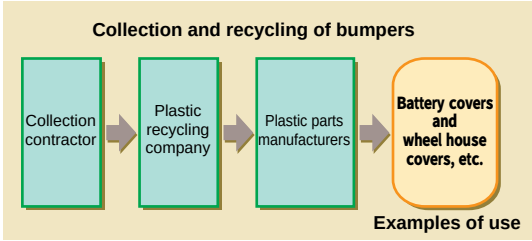
After foreign substances such as metal brackets have been removed, the bumpers are made into pellets by plastic recycling companies and recycled into auto parts by parts manufacturers.

We are currently using recycled materials for parts such as passenger car battery covers, underseals, truck wheelhouse covers, and air cleaner cases. We are also looking into the possibility of adopting a low-cost paint-stripping method to help turn recycled pellets back into bumpers.

■ Use of recycled parts

Some parts such as engines, transmissions and power steering gearboxes that have been replaced by dealers are rebuilt to make them as good as new and then sold. In the future, we plan to expand the range of parts to include drive shafts, and are considering expanding the scheme to cover other parts to reduce the amount of waste generated by dealers further and meet customer needs.

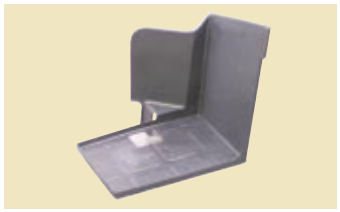




Recycling of plastics

The commonest form of recycling is known as material recycling, which is a method of reusing things as raw materials. Thermal recycling refers to reuse as a source of heat. There also exists a method, known as chemical recycling, for breaking down plastics into chemical raw materials. Although this method is technologically feasible, however, it is too costly at present to be economically viable.

Example of reuse for passenger car parts



Battery cover

Under seal

Example of reuse for truck parts

Wheel house cover

Air cleaner case

Development of technology and systems for disposal of ELVs

Some kinds of technology being developed by MMC to help dispose of ELVs are technology to strip paint from bumpers and wheelcovers,[1)] and technology to convert urethane into oil.

Bumpers tend to be painted for use, and this paint needs to be removed if they are to be effectively recycled. MMC has completed plans for using abrasion-type paint-stripping equipment to remove paint and mixing recycled materials in with other materials to make new bumpers The plan is to make the auxiliary bumpers for two models in this way, and then to move on to use recycled materials in the manufacture of bumpers for other models.

Consideration had previously been given to using rollers to remove paint from bumpers, but the abrasion method was chosen as it is more economical.

Removal of paint from painted wheelcovers by the CS paint-stripping method has also been studied, and it has been confirmed that recycled materials can comprise up to 10% of the content of new wheelcovers.

In order to increase the proportion of ELVs recycled, we decided it was necessary to recycle the urethane foam commonly used in automobile sheeting, and studied ways of turning urethane into fuel oil as one means of recycling it. Although still at the basic research stage, we have confirmed that it is possible to convert urethane into an oily substance with a boiling point equivalent to that of light oil using, for example, super-critical water,[2)] and we are continuing to study ways of making further improvements to the oil-making process.

In the future, the recycling ratio [3)] will need to be raised still further. To cope with infrastructure requirements in the years to come, therefore, we are proceeding to identify and develop ways of designing new models to be 95% recyclable.

As part of such moves, we are enhancing our dismantling test facilities, and plan also to investigate appropriate disposal methods and recycling systems for ELVs.

1) Summary of paint-stripping technologies

① **Abrasive paint-stripping**
Painted chips are fed into a machine and pressed by a screw against the walls to remove the paint.

② **Roller stripping**
Painted bumpers are squeezed between rollers revolving at different speeds, and the paint stripped off by the slippage effect created.

③ **CS paint-stripping**
Painted chips are fed into a machine, and the paint stripped off by the collisions and friction between pins and pellets.

2) Super-critical water

Water at a temperature of 374oC and pressure of 22.1Mpa or more. Organic matter quickly dissolves in super-critical water, which is used to convert waste plastic chips to oil.

3) The target recycling ratio for related industries as a whole under MITI's ELV Recycling Initiative is 95% from 2015.

Urethane chips

Use of super-critical water

Oil produced

2-6. Promotion of ITS

In order to solve mounting traffic problems, such as traffic accidents, traffic congestion and the associated harm done to the environment, R&D is underway both in Japan and overseas on intelligent traffic systems (ITS) utilizing the latest information technology (IT). In order to realize road transport that is safe, comfortable and environmentally friendly, MMC is forging ahead with R&D on ITS to improve car navigation systems, enable electronic toll collection (ETC), assist safe driving, and increase the efficiency of commercial vehicles, and is working to introduce and encourage the spread of such systems on a commercial scale.

Government-backed ITS projects

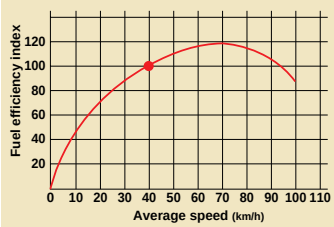
①**Advances in navigation systems**
②**Electronic toll collection systems (ETC)**
③**Assistance for safe driving**
④**Optimization of traffic management**
⑤**Increasing efficiency in road management**
⑥**Support of public transport**
⑦**Increasing efficiency in commercial vehicle operation**
⑧**Support of pedestrians**
⑨**Support for emergency vehicle operations**

The connection between traffic congestion and fuel efficiency

It is estimated that around 11% of automobile fuel consumption is due to traffic congestion. It is also known that increasing average speed in traffic jams from 10km/h to 20km/h would result in an improvement of almost 60% in actual fuel efficiency.

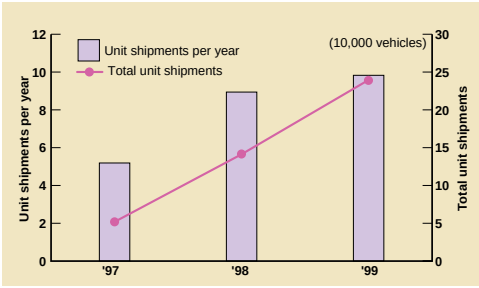
Easing traffic conditions and eliminating congestion to a minimum can therefore make a major contribution to reducing CO_2 emissions.

(Source: JAMA)



Fuel efficiency at various average speeds
(Fuel efficiency of 2,000cc/AT gasoline passenger car at 40km/h = 100)

■ Provision of traffic information



The Vehicle Information and Communication System (VICS) is a service for providing real-time traffic information (e.g. on congestion and traffic restrictions) to car navigation systems so that drivers can change their routes to avoid traffic jams. MMC began equipping its vehicles with VICS-compatible navigation systems to coincide with the launch of VICS in 1996, and is actively expanding the range of vehicles fitted with such equipment. By the end of FY 1999, a total of 240,000 MMC vehicles had been shipped with VICS systems onboard.

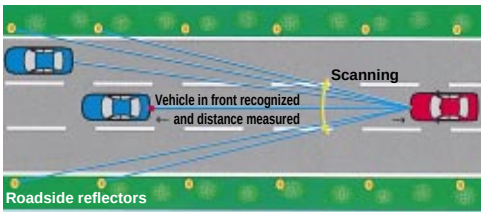
Another traffic information system now available is CompassLink, which is an operator-based system that uses cell-phone lines. Adopted for the Proudia and Dignity models that went on sale in February 2000, CompassLink combines a broad range of information (on a variety of subjects as well as traffic information) with the greater ease of use of car navigation systems.

In this way, MMC is contributing to the spread of information services that help to avoid and ease traffic congestion.

■ ETC developments

A third of traffic congestion on expressways currently occurs at tollbooths. In order to eliminate this cause of congestion, work is underway to introduce non-stop ETC at all tollbooths throughout Japan. MMC is involved in trials that began in April 2000, and is also preparing ETC in-car units for the system's full-scale launch planned for some time in fiscal 2000.

■ Driver support systems



Congestion caused by reducing speed in tunnels and sags (sections of road where the slope changes from down to up) accounts for two fifths of all traffic congestion on expressways. An effective means of reducing this congestion is to provide driver assistance in the form of distance warning and control systems.

MMC was the first in the world to develop a full-fledged "preview distance control" system that detects the vehicle in front by laser radar and automatically controls throttle and shift to maintain a set distance from it. This system was initially adopted for the Diamante that went on sale in 1995, and a similar system for trucks was then installed onboard Super Great models in 1998. MMC has also developed a driver support system for the Proudia and Dignity models mentioned above that combines a rear monitor and warning system that warns drivers when they stray from their lane.

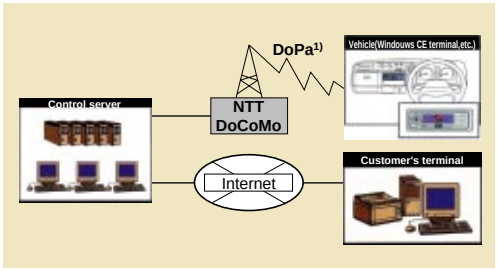
MMC will also be taking part in the "Smart Cruise 21-DEMO2000" public demonstration of smart cruise technology planned for November 2000 by the Ministries of Transport and Construction. MMC's demonstration vehicle will be equipped with an advanced system of radar and brake control known as "advanced preview distance control".

1) DoPa

A type of packet communication service. Users are charged a fee based on the volume of data communicated regardless of distance or connection time. "DoPa" is a registered trademark of NTT DoCoMo Co., Ltd.

■ Improvement of logistical efficiency

The Mitsubishi-Fuso Total Support System launched in autumn 1999 is a state-of-the-art logistical and operational support system enabling more efficient use of commercial vehicles. It is currently used by major frozen freight carriers.



Mitsubishi-Fuso Total Support System

An onboard computer automatically collects data on the operating status of the vehicle, its location as determined by GPS, its speed, and so on. This information is then transmitted instantaneously by packet transmission to a control server, making it possible to monitor in real time vehicle data via the Internet using a terminal at the company's office. Not only does this contribute to vehicle and freight quality control, but by providing information on optimum routes and directions to raise fuel efficiency, it can also improve supervision of operations and reduce the impact on the environment.

■ EV operating systems

The MEEV-II, developed as a next-generation urban commuter car (see p.16), is provided with the ITS features described below. These systems, which are premised on shared use of the vehicle in office and residential districts and use as a rent-a-car in urban areas, form part of a comprehensive system for efficient and effective use of EVs used to travel over comparatively short distances.

● Use of an IC card as a member's card makes it unnecessary to hand over keys, enabling more efficient vehicle management.

● Various services provided by a control center (such as information about routes and user charges) are displayed in real time on a large car navigation screen.

2-7. Environmental protection in the office

MMC encourages environmental protection even in offices that have comparatively little impact on the environment through, for example, the use of recycled paper and the purchase of ecologically sound stationery. Through such activities, MMC is increasing awareness of the environment at the level of the individual.

■ Measures to conserve energy and resources

One way in which resources are conserved in the office is through office automation, which reduces the need for paper and other resources. Use is also made of recycled paper and both sides of paper for photocopying and computer printouts, and recycling of paper is actively encouraged. In fiscal 1999, resources equivalent to around 21,000 trees of 8m in height and with a diameter of 14cm were saved in this way. In addition, used fluorescent lights are collected for recycling.

With regard to energy conservation, MMC encourages employees to save energy in their everyday office activities, such as by switching off lights during the lunch break and turning off air conditioners in conference rooms that are not in use.

Reduction in use of paper	Reduction of need for paper through office automation Use of recycled paper and printing on both sides of paper
Reuse of resources	Collection of old documents for use as recycled paper Amount recycled: approx. 1,000 tons
Energy conservation	Lights switched off during lunch breaks Air conditioners in empty conference rooms switched off

Collection boxes for recycled paper

■ Green purchasing

MMC promotes green purchasing, i.e. the preferential purchasing of environmentally friendly products (such as equipment and supplies). To encourage green purchasing, lists for stationery orders for the head office area also indicate which products are environmentally friendly, and preference given to greener stationery.

In order to provide information to customers interested in making green buying decisions, MMC is also a member of the Green Purchasing Network (GPN),[1)] and supplies data concerning, for example, the fuel efficiency, exhaust emissions and recycling of MMC's main models. Information of this kind is updated twice a year and posted on the Internet.

Environmentally friendly stationery

1) Green Purchasing Network

An organization established to promote the spread of preferential purchasing of environmentally friendly products.

3. Environmental accounting

In order to ensure the effectiveness and sustainability of a company's environmental activities, it is important to accurately determine the costs of such activities and assess them in comparison with the environmental benefits thereby obtained. By introducing environmental accounting, we are working to improve the cost effectiveness of our environmental activities.

■ About environmental accounting

Environmental accounting is currently still at the developmental stage, and there do not exist any common standards regarding the scope and calculation of effects as in the case of financial accounting. In Japan, therefore, individual companies and organizations are developing their own standards taking as a basis the guidelines laid down by the Environmental Agency.

Calculated based in part on these guidelines, MMC announced its environmental costs in fiscal 1998 last year. To make our environmental accounting more sophisticated, however, we have opted this year to also tabulate the data on environmental effects. (The tabulated results are for MMC calculated on an unconsolidated basis excluding subsidiaries and affiliates.)

■ Environmental costs in fiscal 1999

As in fiscal 1998, costs relating to environmental facilities and waste disposal at works, R&D, and other costs judged to have environmental benefits were identified.[1)]

The main change in the data compared with fiscal 1998 concerns environmental expenditures on R&D activities. R&D activities are heavily affected by plans for the development of new products. Total R&D expenditures in fiscal 1999 were lower than in fiscal 1998, causing environmental costs to fall.

■ Environmental effects in fiscal 1999

Regarding environmental effects, which are a new item used in environmental accounting, we describe the main quantitative data on activities reduce the impact on the environment not only at the production stage, but also during and after the use of products.

With regard to environmental effects (in value terms) accompanying measures to protect the environment, the scope and methods of calculation are currently being examined so as to be able to publish figures on them from next year.

April 1, 1999~March 31, 2000

Environmental costs [2)]

Category of expenditure [3)]		(Unit: ¥m)
(1) Expenditures on reduction of environmental impact of production and service activities in business domain (business domain costs)		4,118
Amount	①Expenditures	(2,299)
	②Global environmental protection	(109)
	③Recycling	(1,710)
(2) Expenditures to reduce environmental impact of production and service activities upstream and downstream (upstream/downstream costs)		83
(3) Environmental expenditures on management activities (management activity costs)		1,063
(4) Environmental expenditures on R&D activities (R&D costs)		32,342
(5) Environmental expenditures on social activities (social activity costs)		335
(6) Expenditures to deal with environmental damage (environmental damage costs)		35
Total		**38,001**

Environmental effects

Category [3)]	Environmental impact indices		
	Item	FY1999	% change on previous year
(1) Environmental effects within business domain (business domain effects)	●Energy consumption in production process (total CO_2 emissions)	167,000t-c	97.7%*
	●Quantity of waste for final disposal	8,000t	72.7%
(2) Environmental effects arising upstream and downstream (upstream/downstream effects)	●Number of old bumpers recovered	61,600	119.4%
(3) Other environmental effects	●Average fuel efficiency by vehicle weight category (gasoline-powered passenger cars)		
	(Class 1: ~875kg)	18.9km/ℓ	102.7%
	(Class 2: 1,000~1,500kg)	14.3km/ℓ	100.7%
	(Class 3: 1,750kg~)	10.3km/ℓ	96.3%

*Despite active steps to save energy, energy consumption per unit sales increased to 108% on the previous year as a result of the impact of fluctuations in the number of vehicles produced.

1) "Compound" costs including non-environmental objectives are, as a rule, calculated by differential costing (by deducting non-environmental costs from total costs). Estimates, however, are included where differential costing is difficult.

2) Main categories of environmental costs

(1) Expenditures on environmental facilities, energy conservation, saving resources, and waste disposal, etc. at plants.
(2) Expenditures on recovery of used parts.
(3) Expenditures on environmental secretariat business, ISO14001 certification and employee education concerning the environment, etc.
(4) Expenditures on R&D related to improving fuel efficiency, reducing exhaust emissions, development of clean energy vehicles, and recycling, etc.
(5) Expenditures on donations and membership fees paid to external environmental organizations, and expenditures on maintaining areas of greenery, afforestation, etc.
(6) Expenditures on taxes and other charges paid to central and local governments.

3) Environmental costs are classified on the basis of the latest guidelines laid down by the Environmental Agency for fiscal 2000. They are consequently classified and expressed slightly differently from last year.

4. Social contribution activities/ Communication activities

MMC fulfils its role as a good corporate citizen by making an active contribution to environmental protection activities in society and the community.

Clean Kurashiki Project

MMC takes part in cleaning activities organized by the Kurashiki (Okayama) branch of the Chiisana Shinsetsu Undo Foundation in the following localities:

- The area in the center of Kurashiki from the "urban aesthetic district" designated a national listed building zone to Kurashiki Station and its environs
- Mizushima shopping center and its environs
- Mizushima Works and its environs

Social contribution activities

One way in which MMC contributes to society is by participating in and making donations to organizations involved in environmental protection. In fiscal 1999, MMC participated in numerous volunteer activities, study teams, and committees (such as environmental management study groups). Donations included backing for three symposiums and funding for two tree-planting projects and four antipollution campaigns.

■ Local cleaning and tree-planting activities

Category	Place
Cleaning the streets around factories	Various locations
Participation in cleaning of the urban aesthetic district in Kurashiki	Mizushima
Participation in tree-planting project in Kurashiki	Mizushima
Tree-planting on factory sites	Various locations
Sorting and collection of general waste (discarded cans, PET bottles, etc.)	Various locations

Cleaning up in Kyoto

■ Community education activities

MMC employees at the Car Research & Development Center in Okazaki, Aichi Prefecture, visited local elementary schools to teach children about the environment.

■ Cooperation for LEV fairs

MMC has exhibited low-emission vehicles at related fairs and exhibitions around the country to encourage their use.

Main events in fiscal 1999	Organizer	Date	Place
Sagamihara City Environmental Fair	Sagamihara City	May 8~9	Kanagawa
General meeting of the International Auto Association	International Auto Association	May 14	Tokyo
LEV Fair 1999	Environmental Agency	June 5~6	Tokyo
Clean Car Fair 1999	Chiba Prefecture	June 12~13	Chiba
LEV Promotion Exhibition	MITI	June 17	Hyogo
Shikoku EV Rally Festival	Shikoku EV Challenge 2000	August 21~23	Tokushima
ECO Energy Osaka	Osaka Prefecture	September 25~26	Osaka
Nagoya LEV Fair	Nagoya City, etc.	October 2~3	Aichi
NGV Show	Japan Gas Association	October 6~8	Tokyo
LEV Fair Osaka	Osaka	October 20~23	Osaka
Chiba LEV Fair	Chiba Prefecture Environment Bureau	October 24	Chiba
LEV Fair Kita-Kyushu	Kita-Kyushu City	October 29~31	Fukuoka
LEV Fair Shiga	Environmental Agency and others	March 19~20	Shiga

Communication activities

MMC is involved in activities to encourage greater interaction with customers and local residents near plants. Two-way communication of this type requires the provision of various kinds of information. MMC therefore makes information about its environmental activities available to the public through publications such as this environmental report.

Ways in which MMC is playing a part in local communities include its participation in Kyoto's Association of Businesses to Beautify Omuro and Tenjingawa, and involvement in river patrols.

5. A history of environmental protection at Mitsubishi Motors

Year	Development of products and technologies	Management and production operations, etc.
1966	●R&D on electric vehicles conducted in association with Tokyo Electric Power	
1969	●Gas turbine R&D begins	
		●Mitsubishi Motors spun off from Mitsubishi Heavy Industry
1970	●Limited production of light commercial electric vehicles	
1971	●Involvement in R&D on electric city buses, electric buses delivered to Kyoto and Kobe transportation bureaus	
1972	●Announcement of low-emission MCA engine	
1977	●Announcement of low-emission, high-efficiency MCA-JET engine	
1979	●R&D on methanol-powered car begins ●Development of prototype gas-turbine truck	
1980	●MCA-JET engine wins the Japan Society of Mechanical Engineers' (JSME) prize for technologye	
1982	●High-fuel efficiency Orion 1400MD engine announced	
1986	●Cyclone engine offering high combustion efficiency announced	
1987		●MMC wins the Minister of International Trade and Industry's award for tree planting at its Shiga plant
1988	●Announcement of world's first pre-stroke control fuel injection pump to reduce NOx emissions from diesel engines	
1989	●Eterna Sigma methanol car road tests begin	●Project team established to examine global nvironmental issues ●Diamond Star Motors (now Mitsubishi Motor Manufacturing of America) awarded the Prize for Outstanding Environmental Contribution by the U.S. Industrial Development Survey Association ●Nagoya plant-Okazaki awarded a special award by Aichi Prefecture for its greenification activities
1990	●Long-term tests of Gallant FFV (methanol car) conducted by Californian Energy Commission ●Pre-stroke control fuel injection pump wins JSME's prize for technology ●MMC participates in Japanese Ministry of International Trade and Industry's (MITI) Auto Ceramic Gas Turbine Project	
1991	●Announcement of MVV engine ●Joint development of Lancer electric car with Tokyo Electric Power	●Plastic parts weighing at least 100g marked with identifying code
1992	●MVV engine wins Automobile Technology Society's prize for technological development ●Announcement of MIVEC engine combining high fuel efficiency and high output ●Start of research into reducing particulate emissions from diesel trucks ●Awarded Japan Gas Turbine Society's prize for technology for development of ceramic turbine rotor	●Introduction of cogeneration system at Nagoya plant-Oye ●Mizushima Plant commended for contribution to the environment by Okayama Prefecture
1993	●Joint development of Libero electric vehicle with Tokyo Electric Power, delivery of 30 vehicles to Tokyo Electric Power and Tokyo government ●Light hybrid passenger car (ESR) exhibited at the 30th Tokyo Motor Show ●Start of road tests of methanol-powered Canter	●MMC Environmental Plan formulated and Basic Philosophy on the Environment established ●MMC Environmental Council established
1994	●Libero electric vehicle goes on general sale ●Start of model business for introduction of Gallant methanol-powered vehicle ●Sales of buses fitted with hydraulic hybrid systems (MBECS) start ●Start of trial sale of methanol-powered Gallant ●Development of Canter natural gas vehicle ●Elimination of CFC-12 coolant from air conditioners in all new models and switch to HFC-134a for all vehicles ●Launch of moves to reduce use of lead in new models ●Introduction of technology to strip paint from plastic parts in order to better greater recycling	●CFCs entirely eliminated from production processes

5. A history of environmental protection at Mitsubishi Motors

Year	Development of products and technologies	Management and production operations, etc.
1995	●Development and announcement of world's first high-fuel efficiency, high-output gasoline direct injection (GDI) engine	●Kyoto plant-Shiga awarded the Prime Minister's environmental contribution award for its contribution to tree-planting campaigns
	●Development of Mitsubishi HEV, tested by California Air Resource Board	●Elimination of 1.1.1-trichloroethene from all production processes
	●Announcement of MBECS-II (first diesel car to pass the 1999 exhaust controls)	
	●Canter HEV developed and exhibited at 31st Tokyo Motor Show	
	●Road tests start on city bus fitted with DPF system	
1996	●Announcement of vehicles powered by GDI engines (Gallant, Legnum)	●MMC Environmental Plan revised
	●GDI engine awarded the Minister of International Trade and Industry's award by the Energy Conservation Center	●Recycling Committee established in the MMC Environmental Council
	●Development of mechanical AT "INOMAT"	
	●MBECS-III offering improved high efficiency goes on sale	
	●First ever common-rail fuel injection system adopted for mass-produced tractor engine	
	●LPG Canter goes on sale	
	●DPF system for city buses enters commercial use, 30 vehicles delivered to Yokohama	
1997	●GDI engine wins JSME and Auto Technology Society prizes for technological development	●Launch of recovery and recycling of old bumpers replaced by dealers
	●MMC awarded the 1997 Environmental Contribution Award for the Prevention of Global Warming for developing and encouraging the wider use of GDI engines	●Introduction of cogeneration system at Kyoto Plant
		●Nagoya Plant-Okazaki and Tokyo Plant-Kawasaki take part in Environmental Agency's PRTR Pilot Project
	●CNG Canter goes on sale	●All eight plants take part in voluntary PRTR trials organized by Keidanren
	●Joint development of low-cost, high-performance lithium-ion battery with Japan Storage Battery	●Publication begins of "Plant Environmental Topics" for distribution to suppliers, etc.
	●Approximately 20% reduction in use of HFC-134a coolant in air conditioners for the Chariot Grandis	●Environmental Liaison Council established to liaise between main affiliates and members of the MMC Group
	●World-beating thermal efficiency achieved in MITI Auto Ceramic Gas Turbine Project	
1998	●MVV engine fitted as standard in all minicars built under the new minicar standards	●Announcement of MMC's voluntary ELV Recycling Action Plan
	●Low-emission Gallant, Legnum and Aspire go on sale	●Completion of nationwide system for recovery and destruction of CFC-12 coolant used in air conditioners
	●Development of parts made from waste paper and use in new Pajero model	
	●CNG Aerostar goes on sale	●Nagoya, Kyoto and Mizushima Plants acquire ISO14001 certification
	●Development of easy-to-recycle TEO weather strip suitable for all vehicles	●Abolition of use of tetrachloroethene and dichloromethane chlorine cleaning agents
1999	●Development of GDI Sigma series	●Replacement of Basic Philosophy on the Environment by new MMC Environmental Guidelines
	●New Pajero model fitted with direct injection diesel passenger car engine	●Establishment of Environmental Affairs Department
	●Development of Pistachio GDI-ASG vehicle	●Publication of first MMC Environmental Report
	●Establishment of project team to investigate ways of reducing vehicle weight	●Tokyo Plant acquires ISO14001 certification (all domestic works now ISO14001 compliant)
2000 (to March)	●Aggregate output of GDI engines: 700,000 (February)	

6. Main business establishments and affiliates

■ Business establishments	Address	Telephone
Head office	5-33-8, Shiba, Minato-ku, Tokyo 108-8410, Japan	☎+81-3-3456-1111
Car Research & Development Center	1, Nakashinkiri, Hashime-cho, Okazaki, Aichi 444-8501, Japan	☎+81-564-31-3100
Tokachi Proving Ground	9-3, Otofuke-cho, Kato-gun, Hokkaido 080-0271, Japan	☎+81-155-32-7111
Tama Design Center	1-16-1,Karakida, Tama-shi, Tokyo, 206-0035, Japan	☎+81-423-89-7307
Truck & Bus Research & Development Center	10,Okura-cho, Nakahara-ku, Kawasaki, Kanagawa 211-8522, Japan	☎+81-44-587-2000
Kitsuregawa Proving Ground	4300, Washijuku, Kitsuregawa-cho, Shioya-gun, Tochigi 329-1411, Japan	☎+81-286-86-4711
Nagoya Plant		
Oye	2, Oye-cho, Minato-ku, Nagoya, Aichi 455-8501, Japan	☎+81-52-611-9100
Okazaki	1, Nakashinkiri, Hashime-cho, Okazaki, Aichi 444-8501, Japan	☎+81-564-31-3100
Kyoto Plant		
Kyoto	1, Uzumasa, Tatsumi-cho, Ukyo-ku, Kyoto 616-8501, Japan	☎+81-75-864-8000
Shiga	2-1, Kosunamachi, Kosei-cho, Koga-gun, Shiga 520-3212, Japan	☎+81-748-75-3131
Yagi	10-1, Oazamurohashi Koazayamada, Yagi-cho, Funai-gun, Kyoto, 629-0102, Japan	☎+81-0771-43-2200
Mizushima Plant	1-1, Mizushima Kaigandori, Kurashiki, Okayama 712-8501, Japan	☎+81-86-444-4114
Tokyo Plant		
Kawasaki	10, Okura-cho, Nakahara-ku, Kawasaki, Kanagawa 211-8522, Japan	☎+81-44-587-2000
Maruko	21-1, Shimomaruko, 4-chome, Ohta-ku, Tokyo 146-0092, Japan	☎+81-3-3757-7300
Nakatsu	4001, Nakatsu Aza Sakuradai, Aikawa-cho, Aiko-gun, Kannagawa 243-0303, Japan	☎+81-462-86-8111

■ Main affiliates	Location	Line of business	Ownership	Capital stock
Mitsubishi Automotive Engineering Co., Ltd.	Kawasaki City, Kanagawa	Engineering (design, drafting, testing, etc.)	100%	¥450m
MMC Computer Research Co., Ltd.	Okazaki City, Aichi	Computer development related work	100%	¥30m
Mitsubishi Automotive Tecno-Metal Co., Ltd.	Nihonmatsu City, Fukushima	Manufacture and machining of cast/forged products	100%	¥1,940m
Ryowa Sheet Metal Processing Co., Ltd.	Chiryu City, Aichi	Manufacture of sheet metal parts (doors, hoods, etc.)	100%	¥150m
Mitsubishi Automotive Bus Manufacturing Co., Ltd.	Nei-gun, Toyama	Bus body mounting	100%	¥900m
Pabco Co., Ltd.	Ebina City, Kanagawa	Truck mounting (decks, van bodies, etc.)	100%	¥600m
Pajero Manufacturing Co., Ltd.	Kamo-gun, Gifu	Pajero production and manufacture of die-cast and sheet metal parts	66%	¥610m
Mitsubishi Motors Training Center Co., Ltd.	Okazaki City, Aichi	Center for car mechanic training and domestic and overseas repair and servicing skills training	100%	¥750m
Mitsubishi Automotive Tecno-Service Co., Ltd.	Shinagawa-ku, Tokyo	Servicing of new passenger cars, diesel engine recycling	100%	¥400m
Mitsubishi Auto Credit Lease Co., Ltd.	Minato-ku, Tokyo	Credit services, car rental, leasing	43%	¥960m
Mitsubishi Automotive Logistics Co., Ltd.	Ota-ku, Tokyo	Original contractor for transport of finished vehicles for domestic and export markets	75%	¥300m
Mitsubishi Motor Manufacturing of America, Inc.（MMMA）	USA	Auto manufacture	97.11%	US$6.9m
Mitsubishi Motor Sales of America, Inc.(MMSA)	USA	Auto import, sale and related business	97.20%	US$72.75m
Mitsubishi Fuso Truck of America, Inc.(MFTA)	USA	Auto import and marketing	100%	US$10m
Mitsubishi Motors America, Inc. (MMA)	USA	Collection of vehicle data, etc.	100%	US$5.7m
Netherlands Car B.V.(NedCar)	Netherlands	Auto manufacturing	35%	NLG 551m
Mitsubishi Motors Europe B.V.(MME)	Netherlands	Overall control of European facilities	100%	NLG 117m
Mitsubishi Motor Sales Europe B.V.(MMSE)	Netherlands	Marketing of vehicles and parts, etc.	MME82%	NLG 3.5m
Mitsubishi Motors Philippines Corp.(MMPC)	Philippines	Import, assembly and marketing of vehicles	51%	Pesos 1,464m
MMC Sittipol Co. Ltd. (MSC)	Thailand	Manufacture, import and marketing of vehicles	46.22%	Baht 834m
Mitsubishi Motors Australia Co., Ltd.(MMAL)	Australia	Manufacture, import and marketing of vehicles	60%	A$106.9m

7. Glossary

Glossary	
A/T	Automatic Transmission
ACE Project	Advanced Clean Energy Vehicle Project
ASG	Automatic Stop and Go
BOD	Biochemical Oxygen Demand
CAN	Controller Area Network
CARB	California Air Resources Board
Cd	Drag Coefficient
CFC	Chlorofluorocarbon
CNG	Compressed Natural Gas
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COD	Chemical Oxygen Demand
CVT	Continuous Variable Transmission
dB	Decibel
DOHC	Double OverHead Camshaft
DPF	Diesel Particulate Filter
ECU	Electronic Control Unit
EGR	Exhaust Gas Recirculation
EMAS	Eco Management and Audit Scheme
ETC	Electronic Toll Collection
EV	Electric Vehicle
GDI	Gasoline Direct Injection
GPN	Green Purchasing Network
GPS	Global Positioning System
HC	Hydrocarbon
HEV	Hybrid Electric Vehicle
HFC	Hydrofluorocarbon

Glossary

IC	Integrated Circuit
INOMAT	Interigent and Innovative Mechanical Automatic Transmission
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
ITS	Intelligent Transport Systems
LPG	Liquid Petroleum Gas
M/T	Manual Transmission
MBECS	Motor Vehicle Brake Energy Conservation System
MIQCS	Mitsubishi Innovative Quiescent Combustion System
MMCS	Mitsubishi Multicommunication Systems
MSDS	Material Safety Data Sheet
MVV	Mitsubishi Vertical Vortex
ND	Not Detected
NO_x	Nitrogen Oxide
OJT	On The Job Training
PET	Polyethylene Terephthalate
pH	An index for hydrogen ion concentration. P(otenz) potency + H(ydrogen)
PM	Particulate Matter
PRTR	Pollutant Release and Transfer Register
SOHC	Single OverHead Camshaft
SO_x	Sulfur Oxide
SS	Suspended Solid
TEO	Thermoplastic Elastomers Polyolefinic
VG	Variable Geometry
VICS	Vehicle Information and Communication Systems
VOC	Volatile Organic Compounds

MITSUBISHI MOTORS

GDI GDI-ASG GDI-CVT GDI-HEV MFCV EV

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