

CHAPTER

2

EARTH

Environmental problems, including global warming, are issues of critical importance for the human race. Mazda actively adopts initiatives to promote a decarbonized/low-carbon and recycling-oriented society in harmony with nature, in cooperation with local governments, industrial organizations, and non-profit organizations. These efforts are reflected in all of Mazda's corporate activities with the aim of achieving a sustainable society.



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Endeavor for Carbon Neutrality
by 2050

Resource Circulation

Basic Approach to Environmental Protection,
and Environmental Promotion Framework

Environmental Management

Initiatives for Reducing
Environmental Impact

Biodiversity Conservation

EARTH

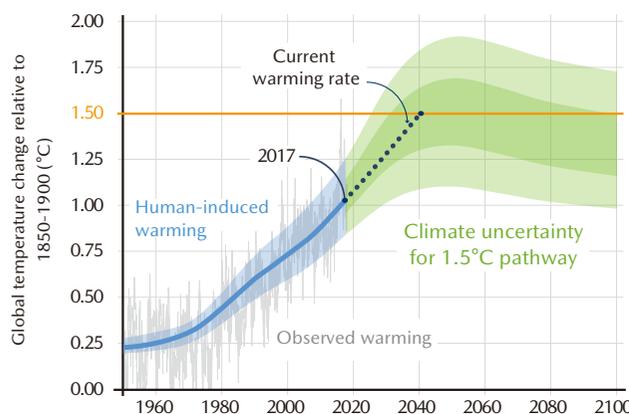
ENDEAVOR FOR CARBON
NEUTRALITY BY 2050

Recognizing Social Issues

The average global temperature has already risen by about 1.0°C from pre-industrial levels. The Special Report on Global Warming of 1.5°C published by the Intergovernmental Panel on Climate Change (IPCC) states that if global warming continues to increase at the current rate and the rise in temperature far exceeds 1.5°C, there will be a significant impact on nature and human activities. The Special Report therefore points out the need to achieve net zero global carbon emissions by around 2050 in order to limit the temperature rise to 1.5°C.

In response to the above forecast, 144 countries (including Japan)*1 have declared their intention to achieve carbon neutrality by 2050, with nations around the globe stepping up their measures to design carbon pricing and other mechanisms and invest in the development of energy technologies. In the industrial world, initiatives have been accelerated to change the energy and industrial structures, promote decarbonization throughout the supply chain based on a life cycle assessment (LCA), and encourage the effective use of decarbonization/low-carbonization technologies to reduce greenhouse gas emissions.

Average anthropogenic temperature increase since the industrialization



This is not the IPCC's official translation of the [FAQ 1.2, Figure 1] of the IPCC report. It has been compiled by Mazda Motor Corporation with attention to the most accurate reflection of the language used in the original text.
*Frequently Asked Questions, Coordinating Editors: Sarah Connors, Ros Pidcock, p8, https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_FAQ_High_Res.pdf

Mazda's Approach to Resolving Issues

Reasons for Addressing Social Issues

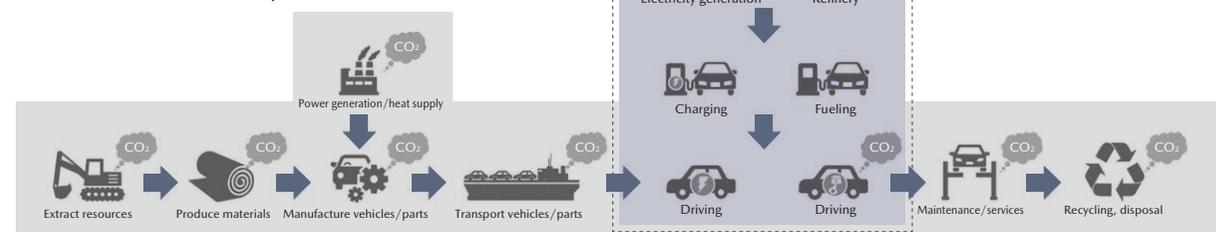
As for the trends regarding vehicles around 2030, Mazda predicts that the fuel economy of vehicles as a whole will be further improved though the combination of highly efficient combustion engines, electric device technologies, highly efficient transmission systems and reduced body weight. Mazda also foresees technological innovation accelerating in accordance with fuel diversification. In addition, electric vehicles will be selected more often in regions where electricity can be generated with renewable energy or other cleaner sources. Energy decarbonization/low-carbonization and related technologies will be further promoted, which will intensify society-wide efforts to reduce environmental impact toward the achievement of carbon neutrality by 2050.

As a proportion of Japan's total CO₂ emissions, the entire transport sector contributes approximately 20%, with the automotive industry accounting for about 90% of CO₂ emissions from the sector. Mazda understands that, as a company belonging to the automotive industry, it has a duty to reduce CO₂ emissions with the aim of curbing global warming. In order to preserve our beautiful planet for future generations, the Company will advance its initiatives toward the realization of a sustainable mobility society.

Mazda's perspective: "Well-to-Wheel" and "LCA"

Life-Cycle

Vehicle (product)-related cycle from resource extraction to disposal



Approach to Resolving Social Issues

Mazda announced that it will endeavor to achieve carbon neutrality by 2050.

To accomplish this objective, the Company recognizes the importance of reducing CO₂ emissions throughout a vehicle's life cycle. For this reason, Mazda considers it necessary to provide multiple solutions that enable the Company to offer various power unit choices that adapt to each region's energy sources and power generation methods, from both the perspective of well-to-wheel and the perspective of life cycle assessment (LCA). In manufacturing and logistics, the Mazda Group strives for energy value maximization and energy diversification, aiming to achieve reductions in the global total CO₂ emissions from plants/offices and logistics operations. The Group will continue these efforts, which must be made throughout the entire supply chain, with the cooperation of local governments and other industries.

[▶ For details of the activities carried out by the Carbon Neutrality Promotion Council refer to the following \(Japanese only\)](#)

*1 Compiled at the Ministry of Economy, Trade and Industry by counting countries participating in the Climate Ambition Alliance, countries that have expressed their commitment to achieving carbon neutral (CN) by 2050 by submitting long-term strategies to the United Nations, and countries that expressed their commitment to achieving CN by 2050 at the Climate Summit in April 2021, COP 26, and other events. (As of November 9, 2021)

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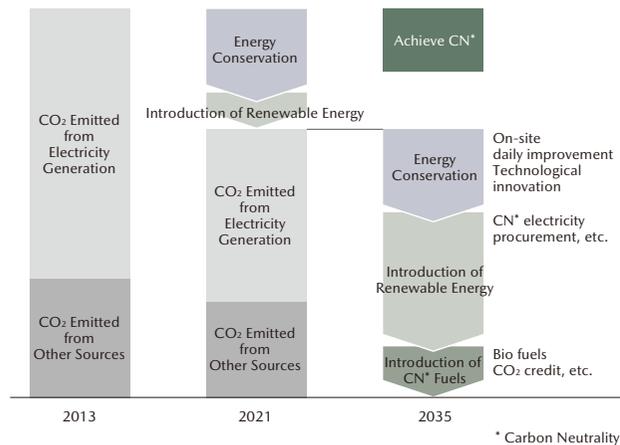
Biodiversity Conservation

Commitment To Making Mazda Factories Worldwide Go Carbon Neutral by 2035

To achieve carbon neutrality throughout the entire supply chain by 2050, Mazda will endeavor to achieve carbon neutrality in its global plants by 2035. Toward the achievement of carbon neutrality, the Company will promote the following three initiatives in collaboration with partner companies. In addition, we will promote an optimum approach in overseas plants by employing initiatives in Japan.

Three Pillars to Achieve Carbon Neutrality

(1) Energy Conservation	In the manufacturing process of vehicles that emits a large amount of CO ₂ emissions, reduce the thermal energy through the development of low-temperature curing coating paints and improvement of energy conversion efficiency by optimizing processing technologies.
(2) Shift to Renewable Energies	Mazda recognizes the importance of not only making steps toward the company's carbon neutrality, but also that of contributing to the growth of the local economy. Therefore, we will participate proactively in efforts of the Carbon Neutral Electricity Promotion Subcommittee, which aims to expand the supply and demand of carbon neutral electricity in the Chugoku Region.
(3) Introduction of Carbon Neutral Fuels for In-house Transportation	Mazda working toward using carbon neutral fuel for in-house transportation in cooperation with the Hiroshima Council for Automotive Industry-Academia-Government Collaboration which is promoting the practical use of next-generation biofuels.

Road Map for CO₂ Emissions Reduction

EARTH

RESOURCE CIRCULATION

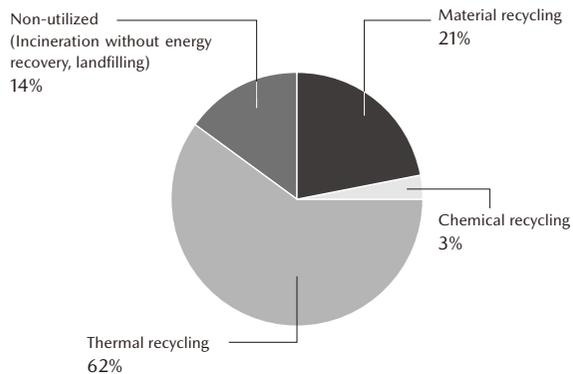
Recognizing Social Issues

Resource Recycling for Materials

In the context of a growing world population, the global community is facing challenges due to an increase in demand for resources and the worsening environmental issues, including the rising amount of waste. To address these challenges, it is necessary to transition to a circular economy that considers medium- and long-term outlooks, but also to promote the conventional 3R (reduce, reuse, and recycle) initiatives in all economic activities. A circular economy intends to generate new value while reducing resource inputs and consumption and making effective use of social stock.

Plastic recycling is indispensable in achieving a circular economy. In Japan, currently an estimated 60% of plastic waste goes through thermal recycling, which means that the waste is combusted in incinerators to produce energy. In Western countries, however, usually combustion is not included in the concept of recycling. Also, a minute amount of dioxin is generated during the process of combustion. For these reasons, companies are required to contribute to the circular use of resources (material recycling/chemical recycling) or the use of biomass plastics.

Breakdown of plastic waste recycling by type (Japan)



The above pie chart was created by Mazda, based on "An Introduction to Plastic Recycling 2022" published by the Plastic Waste Management Institute.

Resource Recycling for Water

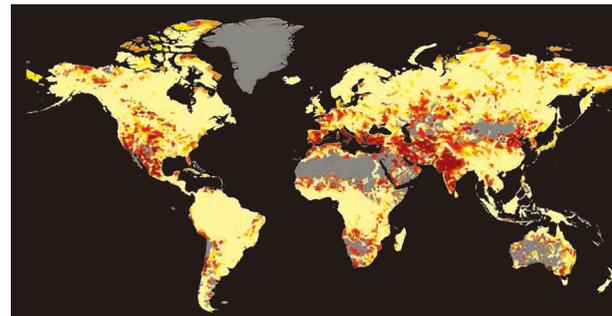
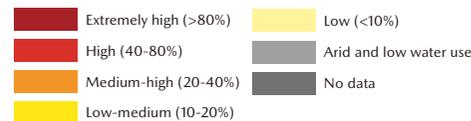
Of the total volume of water existing on the planet, only 0.01% is useable by humans. This small amount of water is not distributed around the world, so a number of countries and regions face high water stress.*

If the earth's temperature continues to increase due to climate change in the future, the sea levels will rise owing to the thermal expansion of the oceans and melting ice caps. This will result in rivers being contaminated with salt water, a rise in groundwater levels and other disasters that will reduce the amount of freshwater available to humans. Meanwhile, the United Nations World Water Development Report 2018 states that by 2050, global demand for water is expected to increase by 20-30% from 2010, driven by population growth, economic development and changing consumption patterns, among other factors. Companies must address the issues regarding global water resources in order to conduct sustainable business activities.

* Term that refers to the ability, or lack thereof, to meet human and ecological demand for water

Water stress around the world

Baseline (water stress)



The below figure was created by Mazda under license from the World Resources Institute (WRI).

[Figure posted on the World Resource Institute \(WRI\)'s website](#)

"17 Countries, Home to One-Quarter of the World's Population, Face Extremely High Water Stress", World Resources Institute/Aqueduct

Mazda's Approach to Resolving Issues

Reasons for Addressing Social Issues

Around 2030, Mazda forecasts progress in various initiatives to realize a recycling-oriented society from the perspective of natural capital. This will be achieved through using resources without any losses, promoting the 3Rs to encourage the reuse of water, plastic and other resources, and establishing resource circulation systems, such as a circular economy. Meanwhile, a significant reduction in energy and resource losses throughout the entire vehicle manufacturing supply chain may be expected as a result of efforts to make process more efficient. Dramatic progress will also be made in recycling and waste reduction initiatives through the promotion of the 3Rs and the transition to a circular economy.

Aiming to become a company that can coexist in harmony with the earth, Mazda will continue to implement thorough recycling and waste reduction initiatives.

Approach to Resolving Social Issues

To carry out product development and design with consideration for recycling needs, Mazda builds resource-recycling initiatives into every phase of the lifecycle of its vehicles, based on the 3Rs. Many limited resources are used to manufacture vehicles, such as steel, aluminum, plastics and rare metals. At its business sites (areas of manufacturing, logistics, etc.), the Company will push forward with initiatives toward the realization of a recycling-oriented society from two different perspectives shared throughout the entire vehicle supply chain. One is the well-to-wheel perspective, and the other is the global & supply chain perspective.

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Mazda's Initiatives

Resource Recycling Initiatives for Products

Mazda is steadily increasing the recyclability of its new vehicles, drawing on the following initiatives.

1. Research into vehicle design and dismantling technologies that simplify dismantling and separation, to make recyclable parts and materials easier to remove
2. Use of easily recyclable plastics, which constitute the majority of ASR*¹ by weight

Resource-Recycling Initiatives at Business Sites

Mazda will pursue and promote environmental technologies that will contribute to resource/energy value maximization (by minimizing consumption and fully utilizing resources/energy without any waste) and resource/energy diversification.

Resource Recycling for Materials

The Mazda Group continues to expand its global efforts for zero emissions and resource recycling, by such means as using resources without any losses, and 3R activities (to reduce, reuse, and recycle resources).

2030	2050
Achieve zero emissions in manufacturing and logistics processes on a global basis. <ul style="list-style-type: none"> • The status in which landfill waste is reduced to 0.1% or lower of the total waste generated. The Mazda Group companies in Japan achieved zero emissions in 2018. 	Achieve zero emissions through expanded resource recycling initiatives in manufacturing and logistics processes on a global basis. <ul style="list-style-type: none"> • Break away from dependence on thermal recycling or other combustion based recycling methods, and augment material recycling.

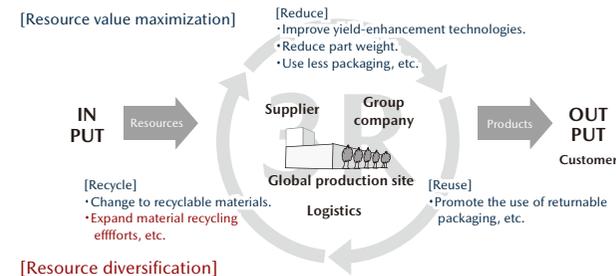
Resource Recycling for Water

To conserve water resources, the Mazda Group promotes activities to eliminate wasteful water use, and circulate water resources by treating used water so that it is the same quality as it was taken from nature.

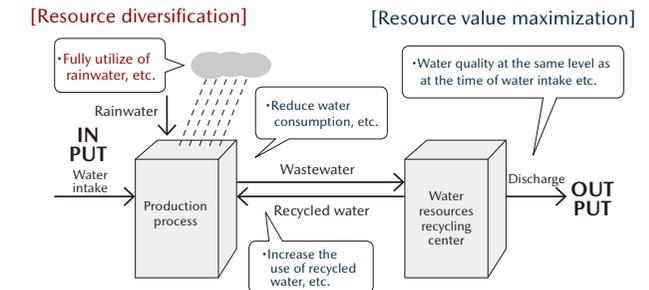
2030	2050
Implement an optimal approach to water resources recycling and circulation at model plants* in Japan. <ul style="list-style-type: none"> • Fully utilize water without any waste, as a valuable resource that is a natural blessing. • Circulate water as a valuable resource that is a natural blessing, by treating used water so that it is the same quality as before it was used, and returning it to nature. 	Implement an optimal approach to water resources recycling and circulation in global manufacturing processes. <ul style="list-style-type: none"> • Fully utilize water without any waste, as a valuable resource that is a natural blessing. • Circulate water as a valuable resource that is a natural blessing, by treating used water so that it is the same quality as before it was used, and returning it to nature.

* Model plant: A pilot plant where new attempts are made, ahead of other facilities.

Ideal vision



Ideal vision



*¹ Automobile Shredder Residue

It refers to the residue remaining after the crushing/shredding of what is left of the vehicle body following the removal of batteries, tires, fluids, and other parts requiring appropriate processing; the removal of engines, bumpers, and other valuable parts; and the separation and recovery of metals.

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BASIC APPROACH TO ENVIRONMENTAL PROTECTION, AND ENVIRONMENTAL PROMOTION FRAMEWORK

The Mazda Global Environmental Charter

Environmental Principles

The Mazda Group aims to promote environmental protection and contribute to a better society while maintaining harmony with nature in its business activities worldwide.

- We will contribute to society by creating environmentally friendly technologies and products.
- We will use the Earth's resources and energy sparingly and never overlook environmental considerations when conducting our business.
- We will do our part to improve the environment by working with local communities and society.

Action Guidelines

1. Creation of Environmentally Sound Technologies and Products

We are committed to the task of creating clean technologies, including methods to achieve cleaner exhaust emissions and reductions in CO₂ emissions, and the development of clean energy vehicles.

We will promote the creation of products that are environmentally friendly from planning and development to manufacturing, use and recycling/disposal.

2. Corporate Activities in Consideration of Conserving Resources and Energy

We will actively promote resource-saving and recycling activities to conserve the Earth's limited resources.

We will strive to diversify energy sources and use them efficiently. We will promote the appropriate disposal and recycling of end-of-life vehicles.

3. Corporate Activities in Pursuit of a Cleaner Environment

We will comply with environmental laws and regulations, and will also impose voluntary controls for higher standards and implement self-regulated controls. We will promote the development of new technologies and the introduction of new systems in our pursuit of a cleaner environment.

4. Working with Business Partners to Create a Better Environment

We will actively provide our employees with education and information about environmental protection to enhance their awareness of the global environment.

We will work in close cooperation with each other to achieve better environmental protection.

5. Creating a Better Environment in Cooperation with Local Communities and Society

We will work actively to understand and appreciate society's requirements for the environment and reflect them in our business activities.

We will disclose and publicize environment-related technologies, systems and information.

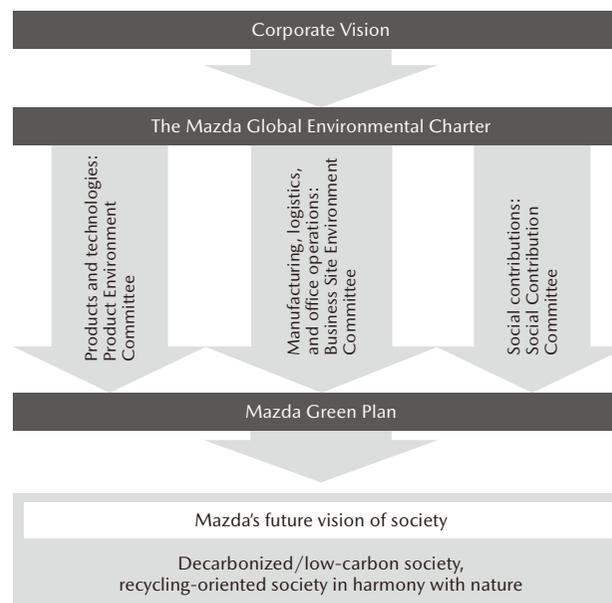
We will not only conduct our own environmental activities, but will also actively participate in social activities for the conservation of the environment.

(Established in 1992; revised in April 2005)

Philosophy and Policies

Mazda carries out its corporate activities with the aim of fulfilling its Corporate Vision (P9). To this end, Mazda established the Mazda Global Environmental Charter as the basic policy for environmental matters in the Mazda Group. The Charter, which states "The Mazda Group aims to promote environmental protection and contributes to a better society while maintaining harmony with nature in its business activities worldwide," along with the five Action Guidelines forms the basis of Mazda's approach to the environment. The Company carries out corporate activities related to products and technologies; manufacturing, logistics, and office operations; social contributions, respectively in consideration of the environment. The Company also strives to address various social issues, including climate change and resource recycling, while placing emphasis on collaboration with external organizations/international initiatives.*1

Philosophy and Policies for Environmental Initiatives



Mazda Environmental Promotion Framework

Mazda has established three committees under the CSR Management Strategy Committee, chaired by the president of the Company, to promote environmental management throughout the Group. These are the Product Environment Committee, the Business Site Environment Committee, and the Social Contribution Committee.

Mazda Environmental Promotion Framework (as of April 1, 2022)



*1 External organizations/international initiatives in which Mazda Participates:
- Subcommittees of Japan Automobile Manufacturers Association, working groups of Global Compact Network Japan (GCNJ), Challenge Zero initiative of Keidanren (Japan Business Federation), etc.

ENDEAVOR FOR CARBON NEUTRALITY BY 2050

Mazda announced that it would endeavor to achieve carbon neutrality by 2050. To accomplish this objective, the Company will promote efforts to reduce CO₂ emissions over a vehicle's entire life cycle through its products and business activities.

Efforts Regarding Product and Technology Development

Approach to Product Environmental Performance

As vehicle ownership continues to expand around the world, automobile manufacturers must redouble their efforts to achieve cleaner exhaust emissions, and improve fuel economy in order to cut CO₂ emissions and help reduce the world's dependence on increasingly scarce fossil fuels. Mazda considers it necessary to develop a multiple solution approach to automobile-related environmental issues that takes into account various factors such as regional characteristics, vehicle characteristics and types of fuel.

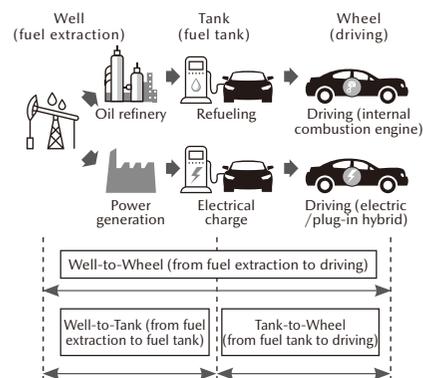
Addressing Global Warming

Mazda sees reducing emissions of CO₂ and other greenhouse gases over the vehicle's entire lifecycle — including manufacturing, use and disposal — as one of its top priorities and a duty of automotive industry. The Company wants to maximize its contribution by considering not only “tank-to-wheel” emissions that occur while driving but also “well-to-wheel” emissions, including fuel extraction, refining and power generation (well-to-tank). Offering a number of powertrain options in consideration of each region's energy sources and power generation methods will allow Mazda to make the optimum contribution to CO₂ emissions reductions by region.

The “Well-to-Wheel” Perspective

Make efforts to reduce CO₂ emissions from the perspective of “well-to-wheel,” with the aim of reducing emissions over a vehicle's entire lifecycle.

Conceptual diagram of Well-to-Wheel*



* Where fossil fuel is extracted and used to drive a vehicle.

Life Cycle Assessment (LCA)

Life Cycle Assessment (LCA) is a method for calculating and evaluating the environmental influence of vehicles across their entire life cycle through the purchase of materials, manufacture, use, recycling, and final disposal. Since 2009, Mazda has adopted LCA as a means of determining the time required to reduce the environmental impact of vehicles in their life cycle, and has been actively working to reduce the environmental impact at each stage of the life cycle. The Company is also promoting evaluation of the practicability and reliability of new technologies for environmental performance in compliance with the methods specified in the international standards (ISO14040 and ISO14044).

Multiple Solution Oriented Technology Development from the Perspective of LCA

In FY March 2019, the Company assessed the life cycle CO₂ emissions from internal combustion engine vehicles and electric vehicles (EVs) in five regions of the world. The results revealed that the significance of CO₂ emissions from internal combustion engine vehicles and EVs during their life cycles depends on the electric power supply status, fuel/electrical power cost, total mileage, and other factors in each region. In FY March 2020, these LCA results were compiled into academic papers and presented at academic conferences.

Conference presentation / Publication of paper on Mazda's LCA

Conference presentation:

The 9th International Conference on Life Cycle Management (August 2019)

Subject: Estimation of CO₂ Emissions of Internal Combustion Engine Vehicle and Battery Electric Vehicle Using LCA

Publication of academic paper:

Sustainability magazine, 2019, Volume 11, Issue 9, p.2690

Subject: Estimation of CO₂ Emissions of Internal Combustion Engine Vehicle and Battery Electric Vehicle Using LCA

<https://doi.org/10.3390/su11092690>

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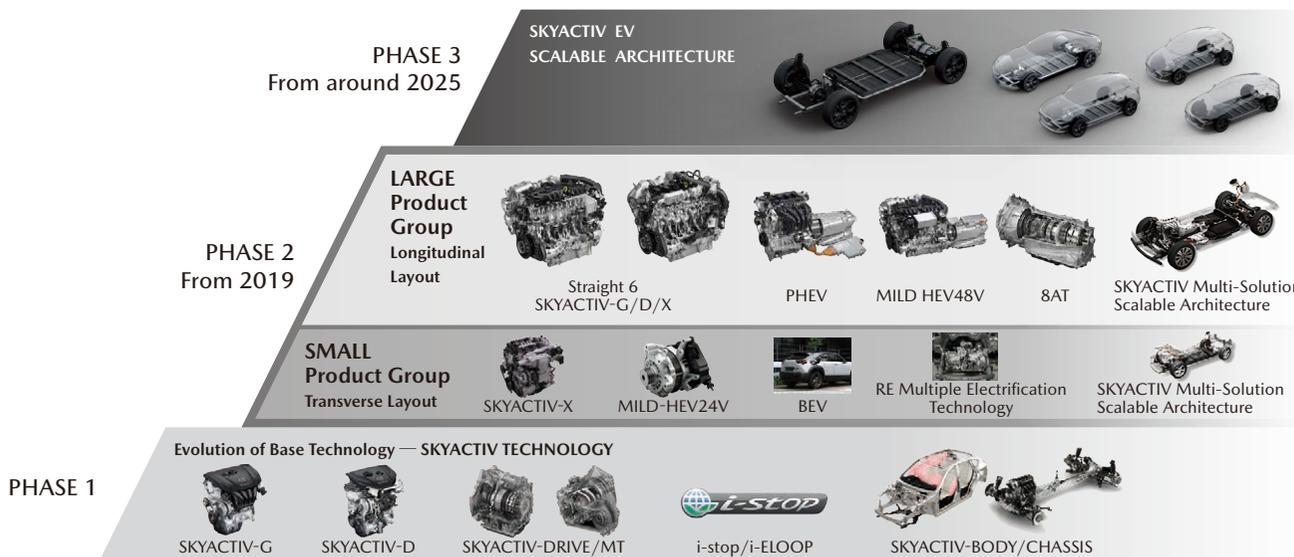
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Building Block Concept

Mazda adopts the Building-Block concept to realize its goal of reducing CO₂ emissions and raising the average fuel economy of Mazda vehicles. The Building Block Concept calls for the commercial introduction of electric, plug-in and other electrified vehicles (EVs) with the combination of optimal control technology and efficient electrification technologies in consideration of each country or region's energy resources, regulations, power generation methods, infrastructure, and so on. Through this Building-Block concept and advances in process innovations, such as Model Based Development (P85), and Monotsukuri Innovation (P84), Mazda will, despite limited management resources, offer products and technologies that exceed customers' expectations.

Building Block Concept for Product Technologies (As of June 2021 announcement)



Continuous Evolution of Skyactiv Technology

The term Skyactiv Technology covers all Mazda's innovative technologies. Mazda redesigned these technologies from scratch, enhancing the efficiency of powertrain components, such as the engine and transmission, reducing vehicle body weight, and improving aerodynamics. The number of models featuring Skyactiv Technology has steadily increased since the first Skyactiv-G engine was introduced in 2011 in the Demio (known as Mazda2 overseas). Following the adoption of the technology in the CX-5 in 2012, the number of models that fully incorporate Skyactiv Technology has increased.

The latest Skyactiv Technology

- 2019: Introduced new-generation technologies, including the Skyactiv-X engine, set to become the world's first commercial gasoline engine to use compression ignition.*1 This engine is a new internal combustion engine unique to Mazda, which combines the advantages of gasoline and diesel engines to achieve outstanding environmental performance and uncompromised power and acceleration performance.
- 2020: Introduced vehicles newly equipped with its electrification technology, e-Skyactiv. Continued development of Skyactiv Multi-Solution Scalable Architecture, a platform that supports electrification technology.
- 2021: Newly developed e-Skyactiv D equipped with a new straight-six-cylinder engine with large displacement and powerful torque characteristics, as well as a small motor for effective environmental performance, and e-Skyactiv PHEV, Mazda's first plug-in hybrid system.

*1 As of August 2017, according to Mazda data

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Improving Fuel Economy

Mazda is working to improve fuel economy in order to help our customers save money and reduce the use of fossil fuels, which is a cause of global warming. Prioritizing improvements in real-world fuel economy, the Company has adopted cylinder deactivation and other technologies that suppress fluctuations in fuel consumption rooted in the way the car is used and environmental factors such as air temperature. Mazda has also employed the mild hybrid system, Mazda M Hybrid, which realizes enhanced fuel economy and a pleasant driving experience by maximizing performance of the engine that has been improved in pursuit of ultimate efficiency, through pairing with efficient electrification technologies.

Development of Electrification Technology

After taking into account the appropriate power source for vehicles, the energy situation, the power generation mix, and other factors in each region, Mazda is promoting the development of electrification technology to provide customers in each region with the best solution. In the development of electrification technology, Mazda follows its unique “human-centered” approach that sets priority on human characteristics and sensibilities in order to make the most of the advantages of electric drives.

Electric Vehicles

Mazda is also committed to developing electric vehicles (EVs) in line with its “Sustainable Zoom-Zoom 2030” vision. Based on the Well-to-Wheel perspective, the Company believes that its electric driving technology for EVs is the optimal solution for a region with sufficient clean energy resources or a region with air pollution control norms. Mazda is promoting the commercialization of EVs full of driving pleasure in these regions. In addition, from the perspective of a vehicle’s life cycle, Mazda desires to contribute to substantive reduction of the global environmental impact by installing appropriately sized batteries. In October 2019, the Company unveiled its first mass-production EV, the Mazda MX-30, which was launched globally starting in September 2020.

Mazda MX-30 EV Model



Virtual Power Plant Demonstration Experiment for Reuse Technology of Electric Vehicle (EV) Drive Batteries

Mazda, together with Chugoku Electric Power Co., Inc., and Meidensha Corporation signed a joint research contract to build a stationary-type storage battery system, which reuses driving-force batteries of electric vehicles (EVs), and conduct a demonstration experiment on a virtual power plant (VPP)*1 based on the system. The aim of the demonstration experiment is to verify the possibilities of reusing EV drive-force batteries and utilize them as VPP resources. As part of the experiment, the three companies will build a system to aggregate and control several such batteries and integrate them with other distributed energy sources, including renewable energies, to evaluate the VPP’s responsiveness and the degradation properties of storage batteries, among other aspects. Through this experiment, they intend to gain technologies to optimize the use of renewable energy and control the balance between the power demand and supply. Mazda will continue these undertakings in order to develop technologies that will lead to new services derived from the fusion of vehicle elements and energy, and contribute to the global environment and local communities.

TOPICS

The “development of next-generation lithium-ion batteries high capacity and input / output” adopted by NEDO’s Green Innovation Fund Projects

Mazda’s proposal of the “development of next-generation lithium-ion batteries (LIB) with high capacity and input/output”^{*1} (hereinafter referred to as “project”) was adopted by New Energy and Industrial Technology Development Organization (NEDO). The Company proposed the project for the “Research and development of high-performance storage batteries and materials,” which is one of the project features of “Next-generation Storage Battery and Motor Development/Green Innovation Fund Projects” publicly offered by NEDO. Mazda will work on the development of lithium-ion batteries with both high capacity and high input/output.

^{*1} For details on the “Next-generation Storage Battery and Motor Development/Green Innovation Fund Projects,” please refer to the press release by NEDO. https://www.nedo.go.jp/news/press/AA5_101535.html (Japanese only)

^{*1} A VPP gathers the numerous dispersed power sources owned by general households or factories, such as renewable energy, EVs, and batteries, and integrates and controls them as if they were a single generation plant.

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Promoting Technology Development for Alternative Fuels

Toward the achievement of carbon neutrality through its products, Mazda addresses environmental issues based on a multiple solution approach, by endeavoring to spread carbon neutral fuels (hydrogen, next-generation biofuel, synthetic fuel, etc.) required to vehicles equipped with internal combustion engines, such as hybrids (HEV) and plug-in hybrids (PHEV), in addition to developing electrification technology for HEV, PHEV and battery electric vehicles (BEV). The Company believes that liquid fuel is valued as a useful energy source for automobiles and other movable bodies for its excellent storability and high energy density, contributing to energy security of the entire society promoted by energy diversification. However, the use of petroleum-based fuels mined from underground increases CO₂ in the atmosphere and contributes to global warming. On the other hand, next-generation biofuels and synthetic fuels absorb or recover CO₂ in the atmosphere to produce gasoline and light oils without requiring additional infrastructure. Therefore, Mazda believes that the use of these fuels is one of the effective and realistic methods to address environmental issues that can significantly contribute to reducing CO₂ emissions from vehicles including those already sold.

Compatibility with Bioethanol and Bioethanol Mixed Fuel

Mixed fuels, which include bioethanol or biodiesel (fatty acid methyl ester [FAME]) made from plant materials, are used in some regions for their effectiveness in reducing CO₂ emissions. Mazda sells vehicles that are compatible with these fuels.

Efforts for the Spread of Next-generation Automotive Liquid Fuel

Mazda aims to expand the use of next-generation biofuels made from microalgae oil and used edible oil with excellent sustainability since they do not compete with food production and do not cause deforestation, unlike conventional biofuels made from food crops such as corn. Unlike conventional biofuels such as bioethanol and FAME, the next-generation fuels are hydrocarbon fuels equivalent to gasoline and light oil. For this reason, the Company considers them to be promising energy sources that can completely replace petroleum-based fuels.

R&D for Microalgae

In order to achieve mass production of next-generation biofuels in the future, Mazda considers it necessary to promote the mass cultivation of microalgae that has high oil production capacity compared to plants which are raw materials for edible oil. Toward this goal, the Company is currently promoting R&D for microalgae through industry-academia government collaboration. In 2017, Mazda opened a joint research course called the "Next-generation Automotive Technology Joint Research Course - Algae Energy Creation Laboratory" at a graduate school of Hiroshima University. With support of the "Program on open innovation platform for industry academia co-creation (COI NEXT)," sponsored by the Japan Science and Technology Agency (JST), the Laboratory continues research on improvement in algae performance using genome editing technology in collaboration with Hiroshima University and Tokyo Institute of Technology.

In 2020, Mazda became a member of the Institute of Microalgae Technology, Japan (IMAT), which is conducting a NEDO project on bio-jet fuel derived from microalgae on Osaki Kamijima Island, as part of efforts to resolve issues related to the commercialization of algae biofuels based on the Company's research to date.

Demonstration Tests of Next-generation Biodiesel Fuels

Mazda also aims to expand the use of next-generation biofuels by conducting demonstration tests. In 2018, the Hiroshima Council of Automotive Industry-Academia-Government, in which the Company participate, and Euglena Co., Ltd. jointly launched a "Your Green Fuel" Project, which established an entire biofuel value chain - from material manufacture and supply to the use of next-generation biodiesel fuels - as a "local production for local consumption model" within the Hiroshima area. Since 2020, Mazda has continued demonstration tests with its company-owned vehicles running on next-generation biodiesel fuels. The Company is increasing such tests of next-generation biodiesel fuels through various activities, including participation in the Super Endurance Race, one of the motorsports in Japan, since 2021, and operation of buses to transport Sanfrece Hiroshima players in home games since 2022.

In cooperation with our partners on the entire biofuel value chain, from material purchasing, fuel manufacture, and supply to the use of next-generation biofuels, Mazda will continue its efforts to expand the use of such fuels and other carbon neutral fuels.

TOPICS

Participation in motor sports with vehicles running on next-generation biodiesel fuel

Toward the achievement of carbon neutral society, Mazda uses 100 percent biomass-derived next-generation biodiesel fuel made from used edible oil and microalgae oil for racing vehicles equipped with diesel engines, with the aim of spreading the use of next-generation biodiesel fuels. The Company took part in the Super Endurance Race in Okayama*1 in November 2021 and competed for a full season in 2022.

Unlike conventional biodiesel fuels, the next-generation biodiesel fuels, which are made from sustainable materials such as used edible oil and microalgae oil, do not compete with food production. Furthermore, they can be used as fuels replacing light oil for exiting vehicles and equipment, without requiring additional infrastructure related to fuel supply, and are expected to be excellent liquid fuels that contribute to carbon neutrality.

Mazda aims to conduct demonstration tests by participating in races with its vehicles running on next-generation biodiesel fuels, and to contribute to the revitalization of motorsports in Japan in addition to the increased use of such fuels.

MAZDA SPIRIT RACING Bio concept DEMIO



*1 As a demonstration experiment of 100 percent biomass-derived next-generation biodiesel fuel, Mazda participated in the ST-Q class with its vehicle "MAZDA SPIRIT RACING Bio concept DEMIO" running on a biofuel supplied by Euglena Co., Ltd.

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Development of Resin Material for Auto Parts for Weight Reduction

In addition to Skyactiv Technology, which is developed with the whole concept of weight reduction, Mazda actively adopt new technologies for reducing weights in detailed parts. Mazda will continue to pursue weight reduction by using resin, aluminum, ultra-high tensile steel and other materials having both lightness and strength.

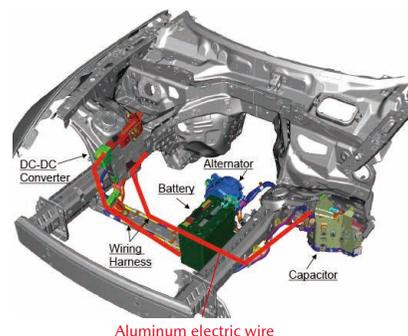
Offers a Bumper Which Is One of the Lightest in Its Class by Developing a Resin Materials for Auto Parts

Mazda has developed a new resin material for auto parts that can maintain the same level of rigidity as conventional materials while trimming vehicle weight. Because the new resin enables the manufacture of thinner parts and thus a significant reduction in the amount of material used, when used for front and rear bumpers, this resulted in the reduction of weight by around 20%. In the manufacturing process, thinner parts have enabled the shortening of cooling time upon shaping and halved the shaping time of bumpers partly due to the utilization of CAE analysis techniques. This resulted in a drastic reduction of the amount of energy used in manufacturing. Mazda further reduced the specific gravity of this new resin bumper by around 4%. The resultant bumper, one of the lightest in its class,^{*1} has been mounted on a series of new generation models. The new bumper was attached to the CX-30 in FY March 2019, to the MX-30 in FY March 2020, to the CX-5 in FY March 2021, and to the CX-60 in FY March 2022.

Development of Light Weight Wiring Harness Using Aluminum Electric Wire

Mazda has developed a lightweight wiring harness using aluminum electric wire, which enables the Company to achieve vehicle weight reduction while maintaining connection reliability (quality). Since equipping the Roadster/MX-5, launched in 2015, with this lightweight wiring harness, the Company has been increasing the number of models^{*2} that incorporate the material. In FY March 2023, the lightweight wiring harness was adopted in the CX-60.

Aluminum electric wire of the Roadster / MX-5 Connection between capacitor and DC-DC converter Connection between DC-DC converter and battery



^{*1} 1,500 to 2,000 cc class, as of March 2017, according to Mazda data

^{*2} Models adopting the lightweight wiring harness (as of November 2022):

Roadster/MX-5, Mazda3, CX-30, Atenza/Mazda6, CX-5, CX-8, CX-9, CX-60, and MX-30

Efforts Regarding Manufacturing and Logistics

Mazda promotes the efficient use of energy while aiming to reduce CO₂ emissions in the areas of manufacturing and logistics.

【Manufacturing】 Energy-Saving / Measures to Reduce CO₂ Emissions

<FY March 2022 Results (compared with FY March 2014)>

■ Total CO₂ emissions from Mazda's four principal domestic sites*1 reduced by 37.2% compared with FY March 2014 (349 thousand t-CO₂)

■ Emissions per unit of sales revenue reduced by 44.8% (14.9 t-CO₂/100 million yen)

Production sites in Japan and abroad promote activities to improve the facility operation rate and shorten the cycle time, and take measures to cut losses at each step from production to consumption of energy.

Under "Monotsukuri Innovation," Mazda strives to reduce per-unit energy consumption. The "Monotsukuri Innovation" is the initiative to achieve a breakthrough in "sharing a completely new concept beyond the boundaries of models," in order to improve quality and brand value, as well as to increase profit margins, while flexibly responding to the requirements for the manufacture of several models and changes in production volume. (P84)

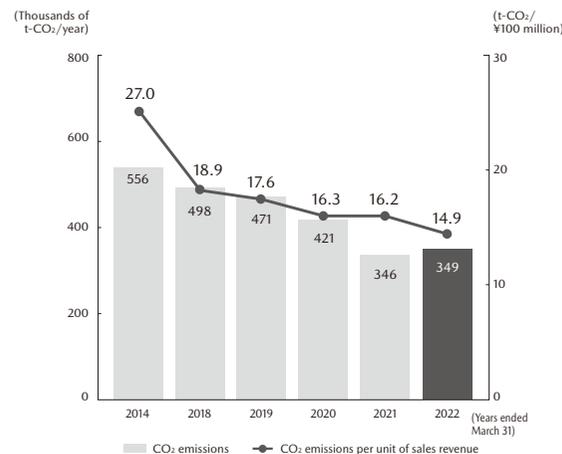
■ Material: Reduced material weight by using thinner casted and forged parts, and reduced energy consumption by shortening the forging cycle time and downsizing the capacity of melting and heat treatment equipment.

■ Processing and assembly: Evolved conventional flexible manufacturing lines to realize higher-efficiency, mixed flow production. Also pursued more efficient manufacturing by ensuring a smooth flow of lines and by consolidating and integrating lines.

■ Press: Reduced the amount of scraps generated in manufacturing of press parts, and retrieved parts from scraps to reduce the amount of use of steel sheets. Also achieved multi-pressing, which performs molding of several parts using a single die, resulting in both integration of processes and reduction of energy consumption.

■ Paint: Completed the introduction of the Aqua-Tech Paint System, a new water based painting technology realized through the integration of painting functions and high-efficient painting technologies, into the Ujina Plant No.2. Also introduced the Aqua-Tech Paint System to global production sites, resulting in reduced energy use and a substantial reduction of VOC (volatile organic compound) emissions.

CO₂ Emissions from Mazda's Four Principal Domestic Sites / CO₂ Emissions per Unit of Sales Revenue



* CO₂ emissions at Mazda's four principal domestic sites are calculated using the CO₂ coefficient for each year based on standards from the Japan Automobile Manufacturers Association Inc. (JAMA) (Carbon Neutrality Action Plan).

The power coefficient for FY March 2022 was undetermined as of September 10, 2022; the FY March 2021 power coefficient is used for FY March 2022.

* The figures of the amount of CO₂ emissions at Mazda's four principal domestic sites in FY March 2022 have been verified by a third party. (P128)

Greenhouse gas (GHG) emissions (P113)

*1 Head office (Hiroshima); Miyoshi Plant; Hofu Plant, Nishinoura District; Hofu Plant, Nakanoseki District (including non-manufacturing areas such as product development)

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Use of Renewable Energy

Mazda promotes the use of renewable energy*1 for in-house power.

■ Solar panels were installed at the Hiroshima Plant, and operation of the solar power generation system was started in July 2021. Electricity generated by this system is used to charge the batteries of MX-30 EV models produced at the plant and for other manufacturing processes there.

■ At the Hofu Plant, solar-powered units have been introduced in some corridor lighting.

■ A solar power system is installed on the roof of the radio wave experiment building of the Miyoshi Office. The amount of electricity generated by this system in FY March 2022 was 26.6 MWh. Electricity generated by this system is used to provide power and lighting for the building, thereby continuously contributing to the reduction of CO₂ emissions.

■ Mazda de Mexico Vehicle Operation (MMVO) in Mexico installed outdoor solar lighting, thereby promoting effective use of renewable energy using solar power and LEDs.

 Amount of electricity generated from renewable energy (P114)

Hiroshima Plant (Head Office) building with solar panels installed on the rooftop



Electrical charge of MX-30 EV model



 Photovoltaic Generation Report (Japanese only)

TOPICS

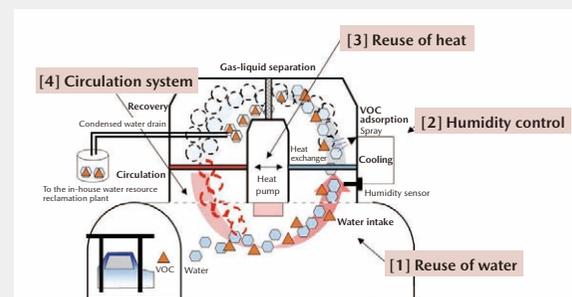
Mazda Receives "Ichimura Global Environmental and Industrial Award/Contribution Prize" for its VOC recovery technology

In April 2022, Mazda received the "Ichimura Global Environmental and Industrial Award/Contribution Prize" of the 54th Ichimura Industrial Awards*1 (organized by Ichimura Foundation for New Technology) for its VOC*2 recovery technology.

The "Ichimura Global Environmental and Industrial Award/Contribution Prize" targets the industrial fields related to global warming prevention. The awarded VOC recovery technology reduces environmental impact and realizes energy saving by recovering and processing VOCs generated during the coating drying process using a heat pump.

This technology achieved zero emission from the coating drying furnace by adopting a system in which VOC components are absorbed to condensed water (from vapor water using a heat pump) and recovered with water, which serves as an alternative of the conventional method for removing VOCs through combustion. The Company expects that this technology will contribute to reducing CO₂ emissions by 63% compared to the conventional method (annual reduction of approximately 710 tons). The technology also saves water resources and electricity by reusing the heat and water in the system. It has been already introduced into several lines of the coating process in plants and will be introduced into other plants.

Structure of the "VOC recovery drying system"



*1 The awards go to a technology developer who is contributed to science technology and industrial development. There are four awards; "Ichimura Industrial Awards," "Ichimura Academic Awards," "Ichimura Global Environmental and Industrial Award," and "Ichimura Global Environmental and Academic Award."

*2 Volatile Organic Compounds

*1 Refers to natural energy sources that can be used continuously without being depleted, such as electricity generation using solar, wind, geothermal, hydroelectric or biomass power, or direct solar heating. These types of energy generate zero or negligible CO₂ emissions.

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[Logistics] Initiatives for Reducing CO₂ Emissions during Product Shipment

Mazda is working with logistics companies, dealerships, and other automakers throughout Japan to provide customers with the volume they require, with the precise timing they expect, while reducing CO₂ emissions during product shipment through highly efficient logistics across the entire supply chain.

<FY March 2022 Results>

■ Total domestic transportation volume was approximately 450 million ton-kilometers.

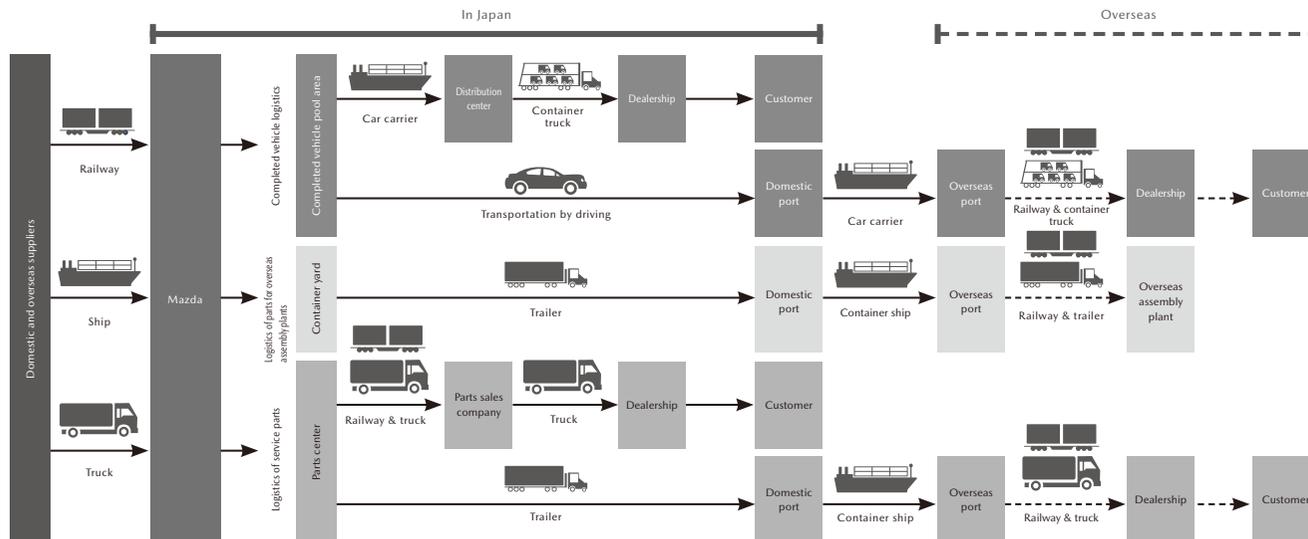
In FY March 2022, CO₂ emission per ton-kilometer was reduced by 11.6% compared with FY March 2014 levels.

CO₂ emissions from logistics (P114)

■ **Range of the tracking capability for CO₂ emissions in the supply chain**

(→) **Current tracking line**

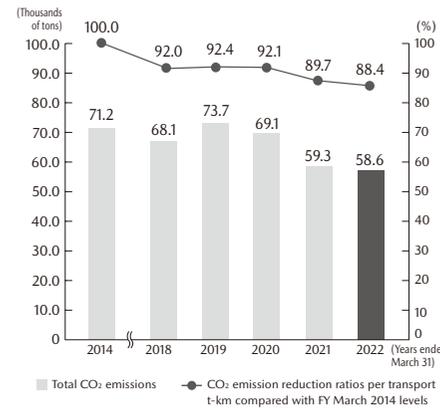
(-----→) **Tracking line to be extended by 2030**



<Specific Initiatives>

In logistics, Mazda continued its efforts to reduce CO₂ emission in the following three fields by visualizing in detail hidden logistics in each process on a global level.

CO₂ Emissions and Reductions for Logistics (in Japan)



1. Delivering completed vehicles

<In Japan/Overseas>

Mazda has increased loading capacity and reduced CO₂ emissions by continuously reviewing the operation of domestic vehicle carriers based on shipping volumes through initiatives such as promoting collaborative transportation with other companies using the domestic vehicle carriers on the return journey. In addition, the Company is promoting the loading of completed vehicles into ships as directly as possible from their manufacturing sites. Through these efforts, Mazda succeeded in curbing around 350 tons of CO₂ emissions in FY March 2022. With regard to domestic and overseas car carriers and container trucks, the Company will discuss and review with logistics companies including shipping companies as well as energy-related companies in order to realize transport with further less CO₂ emissions. The Company will continue all of its initiatives as well as adopt new technologies and alternative fuels to achieve carbon neutrality.

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2. Transport of service parts

<In Japan>

Mazda is striving to improve the rate of modal shift regarding the transportation of service parts. The Company has also used large returnable containers, originally introduced to transport parts overseas, for domestic transportation to improve the loading efficiency of JR containers, thereby contributing to the reduction of CO₂ emissions. In FY March 2022, Mazda's railway transportation rate was 26%, reducing CO₂ emissions by around 130 tons. In addition, the Company is planning to shorten transport distance by switching the production of service bumpers and some sheet metal parts that are currently transported from Hiroshima and Yamaguchi to the production in the area closer to the Kanto and Kansai regions where transport volumes are higher.

<Overseas>

The Company has shifted the production of service bumpers from its Mexican plant to North American plants, where transport volumes are higher, thereby shortening transport distances by around 30% and reducing CO₂ emission by around 150 tons in FY March 2022.

3. Transport of procured parts

<In Japan>

For trucks transporting procured parts in Japan, the Company introduced the Cloud-based Transportation/Delivery Progress Management Service for Logistics Operations*¹ in 2016. As a result of the initiative to apply this service to 600 vehicles in five years after its launch, the Company has already achieved application to 673 vehicles in FY March 2021, achieving the goal one year earlier than planned. By utilizing this system and reviewing cargo handling operations, Mazda is also working to improve truck turnover rates and reduce truck waiting time in the plants.

The Company is working to enlarge the scope of straight logistics--i.e., after the manufacture of parts to be exported to overseas assembly plants is completed, they are packaged and loaded into containers at the same location without the need for shipment between production locations and distribution centers. Now this straight logistics system has been expanded to cover engines, transmissions and auto body parts produced at Hiroshima Plant and the Hofu Plant. In FY March 2022, by applying this system to a broader range of parts destined for the Mexico Plant, the Company reduced CO₂ emissions by around 5 tons.

<Overseas>

The Company is now introducing new standard containers for parts to be transported in containers from Japan to overseas assembly plants. This makes us possible to eliminate the empty space inside the containers. It also reduces the number of containers and the number of transportation truck services. The Company is also working to reduce the inventory and transportation of unnecessary parts by shipping the parts to overseas plants at the timing they are needed. In addition, for the future, the Company is in discussions with shipping companies to introduce alternative fuels with lower CO₂ emissions to its container carriers. With these steps, the Company expects to reduce CO₂ emissions by around 1,700 tons per year.

*1 The Cloud-based Transportation/Delivery Progress Management Service for Logistics Operators, developed by DOCOMO Systems, Inc.

Initiatives by Mazda Offices

To raise environmental awareness among its employees, Mazda conducted a wide range of activities in FY March 2022, including the following.

Eco Walk Commuting Program

In order to raise employees' environmental consciousness and encourage them to take better care of their health, employees who walk two kilometers or more as part of their daily commute to work are rewarded with an addition of 1,500 yen per month to their commuting allowance.

Environment Month

■ Environmental activities survey

The Company conducted a survey of its employees on the environmental activities they carry out on a daily basis. Compared to the results of previous surveys, electricity and water saving activities have taken root.

■ Environmental Education

To encourage every employee to think about and take action for the environment in all aspects of their work and personal life, educational programs regarding global environmental issues and trends in Japan and overseas, Mazda's environmental initiatives, and environmental conservation activities in the workplace have been implemented as part of environmental education and training on ISO 14001.

Light-Down Campaign

■ Mazda Light-Down Campaign

To raise environmental awareness, Mazda and its domestic Group companies participated in the Light-Down (i.e., lights-off) Campaign, in which they turned off their signboards and indoor lighting.

These participating sites shut off lighting for two hours from 20:00 to 22:00 on June 21 (summer solstice) and July 7 (Tanabata, or the Star Festival), 2021. This campaign saved 8,000kWh of electricity, equivalent to around 4 tons of CO₂ emissions.

(No. of participants)

Mazda Motor Corporation: 12 sites

Domestic Group companies: 822 sites of 161 companies

This campaign started in 2011 with turning off lights at Mazda's six sites. In 2021, when it was in the 11th year, the largest number of Mazda Group companies participated in the campaign.

■ WWF's Earth Hour 2022

Mazda and its domestic Group companies supported and participated in Earth Hour 2022 organized by the World Wildlife Fund (WWF), which is the world's largest global warming campaign.

For one hour from 20:30 to 21:30 on March 26, 2022, the participating sites turned off signboards and indoor lighting.

(No. of participants)

Mazda Motor Corporation: 12 sites

Domestic Group companies: 821 sites of 133 companies

Mazda also participated in the Earth Hour promotional event held at the Hiroshima Peace Memorial Park as a partner company and streamed the event online.

 [For details of the Light-Down Campaign, see Sustainability "Earth: Related Information"](#)

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Response to TCFD (As of June 2022)

Basic Approach

In May 2019, Mazda declared its support for the recommendations from the Task Force on Climate-related Financial Disclosures (TCFD)*¹ and joined the TCFD Consortium,*² showing its commitment to strengthening its efforts to address climate change. In addition, in January 2021, the Company announced that it would endeavor to achieve carbon neutrality (hereinafter "CN") throughout the entire supply chain by 2050. Mazda strives to address climate change in accordance with the TCFD recommendations.*³

Governance

In 2021, Mazda launched a special team to response to carbon neutrality, led by the Corporate Strategy Office and consisting of units specializing in merchandise, production, procurement, logistics, sales and recycle. Under the guidance of the officer in charge, Corporate Strategy Office leads the team in planning and implementing the strategy to respond to risks and opportunities selected based on scenarios and trends issued by the

Intergovernmental Panel on Climate Change and International Energy Organization from a perspective of life cycle assessment. The team also develops and promotes investment and response schedule required to address such initiatives.

Strategies reviewed are reported to and discussed at the Executive Committee Meeting attended by Representative Director and President.*⁴ Development plans to products and technologies that are intended to materialize are discussed by the Product Planning and Design Committee consisting of executive officer and above.

Strategy

As a result of reviewing scenarios from IPCC and IEA, policies, regulatory trends, and industry trends, the Company recognized the following major risks and opportunities as shown in the table below.

Risk Management

Major risks and opportunities are identified based on the review of scenarios issued by IPCC and IEA, policies and regulatory trends and industrial trends. Specialist team is implementing the risk identification and assessment process biweekly, sharing the progress of initiatives and challenges. Strategies reviewed are reported to and discussed at the Executive Committee Meeting attended by Representative Director and President. Physical risks are managed within the emergency risk management system as part of the Business Continuity Plan (BCP).

Metrics and Targets

To achieve the goal for the entire supply chain by 2050, it is essential to grasp Scope 1, 2 and 3*⁵ greenhouse gas (GHG) emissions. Also, stricter carbon pricing due to introduction of carbon tax may impact the financial conditions. Mazda is promoting the establishment of environmental management systems (EMS) such as ISO 14001 to ensure that all group companies and the entire supply chain effectively conduct their business activities in an environmentally friendly way. The Company requests its suppliers to develop the GHG emission reduction plan at monthly-held Supplier Communication Meeting.

[▶ Latest information on TCFD](#)

Major Risks and Opportunities

Transition Risks	Policies, regulations	<ul style="list-style-type: none"> Stricter fuel efficiency and emission regulations, stricter carbon pricing through the introduction of carbon tax
	Technologies	<ul style="list-style-type: none"> Expansion of development resource of electrification technologies such as electric drives and batteries
	Market	<ul style="list-style-type: none"> Surging prices of raw material required for electrification and weight reduction, tight procurement of semiconductor components Energy price surge and supply instability due to tight fossil fuel and renewable energy supplies caused by political conditions and market influences
	Reputation	<ul style="list-style-type: none"> Impact on ESG investment decisions by investors
Physical Risks	Acute	<ul style="list-style-type: none"> Production suspension due to disasters and supply chain disruptions caused by increasingly heavy rainfall
	Chronic	<ul style="list-style-type: none"> Impact of more severe and frequent natural disasters, flooding damage caused by tidal waves
Opportunities	Resource efficiency	<ul style="list-style-type: none"> Efficient use of raw materials through thorough material recycling
	Energy Resources	<ul style="list-style-type: none"> Stable supply of CN electricity through promotion of electricity supply in cooperation with local communities Variety of options of renewable energy sources
	Production/Service, Market	<ul style="list-style-type: none"> Building-Block concept, multiple solutions to put the right products in the right places
		<ul style="list-style-type: none"> Diversification of products adaptable to next-generation fuels for vehicles (alternative fuels such as biofuels and synthetic fuels) Expanding market opportunities through the deployment of the right products in the right places and diversification of product offerings

*1 TCFD: Task Force on Climate-related Financial Disclosures

A private sector organization set up by the Financial Stability Board (FSB), in response to the request from the G20 Finance Ministers and Central Bank Governors.

*2 An organization established in Japan, aimed at holding discussions regarding climate change on effective corporate information disclosure and efforts for leading disclosed information to appropriate decision-making on investment by financial institutes and other entities. The Ministry of Economy, Trade and Industry, the Financial Services Agency, and the Ministry of the Environment participate in the consortium as observers.

*3 Source: <https://tcfid-consortium.jp/en/about>

*4 As of June 2022, deliberated two times at Executive Committee Meetings.

*5 Scope 1: Direct emissions from consumption of fuels and industrial processes; Scope 2: Emissions associated with consumption of purchased heat/electricity (indirect emissions from energy consumption); Scope 3: Other indirect emissions

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RESOURCE CIRCULATION

Mazda promotes initiatives for resource recycling based on the 3 Rs (reduce, reuse, and recycle) and the circular economy concept over a vehicle's entire life cycle. The Company implements thorough recycling and waste-reduction initiatives in order to ensure that limited resources are used effectively.

Efforts Regarding Product and Technology Development

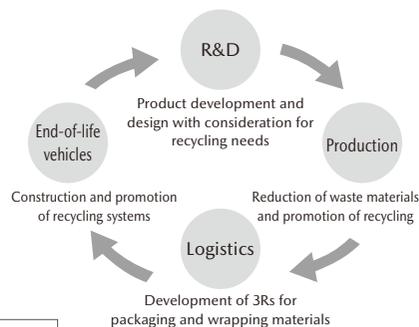
Product Development and Design with Consideration for Recycling Needs

Many limited resources are used to manufacture vehicles, such as steel, aluminum, plastics and rare metals. Mazda is incorporating 3 Rs design into all vehicles currently under development to increase the recyclability of its new vehicles.

<Specific Initiatives>

1. Research into vehicle design and dismantling technologies that simplify dismantling and separation, to make recyclable parts and materials easier to remove
2. Use of easily recyclable plastics, which constitute the majority of ASR*¹ by weight

Resource recycling based on 3Rs



Instrument Panel
Instrument panel fasteners are constructed to disengage simply, so that they can be removed easily when pulled during dismantling

Bumpers
Thin-walled construction of bumper underneath fastenings makes the bumper easy to demount by pulling its opening.



Easily Dismantled Earth Terminals
Terminals are designed to break off when the harness is pulled out to prevent breakage of the harness

Expanded Adoption of Biomaterials

Mazda has been proactively developing plant-derived biomaterials which have the potential to help reduce environmental impact by curbing the use of fossil fuels and CO₂ emissions. In 2006, the Company became the first in the automotive sector to develop high heat-resistant, high-strength bioplastic for vehicle interior parts. In 2007, Mazda succeeded in the development of the world's first biofabric made with completely plant-derived fibers for vehicle seat covers. In 2014, bio-based engineering plastic,^{*2} suitable also for use in vehicle exterior parts, was developed by the Company, which is currently expanding the adoption of this material.

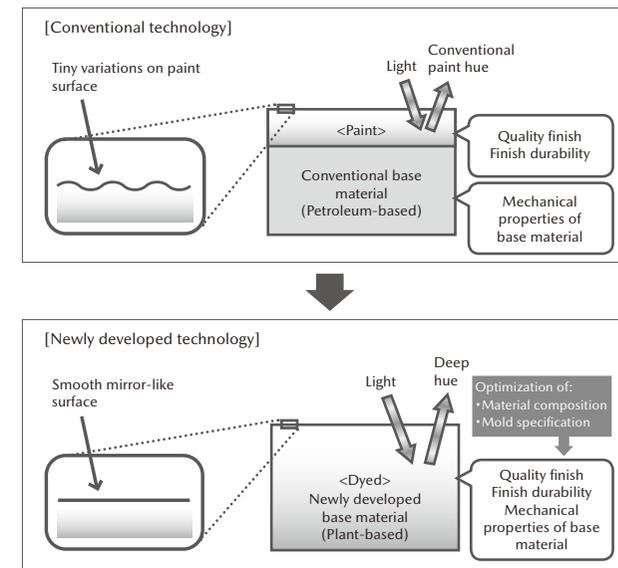
Technology development initiatives related to bio-based engineering plastics

2014: Mazda developed bio-based engineering plastic featuring a high-quality finish without painting. By developing paint-less technology for interior and exterior parts taking advantage of the characteristics of this material, the Company not only secured the excellent environmental performance of the material but also achieved a high-quality finish that could not be achieved with conventional paint, and contributed to environmental protection and production cost reduction by eliminating the painting process.

2017: Mazda developed materials suitable for making large, intricately shaped exterior parts, such as front grilles, and optimized the die specifications in order to substantially enhance the formability of these parts. In 2020, the Company received the Award for Science and Technology (Development Category) of the 2020 Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology for the development of the above-mentioned bio-based engineering plastic.

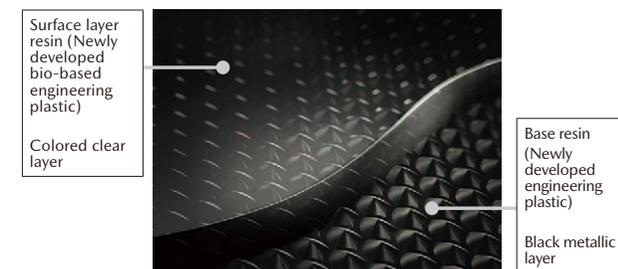
2018: Mazda developed a new technology for two-layer molding of pattern designed bio-based engineering plastic, which enables the molding of a transparent surface layer and a base layer with a pattern-engraved surface, both of which are made of environmentally friendly bio-based engineering plastic. The new technology reduces environmental impact while making it possible to provide elaborated, shaded patterns of deep color, which was previously impossible with conventional technology. In 2021, the Company received the Aoki Katashi Innovation Award from the Japan Society of Polymer Processing for the development of the above-mentioned new technology for two-layer molding of pattern designed bio-based engineering plastic.

2014: Development of paint-less technology for interior and exterior parts taking advantage of this material



2018: New technology for two-layer molding of pattern designed bio-based engineering plastic

New technology for two-layer molding of pattern designed bio-based engineering plastic: surface view



*¹ Automobile Shredder Residue

It refers to the residue remaining after the crushing/shredding of what is left of the vehicle body following the removal of batteries, tires, fluids, and other parts requiring appropriate processing; the removal of engines, bumpers, and other valuable parts; and the separation and recovery of metals.

*² Bio-based engineering plastic was developed by Mazda Motor Corporation in collaboration with Mitsubishi Chemical Corporation.

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Manufacturing Materials: Maintaining the Status of Zero Landfill Waste and Promoting the Reduction of Waste

To reduce landfill waste at its four principal domestic sites*¹ to zero, Mazda is promoting reductions in the volume of manufacturing by-products and waste, more rigorous sorting of waste, and recycling. As a result, the Company has achieved zero landfill waste, and has maintained this status from FY March 2009 to FY March 2022. The Company has also achieved material recycling, to ensure that packaging materials used in the vehicle assembly process can be reused as raw materials, by more strictly sorting these packaging materials by ingredient and quality. The amount of waste in FY March 2022 was reduced by 87% compared with FY March 1991 levels.

Mazda has been proactively using recycled materials for the plastic pallets used to transport parts overseas. Currently, the Company is planning to use plastic waste generated at its plants as a recycled material for the production of plastic pallets, working to further reduce the amount of waste generated.

 Amount of landfill waste, amount of recycled materials, recycling ratio (P115)

Logistic Materials: Reducing Volume of Packaging and Wrapping Materials

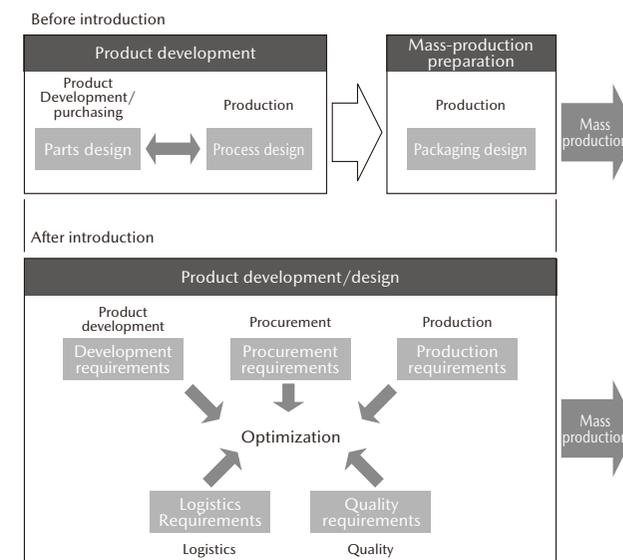
Mazda is moving forward with efforts centering on the “3 Rs of Mazda logistics” to cut down on resources used for packaging and wrapping. In FY March 2022, the use of packaging and wrapping materials was reduced by 27% compared with FY March 2020 levels. In FY March 2017, departments in the five areas—development, production, procurement (purchasing), logistics and quality—closely worked together to achieve the optimization of parts procurement and vehicle manufacturing, from the stage of product development, and to establish strong cooperation with the supply chain. These efforts resulted in reduced volumes of packaging and wrapping materials, and an increased packaging filling rate. In FY March 2022 as well, these departments worked in close collaboration to improve the packaging filling rate for some parts, and to reduce the volumes of their packaging and wrapping materials. Mazda will continue promoting and expanding these activities that involve efforts in different areas, so as to reduce the consumption of materials. In the area of repair parts for overseas, the Company continues to expand the application of large-size returnable containers, aiming at increasing the container filling rate. By utilizing these containers, Mazda succeeded in reducing the use of packaging and wrapping materials by about 1,900 tons in FY March 2021 and by about 2,100 tons in FY March 2022.

For the parts exported to overseas assembly plants, the Company is now introducing new standard contains for parts to be transported in containers from Japan. This makes it possible to eliminate the empty space inside the containers. By improving filling rate inside the container from 70% to 90%, the Company could reduce the number of containers and the number of transportation truck services, thus contributing not only to the reduction of the use of packaging and wrapping materials, but also to the reduction of CO₂ emissions.

The Company also developed these activities at Mazda Toyota Manufacturing (MTM) that started operation in January 2022. By introducing new standard containers, in FY March 2021, the Company succeeded in reducing the number of containers about 50 vessels, and the use of packaging and wrapping materials by around 2,800 tons respectively. The Company is planning to introduce the new standard containers for the other parts to achieve further reduction.

 Consumption of wrapping and packaging materials (p115)

Activities Image



Introduction of Returnable Containers



*1 Head office (Hiroshima); Miyoshi Plant; Hofu Plant, Nishinoura District; Hofu Plant, Nakanoseki District (including non-manufacturing areas such as product development)

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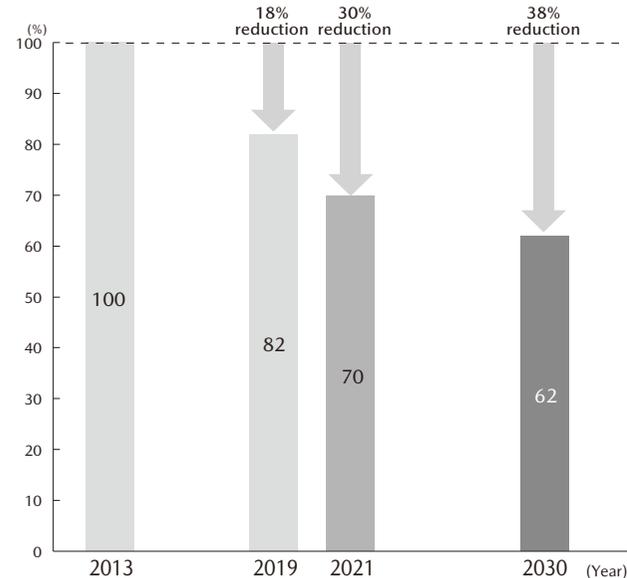
Biodiversity Conservation

Water Resource Conservation Target

Mazda Group promotes activities to eliminate wasteful water use and circulate water resources by treating used water so that it is the same quality as it was taken from nature. In order to implement its initiative of water resource reuse and recycling at a domestic model plant, the Company has set a target of reducing the water intake by the entire Mazda Group companies in Japan*1 by 38% in 2030 compared with 2013 levels. In order to achieve this target, the Company is planning to reduce the annual water use by 2%. In addition, the Company promotes the further use of rainwater and recycled water.

 Water withdrawal and wastewater amount (P116)

Water withdrawal amount by Mazda Group companies in Japan



To Achieve Water Resource Conservation Target

By clarifying input, process, and output of water resource in its business activities, Mazda is promoting initiatives to efficiently use the valuable water (i.e., utilizing water resources without wasteful use), minimizing the water usage, and circulating water resources by treating used water so that it is the same quality as it was taken from nature. For the progress of these initiatives, Water Resource Group was established consisting of members in charge of water resource conservation. Under two teams, the Group works for six major themes of “eliminating wasteful use,” “reduction,” “reuse,” “recycling,” “utilization of rainwater, water sludge and waste fluid” as well as “building communities and systems and developing human resources” by analyzing the current conditions and find out the solution based on the analysis. Water Resource Group also started sharing information on initiatives at domestic plant with overseas plant, as well as supporting the overseas plants address the issues.

- Recycling/Circulation Team: review models in the field of wastewater treatment, review models and implement trials in the field of water intake
- Use Reduction Team: Introduce models and trial results reviewed by Recycling/Circulation Team to plants

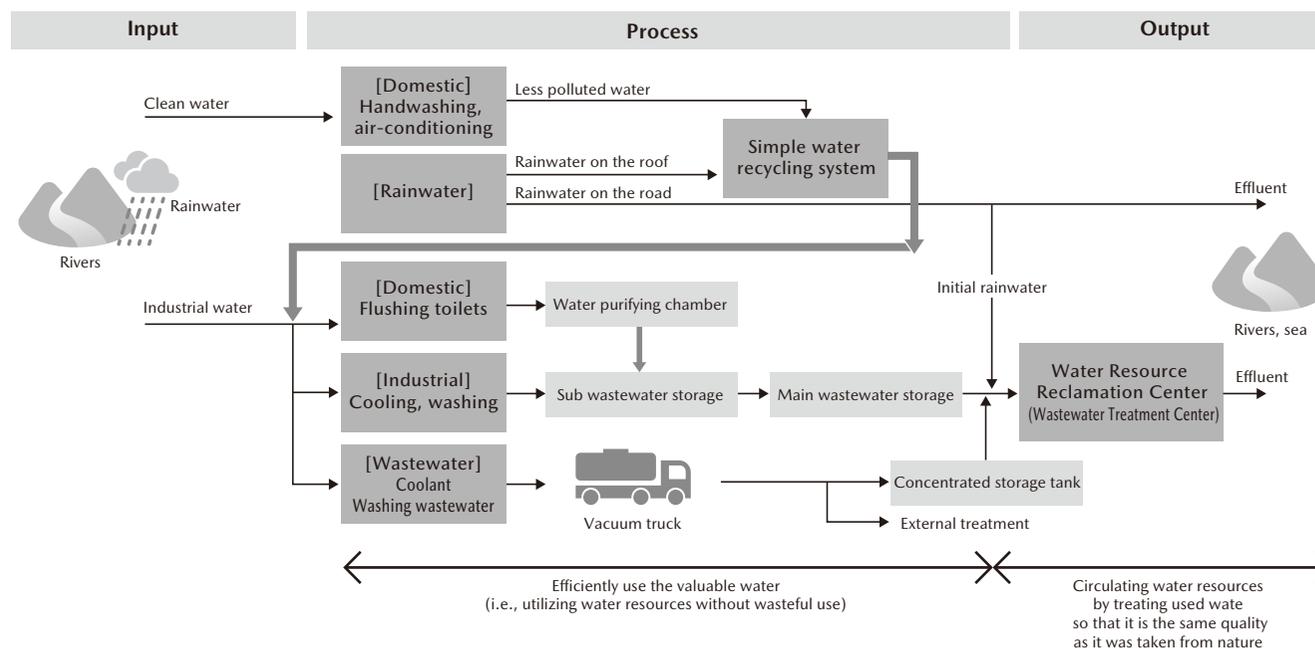
<Examples of Efficient Use of Water Resources>

[Appropriate use / reuse]

- Appropriate drainage of cooling towers
Prevention of overflows caused by excessive water supply, and reuse of less polluted water in circulation without draining in accordance with internal standards
- Reducing toilet washing water:
Put a sensor on each toilet that allows flushing only when the sensor senses the existence of the user
- Effective use of electrodeposition paint cooling drainage:
Water used to cool paint is reused in other processes

[Recycling of drain water / utilization of rainwater]

- Less polluted water, such as hand washing water and air-conditioning drainage, is recaptured and recycled with simple recycling system and used together with stored rainwater for flushing toilets, etc.



Initiatives for Collection and Recycling of End-of-Life Vehicles (ELVs) and Used Parts

Around 80% of a vehicle can be recycled. Implementing thorough recycling and waste reduction initiatives to ensure that limited resources are used effectively, Mazda promotes efforts to establish a recycling-oriented society.

Measures in Response to End-of-Life Vehicle Recycling Law in Japan

Mazda properly processes and recycles three designated items (fluorocarbons, airbags, and automobile shredder residue [ASR]^{*1}) pursuant to the End-of-Life Vehicle Recycling Law in Japan. In addition, the Company is creating unique technologies and measures to move this recycling program forward. In the case of ASR, Mazda is working through ART,^{*2} a consortium of 13 key companies including Mazda, Nissan Motor Co., Ltd., and Mitsubishi Motors Corporation, to comply with the law and achieve progress in the reuse of resources.

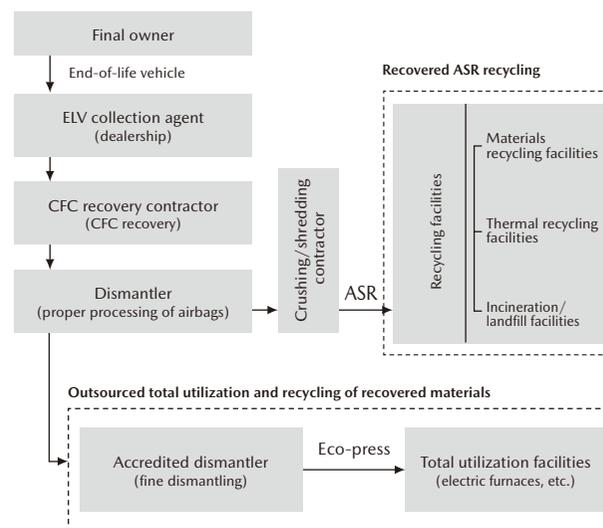
The Company appropriately executes recycling at dealerships. Dealerships collect vehicle recycling fees at the time of sale and receive the ELVs from their final owners in order to transfer them to the disposal processing companies. As for recycling fees, the Company reviewed its fee calculation standard in sequence for new models launched in 2012. The new fee standard is applicable to the Company's new models released after that. While forecasting a future recycling situation, the Company will continue to push forward with its recycling business in such a way to ensure a balance between revenue and expenditures in the medium and long term.

The End-of-Life Vehicle Recycling Law was revised in February 2012, and newly designated lithium-ion batteries and nickel-metal hydride batteries as items for advance collection before dismantling of end-of-life vehicles. Mazda is committed to collecting lithium-ion batteries installed in vehicles launched in and after October 2012 through the LiB Joint Collection System of Japan Auto Recycling Partnership, Ltd. The Company also independently collects nickel-metal hydride batteries installed in the Axela (Mazda3 overseas) Hybrid (launched in November 2013).

In order that the related supplier safely recycle vehicles installed with lithium-ion batteries and nickel-metal hydrate batteries as well as deceleration energy regeneration system capacitor, Mazda published the disposal work procedure on its website and promotes appropriate disposal.

[▶ Reference website \(Japanese only\) for Mazda's efforts with regard to the End-of-Life Vehicle Recycling Law](#)

End-of-Life Vehicle Recycling Process



Resource Recycling Results in FY March 2022

Number of vehicles from which ASR is collected	129,770 units	
Number of vehicles from which airbags are collected	118,837 units	
Number of vehicles from which fluorocarbon is collected	118,939 units	
Recycling ratio	ASR	96.5%
	Airbags	95.2%
Recycling ratio for ELVs*	More than 99%	
Total contracting deposits received	1,556,426,986 yen	
Total expenses for recycling	1,482,568,896 yen	

(Includes separate cost required at Mazda)

* Recycling ratio for ELVs is the recycling ratio in dismantling/shredder processes of around 83% (cited from the May 2003 joint council data), plus the remaining ASR ratio of 17% multiplied by the ASR recycling rate of 96.5%.

[▶ Status of resource recycling initiatives \(Japanese only\)](#)

ASR and the End-of-Life Vehicle Recycling Law in Japan

Disposed vehicles consist of about 80% useful metal and about 20% automotive shredder residue (ASR) that includes resin.

Useful metal is recycled in cooperation with metal recycling-related companies such as dismantlers, crushing/shredding contractors, and steel manufacturers. With regard to ASR, which used to be disposed by landfill, is now subject to the End-of-Life Vehicle Recycling Law, which was enforced in January 2005.

This is due to the rise in the risk of illegal dumping of end-of-life vehicles on the back of a surge in disposal costs due to overstrained final landfill sites and weakness in iron scrap prices. After the enforcement of this law, car manufacturers are required to recycle ASR, chlorofluorocarbons—which lead to global warming and ozone depletion—and airbags—which require specialist knowledge for disposal—under their responsibility, using recycling fees deposited by final owners of the ELVs.

*1 Automobile Shredder Residue

It refers to the residue remaining after the crushing/shredding of what is left of the vehicle body following the removal of batteries, tires, fluids, and other parts requiring appropriate processing; the removal of engines, bumpers, and other valuable parts; and the separation and recovery of metals.

*2 ART: Automobile shredder residue Recycling promotion Team

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Promoting Recycling of End-of-Life Vehicles Overseas

Mazda is committed to the recycling of end-of-life vehicles overseas in accordance with the laws in each country and region, under the initiative of the local distributors. As for countries in which recycling-related laws are planned to be established, Mazda is preparing to respond in cooperation with the distributors in such countries.

As well as vehicles for domestic use, in order that the related supplier safely recycle vehicles installed with lithium-ion batteries and capacitors, the Company published the disposal work procedure on its website and promotes appropriate disposal.

[▶ Reference website for Mazda's efforts with regard to recycling of end-of-life vehicles overseas](#)

Europe

Based on the EU Directive, Mazda Motor Europe provides a dismantling manual to recycling contractors when introducing a new model and has established a network to collect used vehicles from their final owners free of charge, in cooperation with the distributors in each country.

China

A law was enforced in January 2015, in accordance with which local manufacturers are managing substances with environmental impact and developing dismantling manuals.

Promoting the Collection and Recycling of Used Parts in Japan

Mazda is continuously engaged in the recycling of damaged bumpers replaced for repairs as plastic materials for new vehicle bumpers, etc.

- Recycling of damaged bumpers: Mazda collects bumpers removed for repairs at dealerships throughout Japan, and recycles them for reuse as plastic parts (new vehicle bumpers, undercovers, etc.). In FY March 2022, the Company collected 47,939 bumpers, which were utilized as recycled materials.

 Amount of recycled parts (P115)

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ENVIRONMENTAL MANAGEMENT

Establishing Environmental Management Systems

Mazda is promoting the establishment of environmental management systems (EMS) across its entire supply chain and in all Group companies. The purpose of the EMS is to carry out more environmentally conscious business activities in a more effective manner, based on ISO 14001 and other standards.

Progress Status

- 14 Mazda and Group manufacturing companies in Japan and overseas have now acquired ISO 14001 certification. (Obtained by 14 out of a total of 15 companies)
- Mazda has had dealerships in Japan certified under EcoAction 21 (EA21)*¹, an environmental management system. Introduction of the system has been completed at the Company's 15 consolidated dealerships, and is now expanded to owner-managed dealerships. As of March 2022, 25 dealerships of the Mazda/Mazda Enfini sales channel, 119 dealerships of the Mazda Autozam sales channel, and Mazda Chuhan, a used car sales company, have been certified. The dealerships that have already been certified are continuously supporting the introduction of the environmental management system at newly opened shops.
- Mazda has completed introduction of an exclusive Mazda EMS to two Mazda Group vehicle parts companies in Japan.

List of ISO 14001 Certified Production and Business Sites

Domestic production / business sites

Hiroshima district	Hiroshima Plant	June 2000
	Miyoshi Plant	
Hofu Plant	Nishinoura district	September 1998
	Nakanoseki district (extended certification)	September 1999
Tokyo Headquarters		
Mazda R&D Center Yokohama		
Proving Ground (Mine, Kenbuchi, Nakasatunai)		
September 2016		
Technical Service Center Osaka		
Osaka Corporate Sales Office		

Overseas production site

AutoAlliance (Thailand) Co., Ltd.* ¹	May 2000
Changan Mazda Automobile Co., Ltd.* ¹	December 2008
Changan Mazda Engine Co., Ltd.* ¹	February 2009
Mazda de Mexico Vehicle Operation* ²	December 2014
Mazda Powertrain Manufacturing (Thailand) Co., Ltd.* ²	November 2016

*¹ Equity-method group company*² Consolidated group company

Four domestic consolidated group companies (excluding sales companies)

Mazda E&T Co., Ltd.* ³	June 2000
Mazda Ace Co., Ltd.* ³	June 2000
Mazda Logistics Co., Ltd.* ³	June 2000
Kurashiki Kako Co., Ltd.	December 2001

*³ Some or all of the organizations at each of the companies above acquired ISO 14001 certification in the certification scope of Mazda.

Four domestic equity-method group companies

Toyo Advanced Technologies Co., Ltd.* ⁴	June 2000
Japan Climate Systems Corporation	May 2000
Yoshiwa Kogyo Co., Ltd.	April 2002
MCM Energy Service Co., Ltd.* ⁵	June 2008

*⁴ The company was ISO 14001 certified in the certification scope of Mazda. As a separate business facility, the company individually acquired the certification in March 2016. As a separate company, however, the company acquired re-certification in April 2017, resulting in the exclusion of the company from the certification scope of Mazda.*⁵ Although the company was inside the certification scope of Mazda, it acquired the certification on its own in March 2013.

Development of Environmental Policies

In order to promote environmental initiatives, Mazda has developed the following environmental policy within the scope of domestic certification.

Mazda Environmental Policy

Basic Policy

Through business activities that coexist with the society and local community, we will realize the carbon neutral and recycling-oriented society.

Action guidelines

- (1) Mazda will strive to recycle resources, reduce energy consumption, introduce renewable energy, and conserve biodiversity.
- (2) Mazda will promote the use of environmentally friendly products and services by providing products and services whose life cycle was considered.
- (3) Mazda will not only comply with environmental laws and regulations, but also consider the environmental impact of its corporate activities on local communities and society and ensure the comfortable environment of the society in the future.
- (4) Mazda will raise the environmental awareness of each employee and contribute to the realization of a sustainable society through the Company's entire corporate activities, while placing importance on the appropriate disclosure of information and mutual communication.

*¹ Simplified EMS established by the Ministry of the Environment, for application at companies of various scales, such as small to medium-sized companies.

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Promoting Green Purchasing

With the aim of reducing the environmental burden throughout its entire supply chain, Mazda established the “Mazda Green Purchasing Guidelines” and engages in operation activities accordingly. These guidelines require all of its suppliers worldwide to undertake measures to reduce their burden on the environment, at all stages from product development to manufacturing and delivery. The guidelines also make it clear that Mazda will give preference in purchasing to suppliers who implement such environmental measures.

Mazda also requires its suppliers of parts, materials, and industrial equipment and tools to obtain and maintain ISO 14001 certification, and to reduce the amount of greenhouse gas emissions generated through their corporate activities. In addition, the Company promotes environmental activities in collaboration with its suppliers by providing them with information and other assistance. Presently, all major suppliers involved in Mazda vehicle development and manufacturing have acquired ISO 14001 certification.

Status of Establishment of Environmental Management Systems (EMS) at Suppliers

- All major suppliers in Japan and abroad with which the Company has ongoing business relationships (around 500 companies), including new suppliers, have maintained certification as of the end of March 2022.
- Under the Mazda Green Purchasing Guidelines, Mazda requires, through primary suppliers, secondary suppliers and the subcontractors to establish EMS.

Status of Implementation of Environmental Audits

To confirm that environmental management systems, such as ISO14001 and EcoAction 21, are operating effectively, both internal audit and environmental management system audit (EMS audit) are carried out annually at Mazda and all of its Group companies, both in Japan and overseas, that have obtained certification. The FY March 2022 EMS audit revealed no serious compliance issues.

The results of the internal audit and EMS audits were reported to senior management. Any problems were swiftly and appropriately rectified.

EMS Audit Results on ISO 14001

Mazda Motor Corporation

	FY March 2018	FY March 2019	FY March 2020	FY March 2021	FY March 2022
Serious noncompliance issues	0	0	0	0	0
Minor noncompliance issues	1	0	0	0	0
Observation issues	5	6	6	5	5

Group Companies

	FY March 2022		
	Japan	Overseas	
ISO14001	Serious noncompliance issues	0	0
	Minor noncompliance issues	0	7
	Observation issues	27	24
EA21	Noncompliance Issues	0	—
	Minor noncompliance issues	2	—
	Issues requiring improvement	56	—

Eliminating Sensory Pollution

Sensory pollution comprises noise, vibration, and odors that have a sensory or psychological impact on people. Mazda recognizes that clearing legal regulations may not be enough to prevent noise, vibration, and odors from annoying neighborhood residents. For this reason, Mazda is systematically stepping up measures to alleviate the causes of such pollution, as well as measures to improve noise insulation and odor removal.

Specific Initiatives in Environmental Risk Management

Environmental Monitoring

- Regular training is conducted at each plant and office to prepare for response in the event of accidents that adversely affect the natural environment.
- Environmental monitoring, including monitoring of air and water pollution, is conducted regularly.

Legal Violations

In FY March 2022, there was one case of violations of environmental laws and regulations at Mazda's group companies in Japan. The Company is taking appropriate actions and will implement measures to prevent recurrence.

Complaints

In FY March 2022, Mazda received complaints concerning two cases, and is taking appropriate actions to address it in good faith.

Environmental Monitoring

Environmental monitoring item	Target of monitoring	Items monitored	Monitoring frequency
Air quality	Boilers, melting furnaces, heating furnaces, drying furnaces, etc.	5 items: sulfur oxides, nitrogen oxides, soot, volatile organic compounds, hydrogen chloride	Around 400 times per year
Water quality	Treated wastewater	43 items: cadmium, cyanide, organic phosphorus, lead, hexavalent chromium, etc.	Around 1,600 times per year
Noise and Vibration	Site boundaries	1 item: noise level	12 times per year
Odor	Site boundaries	1 item: odor index	12 times per year
Waste products	Slag, sludge, scrap metal, etc.	25 items: cadmium, cyanide, organic phosphorus, lead, hexavalent chromium, etc.	Around 200 times per year

Legal Violations and Complaints

(FY March 2022)

		Number of incidents	Response
Legal violations	Water quality	1 item	Reviewed control methods
	Odor	1 item	Implemented remedies for the sources
Complaints	Exhaust	1 item	Implemented remedies for the sources

*Boundary: Mazda and its Group companies

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Environmental Education / Education Program Structure

As part of its EMS, Mazda conducts regular environmental education for all employees once a year, as well as education for EMS leaders twice a year, and encourages employees to obtain environment-related public qualifications. In addition, Mazda offers support for employees working toward these qualifications, including financial support through the Mazda Flex Benefit program. (P120)

Qualifications that Employees Are Encouraged to Obtain:

- Energy attorney
- Head supervisor of pollution control
- Supervisor of air and water pollution control (Class 1 to 4)
- Supervisor of noise- and vibration-related pollution control
- Supervisor of dust and particulate pollution control (Specified, General)
- Supervisor of dioxide pollution control
- Special managing supervisor in charge of industrial waste disposal
- Environmental Society Test (=Eco Test)
- EMS inspector
- Internal environment auditor
- Environment measurer
- Construction environment hygiene control engineer

Environmental Education Structure



Routine Environmental Activities

Every day, each employee is involved in environmentally friendly initiatives in the work they are responsible for.

Reducing Paper Use

Mazda continually makes efforts to considerably reduce the amount of paper used for office work through the digitization of documents, ledger sheets, and other forms, as well as through the use of projectors and monitors at meetings, etc. As part of its recycling efforts, the Company also reuses waste paper (shredder dust) as packaging material for shipping parts, and is increasing efforts to separate the collection of waste paper by type during disposal.

Reducing Energy Use

Through regular initiatives, including purchasing of low power-consumption office equipment and furniture, and turning off lights and computers when they are not in use, Mazda makes continual efforts to reduce energy use.

Furthermore, Mazda implements a “Cool Biz” program during the summer season every year, setting internal room temperatures at 28°C (82.4°F) on a standard basis.

During the winter season when electricity consumption is particularly high, the Company implements a “Warm Biz” program, setting internal room temperatures at 20°C (68°F) on a standard basis.

Environment-Related Accident Emergency Drill and Prevention Campaign

■ Emergency Drill to Prevent Marine Pollution

Mazda's plants are located close to the seas and has a high environmental risk of oil leakage from domestic vessels, etc. For the oil leakage on the sea, the Company has conducting drills based on realistic scenarios to extend oil fence to prevent the spread of oil and collecting oil floating on the sea surface and confirm the effectiveness. In 2021, the drill was cancelled due to Covid-19 pandemic, but the Company is planning to resume the drills in the future, considering the pandemic situations.

■ Campaign for Oil Spill Prevention and Traffic Safety

Jointly with Mazda Logistics Co., Ltd. and several truckload transportation companies, Mazda Motor Corporation conducts an awareness-raising campaign to prevent oil spills on roads during vehicle delivery and improve traffic safety awareness. In this campaign, which are held twice a year, awareness-raising leaflets are distributed to drivers of delivery trucks to the Hiroshima Plant and the Hofu Plant. In doing so, the Company strives to improve such drivers' awareness of the environment and safety and create a system that ensures that employees can make a quick and appropriate response in the event of an accident.

As part of prevent oil leakage from occurring, Mazda established a database to visualize maintenance status of each vehicle and information on past environmental defects and allows to timely send information alert message to transportation companies. The system began operation in March 2021. Initially around 38% of vehicles that deployed the MILK-RUN System*¹ adopted the system. As of August 2022, around 60% vehicles adopted the system. In future the Company is striving to extend the system to more suppliers to prevent oil leakage from occurring.

Campaign for Oil Spill Prevention and Traffic Safety



Emergency Drill to Prevent Marine Pollution in FY March 2020 (Deploying oil containment booms)



*1 A method in which a single truck visits multiple suppliers to collect supplies. Named after truck routes in rural areas, which picked up milk from each farm.

INITIATIVES FOR REDUCING ENVIRONMENTAL IMPACT

Cleaner Emissions

Cleaner Gas Emissions

Mazda is committed to mitigating air pollution from exhaust gas. To this end, the Company is actively developing low-emission vehicles, clearing the emission regulations in each country/region to introduce these vehicles globally.

Development of Unique Single-Nanotechnology

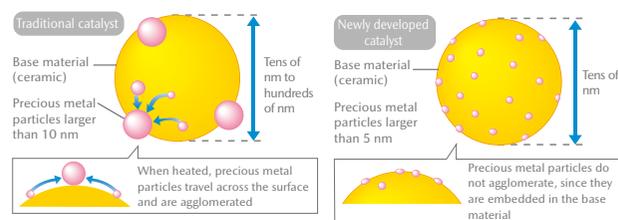
Mazda pays attention to global movements toward tighter control of exhaust emissions and fuel economy, market expansion due to rapidly growing emerging countries, and depletion of scarce resources. The Company has developed its unique single-nanotechnology and soot (PM) oxidation catalyst, promoting reduction of the use of precious metals and cleaning of exhaust gases.

Single-Nanotechnology

Based on the belief that it is important to help catalytic converters exercise excellent catalyst performance after reducing the use of scarce elements, such as rare metals (precious metals) and rare earths (ceria material), Mazda developed the single-nanocatalyst*¹ that achieves both cleaner exhaust characteristics and higher durability.

The Company has been progressively introducing the technology into gasoline engines and clean diesel engines on a global basis.

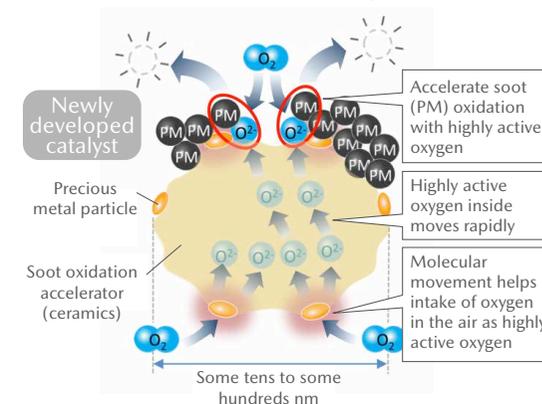
Model of precious metal dispersion by new catalyst technology



Soot (PM) Oxidation Catalyst

Mazda has developed a unique PM oxidation technology for diesel engine catalysts, which enables rapid combustion and removal of soot (PM) and reduces CO₂ emissions. Compared with conventional catalysts, this technology effectively utilizes oxygen not only on the surfaces of catalyst particles but also of their inside, and enables supply of a larger amount of highly active oxygen for soot (PM), thereby achieving dramatic improvement in functions. The introduction of this technology has reduced the use of precious metals, or rare elements, to around one-tenth, along with the durability sufficient to maintain the catalytic function throughout the entire vehicle life cycle.

Mechanism of soot (PM) oxidation catalyst



Proper Management of Chemical Substances and Heavy Metals

Mazda publishes Management Standards for Environmentally Hazardous Materials, specifying substances and heavy metals whose use in parts and materials it purchases is subject to restrictions (prohibited substances and substances for which reporting is required), to properly control the use of such hazardous materials.

*¹ Catalyst featuring single-nanotechnology to control finer materials structures than nanotechnology

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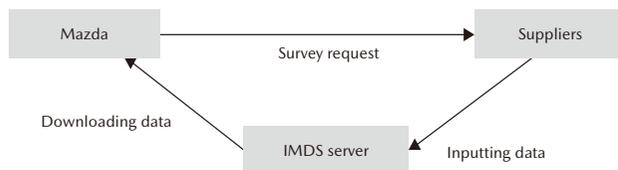
Collection and Management of Automotive Parts Materials

Mazda is working across its entire supply chain to reduce the use of environmentally hazardous materials such as lead, mercury, hexavalent chromium and cadmium. Using the standardized IMDS,*¹ international system, the Company gathers information on the materials from suppliers (Met all of the voluntary targets of the Japan Automobile Manufacturers Association, Inc. (JAMA) (reduction of the use of lead and mercury, and prohibition of the use of hexavalent chromium and cadmium) by February 2007, earlier than the scheduled deadlines).

Measures Related to Application of IMDS

- The Company developed and published the guideline that helps suppliers to correctly input IMDS data.
- The data gathered through IMDS is used to calculate the Company's vehicle recycling rate and to comply with various regulatory regimes for chemical materials, such as REACH*² in Europe.

How IMDS Works



VOC Reductions in Vehicle Cabins

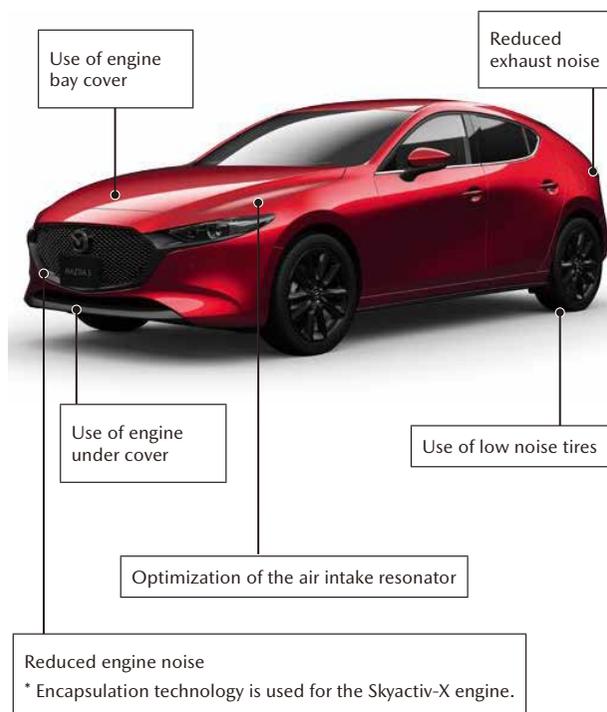
To maintain a comfortable cabin environment, Mazda is committed to reducing VOCs*³ such as formaldehyde, toluene and xylene, which have been implicated as possible causes of sick building syndrome.

- In new models, starting with the Demio (Mazda2 overseas)*⁴ launched in 2007, Mazda reduced VOCs in the main materials used in the cabin, such as plastics, paints, and adhesives, thereby conforming with the indoor aerial concentration guidelines established by Japan's Ministry of Health, Labour and Welfare. (The MX-30, introduced in FY March 2021, followed the above guidelines.)

Reduction of Vehicle Noise

Mazda has established its own noise standards which are even stricter than the most recent legal requirements. In compliance with the above in-house standards, the Company has been working to reduce the road traffic noise of all the passenger vehicles and commercial vehicles it produces. The Company has also been actively addressing the development of technologies to reduce the three major vehicle noises: engine noise, air intake/exhaust system noise, and tire noise.

Example of Anti-Noise Measures (Mazda3)



[Manufacturing] Air Pollution Prevention:

Actively Adopting Fuels that Reduce Environmental Burdens

Mazda is continuing efforts to reduce the emission of sulfur oxides (SOx), nitrogen oxides (NOx), dust and soot, fine particles, vapors, and volatile organic compounds (VOCs).

In addition, Mazda is shifting the use of fuel oil to that of city gas and makes other efforts to actively adopt materials that reduce the environmental burden.

NOx emissions and SOx emissions (P117)

VOC Reductions: Body-Painting Lines

In FY March 2022, Mazda made steady progress toward achieving the target of reducing VOC emissions from vehicle body paint in body-painting lines to 19.0 g/m² or less. The target was achieved as a result of various measures. Such measures include the Three Layer Wet Paint System introduced as the standard process in all plants in Japan and major plants overseas, the Aqua-Tech Paint System (P24) that delivers world-leading environmental performance, a low-VOC paint that the Company developed and introduced, and improved efficiency in thinner recovery in cleaning operations.

VOC waste emissions (P117)

[Manufacturing] Reducing Emissions of PRTR-Listed Substances

With various efforts, such as the introduction of the Aqua-Tech Paint System into the painting process and improvements to the efficiency of thinner recovery for cleaning operation, in FY March 2022 the amounts of substances that are designated under the PRTR Law*⁵ released into the water system and the atmosphere decreased by 78% from FY March 1999 levels to 620 tons. Mazda will continue working to reduce emissions of PRTR-designated substances.

Emissions of PRTR-listed substances (P117)

*1 International Material Data System

*2 Registration, Evaluation, Authorization and Restriction of Chemicals

*3 Volatile Organic Compounds

*4 As of 2007

*5 Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof. PRTR: Pollutant Release and Transfer Register

BIODIVERSITY CONSERVATION

Approach to Biodiversity Conservation

Endorsing the aims of the “Declaration of Biodiversity by Keidanren (the Japan Business Federation),” Mazda promotes initiatives to protect the global environment. In FY March 2012, with the aim of systematically developing its initiatives to protect biodiversity, Mazda conducted an assessment of impacts on biodiversity, and it recognized the significance of the impacts of its business activities and products on the blessings of nature and the environment.

In line with this assessment, the Company established the Mazda Biodiversity Guidelines in December 2012 and has been implementing various initiatives through its business activities aiming at contributing to the conservation of biodiversity and creating a rich, sustainable society that ensures harmony between people and nature.

Based on the results of the above assessment of impacts, Mazda takes measures to mitigate its impacts on biodiversity with a particular focus on energy, water and other resources in the areas of products, technology, production, and logistics. Also, to understand the impacts of business activities on ecosystems, the Company has continued to conduct biodiversity surveys with the cooperation of experts. By carrying out biodiversity surveys not only on company-owned lands but also in surrounding areas and on top of that by conducting literature study, Mazda strives to preserve the ecosystem of the entire region.

Process for Assessment of Impacts on Biodiversity

- Step 1: Selecting an assessment target scope
(The assessment is made for Group companies engaged in automobile-related business, primarily those with major impacts in the value chain in Japan, although the assumed targets also include overseas companies and affiliates.)
- Step 2: Assessing the levels of the dependence and impacts on ecosystem services, as well as assessing the threat to biodiversity
- Step 3: Identifying business risks and opportunities regarding biodiversity
- Step 4: Identifying priority issues and assessing the current situations of the existing responses
- Step 5: Identifying a direction for future responses

The Mazda Biodiversity Guidelines

[Basic Approach]

Based on “The Mazda Global Environmental Charter,” the Mazda Group, recognizing the blessings of nature and the significance of environmental impacts, contributes to the conservation of biodiversity through its corporate activities worldwide, with the aim of establishing and developing a rich, sustainable society that ensures harmony between people and nature.

[Priority Initiatives]

1. Creation of Environmentally Sound Technologies and Products

We will encourage the creation of technologies and products considering harmony between the environment and our corporate activities, by developing technologies that contribute to cleaner emission gases, reduction of CO₂ emissions, research and development of clean energy-based vehicles, promotion of recycling and biodiversity.

2. Corporate Activities in Consideration of Conserving Resources and Energy

We will promote reduction of substances with environmental impact and effective use of resources, and contribute to conservation of biodiversity, through efficient energy use and resource-saving/recycling activities.

3. Collaboration/Cooperation with Society and Local Communities

We will promote local community-based activities, by striving to establish collaboration/cooperation with a wide range of stakeholders including supply chains, local governments, communities, NPOs/NGOs, and education and research institutions.

4. Awareness Enhancement and Information Disclosure

We will take active and self-initiative actions and disclose and share the achievements widely to society, by striving to enhance awareness of the importance of coexistence between people and nature.

Established in December 2012

Examples of Initiatives

Creation of Environmentally Sound Technologies and Products	<ul style="list-style-type: none"> •Continuous Evolution of Skyactiv Technology (P20) •Electric Vehicles (P21) •Product Development and Design with Consideration for Recycling Needs (P30)
Corporate Activities in Consideration of Conserving Resources and Energy	<ul style="list-style-type: none"> •Improving the facility operation rate and shortening the cycle time in the production process (P24) •Assessing and considering the impact on biodiversity when constructing a new plant
Collaboration/Cooperation with Society and Local Communities	<ul style="list-style-type: none"> •Promoting the preservation of forests, support for the protection of wildlife, etc.*1 •Conducting biodiversity initiatives on Company-owned lands
Awareness Enhancement and Information Disclosure	<ul style="list-style-type: none"> •Activities through the Mazda Foundation*2 •Promoting awareness of social contribution activities and disclosure of information on these activities •Educating employees and raising their awareness •Introducing the activities to the inside and outside of the Company through the Mazda Sustainability Report, etc.

*1 <https://www.mazda.com/en/sustainability/social/report/>

*2 Japan <https://mzaidan.mazda.co.jp/> (Japanese only)

United States <https://www.mazdafoundation.org/>

Australia <https://mazdafoundation.org.au/>

New Zealand <https://mazdafoundation.org.nz/>

South Africa <https://www.mazda.co.za/mazda-foundation/foundation/>

Information Provision

The Biodiversity Newsletter is issued regularly to keep employees up to date on the biodiversity initiatives undertaken on Company-owned lands and biodiversity-related news. A total of 11 issues have been published thus far. The newsletter will continue to be issued so that more employees will become interested in biodiversity.

Biodiversity Newsletter (Japanese only)

生物多様性ニュースレター

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身近な外来種との関わり方

皆さんは「外来種」と聞くと、どのような生き物を想像されるでしょうか。外来種とは、「本来の生息地から、人の手によって移動してきた生き物」を意味します。

外来種は国内の生態系に強い影響を与えるとされていますが、その理由として、大きく以下の3点が考えられています。

- ① 外来種は、生息地と異なる環境にも適応できる生存・繁殖能力が高い種である
- ② 外来種は生息地にいる天敵や病原菌の影響を受けないため、個体数が減りにくい
- ③ 国内の在来種は、生息地内の限られた場所での競争関係しか経験していないため、外来種による影響や被害を受けやすい

私たちは、現在も新型コロナウイルスとの戦いの最中にありますが、新型コロナウイルスは人間がこれまで出会ったことのない未知のウイルスであるため、対策に時間がかかっていると言えます。自然界でも同じように、外来種が突然その環境に入ると、在来種は外来種に適応するための進化を経ていないため、すぐに対策が取れず、壊滅的な影響を受けてしまうのです。

身近に生息する外来種

私たちの身の回りには、海外から日本に入ってきた約 2,200 種の外来種が生息していると考えられています。外来種と聞くと、生態系に悪い影響を与える種という印象が強いですが、私たち人間にとっては有益な生き物が数多く含まれています。

例えば、オカダンゴムシ（通称：ダンゴムシ）は、元々地中海沿岸に生息する種が、明治時代に日本に持ち込まれ、日本全国に広がった外来種と考えられています。ダンゴムシは、枯れ葉を分解し、土壌に返す分解者として様々な土壌の生育に役立っています。また、クローバーとしてよく知られているシロツメクサも、もとは牧草用にオランダから持ち込まれた外来種です。クローバーは身近な様々な場所に生育しているため、外来種と感じている人は少ないのではないのでしょうか。



ダンゴムシ



シロツメクサ

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