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 CO_2 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 CO_2 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.

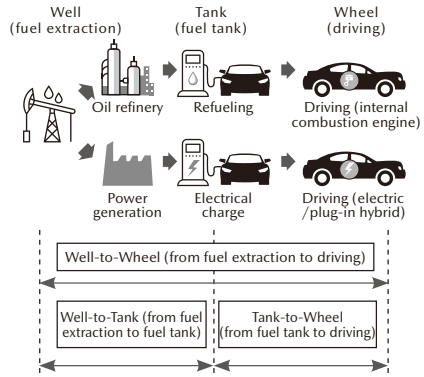
Addressing Global Warming

Mazda sees reducing emissions of CO_2 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 CO_2 emissions reductions by region.

The "Well-to-Wheel" Perspective

Make efforts to reduce CO_2 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 CO_2 emissions from internal combustion engine vehicles and electric vehicles (EVs) in five regions of the world. The results revealed that the significance of CO_2 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 CO_2 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 CO_2 Emissions of Internal Combustion Engine Vehicle and Battery Electric Vehicle Using LCA
https://doi.org/10.3390/su11092690

Building Block Concept

Mazda adopts the Building-Block concept to realize its goal of reducing CO_2 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.

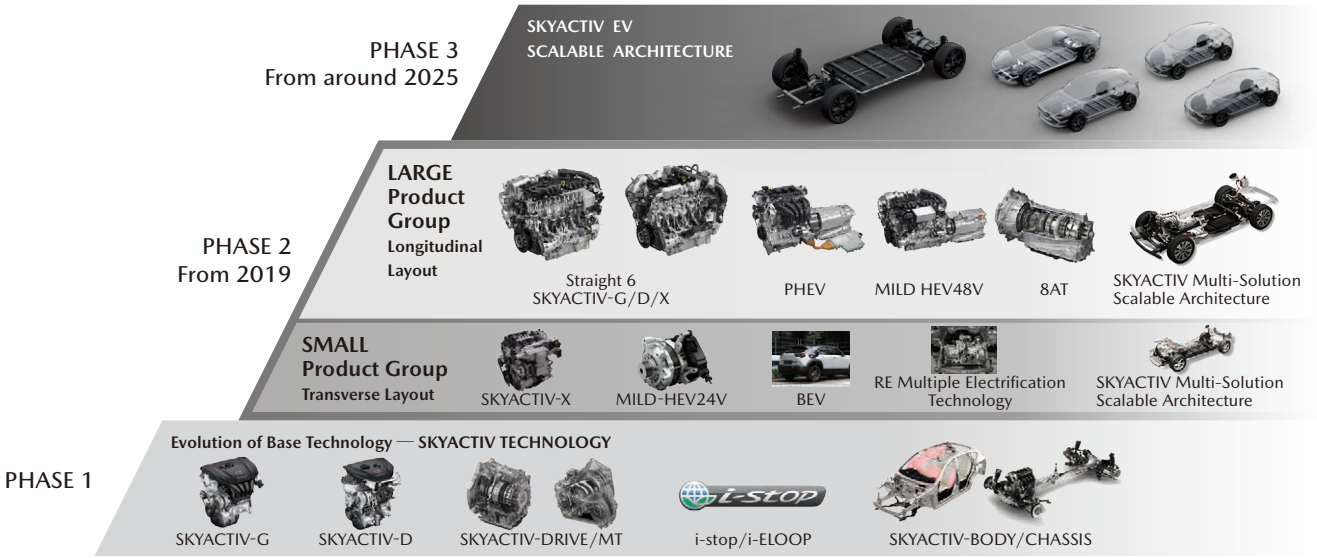
Continuous Evolution of Skyactiv Technology

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.

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



*1 As of August 2017, according to Mazda data

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.

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 CO_2 in the atmosphere and contributes to global warming. On the other hand, next-generation biofuels and synthetic fuels absorb or recover CO_2 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 CO_2 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 CO_2 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 Sanfrecce 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.

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.

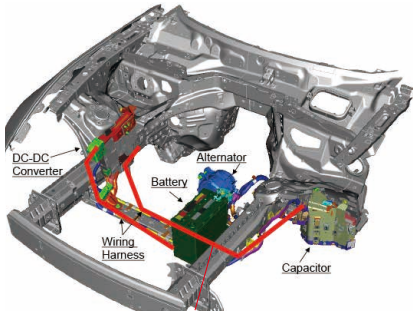
Offers a Bumper Which Is One of the Lightest in Its Class by Developing a Resin Materials for Auto Parts

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 CO_2 emissions in the areas of manufacturing and logistics.

【Manufacturing】 Energy-Saving / Measures to Reduce CO_2 Emissions

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

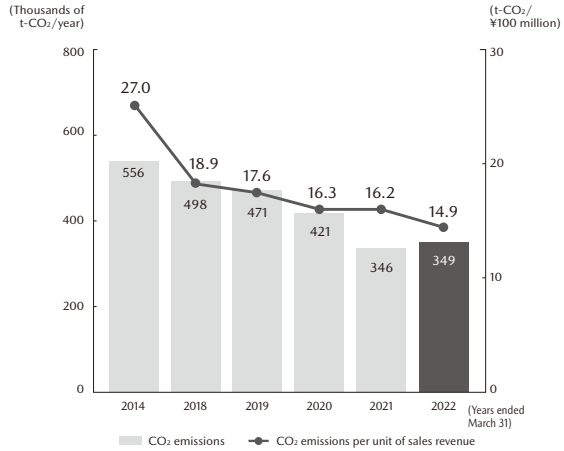
- Total CO_2 emissions from Mazda's four principal domestic sites*1 reduced by 37.2% compared with FY March 2014 (349 thousand t-CO_2)
- Emissions per unit of sales revenue reduced by 44.8% (14.9 t-CO_2/100 million yen)

  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 panting 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.

CO_2 Emissions from Mazda's Four Principal Domestic Sites / CO_2 Emissions per Unit of Sales Revenue



* CO_2 emissions at Mazda's four principal domestic sites are calculated using the CO_2 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 CO_2 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)

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 CO_2 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)

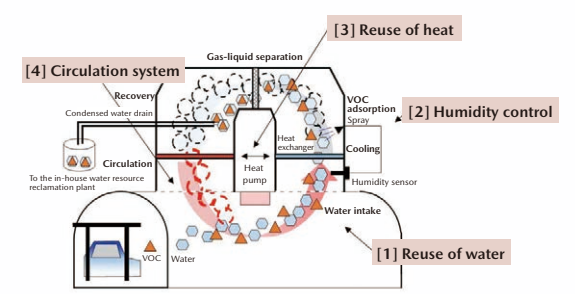
TOPICS Mazda Receives "Ichimura Global Environmental and Industrial Award/Contribution Prize" for its VOC recovery technology

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 CO_2 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 AcademicAward."

*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 CO_2 emissions.

[Logistics] Initiatives for Reducing CO_2 Emissions during Product Shipment

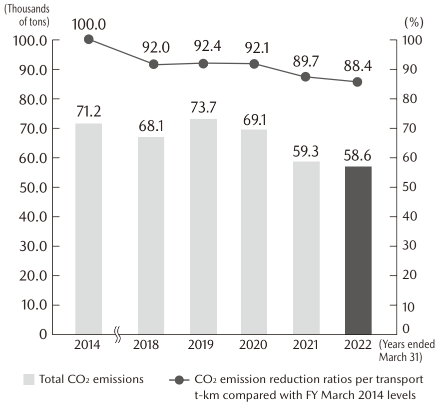
Mazda is working with logistics companies, dealerships, and other automakers throughout Japan to provide customers with the volume they require, with the precise timing they expect, while reducing CO_2 emissions during product shipment through highly efficient logistics across the entire supply chain.

<FY March 2022 Results>

- Total domestic transportation volume was approximately 450 million ton-kilometers.
  In FY March 2022, CO_2 emission per ton-kilometer was reduced by 11.6% compared with FY March 2014 levels.

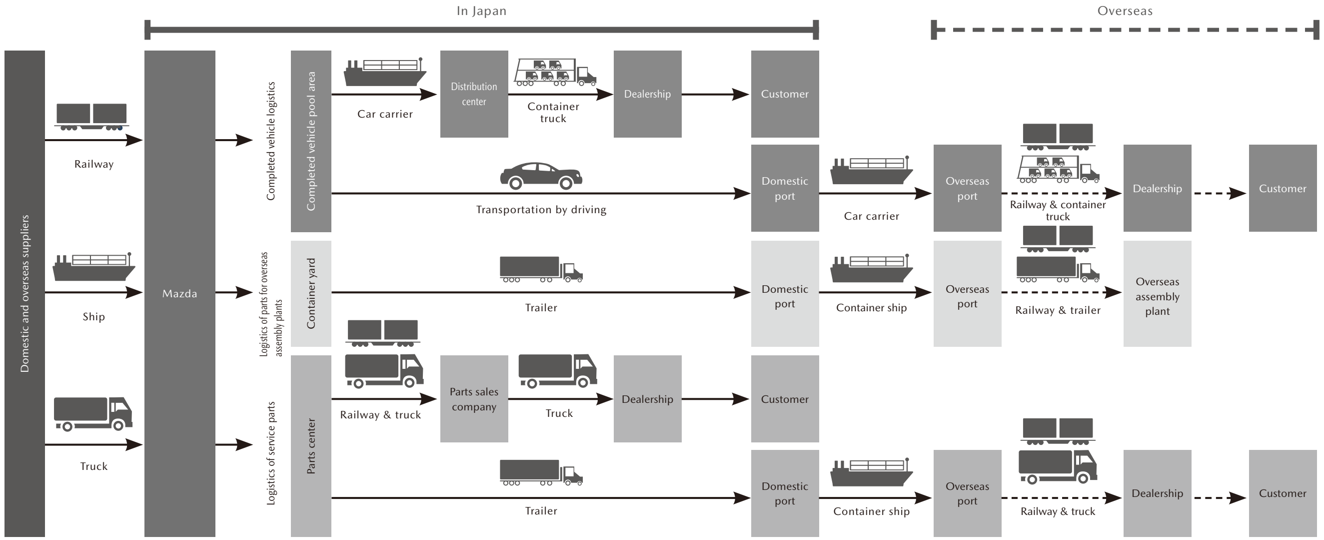
CO_2 emissions from logistics (P114)

CO_2 Emissions and Reductions for Logistics (in Japan)



■Range of the tracking capability for CO_2 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 CO_2 emission in the following three fields by visualizing in detail hidden logistics in each process on a global level.

1. Delivering completed vehicles

<In Japan/Overseas>

Mazda has increased loading capacity and reduced CO_2 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 CO_2 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 CO_2 emissions. The Company will continue all of its initiatives as well as adopt new technologies and alternative fuels to achieve carbon neutrality.

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 CO_2 emissions. In FY March 2022, Mazda's railway transportation rate was 26%, reducing CO_2 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 CO_2 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 CO_2 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 CO_2 emissions to its container carriers. With these steps, the Company expects to reduce CO_2 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 CO_2 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"

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.

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Major Risks and Opportunities

Transition Risks	Policies, regulations	• Stricter fuel efficiency and emission regulations, stricter carbon pricing through the introduction of carbon tax
	Technologies	• Expansion of development resource of electrification technologies such as electric drives and batteries
	Market	• 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	• Impact on ESG investment decisions by investors
Physical Risks	Acute	• Production suspension due to disasters and supply chain disruptions caused by increasingly heavy rainfall
	Chronic	• Impact of more severe and frequent natural disasters, flooding damage caused by tidal waves
Opportunities	Resource efficiency	• Efficient use of raw materials through thorough material recycling
	Energy Resources	• 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	• Building-Block concept, multiple solutions to put the right products in the right places • 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://tcfd-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