ENVIRONMENTAL REPORT 2001

ENVIRONMENTAL REPORT 2001

mazda

ENVIRONMENTAL REPORT 2001

CONTENTS

Message from the president

Environmental sustainability is one of the most important issues facing society today.

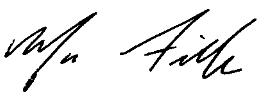
As an auto maker, Mazda is committed to taking a leading role in this process by working to combine economic growth with the preservation of the global environment, while supporting the development of a recycling-oriented society. Mazda regards this as a key element of its responsibility to build a harmonious relationship with society.

The Mazda corporate vision is to create new value and excite and delight our customers through the best automobile products and services. At the same time, we have made our corporate commitment to environmental action clear. Mazda's fundamental Global Environmental Charter recognizes the fact that the environmental issues our society faces cannot be adequately addressed by any single corporation, and require joint effort among companies, people, and industries. To this end, Mazda is working on diverse fronts to minimize the impact our operations have on the environment. These include our own environmental programs; joint action with suppliers and dealers; and working as a member of the global Ford group.

Mazda's approach is holistic. By this we mean we are extending environmental programs to cover every aspect of our business activity – from cradle to grave. Crucially, we are providing our customers with products that incorporate superior environmental technologies, enabling them to make their own contribution to the preservation of the global environment.

This environmental report outlines a number of our key activities in fiscal 2000, including the development of a fuel cell electric vehicle (and the first trials on public roads by a Japanese automobile manufacturer), increased production of low-emission vehicles, collection and recycling of damaged bumpers, reducing manufacturing wastes and energy consumption, and the development of ISO 14001 management standards. We hope that this report will enhance your understanding of our activities and goals - over time we plan to increase the depth and breadth of Mazda's environmental reports.

Until then, we will continue to work for the good of the environment we all share.



Mark Fields, President
Mazda Motor Corporation

■Hiroshima Head Office Area

Corporate outline

Company name: Mazda Motor Corporation
Established: January 30, 1920
Legal representative: Mark Fields, Representative Director and President
Head office: 3-1 Shinchi, Fuchu-cho, Aki-gun, Hiroshima 730-8670 Japan
Capital: 120,078.05 million yen (as of March 31, 2001)
Employees: 20,705 (as of March 31, 2001)
Revenues: 2,015,800 million yen (FY2000 consolidated base)
Major business lines: Manufacture of passenger cars and commercial vehicles

■Hiroshima Head Office

Outline of the Environmental Report

Scope and period covered: This report describes primarily the environmental conservation activities of Mazda in Japan, for FY2000 (April 2000 to March 2001). We plan to continue to issue these annual environmental reports, with the report for FY2001 tentatively scheduled for September 2002.

For information, please contact the PR Planning Department,
TEL +81(82)286-5744　　FAX +81(82)287-5225
MAZDA URL　http://www.mazda.com

This report has been designed to make optimal use of quantitative data to be as clear as possible. We plan to improve both the data and our presentation of environmental information in future editions.

1 : Environmental Management

Mazda established a new Corporate Vision in 1999, setting clear targets for the company, and prescribing the roles and responsibilities of Mazda employees as well as the value systems for achieving them. Through this, Mazda intends to demonstrate a willingness to work positively for solutions to environmental problems.
In terms of internal and external environmental policy, Mazda instituted the Environmental Principles and Guidelines for Actions in 1992, and established these as the Mazda Basic Policy for the Global Environment (also known as the "Mazda Global Environmental Charter").
To promote specific activities in accordance with basic policies, Mazda also formulated the "Environmental Action Plan" and is continuing to make solid efforts.

Corporate Vision

Vision

To create new value, excite and delight our customers through the best automotive products and services.

Mission

With passion, pride, and speed, we actively communicate with our customers to deliver insightful automotive products and services that exceed their expectations.

Value

We value integrity, customer focus, creativity, efficient and nimble actions and respect highly motivated people and team spirit. We positively support environmental matters, safety and society. Guided by these values, we provide superior rewards to all people associated with Mazda.

Mazda Global Environmental Charter

Environmental Principles

"We aim to promote environmental protection and contribute to a better society, while maintaining harmony with nature in our business activities."

Environmental Principles

1. We will contribute to society by creating environmentally friendly technologies and products.
2. We will use the Earth's resources and energy sparingly, and never overlook environmental considerations when conducting our business.
3. Hand in hand with local communities and society at large, we will play our part in improving the environment.

Guidelines for Action

Creation of environmentally sound technologies and products

Guidelines for Action :1

1. We are committed to the challenge of creating clean technologies, including those for purification of exhaust emissions, reduction of CO_2, development of clean-energy vehicles, alternative-fuel vehicles, and protection of the ozone layer.
2. We will encourage the creation of products that are environmentally sound throughout their lifespan, from the planning and development stages through to manufacturing, use, and recycling.

Corporate activities for conserving resources and energy

Guidelines for Action :2

1. In order to conserve limited resources, we will actively promote resource-conservation and recycling activities.
2. We will strive to achieve diversified and efficient use of energy.

Corporate activities in pursuit of a clean environment

Guidelines for Action :3

1. We will not merely comply with environmental laws and regulations, but will also impose voluntary clean control standards and implement self-regulated control.
2. In our pursuit for a clean environment, we will promote the development of new technologies and the introduction of new systems which will contribute to a cleaner environment.

Working with others in the car-making industry to create a better environment

Guidelines for Action :4

1. We will actively provide our employees with in-house education about and information on environmental conservation to enhance their awareness of the global environment.
2. We will work in close cooperation with other car manufacturers in Japan and overseas to achieve better environmental protection.

Creating a better environment in cooperation with local communities and society

Guidelines for Action :5

1. We will actively solicit society's requirements for the environment and reflect them in our business activities.
2. We will disclose and publicize environment-related technologies, systems, and information.
3. We will not only conduct our own environmental activities, but also will cooperate with and take an active part in other social activities for the conservation of the environment.

Environmental Targets and FY2000 Performance

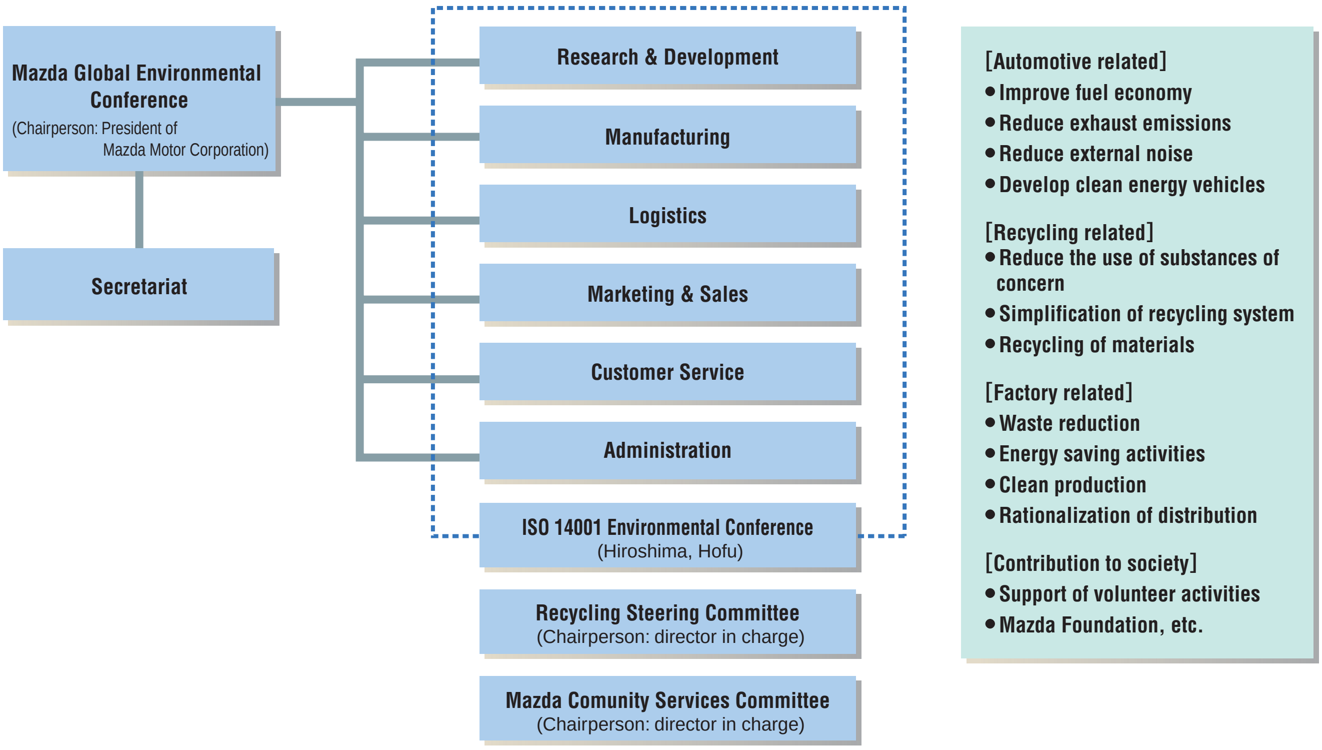
Subject		Environmental target	FY2000 Performance
Products / Development	Fuel efficiency	meet the new 2010 fuel economy standards	Introduced the vehicles meet the new 2010 fuel economy standards. (Demio, Familia Sedan / Familia S-Wagon, Capella, AZ-Wagon, Carol, Raputa, Familia Van)
	Emission gas	launch low-emission vehicles	Introduced Low-emission vehicles: (Excellent-Low Emissions Vehicle) Carol, AZ-Wagon, Raputa, Demio, Familia Sedan, Familia S-Wagon, Tribute (Good-Low Emissions Vehicle) AZ-Wagon, Raputa, Tribute, Familia Van
	Noise	meet latest external noise regulations	Implement of latest regulations into all passenger cars
	Clean energy vehicles	Development of natural gas, LPG and Fuel cell electric vehicles	●Development of Premacy fuel cell electric vehicle (FC-EV), start of road testing ●Introduction of vehicle powered by natural gas: Demio CNG, new Titan CNG, Titan Dash CNG ●Introduction of LPG vehicles: new Titan, Titan Dash
	Recycling	Improve recyclability of new cars Recycling rate of new cars beyond 2002 to be 90% or above	Used thermo plastic resin in major plastic parts such as bumpers, trims etc.
		Push ahead with recycling of damaged bumpers collected from market	●Expanded use of recycled materials: Footrests, rear splash shields ●Bumper reinforcement parts made from material developed from paint-removed recycled bumpers. This material is as strong as new material.
		Proceed with attainment of targets for reduction of use of substances of concern (lead): Half or less the amount used in 1996 by 2000, 1/3 or less the amount used in 1996 by 2005	All vehicles achieved target set for 2000
Production / Logistics	Energy saving	Stabilizing consumption level of crude oil to that of 1990 by 2000	Reduced by 19.5% over 1990 levels, through review of operating procedures and careful energy saving activities
	Reduction in waste product	Reduce volume of waste product by 66% compared to 1990 levels by 2000	Reduced by 69% over 1990 levels, through recycling of casting sand and other measures
	Improvements of logistical efficiency	Reduce CO_2 emissions by distribution efficiency improvements	Reduced by 3,740 tons of CO_2 was achieved over 1998 levels, through modal shift implementation, truck capacity increases and overseas shipping route reviews.
		Reduce materials use through simplification of packaging	Reduced by 1,663 tons of materials over 1998 levels, through use of returnable packaging and shipping containers instead of wooden crates.
Management	ISO14001	All domestic sites to have ISO14001 accreditation by the end of FY2000	Achieved in June 2000, when the Hiroshima plant was given certification.

Organizational Structure

Concurrently with the formulation of the 1992 Environment-Related Activity Promotion Plan, we established a company-wide environmental structure with the Mazda Global Environmental Conference as the decision-making body. The Mazda Global Environmental Conference establishes environmental policies and plans for promoting environmental activities. The departments that receive these policies and plans implement them in systems to roll out environmental-management activities.

The Hiroshima District and Hofu Plant Environmental Committees provide a framework for follow-up for environmental-management activities on production lines. For issues that require company-wide response, Mazda set up specific projects to address the issues. At present Mazda is promoting activities through the Recycling Steering Committee and the Comunity Services Committee. The Ford Group works together in regard to each separate issue involved in the areas of development, production and distribution.

Organizational chart



ISO14001

To conduct activities geared toward protecting the environment systematically and continuously, and to ensure transparency for our actions, Mazda is actively promoting the establishment of an environmental management system in accord with ISO14001, the international standard for environmental management. At our domestic Japanese production sites, Hiroshima Plant (including Miyoshi Plant) obtained certification in June 2000, completing the process of accreditation for our domestic plants. Among Mazda's overseas production sites, AAT (Thailand) and AAI (USA) respectively obtained certification in May and June 2000, completing the certification process for our major overseas production sites.

Domestic Production Sites

Name	Area	Items Produced (as of May 1, 2001)	Accredited
Hiroshima Plant	Head Office	Bongo Friendee / Freda, Bongo (Truck / Van), Bongo Brawny (Van), Titan, Titan Dash	June 2000
		Gasoline piston engines, transmission	
	Ujina	RX-7, Roadster, Familia / Laser Lidea, MPV, Demio / Festiva Mini Wagon	
		Gasoline piston engines, diesel engines, rotary engines	
Miyoshi Plant		Diesel engines	
Hofu Plant	Nishinoura	Familia S-Wagon, Laser Lidea Wagon, Capella, Capella Wagon, Millenia, Premacy / Ixion, Tribute / Escape	September 1998
	Nakanoseki	Transmissions	September 1999

Major Overseas Production Sites

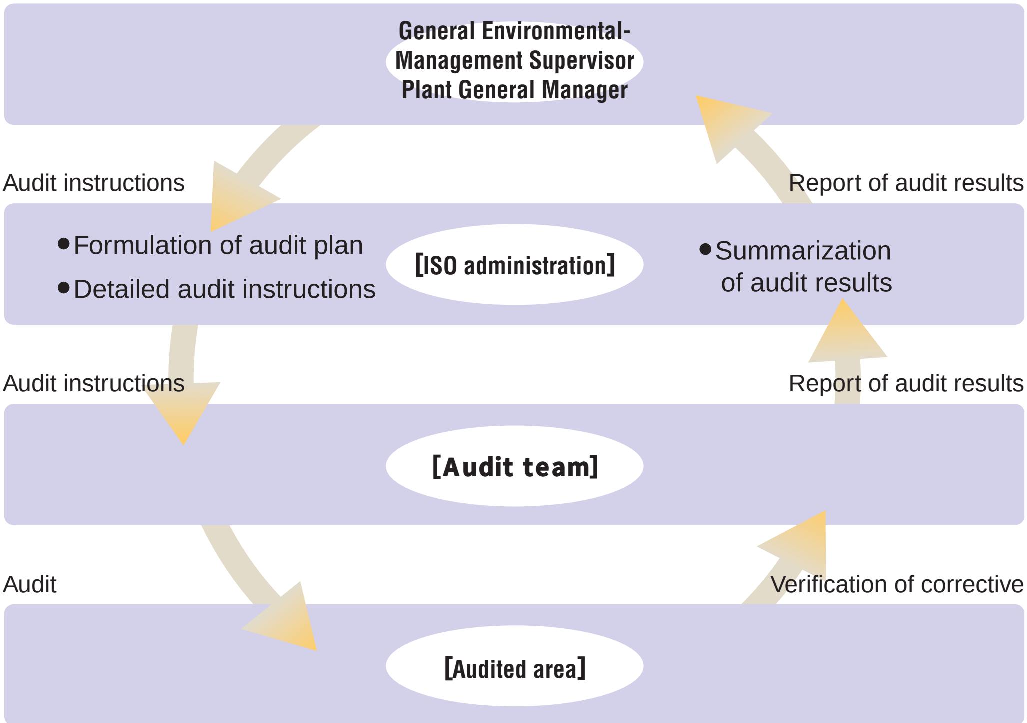
Company name	Location	Products	Accredited
Auto Alliance International, Inc. (AAI)	USA Flat Rock	Mazda 626	June 2000
Auto Alliance (Thailand) Co., Ltd. (AAT)	Thailand, Rayong Province	Mazda B-Series Mazda 323	May 2000

(current as of June 30, 2000)

Environmental Audits

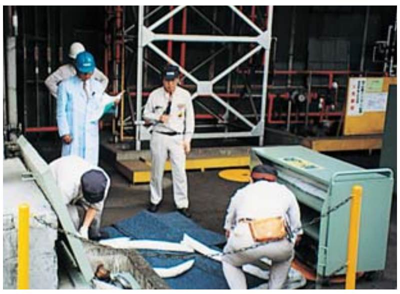
In order to determine if the environmental management system is functioning correctly, internal audits and external audits by an outside certification organization are conducted annually, and the results of these audits are reported to company management. The auditors who carry out the internal audits are selected primarily from among core employees who have received training from an external educational organization and have been certified as having obtained a certain level of qualification. The FY2000 external audit involved an expanded audit for the Hiroshima District and a periodic audit of the Hofu Plant. Both audits revealed no problems, either major or minor.

■ Internal Audit System for Production Sites



Legal Compliance and Emergency Response

There were no incidences of contravention of environmental laws or regulations during FY2000. Mazda is committed to the continued strict observance of all laws and regulations, as well as to the implementation of self-regulation management indexes, and to the strict control of standards, in order to reduce the environmental impact of their work. At production sites, periodic inspections and emergency measures procedures are carried out at facilities, or in regard to processes, which are considered to be in particular danger of causing environmental pollution, in order to prevent incidents and reduce the environmental impact should an incident occur. Alongside the provision of these necessary response measures, we also carry out periodic response drills, in which the procedures are learned and improved upon.



■An audit. Section 1E practices an accident response drill.

[Environmental Complaints Arising in FY2000]

Two concerning noise and one complaint concerning paint mist dispersal, giving a total of three complaints. All these complaints arose due to problems in the control of facilities operations, and the problems were prevented from recurring by adjustments made to the relevant facilities. Changes were also made to the Procedural Manual, which exists to ensure that problems do not recur. There is currently one environment-related legal action under way, dealing with automobile exhaust gas in Tokyo. There were no recalls for environmental reasons.

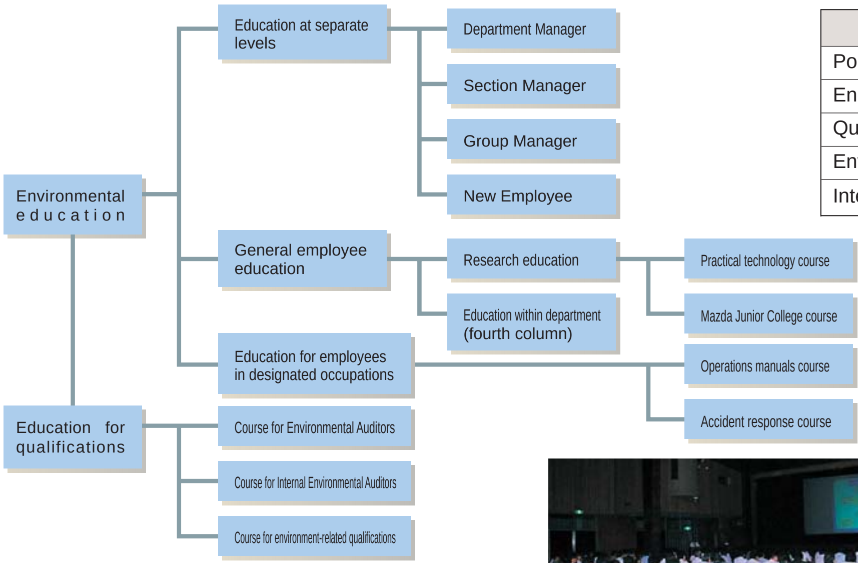
Education and Awareness

Recognizing that the starting point for any environmental initiative is improving the awareness of employees of environmental issues, Mazda is deeply involved in environmental education and promoting self-improvement.

Education

During FY1999, Mazda provided the necessary training for employees to be able to introduce, maintain and operate the environmental management system required for ISO14001. During FY2000, in order to improve the environmental awareness of our employees even further, we introduced structural environmental education throughout all levels of the company. We also encouraged employees to acquire qualifications as necessary for the work in which they are engaged.

Environmental Education Structure



Numbers of employees holding public qualifications in environmental issues

Name of public qualification	Number of employees
Pollution prevention management	134
Energy management	27
Qualification in waste processing	5
Environmental auditing assistance	9
Internal environmental auditing	261

(As of May 10, 2001)

■Management level environmental training

Awareness

We are promoting awareness among both employees and their families through the Intranet and in-house magagine, by means of exhibitions during Global Environment Month and on other occasions, as well as through volunteer activities.

[Major items implemented during FY2000 "Global Environment Month"]

Broadcast of President's Speech	A call for Mazda employees to take seriously their responsibility to meet the challenges posed by environmental problems. •A speech by Mazda's President was broadcast throughout the company.
Mazda Global Environmental Exhibition	In-house exhibition dealing with current challenges faced regarding the environment, and introducing environmentally friendly technology and products. •Fuel cell electric vehicles and electric vehicles on display •Introduction of products made from recycled waste, etc.
Contribution of Display Items to "ECO-CAR WORLD 2000"	The Demio EV, Demio CNG and Titan LPG were loaned for display at the 'ECO-CAR WORLD 2000', sponsored by the Ministry.
Involvement in Local Community Clean-up Activities	Participation in community clean-ups hosted by nearby city and town authorities.
Environmental Patrolling by Plant Managers	The Manager of the Hiroshima Plant visited the main factory and other facilities.

■ECO-CAR WORLD 2000(Tokyo)

Expanded Information Disclosure Policy

Environment information for individual Mazda vehicles is listed on the company web page (see partial list on page 50). The web page also lists vehicles eligible for special tax incentives under the Green Purchasing Law. The address is: "http://www.mazda.co.jp"

[List of Vehicles complying with Green Purchasing Law] (as of September 3, 2001)

Clean energy vehicles

Model	Model	Engine type	Displacement (liter)	Drive	Transmission	Emission level (see note)	Fuel economy level	Remarks
Demio CNG	GF-DW5W (derivative)	B5	1.498	2WD	AT	-	-	CNG (compressed natural gas) vehicle
Titan Dash CNG	GE-SYE6T (derivative)	FE	1.998	2WD	MT	-	-	CNG (compressed natural gas) vehicle
Titan CNG	KK-WHF5T (derivative)	TF	4.021	2WD	MT	-	-	CNG (compressed natural gas) vehicle
	KK-WHF5G (derivative)	TF	4.021	2WD	MT	-	-	CNG (compressed natural gas) vehicle

Vehicles other than clean energy vehicles (gasoline and diesel)

Model	Model No.	Engine type	Displacement (liter)	Drive	Transmission	Emission level (see note)	Fuel economy level	Remarks
Carol	LA-HB23S	K6A	0.658	2WD 4WD	MT,AT	Excellent	2010 fuel economy standards	Not all models comply
	TA-HB23S	K6A	0.658	2WD	MT,CVT	Good	2010 fuel economy standards	
AZ-wagon	LA-MD22S	K6A	0.658	2WD 4WD	MT,AT	Excellent	2010 fuel economy standards	Not all models comply
	TA-MD22S	K6A	0.658	2WD 4WD	MT	Good	2010 fuel economy standards	
Laputa	LA-HP22S	K6A	0.658	2WD	MT,AT	Excellent	2010 fuel economy standards	
	TA-HP12S	F6A	0.657	2WD 4WD	MT	Good	2010 fuel economy standards	
Demio	LA-DW3W	B3	1.323	2WD	MT	Excellent	2010 fuel economy standards	
Familia Sedan	LA-BJ5P	ZL	1.498	2WD	MT	Excellent	2010 fuel economy standards	
Familia S-wagon	LA-BJ5W	ZL	1.498	2WD	MT	Excellent	2010 fuel economy standards	
Familia Van	B-BVY11	QG13DE	1.295	2WD	MT,AT	Good	2010 fuel economy standards	
	TB-BVFY11	QG15DE	1.497	2WD	MT,AT	Good	2010 fuel economy standards	
	TC-BVHNY11	QG18DE	1.769	4WD	AT	Good	2010 fuel economy standards	

Notes:
Emission level
Good: 25% reduction from 2000 emission standards
Excellent: 50% reduction from 2000 emission standards
Ultra: 75% reduction from 2000 emission standards

Environmental Accounting

Mazda is now implementing an environmental accounting system, in order to more accurately grasp the costs and benefits of our environmental protection activities, and to use this understanding in making our activities more efficient. We also hope to be able to gain the understanding of society in regard to our environmental efforts, through the disclosure of our environmental accounts.

The environmental conservation costs and benefits for FY2000 are as shown below. This is the second time we have published our environmental accounting results, but due to some changes in the accounting procedure, a simplified comparison with the previous year's figures is not available. For this reason, the results published below are for FY2000 only.

Future considerations

Improvements to the accuracy of cost data collection, and expansion of the scope of effective evaluation, must be dealt with in the future.

[Cost of Environmental Conservation] (unit: millions of yen)

Category		Major activities	Cost
Cost in business area	Pollution prevention cost	Compliance with regulations, installation of reduced-odor furnace, installation of combustion system for paint-booth exhaust	3,114
	Global environment protection cost	Activity to help prevent global warming, such as reduced energy consumption	424
	Resource recycling cost	Recycling, waste processing, etc.	1,701
Upstream/downstream cost		Switch to returnable distribution containers, etc.	31
Management activity cost		Education, environmental management implementation, etc.	663
R&D cost		Research into reducing environmental loading of Mazda products	26,590
Social activity cost		Green space management, support of external organizations, disclosure of environmental information, etc.	160
Environmental damage cost		Cost of repair after environmental accident	4
Total			32,687

[Environmental Conservation Benefits]

Category	Major activities	
Global environment protection	Amount of energy saved (crude equivalent): (represents a 1.9% reduction in energy consumption from the total for FY1999)	6,000kL
Resource recycling	Reduction in processed waste: (represents a 9.5% reduction from the total for FY1999)	2,300t

Note 1: Scope of data compiled: Mazda Motor Corporation, non-consolidated base
Note 2: Period covered: April 2000 to March 2001
Note 3: Categories: Set by Mazda with reference to the guidelines for 2000 issued by the Ministry of Environment. However, depreciation is not included because a cash-flow basis was used.
Note 4: Evaluation of benefits: The annual reduction in energy consumption was used in the implementation of energy savings.

2 : Reducing Environmental Load

Research and Development / Product Development

Vehicles Continuing to Evolve towards Zero Emissions Target

Current estimates of the number of four-wheeled vehicles on the world's roads today stand at around 700 million. Looking back over the century that has passed since the birth of the vehicle, we see the extent to which vehicles have been used and loved by people, and to which they have changed people's lives. At Mazda, we are continually examining the relationship between vehicles and people.

The need for measures to be taken towards reducing the polluting effects of emissions on the atmosphere was first widely accepted in 1970, when USA, Japan and other countries introduced regulations. One result of this was to bring catalysts, which purify poisonous gases such as CO, HC and NOx from emissions, into general use. Through the application of catalysts and other newly introduced technologies, emissions of these damaging gases have been greatly reduced.

At the same time, Oil shock rocked the world during the 1970s. Suddenly, auto makers were competing with each other to improve fuel efficiency. Since fuel prices were rising, many vehicle owners started to choose vehicles with good fuel efficiency over and above other criteria. Nowadays, increased fuel efficiency is a necessary step in the control of emissions of the greenhouse gas CO_2, and as such much attention is being paid to the subject once again. Other atmospheric pollutants include the unique black smoke and particulate material emitted from a diesel engine. There are also likely to be other pollutants in existence, which have not yet been discovered.

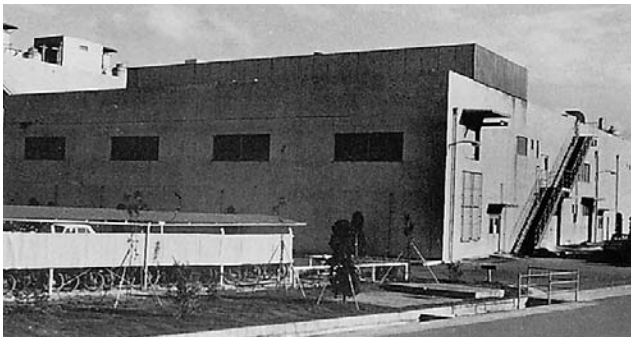
Reducing the amount of emissions from each individual vehicle has contributed to a significant decrease in pollution, but in current society, where such a large number of vehicles are on the roads, it is obviously necessary to persevere towards the target of zero emissions. These efforts will contribute to the evolution of the automobile, change the way we use our vehicles, and form the basis for the vehicle society of the 21st century.

Challenge of Purifying Exhaust Emissons

The US Congress passed the Muskie Act (Clean Air Act of 1970), regulating exhaust emissions in 1970. The emission standards were strict enough for many automobile manufacturers to request extensions before the implementation of the Act, and in fact, by 1975 manufacturers still required further technological solutions before they were to meet the regulations.
Mazda put much of its energies into developing an anti-pollution system for rotary engines, and was able to meet the requirements of the Muskie Act in 1973, earlier than many of its competitors. At that time, the purification system worked using a thermal reactor, but this was later changed in 1976 to a three-way catalytic system, which became the standard of Mazda's purification systems and is still used today. More recently, developments to the system have enabled us to lower the temperature required for the catalyst to start acting, directly after the engine is started. This and other improvements are features of the new three-way catalyst, which has been in use now since 1998.

Mazda's efforts to purify emissions

1965	Established Emissions Response Research Committee. Began development work on emissions purification equipment / thermal reactor.
1967	Established Exhaust Gas Research Center at an investment cost of 480 million yen.
1970	US Federal Administration passed the Muskie Act regulating exhaust emissions, and issued target values for achievement by 1975.
1973	Rotary engine RX-3 passes the Muskie Act's requirements -the first in the world to do so.
1975	Development of oxidizing catalyst
1976	First three-way catalytic system in the world, used in Familia 1300AP and other models
1993	Development of three-way catalyst for lean-burn engine
1998	Improvements including lowering catalysis initiation temperature after engine startup through the use of a new three-way catalyst.



■Exhaust Gas Research Center (1967)

■Internal structure of the new three-way catalyst

■Exhaust emission testing facility

Challenge of CO_2 Reduction

In a standard vehicle, which burns petroleum fuel to gain its motive energy, there is no other way to reduce CO_2 emissions than by improving fuel economy. Fuel economy improvement methods can be divided into three groups. The first of these methods involves improving the efficiency of the powertrain, through improving the efficiency of combustion, and decreasing resistance loss inside the engine. Improvement to the efficiency of the drivetrain also comes within this category.
Secondly, air resistance and tire roll resistance are considered to be issues that could be tackled to reduce driving resistance. Air resistance changes significantly if consideration is given to the shape and design of the vehicle. Lastly, fuel economy could be improved if the vehicle itself underwent a reduction in weight. Lighter vehicles are better in terms of fuel economy. Making vehicles smaller, however, may have the advantage of making them lighter, but it becomes difficult to then ensure the comfort associated with larger vehicles. Safety equipment also makes a vehicle heavier. The various requirements placed on a vehicle are often in conflict, and as such improvements have to be carried out in a way that is balanced, and reflects the character of the vehicle.
Mazda has implemented short and mid-term plans for the reduction of CO_2 emissions, and is currently engaged in improving the fuel economy of current models as well as development and popularization of alternative fuel vehicles. Since it is indisputable that long-term plans require a recyclable, clean energy substitute to be put in place of petroleum, Mazda has taken up the challenge of research and development of clean-energy vehicles.

■Demio FC-EV

■Premacy FC-EV (methanol-reforming fuel cell powered vehicle)

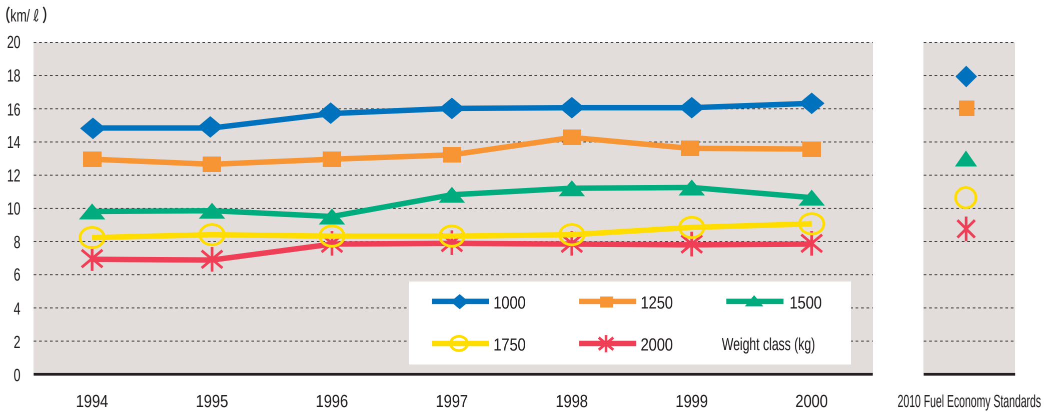
Improving Fuel Economy and Reducing Exhaust Emissions

Pressing Ahead to Improve the Fuel Economy of Existing Engines and Reduce Exhaust Emissions by Various Means

Improved Fuel Economy

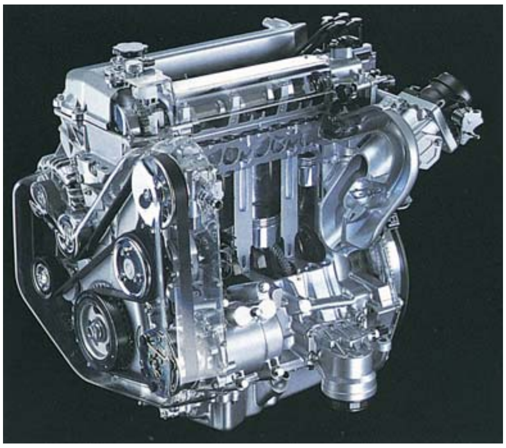
It is clear that the first realistic step in reducing CO_2 emissions is to improve the fuel economy of existing engines. This is due to the fact that as long as gasoline and diesel powered vehicles, which are so numerous in comparison to "Clean Cars" such as Electric Vehicles, remain unchanged, there will be little reduction in the volume of CO_2 being released to the atmosphere. The internal-combustion engine loses a large part of its combustion energy through heat loss and mechanical resistance. Much research has been done into ways of reducing this energy loss and improving the energy efficiency of the engine. Lightening the weight of the crankshaft and other parts, for instance, and increasing the accuracy of processing, reduces resistance energy loss. Improvements to catalysts have also raised energy efficiency. Amidst this research, advances in electronic controlling technology have occurred in line with deepening understanding of the combustion phenomenon, and these promise further levels of fuel economy improvement.
Mazda is proceeding concurrently along both tracks, of improvement fuel economy for existing engines, and reductions in emissions.

Transition in Average Fuel Economy by Vehicle Category



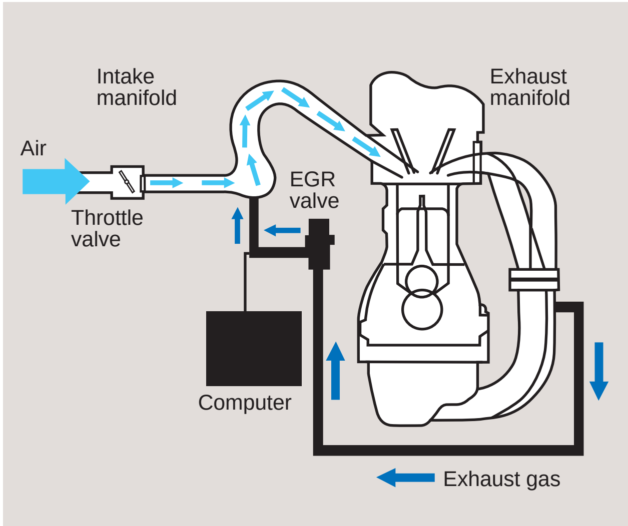
Joint Development of New Engine Series with Ford

Mazda has worked jointly with Ford in the development of the new in-line four-cylinder engine, which is to be produced in sequence at the Mazda Hiroshima Plant and Ford's Dearbone, Chihuahua and Valencia plants. This new engine not only possesses superior capability, but is also lightweight, and is environmentally friendly in other ways - it has excellent fuel economy and low exhaust emissions. (Mazda's plant will begin production of the engine at begining of 2002).



Diluted-Burn Engines

Mazda's new combustion system diluted-burn engine has achieved high engine output across the board, whilst at the same time giving increased fuel economy and reducing NOx emissions.
This system uses an electronically controlled stepper motor, which refluxes large amounts of exhaust gas into the combustion chamber, across a large range from acceleration to cruising, and dilutes the air-fuel mixture before combustion.
The first important effect of exhaust gas recirculation (EGR) is that it lowers the resistant loss (pumping loss) during the intake process, resulting in improved combustion efficiency. Next, the inert gases (EGR) being pumped into the cylinder lowers the combustion temperature, and reduces emissions of NOx.
Mazda has developed the diluted-burn engine, which is a simple system requiring no particularly complex structure, and currently features them in Capella and Familia in Japan.

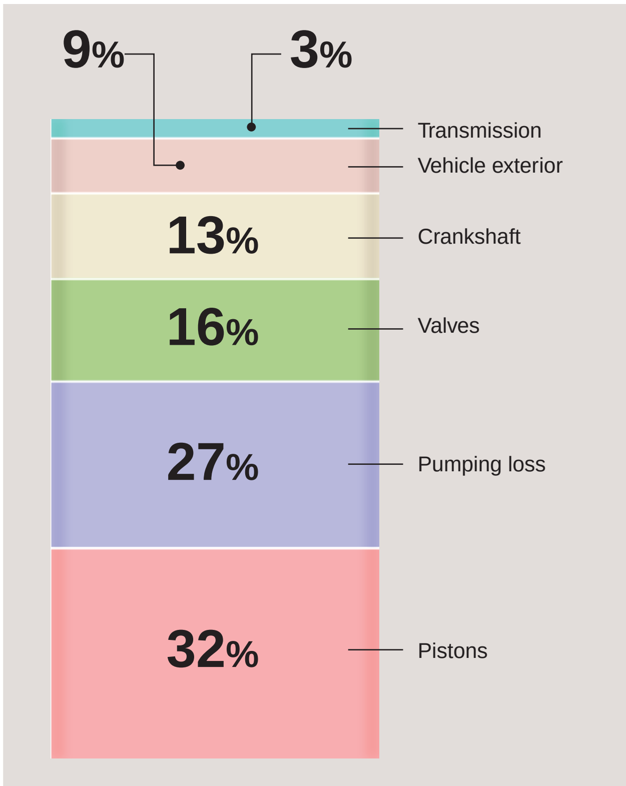


Exhaust Gas Recirculation System

[Mechanism for improved fuel economy]

Pumping loss is the second biggest cause of mechanical resistance energy loss in engines. This occurs in the throttle valve, through the process of controlling intake gas. Through refluxing large amounts of EGR, which contains no oxygen, into the area downward of the throttle valve, the difference in pressure between the inside of the air intake port and the atmosphere is lessened, reducing pumping loss. As a result of this technology, the 1997 Capella, had an output 36% higher than that of any previous model, whilst improving fuel economy by 18% (the FS type 2.0-liter engine with automatic).
This same EGR teahnology is employed in standard engines, though the amount of gas recirculated is of the order of 10%. Mazda's diluted-burn engine recirculate between 13 and 20% of EGR during acceleration and cruising (though not during deceleration).

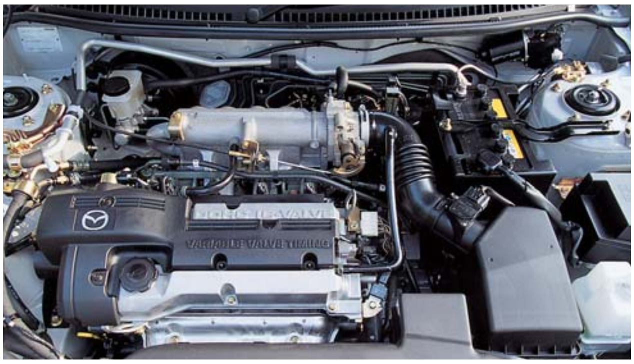
Types of Mechanical Resistance Energy Loss at 40km/h



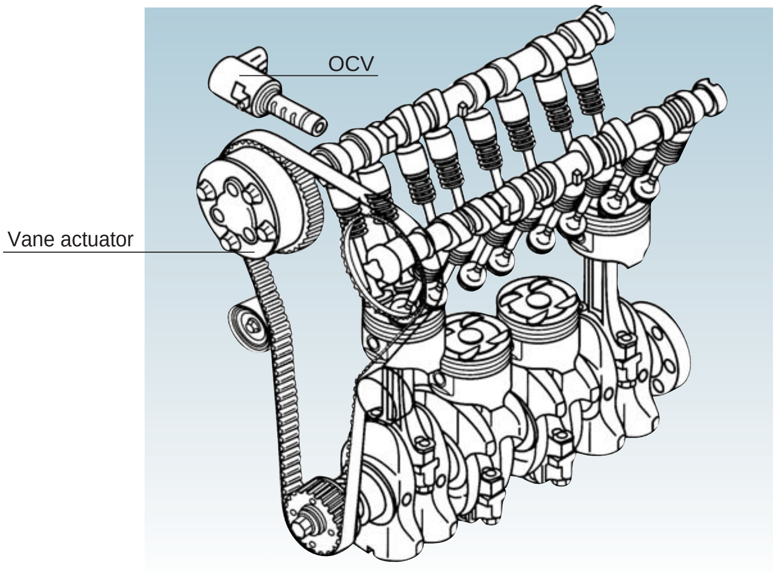
S-VT: Continuously Variable Valve Timing

S-VT (sequential valve timing) controls the valve timing in various driving modes, through continually varying the opening and closing timing of the intake valve, to give the most suitable operation. The application of this control technology has simultaneously improved both the performance of the engine and its fuel efficiency, and Mazda has adopted this technology to the Familia, as its main engine (the 1.5-liter ZL-VE type introduced in 1998). CO_2 emissions have been reduced by 16% and NOx by 14% over previous models, while the pleasure of driving the car has increased.

S-VT is composed of a vane actuator, which continually varies the phase of the intake valve timing and the crank angle through oil pressure, along with a computer, which calculates the intake valve timing, and an oil control valve (OCV), which controls the oil pressure in accordance with instructions from the computer. The most appropriate valve timing control can be achieved through detection of the engine's revolutions, intake volume and water temperature. NOx emissions are also reduced, through the implementation of EGR.



■S-VT Engine
Maximum output: 96kW (130PS)/7000rpm
Maximum torque: 141N･m(14.4kg-m)/4000rpm



Direct-Injection Gasoline Engine with Stratified Charge

Mazda is currently pressing ahead with the development of the direct-injection gasoline engine, which makes possible a further level of diluted combustion. The direct-injection engine takes in only air from its intake port, and directly injects fuel into the combustion chamber. At this point, if the easily ignited air-fuel mixture can be positioned only in the immediate area of the spark plug, it is possible to achieve a higher air-fuel ratio than even that of a lean burn engine. This process of thinning the air-fuel mix to burn it is known as stratified diluted burn.

This type of engine can ensure the supply of motive power for acceleration and at other times when a large torque is required through using not stratified diluted burn but uniform air-fuel combustion according to theoretical air-fuel ratios. Even then, since its average air-fuel ratio is high, the engine achieves a CO_2 emissions reduction of 30%. Other effects of the direct injection system are that it raises maximum output by 10%, and gives an increased response to the depression of the accelerator.

■Mazda DIREC-G
Exhaust output of water-cooled in-line four cylinder DOHC 16 valve gasoline engine: 1,498cc
Maximum output (target value): 77kW (105PS) / 6,000rpm
Maximum torque (target value): 105N・m (15.2kg-m) / 3,500rpm

Compact Direct-Injection Turbo Diesel Engine

A direct-injection type of engine has existed for a long time in the area of diesel engines, mainly for use in large trucks. The direct-injection engine experiences less heat loss than an indirect injection system with an auxiliary chamber, and so has greater output and higher fuel efficiency. The direct-injection system, however, is noisy due to the high speed of combustion, and since combustion temperatures are high, NOx emissions increase. Mazda has been working to produce a small direct-injection diesel engine suitable for passenger cars, and in 1998 developed the RF type 2.0litre DI-TD (direct-injection turbo diesel) engine, which was then used in the Capella series. The DI-TD engine has reduced noise and NOx emissions down to auxiliary chamber levels, while increasing maximum output by around 14% and maximum torque by around 18%, and giving roughly a 16% improvement in fuel efficiency (at a steady speed of 60km/h, when compared with previous models' supercharged engines).

[Achieving mild combustion using more air]

The RF model direct injection diesel engine uses a mechanism of four valves per cylinder, with a central fuel injection and an electronically controlled fuel injection system, to produce highly efficient fuel use.

The use of a turbocharger and the change to 4 valves means that an increased volume of air can be taken in, and the double tangential intake port creates a strong swirl. As a result, the atomized fuel, which is injected into the center of the combustion chamber, can utilize the air within the chamber without it being exhausted. The resulting mild combustion gives higher fuel efficiency and lower emission levels.

■DI-TD (Direct-Injection Turbo Diesel) Engine
Exhaust output of water-cooled in-line four cylinder DOHC 16 valve diesel engine: 1,998cc
Maximum output: 100ps / 4,000rpm
Maximum torque: 22.4kg-m / 2,000rpm

Reducing of Exhaust Emissions

In order to further reduce exhaust emissions, Mazda is committed to research and development into catalyst systems, engine combustion control systems, and other contributory measures. Using the results of this research, we are pushing forward with the market introduction of cars that improve upon Japan's national emissions standards - Excellent-Low Emission Vehicles (*1) and Good-Low Emission Vehicles (*1)

(*1) The Ministry of Land, Infrastructure and Transport has established Low Emission Vehicle Approval System, in order to accelerate the popularization of vehicles with lower emissions. This system is in place as of April 2000. There are three types of approval criteria depending on the level of exhaust emissions, and vehicles that meet the criteria are permitted to display a sticker stating that they are low emissions vehicles.

Low Emissions Vehicles Approval Criteria:

Ultra-Low Emissions: 75% reduction on the emissions standards for 2000
Excellent-Low Emissions: 50% reduction on the emissions standards for 2000
Good-Low Emissions: 25% reduction on the emissions standards for 2000

Demio Pieare

Familia S-Wagon Sport 20

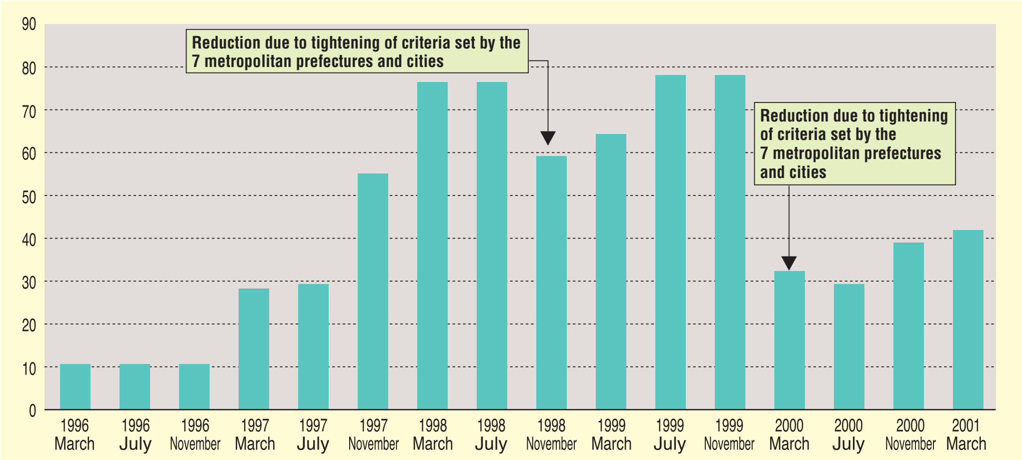
Premacy Sport

Transition in Vehicles receiving Approval under the Low Pollution Vehicles Designation System

Mazda has proactively developed and marketed gasoline, diesel, LPG and CNG powered vehicles amongst others, which fulfill the emissions criteria set for designation as "Low Pollution Vehicles" by the 7 Metropolitan Prefectures and Cities Designated Low Pollution Vehicles System (*2), and the Kyoto / Osaka / Kobe 6 Prefectures and Cities Designation (*3) (LEV-6).

Each of these local governments operates a system of designation for low pollution vehicles, with the aim of popularizing low emissions vehicles. Similarly to the Ministry of Land, Infrastructure and Transport's Low Emissions Vehicle Approval System, the system allows cars that meet the criteria set for low pollution vehicle designation, according to their level of emissions, to display a label stating the fact that they have been designated.

No. of models designated as 7 Metropolitan Prefectures and Cities Designated Low Pollution Vehicles



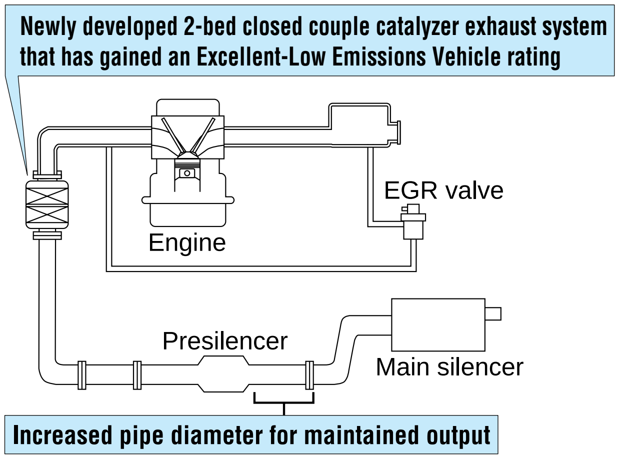
(*2, *3) ・7 metropolitan prefectures and cities: Saitama Prefecture, Chiba Prefecture, Metropolitan Tokyo, Kanagawa Prefecture, Cities of Yokohama, Kawasaki and Chiba.
・6 prefectures and cities: Kyoto and Osaka Prefectures, Hyogo Prefecture, Cities of Kyoto, Osaka and Kobe.

(Note) The reason that the number of models shown as Designated Low Pollution Vehicles drops at points on the graph to the right is that the criteria for designation were tightened, and some models were undesignated.

Emissions Reduction Technology

The Familia, which was introduced to the market in the year 2000 and has gained an Excellent-Low Emissions Vehicle rating, features a newly developed 2-bed closed couple catalyzer, which gives a high standard of purification immediately after the engine is started, as well as an early sensor for activated O_2, which monitors the stability of combustion from the moment the engine is turned on, giving the vehicle super-clean capability.

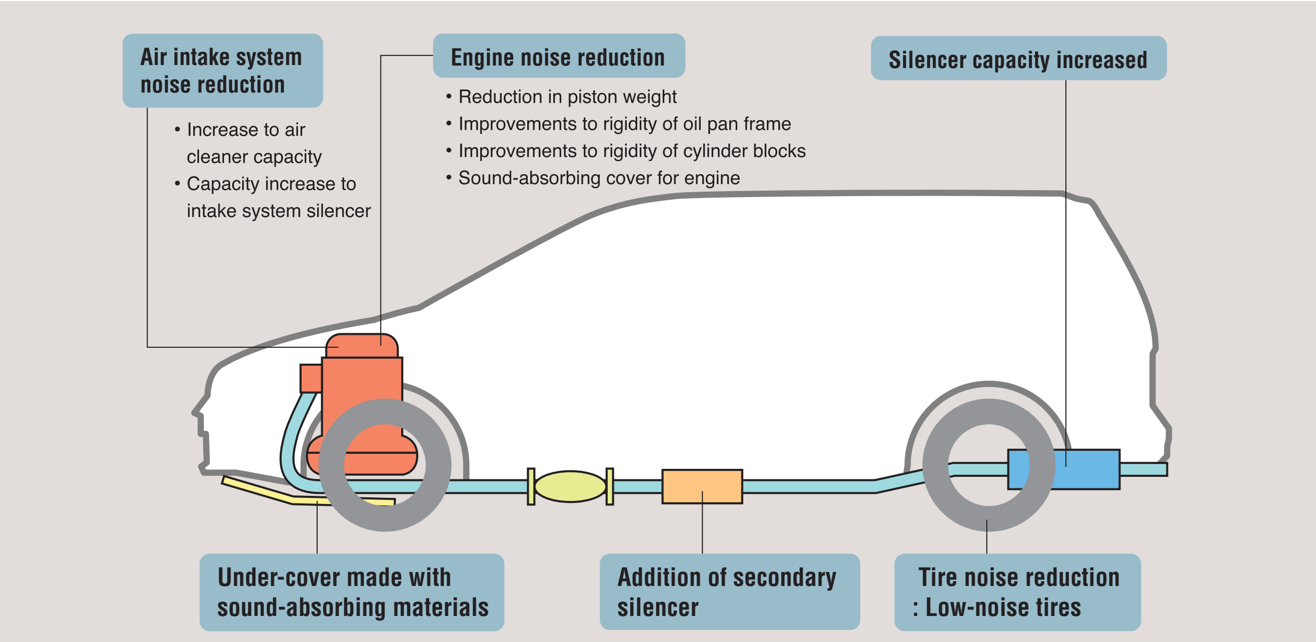
Explanation of 2-bed closed couple catalyzer and O_2 sensor



Reducing of External Noise

The sources of external noise emitted from a vehicle include the exhaust system, the engine, and the tires.
Mazda has brought all its new passenger cars into line with the new tighter Japanese external noise standard of 76db(A) (2db(A) lower than previously).

[Examples of noise reduction measures]



Safe and Comfortable Cabin Environment

Mazda uses aldehyde-scrubbing air filters, eliminating harmful chemical substances from the vehicle cabin.

Equipped models : Familia・MPV・Capella・Premacy

Aldehyde-scrubbing Air Filters

Beginning with the air filter of Premacy in 1999, Mazda was the first auto maker in the world to offer aldehyde-scrubbing air filters.
Conventional activated carbon filters absorb odors, but are incapable of fully removing aldehyde (an irritating and harmful chemical) from the cabin air.
The new air filters use the "Life Breath" aldehyde-capture material developed by Mazda. Instead of the contaminants merely adhering to the agent, as in activated carbon, "Life Breath" utilizes a chemical reaction to turn them into harmless substances for removal. This new technology provides a removal efficiency about a hundred times greater than activated carbon, eliminating essentially all aldehyde from the cabin and providing a clean, comfortable inside environment.

■New Air Filter&Aldehyde-Capture Material

Development of Clean Energy Vehicles

Finding New Fuels:The Importance of Conserving Fossil Fuels

More than 99% of the vehicles running on Japan's roads today are powered by either gasoline or diesel fuel. In some ways, this shows the extreme superiority of gasoline and diesel as automobile fuels. Since petroleum is, however, a limited resource, we are currently faced with the need to lower our dependence on petroleum products. Cleaner alternative fuels are also increasingly required to meet emissions reduction demands. Natural gas can be used as a direct substitute fuel for gasoline and diesel. There are larger underground resources of natural gas available than of petroleum. These resources are well distributed for access from any area of the world, meaning that natural gas could offer supply stability. Natural gas is also produced as a byproduct of LPG (liquefied petroleum gas). In certain countries of the world, a good number of cars already operate fuelled by natural gas and LPG, and it may be said that such cars are reaching utilitarian levels. Whatever alternative fuel is chosen over petroleum and diesel, however, the main issues facing us at this point are improvements in running distance and the adjustments required to fuel supply stations. Mazda is striving to improve the capacity of its major alternative energy vehicles, and to achieve their more widespread use.

●Natural Gas-powered Vehicle

Low CO_2 Emissions Give this Vehicle Great Potential as an Alternative Fuel Vehicle

Natural gas is comprised mainly of methane, which is structured from 1 atom of carbon and 4 atoms of hydrogen (CH_4). Its formation means that its CO_2 emissions per unit of combustion heat are approximately 25% lower than that of gasoline.

In comparison with diesel engines, natural gas produces less NOx, and in addition, no smoke in its exhaust. Natural gas is also well suited for use in large engines.

On the other hand, since natural gas is a gas, even compressed to 200kg/cm^2, compressed natural gas (or CNG) has 4 times the bulk of its equivalent energy in gasoline, resulting in a need for larger and heavier fuel containers. In addition to this, gaseous fuels compress the volume of air taken into the combustion chamber, leading to decreased output.

Mazda introduced the Titan CNG truck (4.0-liter engine) into the market in 1994. Its engine was based on a diesel engine, with some changes made to the spark ignition principle. Through the use of a high compression ratio, the output was increased over that of the base engine, and the engine gave excellent performance in terms of quietness. Its running distance was over 200km on urban roads. The Titan (launched in May 2000) has the largest volume fuel tank in its class, and has increased this running distance even further.

The Demio CNG (1.5-liter engine) was launched in June 2000. This model has preserved the original compact body of the Demio, while still having room for 5 occupants, and has a running distance of over 200km (on urban roads).

The Titan Dash CNG, with a 2.0-liter engine, was launched in April 2001.

■Titan CNG

■Demio CNG

■Titan Dash CNG

LPG (Liquefied Petroleum Gas) Fueled Vehicle

Fuel Supply Infrastructure is Already Available

The main components of LPG at normal temperatures are gaseous butane and propane, but these are liquefied relatively simply in comparison with most of the other substances available from petroleum. LPG is cheap as a fuel, and does not require a bulky fuel tank, and as a result it is already widely used as a fuel by taxis. Progress is also being made in increasing the distribution of LPG supply stations. LPG engines give reduced emissions of NOx in comparison with diesel engines, and their exhaust contains no particulate or smoke. In addition to this, since LPG engines have noise and vibration levels that are comparable to those of a gasoline engine, they are suitable for consideration as an alternative to diesel-engined trucks, in order to give an overall reduction in emission levels. Currently, however, the technical challenge is to develop larger engines, which can cope with characteristics such as small low-speed torque.

Mazda has developed the Titan LPG truck (4.0-liter engine) and the Titan Dash LPG truck (2.0-liter engine) and is in the process of promoting their introduction into the market. Mazda is working on increasing the low-speed torque of these engines, and giving them output characteristics that feel equivalent to diesel engines.

■Titan LPG
Refuse collection vehicle fitted with odor eliminating equipment

No Exhaust Gas or Noise while Running
Clean EVs (Electric Vehicles) Becoming More Active

EVs do not emit any exhaust during use (while running). CO_2 is emitted during the process of producing their motive energy source, but still great hope is placed in their potential use as clean cars within metropolitan and urban areas, where large number of cars congest the roads.

The hurdles still to be cleared before the use of EVs can become more widespread are the improvement of running distance, and lowering production cost. The key to solving these problems is the improvement of battery capability, and much attention is therefore now being focused on the development of vehicles fitted with high-capacity batteries.

EV (Electric Vehicle)

Usability of Electric Vehicles Improved, Conditions for Widespread Use Almost Met

The history of EVs goes back almost as far as that of gasoline-powered vehicles, though the gasoline vehicles always took center-stage in the process of motorization. Due to the fact that the running distance of EVs could not be significantly increased, and given the problems faced in recharging them, they were left behind in the race for widespread use. From another perspective, it could be said that gasoline-powered vehicles were simply versatile to a superior extent. EVs have, however, continued to evolve over time.

Mazda began research and development into EVs in 1966, and was involved in a large-scale project operated by the Transport Ministry for a period of 5 years beginning in 1971. The Demio EV, whose prototype was issued in 1997, has been built as a commuter car, comprising the latest technology. EVs are thought to be suitable for small-scale commuter cars and delivery vans, since they are kind to the urban environment. The Demio EV was intended for this type of user.

Mazda has also developed the small delivery van, the Bongo EV, into a usable form, and began to sell it in 1998. The Bongo was finished to include a sealed lead battery, which Mazda expects to become more widely used.

■Bongo EV

■Demio EV

[The "Commuter Concept Car" - Demio EV]

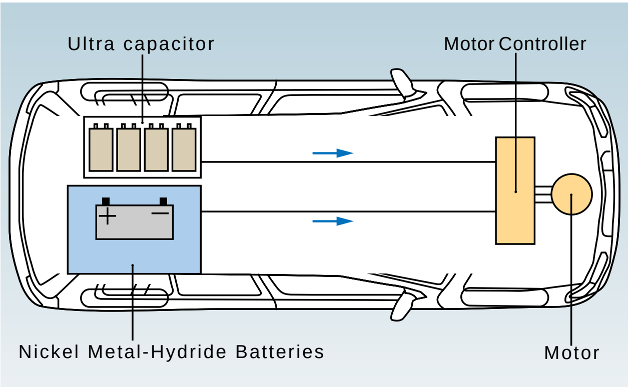
The development concept behind the Demio EV was that of the commuter who drives to work or shops within the local town. It features a highly efficient AC synchronized motor, with newly developed ultra capacitors and nickel metal-hydride batteries combining to give a dual power source system.

[Dual Power Source System]

The dual power source system used in the Demio EV is a combination of ultracapacitors and high-performance nickel metal-hydride batteries. The output density of the 80 ultra capacitors, from which the system is constructed, is high, and the stored electrical energy can be released instantaneously. During acceleration, the system supports the battery by releasing energy, which contributes to the longer lifespan of the battery, since it is not required to discharge a large current when accelerating. The ultra capacitors are recharged from the battery, and energy is also collected when the brakes are applied. The nickel metal-hydride batteries have an energy density approximately twice that of a lead battery.

The ultra capacitors are located under the luggage space, and the 16 nickel metal-hydride batteries are fitted below the rear seats and below the luggage space.

■The Demio EV System



Hybrid Vehicles

Improvements in Fuel Efficiency and Exhaust Emissions through the Engine - Motor Combination

A hybrid vehicle is one that has two sources of motive power - a gasoline engine and an electric motor. Each of these sources utilizes its strengths and is supported by the other in its weaknesses. For example, in the hybrid vehicle developed by Mazda, based on the 1970s model Titan, improvements to the base model include the ability to select the electric motor for use at times when the vehicle is required to operate quietly.
Today, hybrid vehicles are in the spotlight because of their achievements in terms of increased fuel efficiency and reduced emissions. This is due to the fact that their engines can operate at a low enough number of revolutions to give good fuel efficiency and make the purification of exhaust gas relatively simple. Since the engine is recharged from other sources, the requisite number of batteries can be reduced and it is no longer necessary to go to the trouble of recharging the batteries at a fuel station. The hybrid has the disadvantage of a complex construction, but its strong potential for accelerating the changeover from existing vehicles to alternatives makes it an attractive option.
Mazda sees in the hybrid a potential environmental problem-solving vehicle, which can use the technology developed for EVs. Mazda has taken up the challenge of research and development in this area.

[Versatility of Hybrid Vehicles]

Hybrid vehicles have a greater distinctiveness through having the choice and combination of two sources of motive power.
Depending on the role of the engine, there are two systems.
"Series" is a system, that is limited to the generation of electricity.
The other system, "Parallel," is also used for driving the wheels.
It is believed that hybrid vehicles will evolve and become more versatile as they come to be widely used.

■Hybrid Vehicle MX Sports Tourer

[Combination of Consideration for the Environment and Driving Pleasure]

Mazda unveiled its hybrid system MX Sports Tourer at the 71st Geneva Motor Show in 2001. Based on a lightweight, high-power 2.0-liter S-VT direct injection engine, which drives the front wheels, it also incorporates a motor that drives the rear wheels as required, giving a 4WD hybrid system that is not only clean, but also economical to run. In addition, pressing the "Zoom-Zoom" switch on the steering wheel brings the rear wheels into operation, allowing for swift acceleration in order to overtake, or in other situations as necessary.

Hydrogen Vehicles - Prelude to a Clean Energy Society

Our contemporary society is built upon the concept of burning carbon-containing fuels such as petroleum. As long as such fuels continue to be burned, there can be no end to emissions of CO_2. In order to stop having to burn fuel, society needs to make the transition to a new model, using new energy sources. Such new energy sources are required to be clean and reusable.

Hydrogen (H) is considered to be the ideal energy to fulfill these conditions. Burning hydrogen produces water, and water, which is also the main raw material for hydrogen, is easily available to us. Hydrogen also shows some superior qualities as an energy source. For example, hydrogen is the lightest of the elements, and produces 2.7 times the amount of energy per unit weight that can be achieved from gasoline. Mazda set its sights on hydrogen early on, and so far has produced both the Hydrogen RE Vehicle, which is fitted with a hydrogen-powered rotary engine (RE), and the prototype Demio FC-EV, a new type of electric vehicle which uses a fuel cell. Of these, the fuel cell vehicle possesses an energy efficiency level that is fundamentally impossible for internal-combustion engines, and as such expectations for the utilization of the FC-EV are high.

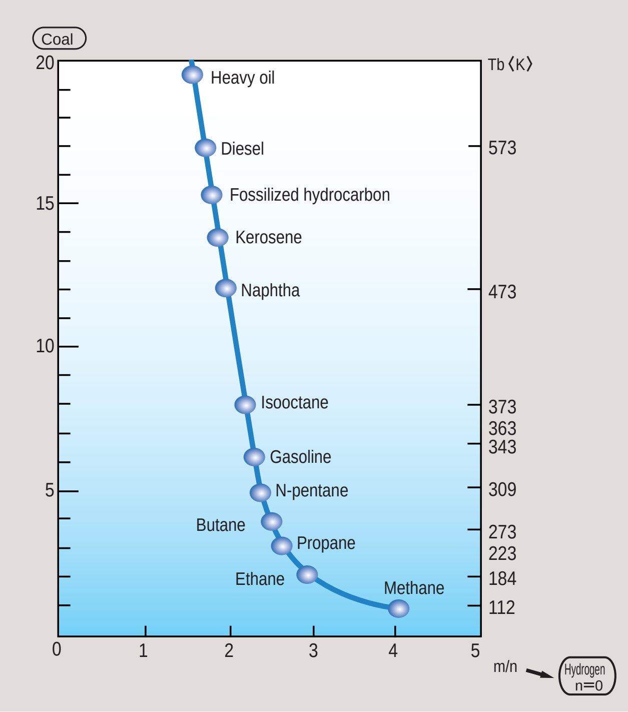
[Composite Hydrogen - Electric System]

In order to establish a "Hydrogen Society," we need production, transport and usage networks for hydrogen. Fortunately, hydrogen can be converted into electric power, and the reverse is also true: electric power can be converted into, and stored, or transported as, hydrogen. Based on this fact, Japan's Transport Ministry and its National Industrial Research Institute have issued plans for the creation of a network for hydrogen use on a global scale (WE-NET [World Energy Network] International Clean Energy System Technology for Hydrogen Use). These plans suggest the use of clean energy such as waterpower, wind power and solar energy, all of which are in plentiful supply throughout the world, although still largely latent, in order to produce cheap hydrogen. The hydrogen thus produced could, the plans suggest, be distributed and used by means of international cooperation.

[Composition of Fossil Fuels]

The diagram to the right shows the composition of the component carbon and the component hydrogen within a fossil fuel (CnHm). Coal is pure carbon, meaning that m=0, and hydrogen obviously gives the reading n=0. These two may be added to the graph at the top left and bottom right corners respectively. The right hand axis Tb(K) represents the boiling point in Kelvins, so that anything below 273K on this scale is gaseous.

The use of fossil fuels has moved left to right on this graph, a fact which has been pointed out as an historical trend. One reason for this is the fact that the calorific value of each of the fuels indicated rises per unit weight, according to its position along the graph, in a right-hand direction.



■Exhibit : "Hydrogen Energy" written by Tokio Ota

Hydrogen Vehicle

Burning Hydrogen instead of Gasoline. A Hydrogen RE Vehicle with Great Driving Results

Mazda unveiled the initial prototype of its hydrogen vehicle, the HR-X, in 1991. In 1993 it issued an improved version, with greater engine output, known as the HR-X2. The particular features of the hydrogen RE vehicle include the fact that it employs a rotary engine, which by virtue of its construction is extremely suitable for use with hydrogen, and the fact that it incorporates a fuel tank using hydrogen-absorbing metal alloy (metal hydride), which is uniquely configured for the storage of hydrogen as fuel. Mazda has also performed on-road tests to a total distance of 20,000km since 1995, using an experimental hybrid based on the mass-produced Capella Cargo. These tests have been used to confirm the safety and reliability of Mazda's hydrogen vehicle system. The hydrogen RE car uses an internal-combustion engine, meaning that it is impossible to reduce NOx emissions to zero, but it does emit extremely clean exhaust gas. In addition, due to the fact that the vehicle basically burns hydrogen in place of gasoline, the technical experience, amassed by Mazda as a vehicle manufacturer, in the production of engines, is put to good use.

[Rotary Engine (RE) which Increased Hydrogen Power]

As hydrogen burns extremely easily, it would be simple for abnormal burning to occur within a reciprocator engine. Since the RE engine is, however, constructed from a low-temperature absorption chamber and a high temperature combustion chamber which are separated from one another, there is no danger of backfiring, in which ignition happens during absorption. In addition, hydrogen is a gaseous fuel, which takes up a large proportion of the mass of any gas with which it is mixed, meaning that the amount of air that can be absorbed is reduced and output is limited. The HR-X2 employs a system that releases hydrogen after air has been absorbed, giving improved output. The RE engine takes 1.5 times longer than a reciprocating engine to complete each process, giving plenty of time for the intake of both air and hydrogen.

[Use of Hydrogen-absorbing Metal Alloy (metal-hydride)]

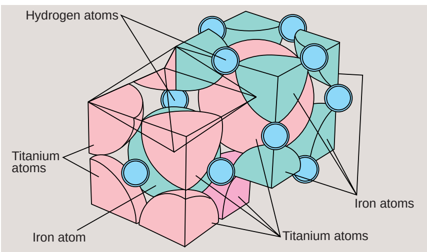
Hydrogen can be stored using one of several unique methods: as compressed gas, in liquid form, or in a hydrogen-absorbing metal alloy (metal-hydride). Mazda targeted the use of absorbent metal alloy for fuel tanks at an early stage. The benefits of this method include the fact that a relatively large volume of hydrogen can be stored per tank, and that it is almost impossible for large volumes of hydrogen to be released into the air, thereby offering a safety advantage. The disadvantage to this method is that the weight per unit of the tank is extremely heavy. In order to combat this, Mazda is putting much effort into the development of metal alloys with higher absorption capacity.

Hydrogen Vehicle HR-X2

Hydrogen Rotary Engine

Metal-Hydride Hydrogen Storage Tank (for Roadster)

When filling the tank with hydrogen fuel, the hydrogen gas is compressed, while at the same time the absorbent alloy is cooled. The supply of fuel to the engine is carried out by using heat from the warmed engine-cooling water to speed the release of the hydrogen.

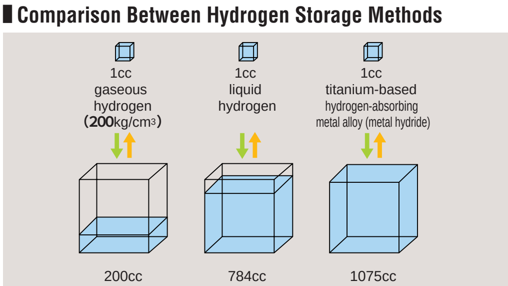


Graphic (c)1985 Yasuaki Usami & Teruhiko Saito, Yanoshobo Ltd.

Composition of Hydrogen-absorbing Metal Alloy (Metal-Hydride)

The small, lightweight hydrogen atoms are able to penetrate the larger metal atoms. Heat and pressure are used to release the hydrogen atoms that have penetrated the metal in this way.

Comparison Between Hydrogen Storage Methods



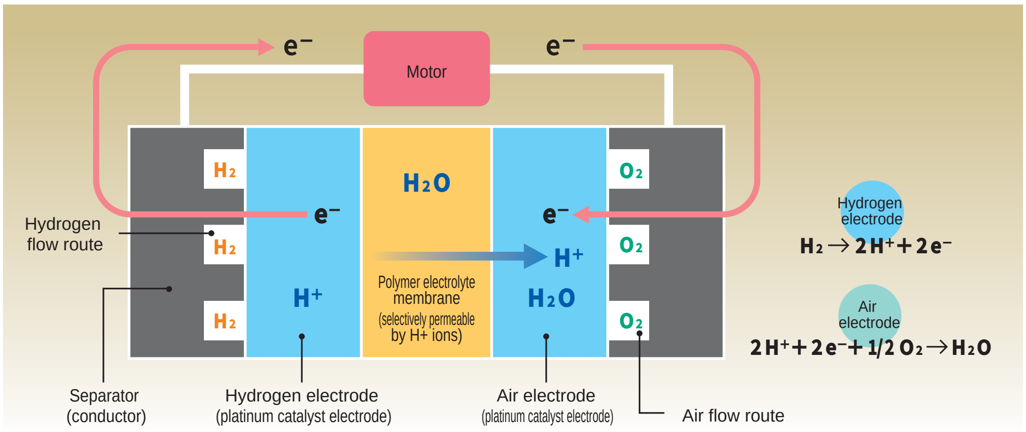
Some types of metal-hydride hydrogen storage tank have better hydrogen storage capacity per unit than liquid hydrogen.

Fuel Cell Electric Vehicle (FC-EV)

Unique Electric Vehicle Operates by Extracting Electricity from Chemical Reaction between Hydrogen and Oxygen

The fuel cell is a new type of electricity generating apparatus, which produces electricity through causing a chemical reaction between hydrogen and oxygen. The only by-product of this reaction is pure water. It is a highly efficient method of generating electricity and if operated in the area where the power is being used, enables the loss of energy usually associated with transporting electricity to be avoided. In addition to this, the process is suitable for use in cogeneration (the supply of heat as well as electricity). Since fuel cells are also extremely quiet, they are now expected to become the apparatus of choice for next generation motive power sources. Mazda received a fuel cell on loan from Ballard Power Systems in 1991 and began basic research in the area. The following year Mazda prototyped a compact cart powered by a fuel cell stack. Through combining the results of its own research, Mazda was able to complete and unveil the first prototype Demio FC-EV in 1997. The vehicle is equipped with a fuel cell known as solid high-polymer type (the same as that used on board the spaceship Gemini 5 in 1965), which is remarkable for its ability to operate at low temperatures.

The FC-EV now needs to be further developed so that the fuel cell is more compact, and the car itself is more reliable, and so that it requires less catalyst. There is also still one further hurdle to be overcome before the use of hydrogen-powered vehicles becomes normal, and that is the problem of creating an infrastructure for the supply of hydrogen. The FC-EV has been made to deal with this problem by being able to reform methanol. Filling a car with methanol as opposed to hydrogen at a fuel station is almost identical to filling it with gasoline. All over the world expectations are high regarding the utilization of FC-EVs. If the process of bringing them into general use continues as expected, they will play a leading role in the next generation of vehicles, and be one of the keys to ushering in the hydrogen society.

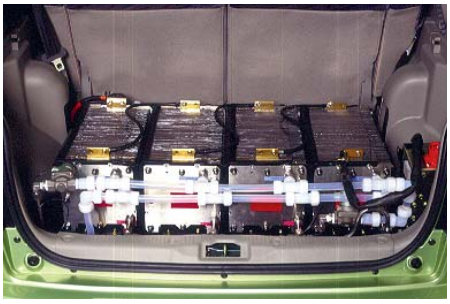


Fuel Cell System

The fuel cell system is composed of the fuel cell stack and the peripheral equipment that supplies hydrogen and oxygen (in the form of air). The fuel cell stack uses a proton exchange membrane that consists of electrodes and a solid polymer electrolytic membrane, sealed between separators. The electrolyte membrane contains a suitable amount of water to cause the hydrogen ions to permeate the membrane and release electricity.

[Reducing the System Size]

Until recently fuel cells used an air humidifier to supply the required amount of water to the membrane. Mazda succeeded in reducing the thickness of the proton exchange membrane, and reducing the temperature required for operation, which rendered the humidifier unnecessary. This is due to the fact that water produced inside the fuel cell is sufficient to fulfill requirements. As a result, the size of the fuel cell stacks has been reduced by 15%.



■Fuel Cell (for Demio)

[Hydrogen Supply System]

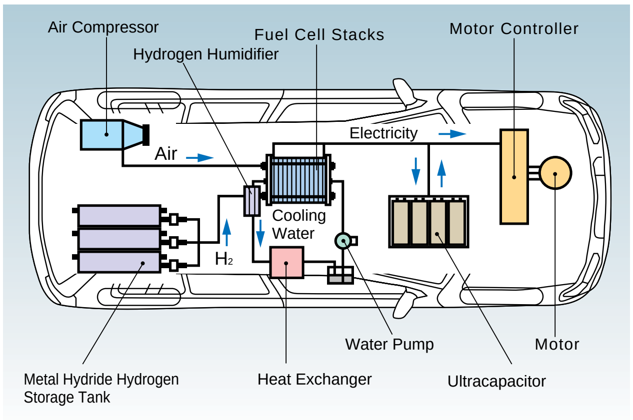
The Demio FC-EV utilizes the same metal-hydride hydrogen storage tank to supply hydrogen as the Hydrogen RE vehicle. In comparison with this, the methanol reforming method uses methanol, which is an easily handled fuel, and converts it into hydrogen before supplying it to the fuel cell. Methanol is a carbonized compound and as such some CO_2 emissions result from its use, but these are around half the volume given when gasoline is used, so environmental impact is less severe.

■1997 Demio FC-EV

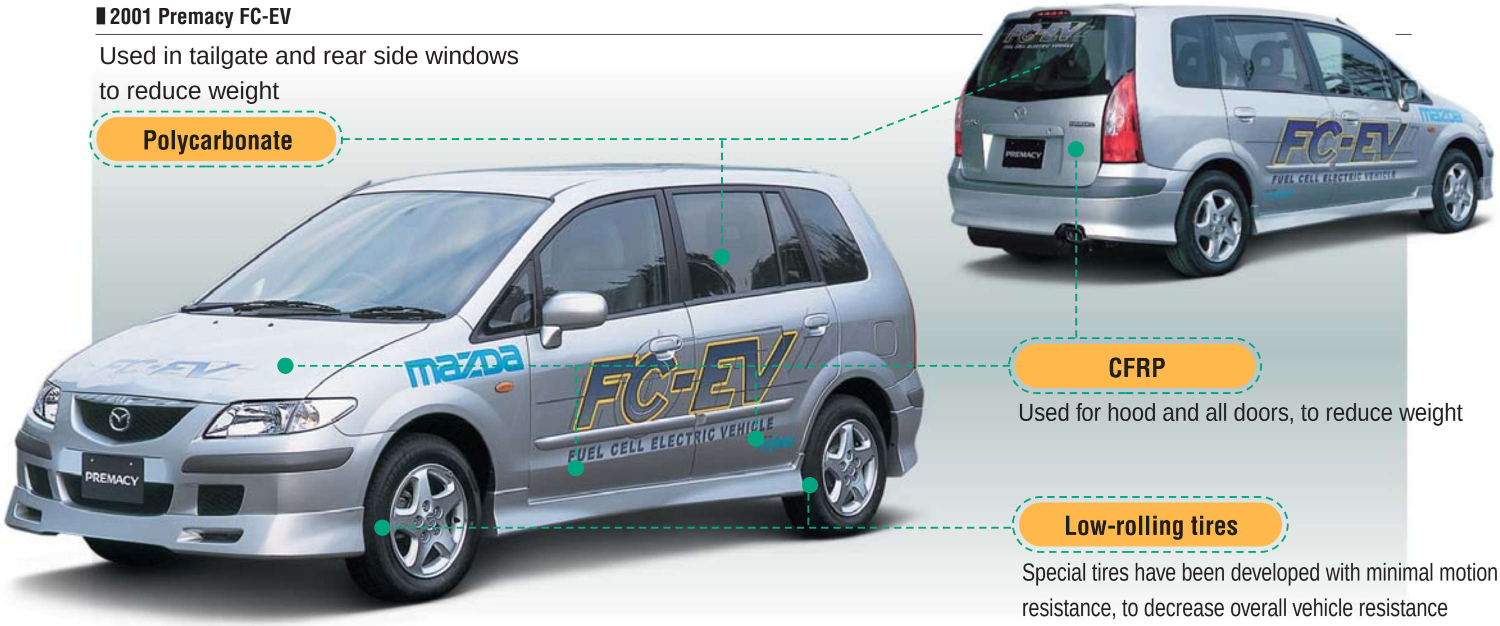
[Joint Development Structure among Vehicle Manufacturers]

In April 1998, Ford, Daimler Benz and Ballard signed an agreement to accelerate development of fuel cell technology in cooperation with one another, and began a joint project. Mazda has been able to participate in this joint project through its strong links with the Ford Motor Company, and is playing a role through contributing its development results in the area of vehicle systems, while also receiving a supply of main composite units. As part of this project, Mazda has been implementing the first road tests of an FC-EV to be carried out within Japan since February 2001, using Premacy FC-EV.

▌Demio FC-EV System



▌2001 Premacy FC-EV



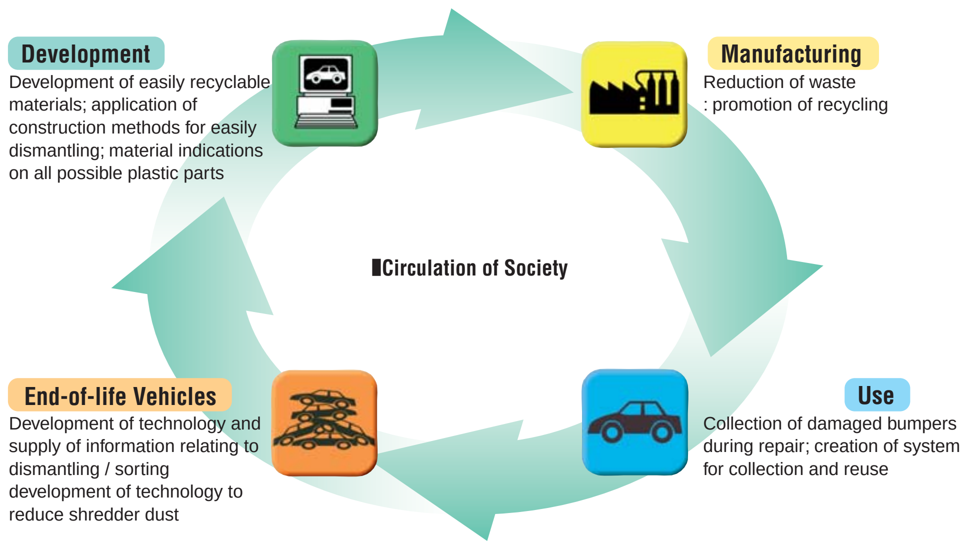
Mazda's first methanol reforming type FC-EV

Recycling Promotion

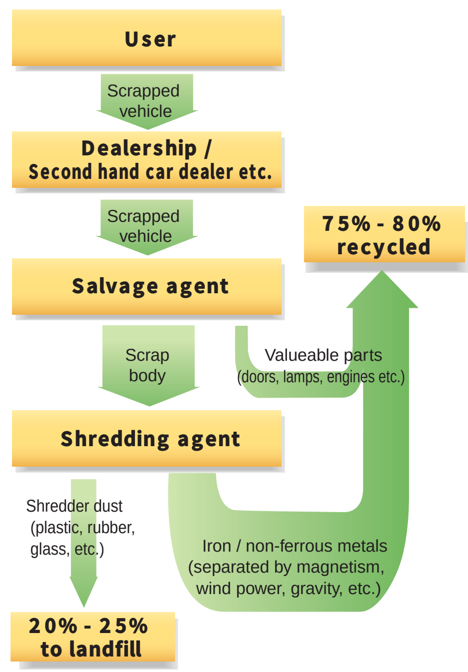
Mazda Accelerating Towards the Promotion of Recycling

Our world is increasingly conscious of the need for a recycling society.

Extending the useful life of limited resources as far as possible. Using things over again. Through care being taken in these areas, reducing the amount of waste produced, and striving for better waste disposal methods, which do not pollute our land. These are lifestyle principles, required of a recycling society. At present, end-of-life vehicles are collected, and between 75% and 80% of their component parts by weight, mostly metal, are recycled. Since there is less and less space available nowadays for landfill, there is increasingly a need for the recycling of plastic and rubber parts as well. Mazda has established a company-wide Recycling Steering Committee, and is accelerating its engagement in research to ensure that new models have higher recyclability, research into the use of recycled materials in automobile parts, and research into recycling technology for plastic and rubber parts.



■ Current Recycling Process for End-of-life Vehicle



Voluntaly Action Plan of Recycling

Mazda Specified New Targets in Recycling Promotion (February 1998)

[Improvement in Recycling Rate]

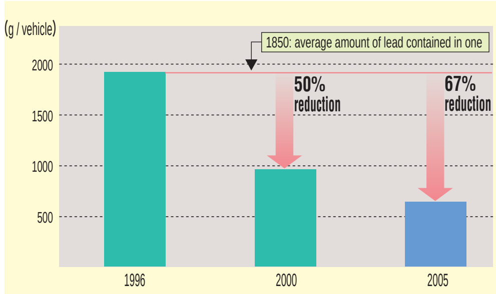
Mazda has set a recycling rate target, for all new cars issued from 2002 onwards, of 90% or above. (The Recycling rate is defined as the percentage of parts of any vehicle judged to be recyclable at any point in the future when the car becomes no longer usable. The rate is calculated using predetermined criteria).

[Reduction in use of Substances of Concern]

Mazda introduced a target as of the year 2000, reducing the amount of lead it uses in its vehicles by half, in order to reduce damaging effects on the environment when a scrapped vehicle reaches the stage of final disposal. Mazda has set a target of reduction to 1/3 the original amount by the end of 2005 (an overall reduction of 67%), and is considering ways of reducing this amount even further. (The standard amount of lead used to calculate the reductions is the average amount contained in a vehicle made in 1996, excluding the battery).

Mazda also eliminated the use of the poisonous sodium azide as an explosive in its airbags in 1999, and has now replaced it with a harmless explosive.

Reduction of Lead Use



Parts targeted for 50% reduction (already achieved)	Parts targeted to achieve 67% reduction (in development stage)
Copper radiator	Gasoline tank
Battery cable terminals	Electropaint
Seat belt G sensor spindle	Harnesses
Copper heater core	
Undercoat	
Side protector chenille	

Development of Easily Recyclable vehicle

Carefully Chosen Materials	The plastics used in vehicles are made from various combinations of substances, and with various additives. This is because up until now each type has been produced to have the specifically required properties for its intended use. Effective alternatives include increased use of thermo plastic regin, which is easily recycled, and the overall decrease or integration in use of different plastic types. Mazda vehicles are currently fitted with bumpers made from over 95% thermo plastic regin (known as polypropylene). Plans are currently underway for the integration of all plastics used in the interior into 3 or 4 types.
Easy Sorting	It is an important theme for development to make vehicles easy to disassemble. Mazda is currently pressing ahead with development of single-material and larger component parts, reduction in joining points, simplifying the removal process for liquid or gaseous components, inclusion of space required for dismantling parts, and simplification of the tools needed to work on its vehicles.
Promotion of Materials Recycling	Mazda labels all possible plastic parts according to ISO standards with an indication of their components, so as to ease the sorting of parts made from the same materials.

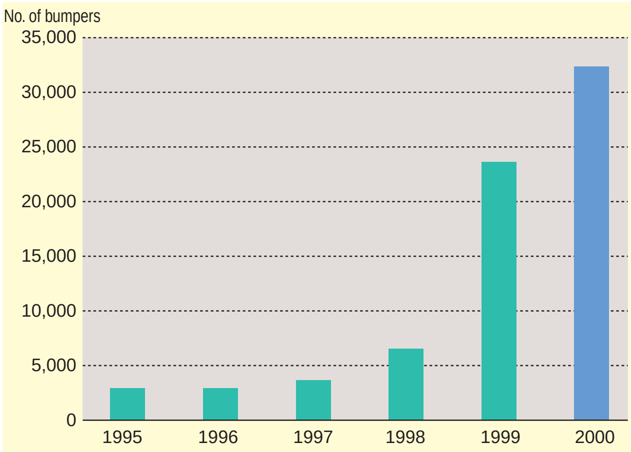
Promotion of Materials Recycling

Mazda collects damaged bumpers that become available after repairs, and recycles them into materials used in automobile parts, as part of the Bumper Recycling Project, which has been in operation since 1991. Mazda extended its bumper collection areas to cover all of Japan in 1999.

The recycled material gained from bumpers is used in new model vehicles as engine undercovers and trunk boards, as well as in other parts.

Mazda also promotes the use of other recycled materials in various areas of its vehicles, for example, the use of carpets made from recycled PET bottles in its vehicles.

▌Number of Bumpers Collected



[Increased Use of Recycled Bumper Materials in Bumper Reinforcement Parts]

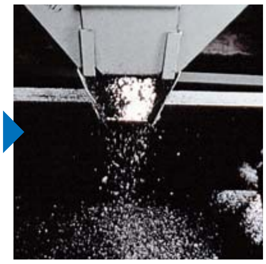
Mazda began using recycled materials from damaged bumpers for bumper reinforcement parts in January 2001.

These parts contain recycled materials that have the same level of mechanical strength as new materials, through having had the paint layer removed during the recycling process. Mazda intends to continue improving developments based on this technology so that it is able to use an increasing blending ratio of this recycled material. Mazda plans to develop an even higher surface quality, which is currently required of such bumper parts.

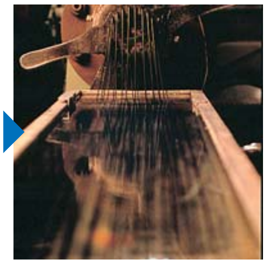
■Recycled material and bumper reinforcement parts

▌Process of Recycling Bumpers

■Inserting bumper



■Grinding



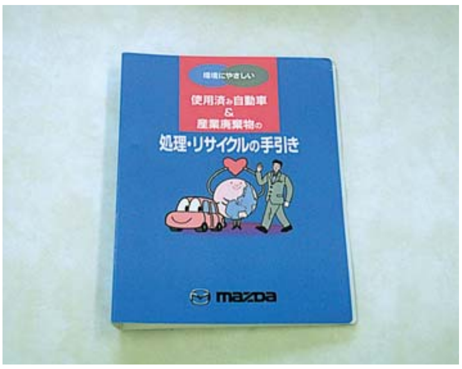
■ Molten extrusions

■Recycled material

■Parts made from recycled material

Support for Recycling of End-of-Life Vehicles

Once a vehicle is sent for scrap, the engine, transmission, doors, lamps and other valuable parts are first removed by a salvage agent, and reused either as second hand parts or as recycled resource materials. The remainder of the body is sent to a shredding agent, where metals such as iron, aluminum and copper are removed and sorted for collection and recycling. Materials that are difficult to recycle such as plastics and rubber are reduced to shredder dust (ground waste product), which is then buried as landfill. This process is the same for all types of vehicle, regardless of the manufacturer. Mazda is working hard to see that valuable parts are removed efficiently and that dangerous substances are eliminated in appropriate ways. Mazda is also committed to lowering shredder dust volumes, and is both developing technology in this area, and sharing its technical information with related agents.



■Recycle Manual

Reduction of Ozone-Depleting Substances

An international framework for response to the need for protection of the ozone layer was established through the Montreal Protocol in 1987. The declaration required gradual reductions in both manufacturing and use of 5 designated types of CFC and other ozone-depleting substances.
As an automobile manufacturer, Mazda had been using three of the specified CFCs and one other designated substance - 1,1,1-trichloroethylene. Mazda abolished the use of these substances by 1995.

Substance name		Use abolished	Use	Alternative Designated
CFCs	CFC11	1989	Manufacturing process (foaming)	Air foaming method
	CFC113	1992	Manufacturing process (cleaning)	Water-based cleaning, petroleum based cleaning etc.
	CFC12	1994	Air conditioning coolant	Replaced with HFC134a
1,1,1-Trichloroethylene		1995	Manufacturing process (cleaning)	Water-based cleaning, combustion cleaning, etc.

Solution for Air Conditioner Refrigerants

The designated CFC12, which was used as an air conditioner refrigerant, is no longer used in new cars, but is still in existence in some scrap or old cars. Mazda has placed CFC collection equipment at its major service facilities throughout Japan, and is pressing ahead with the collection and appropriate disposal of old style refrigerant.
Current air conditioner use HFC134a as their refrigerant. This new refrigerant does not damage the ozone layer, but since it is grouped together with CO_2 in being a gas that contributes to the greenhouse effect, there are problems with the possibility of it being released into the atmosphere. Mazda has developed new air conditioning equipment, which uses only a small amount of refrigerant, in order to control the emissions of new refrigerant into the air, and is currently researching substitute refrigerant, as well as conducting research into preventing leaks of the refrigerant during the manufacturing process. Mazda has cooperated with the Japan Automobile Manufacturers Association,Inc. and its associated industries in the founding of the Automobile Recycling Promotion Center, and is working hard to ensure that both old and new Refrigerant are collected from scrap vehicles and disposed of in an appropriate manner.

■CFC collection equipment

Production

Working to minimize our effect on the environment, including more effective utilization of resources.

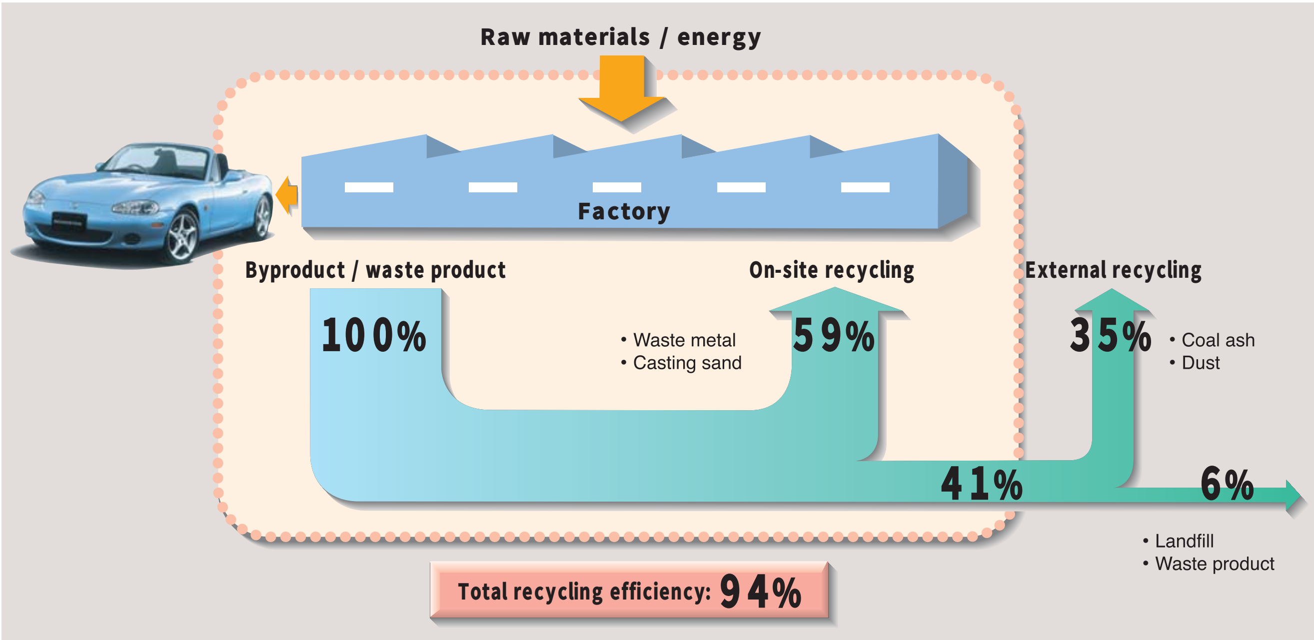
The most important parts of automobile production are mechanical working and assembly, and as a result the automobile industry has long been recognized as a low-pollution industry. Factory scales are extremely large, however, and incorporate a great many processes, so that they consume a large amount of various resources and energy. It is because of this that the automobile industry is so concerned with the problems of resources and the global environment, including atmospheric and water pollution, and local environmental problems such as waste processing.
Minimizing environmental impact means utilizing resources and energy with the best possible efficiency, minimizing emissions and release to the outside world, and using the optimal processing. To help realize this goal, we have established three mottos to guide us here at Mazda: "Treasure resources," "Treasure energy" and "Keep it clean." We are putting great efforts into protecting our environment.

■Hofu Plant (Yamaguchi Prefecture)

Waste Reduction: Utilizing Resources More Efficiently

To utilize resources with the best possible efficiency, we are actively working to reduce resource consumption and increase reuse and recycling, while at the same time decreasing waste tonnages.

▮ Byproduct and waste product recycling for FY2000 production operations



[High-efficiency Utilization]

Measures include minimizing the scrap generated when parts are punched out of steel sheet, circulating cutting fluids and electropaints for reuse, and extending die and mold life.

[Strict Sorting]

All waste materials generated in the production process and elsewhere on site must be sorted properly to assure reuse and appropriate processing. We operate a process of sorting all waste products according to their type and recycling method.

■Humidifying system for using casting sand in cement manufacture.

On-site Recycling

Casting sand is sent to the furnace to be reconstituted and reused. Steel scrap and shavings are collected, melted in the cupola and reused in parts. We also reuse plastic scrap and wood pallets. Combustible refuse is incinerated in a furnace designed for heat recovery, with the generated thermal energy (steam) being utilized throughout the plant.

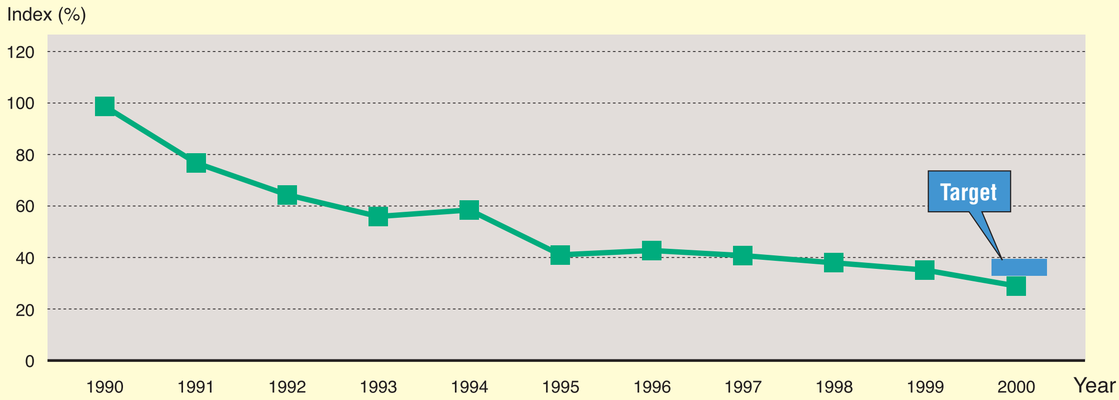
Off-site Recycling

Materials recycled in this group include metals, casting sand, plastic scrap, and waste paper and cardboard. Ash and ore residuals are used in cement manufacture, while cupola slag is used in soil improvement agents and blocks.
Mazda itself pre-processes these materials before handing them over to specialized firms for recycling.

Reducing Tonnage

We use separation, purification, concentrating and dewatering equipment to reduce the amount of oil, cutting fluids and sludge generated, thereby reducing discharge tonnage.

■ Trends in Landfilled Waste since 1990



FY2000 Waste Reduction Targets and Performance

Waste Reduction Target	We established a target figure for FY2000 of a 66% reduction in landfilled waste, compared to 1990.
Results during FY2000	Mazda has continued to positively promote recycling both within and without its company locations, with the aim of achieving zero emissions. As part of these activities, a notable achievement in FY2000 was that of developing slag as a material for cement, which contributed to our landfilling 69% less waste product this year than in 1990.

Reducing Energy Consumption - Utilizing Energy Wisely

The basic approach to reducing energy consumption at Mazda is to use the required amount of energy at the required place and the required time. We were one of the first manufacturers to introduce cogeneration systems (the joint generation of electricity and heat), thereby making maximum use of the thermal energy of our fuel.

Activities to Reduce Energy Consumption

We have implemented a range of efforts to improve energy utilization efficiency, with multi-stage use, and eliminate wastage in all its forms, through measures including the installation of over 300 inverters, modifications to improve the performance of air nozzles, improved piping insulation, and recovery of waste heat from the cupola.

At the same time, we are working to continually improve employee awareness of energy issues, such as turning off lights when not in use and adjusting air conditioner settings more reasonably.

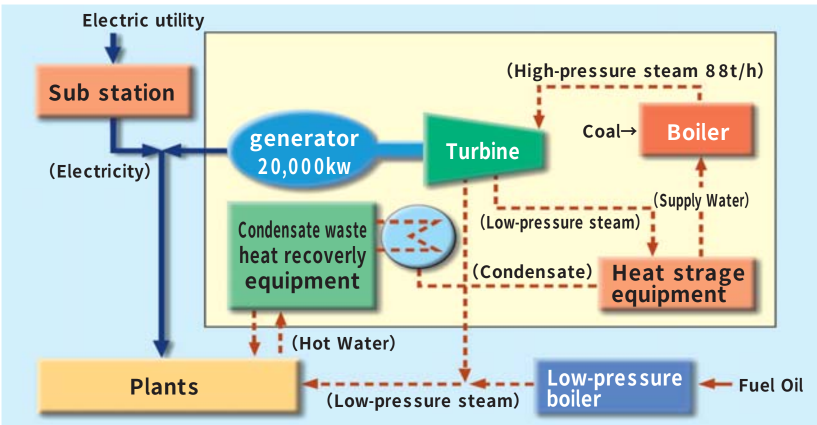
Use of LNG (Liquefied Natural Gas)

We are also actively working on switching over to LNG fuel. Our head office plant in Hiroshima completed the changeover from 6C (LPG City Gas) and butane (LPG) to A Gas (LNG) in December 2000. The Hofu Plant is also in the process of refurbishing facilities in order to be able to make the changeover to LNG, in response to the fact that LNG is now supplied in its area (as of May 2001). Mazda intends to continue to extend and promote the use of LNG in order to reduce CO_2 emissions.

Cogeneration System

As the word itself indicates, cogeneration means using a single fuel to generate several types of energy, such as electricity and heat (or steam). While a system designed to produce electricity alone may develop a thermal efficiency of about 40%, a cogeneration system can achieve 60 or even 80%. In 1987 Mazda installed the first on-site generating facility (cogeneration) in the industry at its Hiroshima Plant. In 1993 this was followed by a new cogeneration system producing electricity and steam at the Hofu Nishinoura Plant, along with reuse of waste heat from the water condensation process. This new type of generating system utilized previously unused waste heat, and was provided with unique features to enable it to track the fluctuating energy demand of the automobile assembly plant (patent held by Mazda). This new generating system now provides about 55% of electrical energy required by the Hiroshima Plant, and about 90% for the Hofu Nishinoura Plant.

Cogeneration System (Hofu Nishinoura Plant)



Energy Consumption Targets and Performance during FY2000

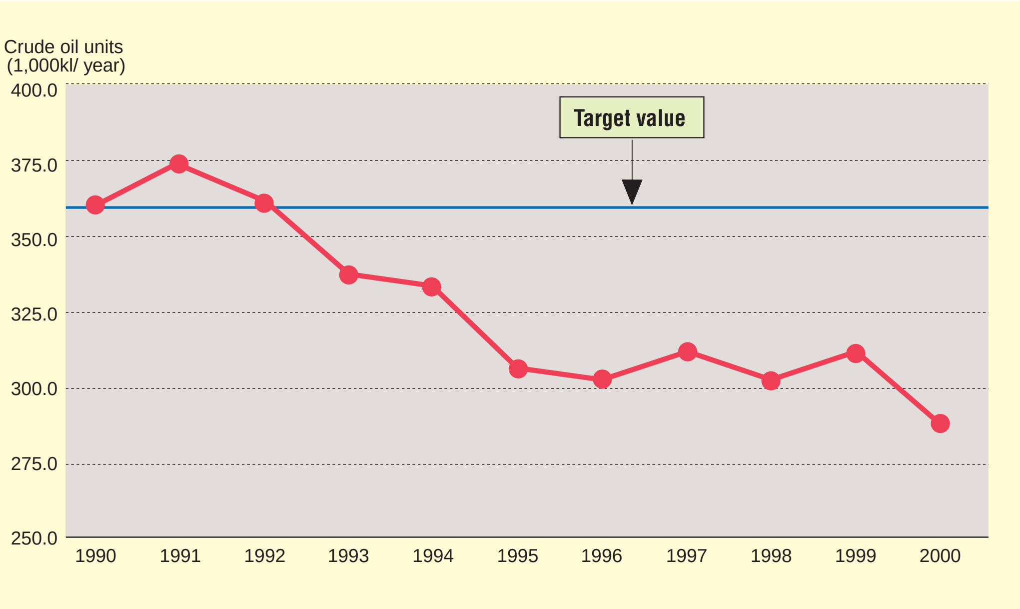
Reduction targets

We established an energy consumption reduction target for FY2000 of stabilizing consumption at the FY1990 level.

Results for FY2000

Due to a company wide review and detailed application of energy-saving measures, which were defined as a key issue for FY2000, Mazda achieved a 6000kl reduction in crude oil consumption. As a result of these activities, as well as changes in production levels, our energy saving during FY2000, measured in units of crude oil, was in fact 18,600kl, giving a 19.5% reduction even on 1990 levels.

Energy Consumption Performance (measured in units of crude oil)



Clean Manufacturing - Minimizing Effects on the Environment

Mazda's production facilities in Japan adjoin the beautiful Seto Inland Sea National Park, offering a gentle climate and stunning scenery.
We believe that this beautiful environment is the heritage of the local community, and have positioned our "clean production" activities to minimize the effect of production on the environment.
To achieve this end, we are defining a framework for environmental protection and systematically implementing and refining it. Concretely, it includes the development of related "clean" technology, advanced evaluation of plant construction and facilities, the establishment of facility operating standards and autonomous discharge management standards, emergency responses, and auditing.

■Itsukushima Shrine, like the Hiroshima Plant, faces Hiroshima Bay.
(The shrine was designated a World Cultural Heritage Site in December 1996)

Preventing atmospheric pollution

Our in-house regulations are even stiffer than national and local regulations, and through daily management we continue to clear them by an ample margin. This is made possible through the following measures:

SOx (Sulphur Oxide) Measures

We use high-grade, low-sulfur fuels, and stacks are fitted with wet and dry exhaust gas desulfurization systems.

NOx (Nitrogen Oxide) Measures

Low-NOx burner and fuel combustion improvement used to reduce NOx emissions.

Dust, Soot and Mist Measures

Large-capacity dust collectors have been installed for the casting process, boilers and other equipment. Painting booths are equipped with wet-type mist separators, while small-scale mist separators in the machining and other processes control dust and soot.

Hydrocarbon and Volatile Organic Compound (VOC) Measures

High-efficiency painting systems and wash thinner recovery provide major reduction in hydrocarbons, whilst exhaust gas combustion systems are being planned and implemented to control hydrocarbon release.

■Wet-type desulfurization equipment

■Dust collector in casting process

■Chemical wash deodorization equipment

Prevention of Waste Water Pollution

Our in-house regulations are even stiffer than national and local regulations, and through daily management we continue to clear them by an ample margin. We have constructed four drainage systems to assure the quality of drainage water, namely the process system, the waste liquids system, the daily living system, and the rainwater system. These are used as shown below. With the exception of rain water, all waste water is passed through a general waste water treatment facility, and is discharged through a single waste water outlet. The water released in this way is continually measured and analyzed using measuring equipment, and fish are kept in the water to detect any irregularities.

Process System

Oils are separated out and coagulation processing implemented at the plant wastewater treatment facility. Depending on the specific characteristics of the wastewater, these processes may be followed by biological or high-level treatment.

Waste Liquids System

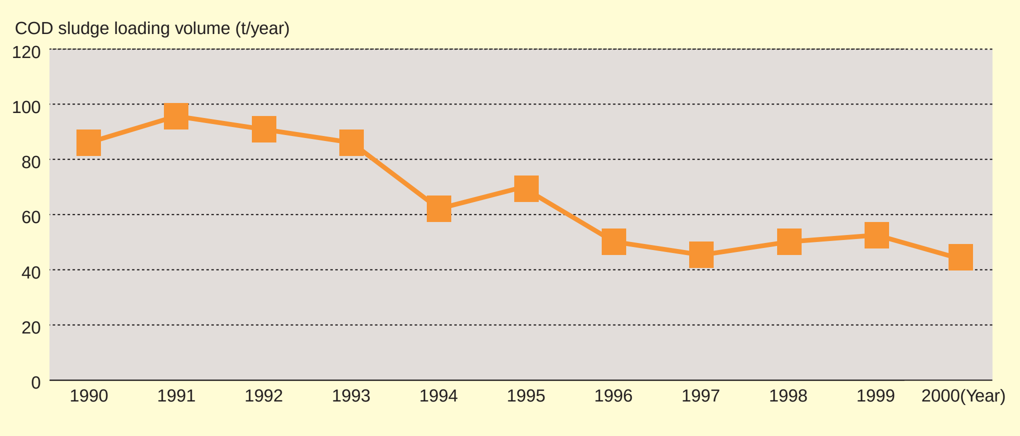
This system is monitored with special care, and detailed processing, including incineration of oils, is implemented.

Daily Living System

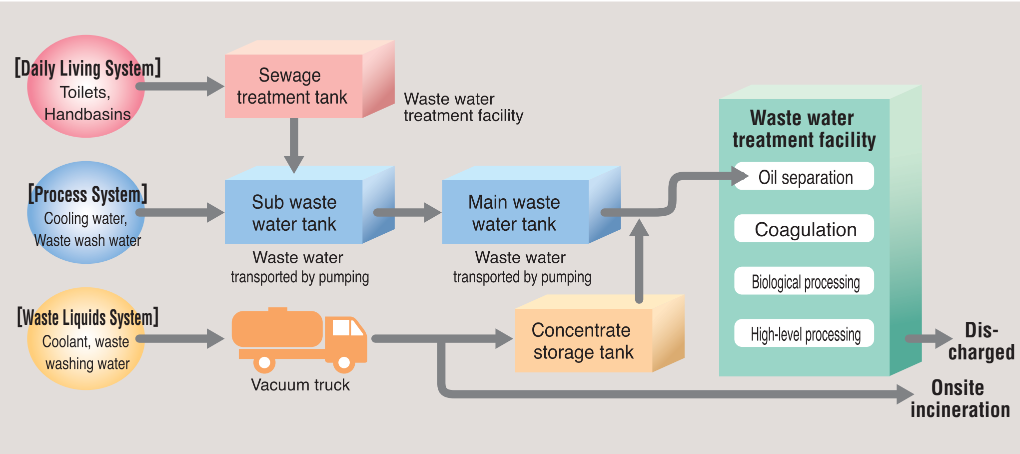
After processing in one of the approximately 200 dedicated or dual-service wash systems installed throughout the plant, the wastewater is processed once again in the plant wastewater treatment facility.

■Fish are raised in the monitor pond to help check water quality

Trends in COD sludge loading since FY1990



Waste water processing outline (Hiroshima plant)



Prevention of odor, noise and other sensory pollution

We are also implementing a range of measures to control forms of pollution effecting human senses, such as odor and noise. Even though laws and regulations may be complied with, there are often situations where the surrounding community finds noise or odor levels unpleasant. We are serious about controlling these forms of pollution as well, and are cooperating closely with the local community to improve and strengthen the measures taken.

■Windowless Factory

Noise Reduction

We are working to reduce generated noise through the installation of low-noise machinery and taking care in layout, along with the use of soundproofing and mufflers.

Vibration Reduction

Measures to eliminate or control vibration include reinforced foundations, vibration-absorbing rubber fittings, and care in layout.

Odor Reduction

The exhaust gas from the painting process is combusted by a special system prior to release, while in the casting process we have implemented measures both to control odor generation and to deodorize.

Other Environmental Measures

Total Elimination of all Chlorine-Based Cutting Fluids

We are in the process of eliminating all chlorine-based cutting fluids used in company-wide machining processes.

PCB Control

We store all PCB used as insulating oil for condensers in accordance with Japanese laws concerning waste processing. As of the end of FY2000, we are currently storing 242 containers of PCB.

Chemical Substance Control

Advance Audit System for Chemical Substances

Before raw materials used in the oils, chemicals and paints for production are purchased, or supplementary materials procured, the proposed materials are carefully analyzed for safety and environmental considerations in accordance with the MSDS (Material Safety Data Sheet). Every effort is made to eliminate, reduce the use of, or replace potentially hazardous substances.

PRTR (Pollutant Release and Transfer Register) Implementation

We have voluntarily participated in the PRTR program sponsored by the Japanese Federation of Economic Organizations (Keidanren) since 1997, and have established a system for tracking the transfer and release of all pollutants from our manufacturing processes. We are now improving the precision of the system.

[Release and Transfer Activities in FY2000]

We control 354 groups of substances under the PRTR system, 19 of which require official reports on activity. Approximately 93% of all release and transfer activity was either consumption or into the atmosphere.

Greenery Planting and Care

Mazda also works to plant and nurture the green space around its facilities. At the Hofu Plant we have created the "Mazda Forest," with 220 native trees and shrubs covering 40 species planted to form a map of Japan, which serves as the symbol of our greenery efforts.

■Mazda Forest (Hofu Plant)

Logistics

Through every stage of distribution, from parts procurement to automobile sales, we have achieved a variety of successes in environmental protection. To guide our continuing efforts in the future to attain even cleaner distribution, we have defined and are continuing to practice two policies:

1. Continue to reduce CO_2 emissions by improving distribution efficiency and reducing energy consumption; and

2. Continue to reduce packaging material consumption by simplfing packaging specifications and also by promoting the use of returnable / reusable materials.

Reducing CO_2 emissions and energy consumption through more efficient distribution

[Distribution in Procurement and Production]

In the procurement area we began full-scale implementation of rail transport for parts from vendors to our plants in November 1989, and since then have investigated a modal shift cooperatively with our business partners in the Tokai region, gradually expanding the range of rail transport. In engine procurement, we used sea transportation between Tomakomai and Hiroshima for the period between September 1994 and April 1998, and have been using sea transportation between Tochigi and Hiroshima since 1995. In the production area we utilize the high loading efficiency of trucks to shuttle engines and transmissions between our dispersed plants, whilst working to reduce the total number of shipments, and have succeeded in reducing CO_2 emissions.

[Vehicle Shipment (sales distribution)]

Taking advantage of our excellent coastal location, we have always used the sea transport route for the domestic market, recognizing its low environmental loading and high transport volume. Sea transport accounts for 84% of total new car shipments. We have established depots in eleven major Japanese cities, provided with new car prep functions, establishing a total distribution system capable of efficiently supplying the new car market. In addition, we implemented a mutual usage agreement with another automobile manufacturing firm in 1999 for transport from Hiroshima to Chiba and Kinuura (Nagoya). CO_2 emissions were reduced through these measures, coupled with cooperative transport and improvements in transport efficiency. We are continuing our efforts to further improve land transport between our depots and the sales companies.

[KD Parts Shipment (sales distribution)]

All knock-down (KD) parts for overseas assembly plants and parts for customers overseas used to be shipped to the international port of Kobe by truck or sea transport, and then loaded onto the mother vessel to the final destination. From 1998 we have been shipping to Korea and Taiwan directly from Hiroshima Port, then loading onto the mother vessel to some destinations. As a result, we have achieved a reduction in CO_2 and NOx emissions caused by shortening transportation from Hiroshima to the final destination in total.

[Vehicle Replacement Parts Shipment (sales distribution)]

The changes in transportation mode since 1993, including cooperative transport and rail transport, are continuing to provide reduced emissions by improving transport efficiency. In addition, in early 2000 we consolidated ten transport depots in the extended Tokyo region (Tokyo, Yamanashi, Saitama, Gunma, Tochigi and Ibaraki) into a single site, and increased the shipping volume per truck. Since June 2000 we have shipping stock refill parts by train to the consolidated depot in metropolitan Tokyo area, enabling CO_2 emissions to be further reduced.

■ Reduction in Energy Consumption (CO_2 Emissions) through Improved Transport Efficiency (units: tons)

Distribution category	Description	1988 standard		Measures implemented
		1999 results	2000 results	
Procurement and production	Transportation for parts procurement In-plant transportation	991	1,086	Modal shift to sea transport from Tochigi to Hiroshima, 1995-2000 Improved truck efficiency between Hiroshima and Hofu, 1999 - 2000
Sales	Vehicle shipment	499	499	Cooperative sea transport between Hiroshima and Chiba with another automobile firm, 1999-2000 Cooperative sea transport between Hiroshima and Kinuura (Nagoya) with same automobile firm, 1999-2000
	KD parts shipment	1,130	1,226	Direct loading in Hiroshima for shipment to Pusan (Korea), 1998-2000 Direct loading in Hiroshima for shipment to Kaohsiung (Taiwan) 1998-2000
	Vehicle replacement parts shipment	132	929	Ten depots in extended Tokyo region consolidated into one, truck numbers reduced, 2000 Modal shift to rail transportation to consolidated depot in metropolitan Tokyo since June 2000
Total		2,752	3,740	

Simplification of Packaging Specifications to Reduce Material Consumption

Reduction in packing material usage through promotion of "3R Activities"

When Mazda automobile parts are shipped to overseas knockdown plants or sales companies within Japan, they are packed using corrugated cardboard boxes and wooden crates. This packing material becomes waste after delivery. By reducing the amount used, it is possible to simultaneously preserve resources and reduce costs. This is the basic policy behind our 3R Activities.

Returnable For example, using steel and plastic containers that can be returned to Mazda to be used again.

Reuse Reusing the wooden pallets utilized for the parts procured from overseas when exporting Mazda parts.

Reduce Reducing the amount of wood consumed in packing and packaging KD parts and customer parts for shipment overseas, formerly shipped in sealed wooden crates, by switching to simplified packing and/or container shipment, thereby contributing to preservation of forest resources.

■Reduction in Resource Consumption through Simplification of Packing and Packaging Specifications (units: tons)

Distribution category	Description	1998 Standard		Description					
		1999 results	2000 results	Returnable		Reuse		Reduce	
				1999	2000	1999	2000	1999	2000
Sales	KD	804	1,427	22	169	8	14	774	1,244
	Customer	188	236	3	62	3	59	182	115
Total		992	1,663						

Green Purchasing

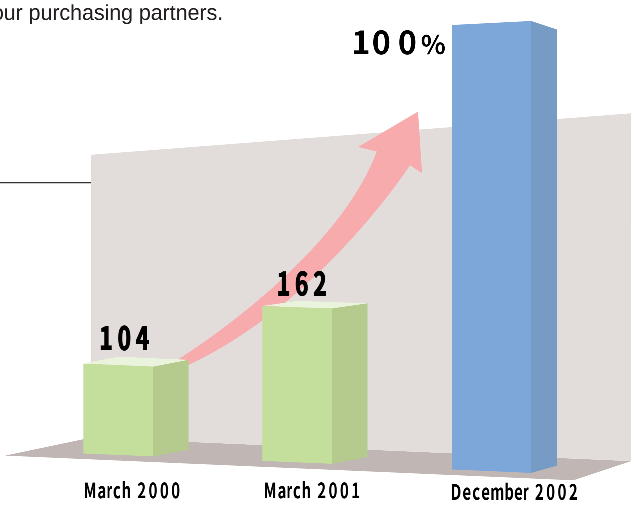
In the Purchasing Division, to reduce substances having an environmental load and avoid risk of environmental impact, we have rolled out activities to establish a comprehensive framework that includes our purchasing partners.

The Challenge of Promoting ISO14001 Accreditation Among Suppliers

At its Supplier's Conference in April 2000, Mazda presented all its suppliers with the requirement to achieve ISO14001 accreditation by the end of December 2002.

In addition to this, Mazda held a "Study Meeting for ISO14001 Accreditation" in October 2000, in order to support suppliers working towards this end, and to raise awareness of the issue among its suppliers.

Mazda is also monitoring the extent of ISO14001 accreditation, as well as following up plans for accreditation among suppliers, on a monthly basis. At the end of March 2001, 162 of our suppliers were accredited.



■ ISO14001 accreditation among suppliers

Increase in Recycling and Reduction in Use of Substances causing Environmental Load

Mazda issued a "Request for Cooperation in Recycling Matters" to its 549 domestic and 120 overseas suppliers in June 2000. This comprised a requirement to strengthen and enforce recycling activities as well reduce the use of substances causing environmental load, and represented a strong call for cooperation.

Items listed within the Request for Cooperation in Recycling Matters

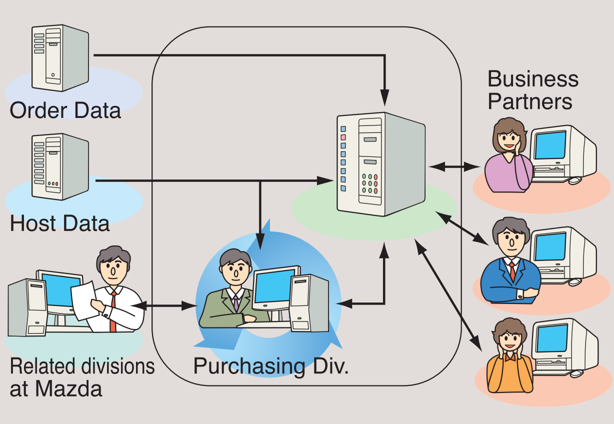
1. Reduction in use of environment-damaging substances (lead, mercury, cadmium, hexavalent chromium, PVCs, etc.)
2. Increase in the recyclability ratio of vehicles (selection of easily recycled materials, use of easily recyclable construction methods, etc.)
3. Promotion of recyclable materials (bumpers, and extension to other parts)

Reduction in Paper Use / Promotion of Use of Recycled Paper

As part of our efforts to use resources efficiently, the Purchasing Department as well as the rest of the company has worked hard to reduce the number of forms that circulate between departments. One hundred fifty thousand sheets of paper were saved to March 2001 through putting records for storage into electronic form, as a result of a review of the memorandum distribution procedure. In addition to this, the introduction in April 2001 of the company's information communications system, the Mazda Global Supplier Network (MGN), which utilizes the internet to allow communication with suppliers, has enabled a further 150,000 sheets of paper to be saved. As a result of these activities, Mazda estimates that it will have saved 300,000 sheets of paper, a reduction to around 60% of previous paper volume, by March 2002.

As a further aspect of green procurement, we have increased the proportion of recycled paper used in our vehicle catalogues. The proportion of catalogues using recycled paper at the beginning of 2000 was around 70%, but this was increased during the year as a result of our recycling activities, so that all catalogues now incorporate recycled paper.

■ Mazda Global Supplier Network



[Other Challenges]

We are also putting efforts into our "Weight Reduction Suggestions Plan" (to lower the weight of vehicle parts), and have also implemented a "Distribution Improvement Activities Development" plan and "Requirements for Environmental Consideration when Taking Delivery of Harmful Substances," in conjunction with our suppliers.

Offices

Resource Conservation, Energy Conservation, and Promotion of Recycling

At Mazda, we took the introduction of ISO14001 as an opportunity to work to reduce environmental loads by making efforts in resource conservation, energy conservation, and promoting recycling in our offices that are more systematic and organized than before.
We have worked to quantify our understanding of the results of our efforts, in order to ensure that genuine change is effected.
Savings in office paper use have been measured through each department sharing data on paper use every month, and the purchasing office keeping records of the overall amount of paper purchased. Energy savings have been achieved by switching off lights during the lunchtime break in certain places at certain times. This has been monitored and managed by regular checks. In addition to these ideas, information on good examples is shared with all departments. In this way, we are effecting ongoing improvements.

■Results in reduction of paper use at Hiroshima Head Office Plant (unit : A4 sheets)

	FY1999	FY2000
Overall amount used	53,800,000	46,200,000
Saving	Base	7,600,000

Main Activities

Paper	We have achieved 100% use of recycled paper for the paper used in copying machines and for printing by personal computers. We also actively use both sides of paper. We are increasing the use of personal computers in offices and are promoting computerization of documents.
Energy Saving	We encourage switching off lighting and personal computers when not in use. We are promoting activities such as no-tie campaigns in summer to save electrical power for air conditioning.
Recycling Promotion	We have been separating collected bottles and containers since 1991, and have also been collecting paper materials for recycling. Materials recycled from plastic bottles (made from PET) are used in work uniforms (in effect since April 2000).

■Uniforms made of fabric from recycled from plastic bottle made from polye thylene telephtalate (PET)

3 : Contribution to the Community

In aiming to be an enterprise trusted and loved by the community in its role as a good corporate citizen, Mazda is engaged in a wide array of activities that contribute to the community.
Above all, Mazda shares its joy and excitement with others by rolling out positive and continuing activities attuned to the needs of the local community, and is proceeding on a course hand in hand with the community. Mazda believes that community activities such as these are an essential role that the company must play as a good corporate citizen. That is why we call our social-contribution activities "Community Services Activities."

Basic Philosophy for Activities

①To bring vitality to the local economy and industry through corporate activities. ②To work for cooperation and symbiosis with the region and to contribute to create a prosperous community as a corporate citizen.

Activity Policies

①Activities attuned to local needs ②Alliances with other companies in the Mazda Group ③Emphasis on continuity ④Emphasis on volunteer activities by employees ⑤Expansion of opportunities for interaction with the local community

Scope of Activities

①International exchange ②Sports ③Social wellfare and medical care ④Protection of the environment ⑤Science and education ⑥Culture and arts ⑦Promotion of regional development ⑧Regional exchange

●The Mazda Community Contributions Tree●

The Mazda Group is committed actively to various activities rooted in the communities in which it operates.

Mazda Community Services Committee

In 1993 Mazda formed the Mazda Community Services Committee composed of members representing areas within Mazda and other Group companies and with a director of the company as the chairman. Mazda's community services activities are decided based on the work of this and the Promotions Committee, which handles operations. The main feature of our community service is "Human Resources Matching Regional Needs."

Support for Volunteer Activities by Employees

In 1994 we began registering employees of Mazda Group companies who possess specialist knowledge, skills, techniques, and other expertise in the company's Specialist Bank, in hopes that they could be of service to the community as instructors for seminars and workshops, and as coaches for sports activities. Since then, we have been dispatching specialists in response to requests from the community. Specialists executed about 240 themes in FY2000. We now have a total of approximately 280 registrations in the three categories of "Business," "Sports," and "Culture, Arts and Crafts, Performing Arts, etc." In 1996 we also established the Mazda Volunteer Center, which registers employees who want to take part in volunteer activities on their own and dispatches them in response to various requests from the community. The center now has some 500 persons registered in the three categories of "Social Welfare," "Environmental Cleanup," and "International Exchange," and participants are involved in around 40 activities each year.

Ujina Junior High School Optional Lessons
Lecturers were dispatched from the Mazda Specialist Bank to address the students on international understanding and environmental problems. These lessons were held 4 times each, a total of 8 times, during FY2000.

[Community Cleanup Campaigns]

Community cleanup activities were launched during the Hiroshima Asia Athletic Meet in 1994, and cleanup campaigns have since taken root at many Mazda Group companies. Mazda and some Group companies conduct cleanups around the company once a month. Around 1,300 employees took part in these activities in FY2000.

Community Cleanup Campaigns
Mazda is involved in community cleanup programs held annually in Hiroshima City and Fuchu Town, and took part in 5 such events in FY2000.

[Stop Engine Idling Campaigns]

Mazda holds an Idling Stop Campaign in conjunction with the Mazda Environmental Exhibition, which is held as part of Environment Month in June, and open to the local community. Mazda Group companies hold these Idling Stop Campaigns to help reduce unnecessary engine idling. Mazda has designated June and November campaign months and promotes the activities during these months. During FY2000, the campaign message was sent out to all group companies, and stickers and pamphlets were distributed.

The Mazda Foundation

On October 26, 1984, Mazda established the Mazda Foundation to promote science and technology and help nurture young people who will play a leading role in the 21st century, and to contribute to the creation of a society where the people of the world can prosper together and lead enriching lives. In addition to providing funding for research and other projects, since 1995 the Foundation has also supported the "Asian Region and Academic Interchange" lectures conducted by Hiroshima University, and has also planned and executed the lectures "New Perspectives on Technology," "New Value System," and "Volunteering" at universities and colleges in the Hiroshima area.

Grants and Activities during FY2000

Projects were implemented in relation to "Development of Science and Technology" and "The Holistic Development of Young People. "Support was also given under these categories to environmental protection projects.

[Support of Community Activities]

Mazda suported four community activities to foster the younger generation, with environmental related themes.

[Research Grants]

The foundation added the category "Recycling / Low-Resource Technology" to its applicable areas in 1999, to commemorate its 15th year of activities, to go alongside the categories of "Materials," "Electronic Technology and Information" and "Precision / Mechanical Engineering. "This new category was renamed "Recycling / Low-Resource Engineering" in FY 2000, and grants were specifically offered towards research into the construction of a recycling society. Seven research projects were given grants, including "Research into the Development of Re-resourcing Disposal Technology for Organic Solid Waste Product, aiming at the Realization of a Recycling Society", and "Development of a New Decomposing Enzyme System for Biomass Recycling."

4 : Traffic Environment Improvement

ITS

Targeting a Future with a People-Friendly Transport Environment

In addition to the evolution and improvement of individual models of vehicles, the improvement of the transport environment and transport systems are also thought to be essential steps towards environmental protection. Taking the people, roads and vehicles (as well as public transport) that comprise "transport" into consideration as a whole, changes are required that would turn transport into something that happens more smoothly and with a greater degree of safety and comfort, by incorporating reductions in emissions and noise, the easing of congestion, and savings in fuel. Most importantly, traffic accidents would be reduced, and the cost burden incurred by society due to "movement" could be significantly lightened.

With this aim, government agencies and civilian groups have cooperated in the project known as ITS (Intelligent Transport System). ITS is based on a "Holistic Concept" involving a wide range of roads, transportation, vehicles, information communication, etc., and the creation of a framework for its implementation is currently in process.

Mazda is involved in a variety of development projects related to ITS, and is carrying out research into the realization of next-generation, people-friendly transport.

■ITS (Intelligent Transport System): ITS's overall concept can be divided into 9 areas of development

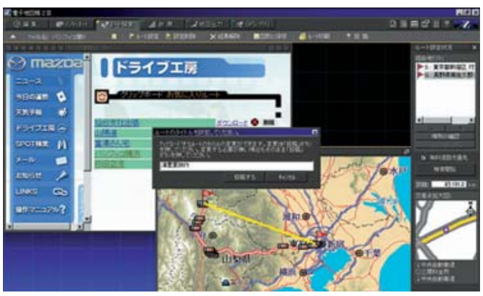
Support for safe driving
Automatic toll collecting systems
Optimization of traffic control
Rationalization of road management
Support for public transport
Rationalization of commercial vehicles
Support for pedestrians
Support for passage of emergency vehicles
Improvement in navigation

■ITS (Intelligent Transport System) Projection: ITS is expected to come into full operation in 2010

VICS (Vehicle Information and Communications System) / Mazda Telematics Center

VICS is a system which uses the three media of radio, optical beacons and FM multi-channel broadcasting, to supply drivers with information about accidents which affect their route, congestion, parking conditions, etc. VICS has been in full operation since April 1996. Mazda also established "Mazda Telematics Center," and is working towards improving the usefulness of the supply of information using the Internet.

■Mazda Telematics compatible navigation system screens



■Mazda VICS / Telematics compatible navigation system

ASV/AHS

Mazda is engaged in research and development to use electronics, particularly IT, to improve the intelligence of automobiles, to assist the prevention and avoidance of accidents, and aiming to realize a smooth transport system. This research is known as ASV (Advanced Safety Vehicle) and AHS (Advanced Cruise-Assist Highway System).

Mazda has produced results in the areas of new technology through such research projects as the Approaching Obstacle Impact Warning System, the Pedestrian Crossing Collision Prevention Information Supply Equipment, the Rear / Side Information Supply Equipment, and the Impact Prediction Whiplash Damage Reduction System.

■ASV-2 (prototype car)

■Mazda ITS Instrument Panel

■Rear alert

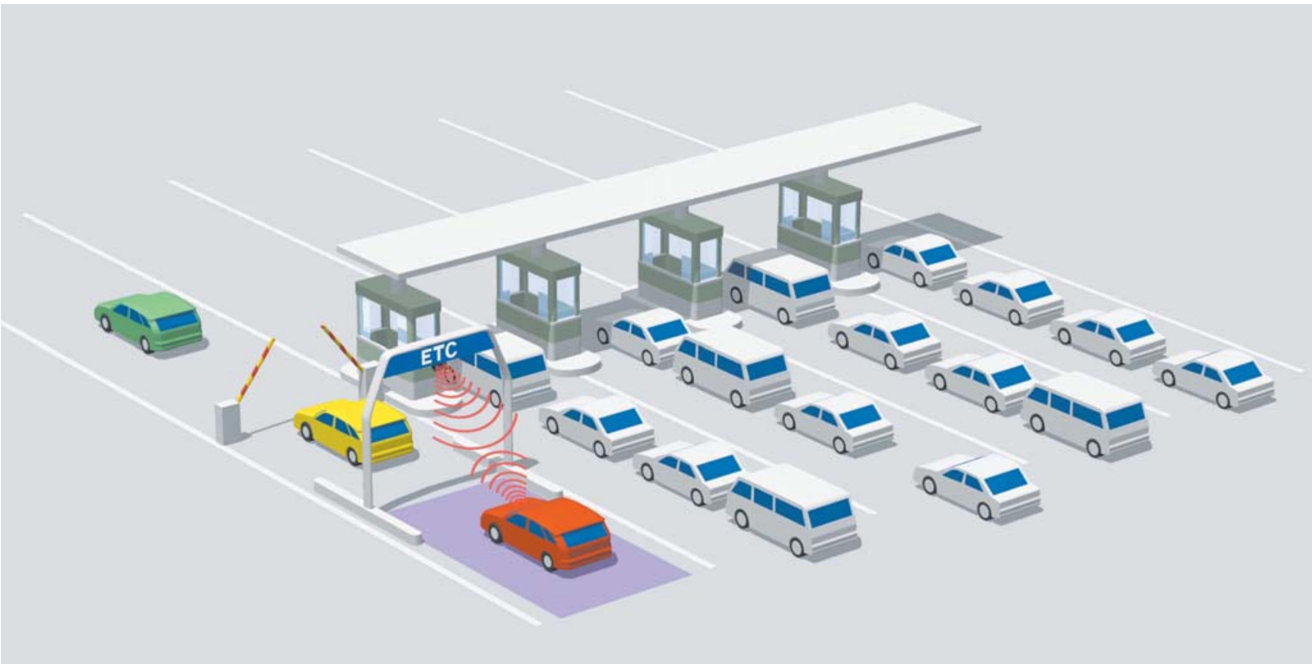
■Lane escape alert

■Curve entry speed alert

ETC (Electronic Toll Collection) System

Duplex communication makes it possible to pay expressway tolls without having to stop the vehicle at the toll gate, facilitating a smooth traffic flow.

▌ETC (Electronic Toll Collection) System



5 : Environmental Data

Environmental Data for New Models / Redesigned Models (Passenger Cars)

∗Data selected for version of each model which has largest sales

Vehicle Name			Demio CNG	Demio	Familia	Familia S-Wagon	Roadster	Millenia	Premacy	Tribute
Specifications	Vehicle Type		GF-DW5W (improved)	LA-DW3W	LA-BJ5P	LA-BJ5W	GF-NB8C	GF-TA5P	TA-CPEW	LA-EPFW
	Engine	Model	B5	B3	ZL	ZL	BP	KL	FS	AJ
		Type	I4 DOHC 16V	I4 DOHC 16V	I4 DOHC 16V	I4 DOHC 16V	I4 DOHC 16V	V6 DOHC 24V	I4 DOHC 16V	V6 DOHC 24V
		Displacement (cc)	1498	1323	1498	1498	1839	2496	1991	2967
		Fuel	CNG	Unleaded	Unleaded	Unleaded	Unleaded premium	Unleaded premium	Unleaded premium	Unleaded
		Fuel supply system	CNG system	EGI	EGI	EGI	EGI	EGI	EGI	EGI
	Drive system		FF	FF	FF	FF	FR	FF	FF	4WD
	Transmission		4AT	4AT	4AT	4AT	6MT	4AT	4AT	4AT
	Vehicle weight (kg)		1100	1000	1090	1130	1050	1480	1330/1350	1510
	Passenger quota		5	5	5	5	2	5	5/7	5
Fuel economy	Fuel economy at 10·15 mode (km/L)		(12.8km/Nm3)	16.0	14.8	14.8	13.0	9.7	11.6	8.4
	Compatibility with fuel economy target for year 2010		–	★ (5MT only)	★ (5MT only)	–	–	–	–	–
	Major fuel economy improvement technology		–	Torque converter with lockup function (in AT models)	Torque converter with lockup function (in AT models)	Torque converter with lockup function (in AT models)	Torque converter with lockup function (in AT models)	Torque converter with lockup function (in AT models)	Torque converter with lockup function (in AT models)	Torque converter with lockup function (in AT models)
			–	–	S-VT	–	–	–	–	–
Exhaust emissions	Regulations complied with		–	2000	2000	2000	1978	1978	2000	2000
	Low Emissions Vehicle		–	Excellent-Low Emissions Vehicle	Excellent-Low Emissions Vehicle	Excellent-Low Emissions Vehicle	–	–	Good-Low Emissions Vehicle	Excellent-Low Emissions Vehicle
	CO (g/km) [10·15 mode]		0.05	0.67	0.67	0.67	2.10	2.10	0.67	0.67
	HC (g/km) [10·15 mode]		0.01	0.04	0.04	0.04	0.25	0.25	0.06	0.04
	NOx (g/km) [10·15 mode]		0.00	0.04	0.04	0.04	0.25	0.25	0.06	0.04
	Local Community Organization low emissions designation		★	★	★	★	–	–	★	★
External noise	Regulations complied with		1998 regulations	1998 regulations	1998 regulations	1998 regulations	1998 regulations	1998 regulations	1998/9 regulations	1998 regulations
	Regulation value complied with		76dB	76dB	76dB	76dB	76dB	76dB	76dB	76dB
Greenhouse gases	Air conditioner refrigerant		HFC-134a	HFC-134a	HFC-134a	HFC-134a	HFC-134a	HFC-134a	HFC-134a	HFC-134a
	Amount of refrigerant used (g)		600	600	625	625	350	750	650	900
	CO_2 emissions (g/km)		–	147	159	159	181	243	203	281
Recycling	Parts using easily recycled materials		Bumper and interior materials use easily recycled heat-molded resin	Bumper and interior materials use easily recycled heat-molded resin	Bumper and interior materials use easily recycled heat-molded resin	Bumper and interior materials use easily recycled heat-molded resin	Bumper and interior materials use easily recycled heat-molded resin	Bumper and interior materials use easily recycled heat-molded resin	Bumper and interior materials use easily recycled heat-molded resin	Bumper and interior materials use easily recycled heat-molded resin
	Parts using recycled PP from bumpers etc.		Battery box, splash shield	Battery box, splash shield	Splash shield, footrest, bumper reinforcement	Splash shield, footrest, bumper reinforcement	Undercover	Splash shield, seal board upper, trunk board	Splash shield	–
	Material indication on plastic parts		★	★	★	★	★	★	★	★
Use of substances of concern	Lead (compared to 1996)		1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
	Mercury		Extremely small quantity	Extremely small quantity	Extremely small quantity	Extremely small quantity	Extremely small quantity	Extremely small quantity	Extremely small quantity	Extremely small quantity
	Cadmium		Extremely small quantity	Extremely small quantity	Extremely small quantity	Extremely small quantity	Extremely small quantity	Extremely small quantity	Extremely small quantity	Extremely small quantity
	Sodium Azide		Not used	Not used	Not used	Not used	Not used	Not used	Not used	Not used

Environmental Data for FY2000

Hiroshima Plant

Atmospheric pollutants		Units	Regulation	Actual*1
NOx	Boiler	ppm	300	189
			230	196
			150	100
	Drying oven	ppm	250	94
	Melting furnace	ppm	180	151
	Diesel engines	ppm	950	651
	Heating furnace	ppm	200	107
			180	77
	Incinerator	ppm	450	73
Ash	Boiler	g/m^{3}N	0.20	0.0100
			0.25	0.198
	Drying oven	g/m^{3}N	0.15	0.01
			0.35	0.0085
	Melting furnace	g/m^{3}N	0.20	0.133
			0.10	0.085
	Diesel engines	g/m^{3}N	0.10	0.073
	Heating furnace	g/m^{3}N	0.25	0.01
			0.20	0.008
	Incinerator	g/m^{3}N	0.25	0.21
SOx	K regulation	–	7	1.3
Dioxin	Waste incinerator	ng-TEQ/m^{3}N	80	0.13

Water pollutants	Units	Regulation	Actual		
			Max	Min.	Avg.
pH (freshwater)	–	5.8–8.6	7.8	7	7.3
pH (seawater)	–	5.5–9.0	7.8	7	7.5
BOD	mg/L	120	4.8	1	2.7
COD	mg/L	15	13	1.8	6.1
SS	mg/L	150	7.8	1.4	4.8
Oil	mg/L	5	2.4	ND	<0.7
Copper	mg/L	3	0.02	ND	<0.01
Fluorine	mg/L	15	6	ND	<2
Zinc	mg/L	5	3.6	0.4	0.02
Soluble iron	mg/L	10	ND	ND	ND
Soluble manganese	mg/L	10	0.7	ND	<0.3
Total nitrogen	mg/L	60	12	0.3	6
Total phosphorous	mg/L	8	7.4	0.01	1.8
Coliform groups	colonies/cm^3	3000	1800	0	221
Phenol	mg/L	5	0.05	ND	<0.02
Lead	mg/L	0.1	0.02	ND	<0.01
Chromium	mg/L	2	0.02	ND	<0.01

Other than the categories stated above, the following regulated substances were not detected: cadmium, cyan, organic phosphorous, hexavalent chromium, arsenic, mercury, alkyl mercury, PCB, trichloroethylene, tetrachloroethylene, dichloromethane, carbon tetrachloride, 1.2-dichloroethane, 1.1-dichloroethylene, mis1.2-dichloroethylene, 1.1.1-trichloroethane, 1.1.2-trichloroethane, 1.3-dichloropropene, lithium, simazine, thiobencarb, benzene and selenium.

Miyoshi Plant

Atmospheric pollutants		Units	Regulation	Actual*1
NOx	Boiler	ppm	250	196
	Diesel engines	ppm	950	826
Ash	Boiler	g/m^{3}N	0.30	0.18
	Diesel engines	g/m^{3}N	0.10	0.094
SOx	K regulation	–	17.5	6.6

Actual*1 : Maximum value indicated for atmospheric pollutants.

Water pollutants	Units	Regulation	Actual		
			Max	Min.	Avg
pH	–	5.8–8.6	7.9	7.4	7.7
BOD	mg/L	70	11	1.5	4.1
SS	mg/L	70	10	2.5	5.5
Oil	mg/L	5	0.7	ND	<0.5
Soluble manganese	mg/L	10	0.4	ND	<0.2
Coliform groups	colonies/cm^3	3000	530	6	161

Other than the categories stated above, the following regulated substances were not detected: cadmium, cyan, organic phosphorous, iron, hexavalent chromium, aersenic, mercury, alkyl mercury, PCB, trichloroethylene, tetrachloroethylene, dichloromethane, carbon tetrachloride, 1.2-dichloroethane, 1.1-dichloroethylene, mis1.2-dichloroethylene, 1.1.1-trichloroethane, 1.1.2-trichloroethane, 1.3-dichloropropene, lithium, simazine, thiobencarb, benzene and selenium.

Hofu Plant

[Nishinoura District]

Atmospheric pollutants		Units	Regulation	Actual※1
NOx	Boiler	ppm	150	140
			250	80
	Drying oven	ppm	230	130
	Incinerator	ppm	230	100
Ash	Boiler	g/m³N	0.25	0.086
			0.20	0.024
	Drying oven	g/m³N	0.35	0.003
			0.30	0.0048
			0.20	0.0027
	Incinerator	g/m³N	0.25	0.21
SOx	K regulation	–	4.5	0.7590
	Total regulation	m³N/h	52.66	5.01
HCl	Incinerator	mg/m³N	700	180
Dioxin	Waste incinerator	ng-TEQ/m³N	80	15

Water pollutants	Units	Regulation	Actual		
			Max	Min	Avg
pH	–	5.0–9.0	7.2	6.1	6.6
COD	mg/L	40	14.6	0.7	5.1
SS	mg/L	30	10	0.7	5.1
Oil	mg/L	2	0.7	ND	<0.5
Copper	mg/L	3	ND	ND	ND
Zinc	mg/L	5	0.08	0.06	0.07
Soluble iron	mg/L	3	ND	ND	ND
Total nitrogen	mg/L	60	13	7	8.3
Total phosphorous	mg/L	8	4.4	0.1	1.3
Coliform groups	colonies/cm³	3000	73	70	70
Chrome	mg/L	2	ND	ND	ND
Phenol	mg/L	1	ND	ND	ND

Other than the categories stated above, the following regulated substances were not detected: cadmium, cyan, lead, hexavalent chromium, arsenic, mercury, trichloroethylene, tetrachloroethylene, dichloromethane, carbon tetrachloride, 1.2-dichloroethane, 1.1-dichloroethylene, mis1.2-dichloroethylene, 1.1.1-trichloroethane, 1.1.2-trichloroethane, 1.3-dichloropropene, lithium, simazine, thiobencarb, benzene and selenium

[Nakanoseki District]

Atmospheric pollutants		Units	Regulation	Actual※1
NOx	Boiler	ppm	180	110
	Diesel engines	ppm	950	830
Ash	Boiler	g/m³N	0.30	0.092
	Diesel engines	g/m³N	0.10	0.025
	Heating furnace	g/m³N	0.25	<0.001
			0.20	0.0075
SOx	K regulation	–	4.5	1.0
	Total regulation	m³N/h	27.90	3.80

Water pollutants	Units	Regulation	Actual		
			Max.	Min	Avg
pH	–	5.0–9.0	7.9	7.3	7.6
COD	mg/L	40	18	4.5	12
SS	mg/L	30	14	0.5	1.9
Oil	mg/L	2	0.6	ND	<0.5
Copper	mg/L	3	ND	ND	<0.01
Fluorine	mg/L	15	ND	ND	<0.1
Zinc	mg/L	5	0.13	0.13	0.13
Soluble iron	mg/L	3	ND	ND	<0.1
Soluble manganese	mg/L	3	ND	ND	<0.1
Total nitrogen	mg/L	60	12	1	5.2
Total phosphorous	mg/L	8	0.53	0.16	0.35
Coliform groups	colonies/cm³	3000	480	140	310
Chrome	mg/L	2	ND	ND	<0.02
Phenol	mg/L	1	ND	ND	<0.02

Other than the categories stated above, the following regulated substances were not detected: cadmium, cyan, lead, hexavalent chromium, arsenic, mercury, trichloroethylene, tetrachloroethylene, dichloromethane, carbon tetrachloride, 1.2-dichloroethane, 1.1-dichloroethylene, mis1.2-dichloroethylene, 1.1.1-trichloroethane, 1.1.2-trichloroethane, 1.3-dichloropropene, lithium, simazine, thiobencarb, benzene and selenium

Actual*1 : Maximum value indicated for atmospheric pollutants.

Fiscal 2000 PRTR Environmental Pollutant Release and Transfer

(※ indicates Class 1 Designated Chemical Substances of which more than 500kg are handled per year)
(Other indications are of Class 1 Designated Chemical Substances of which more than 5000kg are handled per year)

HIROSHIMA PLANT

[All units are kg / year other than dioxins, which are mg-TEQ / year]

Substance No.	Substance Group	Amount handled	Volume emitted				Volume consumed	Volume disposed	Volume transferred		
			Atmosphere	Water	Soil	Total			Waste product	Recycled	Total
30	Crude concentrate of 4,4'-isopropolydenziphenol and 1-chloro 2,3-epoxypropane	8,445	0	0	0	0	8,445	0	0	0	0
40	Ethyl benzene	161,825	81,722	0	0	81,722	74,899	173	0	5,031	5,031
43	Ethylene glycol	1,491,955	8	0	0	8	1,491,947	0	0	0	0
63	Xylene	1,007,594	473,502	0	0	473,502	369,044	1,005	0	164,043	164,043
68	Chromium and trivalent chromium compounds	126,334	0	0	0	0	125,204	0	1,130	0	1,130
69※	Hexavalent chromium compounds	3,297	0	0	0	0	2,167	1,130	0	0	0
100	Cobalt and cobalt compounds	31,187	0	0	0	0	31,176	0	11	0	11
179※	Dioxins	18.0	13.0	1.0	0.0	14.0	0.0	0.0	4.0	0.0	4.0
198	1,3,5,7-tetraazetoricyclo [3.3.1.13.7] decane	144,002	0	0	0	0	144,002	0	0	0	0
224	1,3,5-trimethylbenzene	35,444	33,317	0	0	33,317	0	71	0	2,056	2,056
227	Toluene	1,577,026	935,694	0	0	935,694	550,863	142	0	90,327	90,327
230	Lead and lead compounds	8,526	0	0	0	0	2,107	0	6,419	0	6,419
231	Nickel	41,389	0	0	0	0	41,389	0	0	0	0
232※	Nickel compounds	4,938	0	597	0	597	1,699	0	2,642	0	2,642
266	Phenol	880,402	23	21	0	44	880,358	0	0	0	0
299※	Benzene	35,166	99	0	0	99	35,067	0	0	0	0
310	Formaldehyde	329,253	15,211	0	0	15,211	329,072	0	0	0	0
311	Manganese and its compounds	10,569	0	603	0	603	6,542	0	3,424	0	3,424
346	Molybdenum	35,718	0	1	0	1	35,649	0	68	0	68

MIYOSHI PLANT

Substance No.	Substance Group	Amount handled	Volume emitted				Volume consumed	Volume disposed	Volume transferred		
			Atmosphere	Water	Soil	Total			Waste product	Recycled	Total
40	Ethyl benzene	5,766	35	0	0	35	5,731	0	0	0	0
63	Xylene	27,246	3,567	0	0	3,567	23,679	0	0	0	0
227	Toluene	36,905	1,841	0	0	1,841	35,064	0	0	0	0
299※	Benzene	2,397	6	0	0	6	2,391	0	0	0	0

HOFU PLANT

[Nishinoura Area]

Substance No.	Substance Group	Amount handled	Volume emitted				Volume consumed	Volume disposed	Volume transferred		
			Atmosphere	Water	Soil	Total			Waste product	Recycled	Total
40	Ethyl benzene	63,700	29,904	0	0	29,904	28,112	3,020	0	2,664	2,664
43	Ethylene glycol	596,281	4	0	0	4	596,277	0	0	0	0
63	Xylene	606,481	285,788	0	0	285,788	136,623	28,884	0	155,186	155,186
179※	Dioxins	413.700	413.000	0	0	413.000	0	0	0.7	0.0	0.700
224	1,3,5-trimethylbenzene	18,552	15,584	0	0	15,584	0	1,577	0	1,391	1,391
227	Toluene	521,833	223,331	0	0	223,331	213,601	21,181	0	63,720	63,720
232※	Nickel compounds	1,794	0	217	0	217	617	0	960	0	960
299※	Benzene	11,977	49	0	0	49	11,928	0	0	0	0

[Nakanoseki Area]

Substance No.	Substance Group	Amount handled	Volume emitted				Volume consumed	Volume disposed	Volume transferred		
			Atmosphere	Water	Soil	Total			Waste product	Recycled	Total
63	Xylene	6,747	6,369	0	0	6,369	378	0	0	0	0