EFFORTS REGARDING PRODUCT AND TECHNOLOGY DEVELOPMENT

Mazda is actively developing unique technologies to help achieve a sustainable society. In March 2007, Mazda announced its long-term vision for technology development: "Sustainable Zoom-Zoom." The basic policy of this vision is to "provide all customers who purchase Mazda vehicles with driving pleasure as well as outstanding environmental and safety performance."
In August 2017, a decade after the original and in light of the rapid changes taking place in the automotive industry, Mazda announced "Sustainable Zoom-Zoom 2030"(see pp. 4-6). This new vision for technology development takes a longer-term perspective and sets out how Mazda will use driving pleasure, the fundamental appeal of the automobile, to help solve issues facing people, the earth and society. Mazda believes its mission is to bring about a beautiful earth and to enrich people's lives as well as society. The Company will continue to seek ways to inspire people through the value found in cars. In terms of the environment, "Sustainable Zoom-Zoom 2030" demonstrates Mazda's determination to use conservation initiatives to help create a sustainable future in which people and cars can coexist with a bountiful, beautiful earth.

Energy-and Global-Warming-Related Issues

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 multi-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. 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. In August 2017, Mazda set a goal of reducing corporate average "well-to-wheel" CO_2 emissions to 50% of 2010 levels by 2030, with a view to achieving a 90% cut by 2050. a

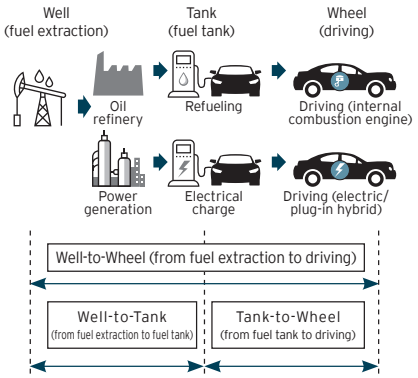
The Building-Block Strategy

Mazda adopts the Building-Block Strategy to realize its goal of reducing CO_2 emissions and raising the average fuel economy of Mazda vehicles sold worldwide. Given the internal combustion engine is forecast to remain a principle propulsion technology in cars worldwide for many years to come, the Company thinks it important to continue efforts to perfect the technology. At the same time, the Building Block Strategy also calls for the commercial introduction of electric, plug-in and other electrified vehicles in consideration of each country or region's energy resources, regulations, power generation methods, infrastructure and so on. Through this Building-Block Strategy and advances in process innovations, such as computer modeling-based development and *Monotsukuri* Innovation (see p. 126), Mazda will, despite limited management resources, offer products and technologies that exceed customers' expectations. From 2019, Mazda plans to start introducing electric vehicles and other electric drive technologies in regions that generate a high ratio of power from clean energy sources or restrict certain vehicle types to reduce air pollution. b c

a The "Well-to-Wheel" Perspective

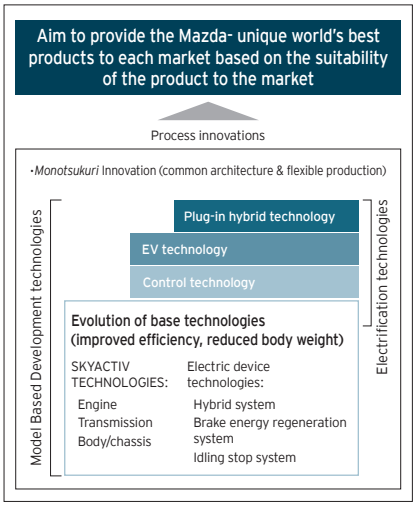
Make efforts to reduce CO_2 emissions from the perspective of "well-to-wheel," with the aim of reducing emissions over a vehicle's entire lifecycle.

Conceptual diagram of Well-to-Wheel*



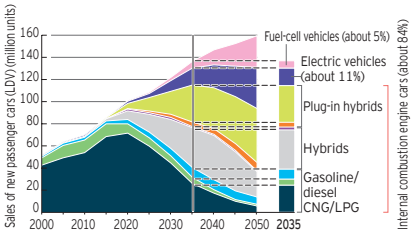
* Where fossil fuel is extracted and used to drive a vehicle.

b Building-Block Strategy



c Graphic representation of global market share of powertrain technologies

It is expected that the majority of vehicles in the global market will continue to be powered by internal combustion engines, and that such vehicles will contribute the most to CO_2 reduction. (about 84% of the vehicles are powered by internal combustion engines in 2035)



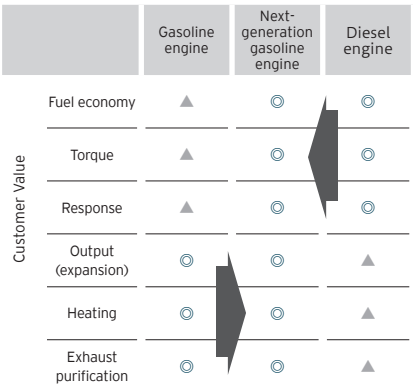
Source: IEA/ETP Energy Technology Perspective2015

Comprehensive Improvements of Base Technologies by SKYACTIV TECHNOLOGY

The term SKYACTIV TECHNOLOGY covers all Mazda's innovative base 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 upgraded 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.

In August 2017, Mazda disclosed plans to introduce next-generation technologies from 2019, including the SKYACTIV-X engine, set to become the world's first commercial gasoline engine to use compression ignition.*1 This unique new engine combines the advantages of gasoline and diesel engines to achieve outstanding environmental performance and uncompromised power and acceleration performance. Mazda will work toward the market introduction of the SKYACTIV-X while continuing to advance SKYACTIV-G and SKYACTIV-D, both of which remain highly competitive engines.

Features of the next-generation gasoline engine



*1 As of August 2017, according to Mazda data

TOPICS

[Japan] CX-3 Acquired Certification for Driving Tests of the WLTC Mode, a Global Test Cycle
—To enable Mazda's customers to check mode fuel economy that better reflects real world performance, in accordance with their driving environment—

CX-3 vehicles powered by the gasoline engine SKYACTIV-G 2.0, which were launched in summer 2017, have obtained authorization under the WLTC mode,*1 with the figures listed in catalogs. WLTC is a test cycle based on the worldwide harmonized light vehicles test procedure and consists of three driving modes: city, suburban, and highway. Compared to the previous JC08 mode, it better reflects real world performance such as by increasing the percentage of driving hours in cooling conditions, reducing the idling time ratio, and considering the weight of passengers (excluding the driver) and the load. Starting at the end of 2017, figures of the "WLTC mode fuel economy," which are based on the WLTC mode, and the fuel economy of each of the three driving modes will be indicated in the catalogs for cars that have acquired certification for WLTC mode. Consequently, customers will be able to check the mode fuel economy that better reflects real world performance, in accordance with their driving environment.

*1 Stands for Worldwide-harmonized Light vehicles Test Cycle. This is a test cycle based on WLTP (Worldwide harmonized Light vehicles Test Procedure).

TOPICS

Mazda Leads Manufacturer Adjusted Fuel Economy in U.S. Environmental Protection Agency Report for Fourth Straight Year

The Light Duty Fuel Economy Trends Report,*1 released by the U.S. Environmental Protection Agency (EPA) on November 2016, lists the Company as having the highest overall Manufacturer Adjusted Fuel Economy*2 for the 2015 model year. Mazda received the first-place ranking for the fourth year in a row.

The EPA's Fuel Economy Trends Report summarizes the fuel economy trends of vehicles sold in the U.S. on a model year basis, and ranks automakers by Manufacturer Adjusted Fuel Economy. Mazda's overall average fuel economy was 29.6 miles per gallon (mpg) for the 2015 model year, an improvement of 0.2 mpg over the previous year.

Mazda3 (2015 U.S. model)

*1 Light Duty Fuel Economy Trends Report: An annual report released by the EPA summarizing the trends of fuel economy of new model cars (passenger vehicles and small trucks) launched since 1975.
http://www3.epa.gov/otaq/fetrends-complete.htm
*2 Manufacturer Adjusted Fuel Economy: The average fuel economy of cars sold by a manufacturer over a year. In EPA's Light Duty Fuel Economy Trends Report, the fuel economy figures (city and highway) of each model measured by a method stipulated by the EPA are weighted according to the number of units sold on a model year basis.

Base Technologies (SKYACTIV TECHNOLOGY and Electric Devices)

	Name	Features
SKYACTIV TECHNOLOGY	Next-generation gasoline engine SKYACTIV-X	A new proprietary internal combustion engine that combines the advantages of gasoline and diesel engines. Achieves outstanding environmental performance, power and acceleration performance.
	SKYACTIV-G	New-generation highly-efficient direct-injection gasoline engine Excellent fuel efficiency, powerful torque **d**
	SKYACTIV-D	New-generation highly-efficient clean diesel engine Excellent fuel efficiency and complies with global emissions regulations without expensive systems **e**
	SKYACTIV-DRIVE	New-generation highly-efficient automatic transmission Direct shift feel and contributes to improved fuel economy **f**
	SKYACTIV-MT	New-generation manual transmission Light and crisp shift feeling, reduced weight and compact size **g**
	SKYACTIV-BODY	Lightweight body with high rigidity High rigidity, light weight, and the excellent crash safety performance **h**
	SKYACTIV-CHASSIS	High-performance, lightweight chassis Highly rigid and light weight, excellent handling stability delivers driving pleasure **i**
Electric Device Technologies	i-stop	Idling stop system The system automatically shuts the engine off temporarily when the vehicle comes to a standstill.
	i-ELOOP	Brake energy regeneration system As the vehicle decelerates, the system converts kinetic energy into electricity, which can be used later as needed.
	SKYACTIV-HYBRID	Hybrid system The system, using an electric motor, assists gasoline engines at times when a vehicle is running at low engine speeds or during low-load operation.

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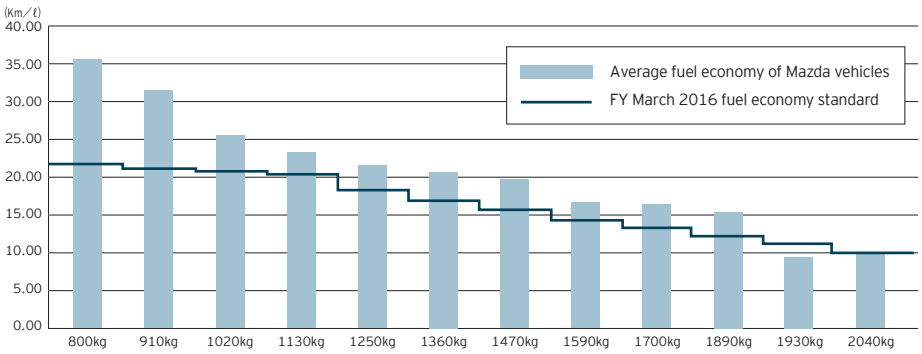
Improving Fuel Economy

Mazda is making efforts to improve fuel economy toward the goal of raising the average fuel economy of all Mazda vehicles sold worldwide by 2020 by 50% with 2008 levels. **j k**

k Average Fuel Economy in Passenger Vehicles by Weight Class*1



*1 Fuel economy of vehicles at JC08 mode test cycle. Figures screened by Ministry of Land, Infrastructure, Transport and Tourism. The fuel economy figures shown are the results of testing under a fixed set of conditions. In practice, fuel economy figures may vary according to driving circumstances.

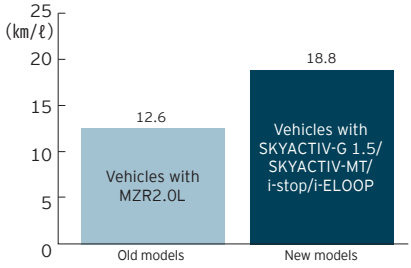
Mazda Models Qualify for Eco-Car Tax Reductions

Mazda's environmentally conscious vehicles are subject to tax incentives in many countries. In Japan, as of March 2017, 38 Mazda models qualified for the Japanese government's ecocar tax reduction,*1 implemented in April 2016. Among presently registered Mazda vehicles, around 94% meet the reduction requirements. (Figures based on the number of vehicles shipped in FY March 2017) **l**

Evolution of Eco Drive Support Technology

The Intelligent-Drive Master "i-DM," developed by Mazda to encourage drivers to drive in a safe, fun and environmentally conscious manner, was introduced in all of Mazda's Japanese models that incorporate SKYACTIV TECHNOLOGY.

j Comparison of Fuel Economy between New and Old Models (Roadster(MX-5 overseas), fuel economy at Japanese JC08 mode test cycle)



l Eco-Car Tax Reduction in Japan*1

Tax reduction rate*2		Eligible models	
Automobile acquisition tax	Automobile weight tax		
Tax free	Tax free	12 models	Flair (OEM), Flair Crossover (OEM), Flair Wagon (OEM), Carol (OEM), Scrum Van (OEM), Demio (diesel), CX-3, Axela (hybrid/diesel), Atenza (diesel), CX-5 (diesel), Familia Van (OEM), Titan CNG (OEM)
80% reduction	75% reduction	7 models	Flair (OEM), Flair Wagon (OEM), Flair Crossover (OEM), Carol (OEM), Scrum Van (OEM), Titan (OEM), Bongo
60% reduction	50% reduction	6 models	Flair (OEM), Flair Wagon (OEM), Demio (gasoline), Titan (OEM), Axela (gasoline), Bongo
40% reduction	25% reduction	9 models	Flair (OEM), Demio (gasoline), Axela (gasoline), Atenza (gasoline), CX-5 (gasoline), Premacy, Biante, Titan (OEM), Bongo
20% reduction		4 models	Scrum Van (OEM), Demio (gasoline), CX-5 (gasoline), Premacy

*1 Tax reduction measures differ according to factors such as model, grade, and vehicle weight. (As of March 31, 2017)
*2 Only indicates tax reduction rates at the time of new registration.

*1 Automobile weight tax and automobile acquisition tax reduction are applied when consumers purchase environmentally conscious new cars meeting or exceeding requirements for fuel economy and exhaust gas emissions.

Electric Vehicles

Mazda believes it is important to reduce CO_2 emissions not only while driving (“tank-to-wheel”), but also in the “well-to-tank” stage, which includes fuel extraction, refining and power generation. Since the optimum power source to contribute to reduced “well-to-wheel” CO_2 emissions differs according to each country or region’s energy situation, Mazda believes electrification technologies, such as electric vehicles and plug-in hybrids, are effective in countries and regions that do not rely heavily on thermal power generation. The Company’s development efforts are premised upon introducing a new electric vehicle in 2019, and a new plug-in hybrid*1 vehicle in and after 2021.

From 2012 to 2013, Mazda leased around 100 units of the Demio EV, an independently developed electric vehicle based on the Mazda Demio (known as Mazda2 overseas). Using a highly efficient lithium-ion battery and Mazda’s unique electric motor, the Demio EV delivers an exhilarating driving experience, including powerful acceleration, precise handling, and a comfortable ride. It also achieves an outstanding driving range of 200 kilometers (JC08 mode test cycle measured by Mazda). The Demio EV also maintains the same cabin space and cargo capacity as the base Demio model. m

m Electric Vehicle ‘Demio EV’ specifications

Model name	Demio EV	
Drive	FF	
Seating capacity	Five persons	
Dimensions and weight	Overall length/ width/ height*1	3,900mm/ 1,695mm/ 1,490mm
	Vehicle weight*1	1,180kg
Performance	AC electric power consumption (JC08 mode test cycle)*1	100Wh/km
	Driving range on a single charge (JC08 mode test cycle)*1	200km
Drive battery	Type	Lithium-Ion batteries
	Total voltage*1	346V
	Total electric energy*1	20kWh
Motor	Max. output*1	75kW<102PS>/ 5,200 - 12,000rpm
	Max. torque*1	150N・m <15.3kgf・m>/ 0 - 2,800 rpm
Charging time	Normal charge (AC200 V・15 A)*2	Around 8 hours (full charge)
	Fast charge*3	Around 40 minutes (80% charge)

*1 Measured by Mazda

*2 Amount of time required to charge battery after low battery warning light comes on. Given time is only a guide. Actual charging time may vary depending on air temperature and condition of power source.

*3 Amount of time required when using a 50 kW fast charger. Given time is only a guide. Actual charging time may vary depending on specifications of the charger.

Promoting Technology Development for Alternative Fuels

In addressing global warming through its products, Mazda is promoting the research & development of technologies compatible with alternative fuels such as biofuels, synthetic fuels, and hydrogen, to enable the use of energy that suits each country or region.

Compatibility with Bioethanol and Bioethanol Mixed Fuel

Mixed fuels, which include bioethanol or biodiesel made from plant materials, are attracting attention for their effectiveness in reducing CO_2 emissions. Mazda sells vehicles that are compatible with these fuels.

Present Status

- Mazda vehicles that are compatible with E10 (gasoline mixed with 10% ethanol) are sold in North America and Europe.
- In Thailand, the Mazda3, the Mazda2, the CX-5, and the MX-5, all compatible with E20 (gasoline mixed with 20% ethanol), became respectively available in FY March 2008, FY March 2010, FY March 2014, and FY March 2016.
  In FY March 2014, the Mazda3 compatible with E85 (gasoline mixed with 85% ethanol) became available, replacing the Mazda3 compatible with E20.
  In FY March 2016, the CX-3 compatible with E85 became available.
  In FY March 2016, the CX-5 compatible with E85 became available, replacing the CX-5 compatible with E20.
- In Japan, models equipped with a SKYACTIV-D 2.2 clean diesel engine compatible with B5 (diesel mixed with 5% biodiesel fuel) became available in FY March 2012 for the CX-5, in FY March 2013 for the Atenza (Mazda6 overseas), and in FY March 2014 for the Axela (Mazda3 overseas).
  In FY March 2015, models equipped with a SKYACTIV-D 1.5 clean diesel engine compatible with B5 (diesel mixed with 5% biodiesel fuel) became available for the Demio (Mazda2 overseas) and for the CX-3.

*1 Hybrid vehicle with a battery that can be charged by household power supply

TOPICS

Opened a Joint Research Course for Bio Liquid Fuel Using Microalgae with Hiroshima University

Mazda opened the Algae Energy Creation Laboratory of the Next-Generation Automotive Technology Joint Research Course within the Graduate School of Science of Hiroshima University, a joint research course with Hiroshima University starting in April 2017. The aims of the laboratory are to carry out genetic research and retrieval research of cultivation environments in order to produce renewable bio liquid fuel from microalgae. Mazda believes that liquid fuel will continue to be an efficient and practical energy source for mobile objects such as vehicles equipped with internal combustion engines. Through this joint research course, Mazda intends to offer technical support for disseminating renewable next-generation liquid fuel, including algae bio liquid fuel, as well as achieving a significant reduction of CO_2 emissions in internal combustion engines from the perspective of "well-to-wheel (from fuel extraction to driving)".

Reducing Use of "CFC Alternative" Greenhouse Gases

Mazda is working to reduce the amount of CFC alternatives, which constitute greenhouse gases, used as car air-conditioner refrigerants. The Company intends to promote development and early adoption of car air-conditioning systems using new refrigerants.

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

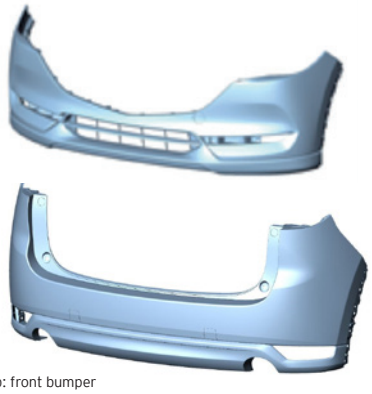
Mazda has developed a new resin material for auto parts that can maintain the same level of rigidity as conventional materials while trimming vehicle weight. The new resin enables the manufacture of thinner parts, which results in a significant reduction in the amount of material used; when used for front and rear bumpers, this trims weight by around 20%. In the manufacturing process, thinner parts have enabled the shortening of cooling time upon shaping, and in addition, use of CAE analysis technology has enabled optimization of material liquidity, halving the shaping time of bumpers from approximately 60 seconds to 30 seconds. This drastically reduces the amount of energy used in manufacturing.

This new-resin bumper, one of the lightest in its class,*1 has been used for the CX-5, the Atenza/Mazda6, the Axela/Mazda3, the Demio/Mazda2, the CX-3, the Roadster/ MX-5, CX-9, and the new CX-5. The Company also intends to use it for subsequent models. n

Development of Light Weight Wiring Harness Using Aluminum Electric Wire

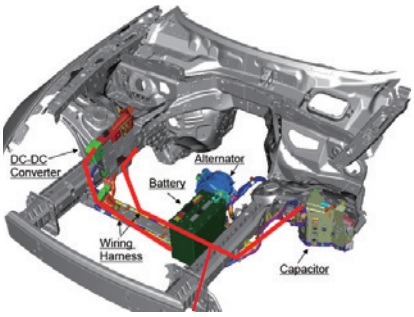
Mazda has adopted for some vehicles a light weight wiring harness using aluminum electric wire, which enables the Company to achieve vehicle weight reduction while keeping the connection reliability (quality) as before. The Company uses this lightweight wiring harness for the Roadster/MX-5, launched in 2015, and has been increasing the number of models that incorporate the material, including the Axela/Mazda3, the Atenza/Mazda6, the CX-9, and the new CX-5. The Company also intends to use the light weight wiring harness for new models to be launched in the future. o

n The new CX-5



Top: front bumper
Bottom: rear bumper

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



Aluminum electric wire

*1 1,500 to 2,000 cc class, as of March 2016, according to Mazda data

Cleaner Emissions

Cleaner Gas Emissions

Mazda is committed to mitigating air pollution from exhaust gases. To this end, the Company is working hard to develop low-emission vehicles.
The Company is steadily bringing to market vehicles that clear both SU-LEV, Japan's certification system for ultra-low-emission vehicles, and Euro 6, the stringent emissions regulations of the European Union (EU).

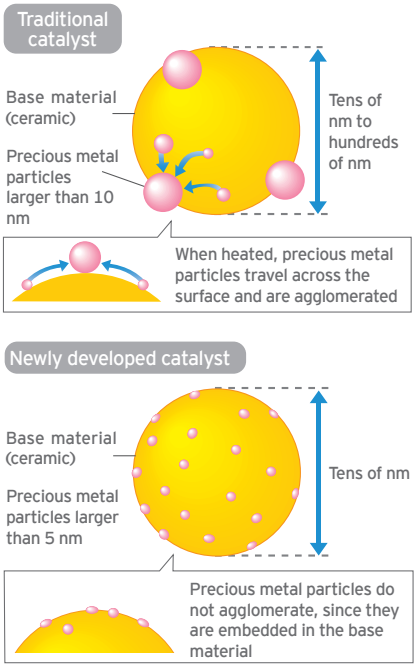
- As of March 31, 2015, a remarkable 97% of Mazda passenger models (not including compact mini vehicles and OEM-supplied vehicles) were SU-LEV-certified—the highest level*1 among Japanese automakers.
- The new CX-5, which is equipped with the clean diesel engine SKYACTIV-D 2.2, was introduced in the U.S. in summer 2017.

Development of Unique Single-Nanotechnology
Single Nanotechnology Dramatically Reduces Consumption of Precious Metals

There are global movements toward tighter control of exhaust emissions and fuel economy, market expansion due to rapidly growing emerging countries, and depletion of scarce resources. It is a very important challenge to reduce the use of expensive precious metals, such as rare metals (precious metals) and rare earths (ceria material), needed for three-way catalysts (or catalysts used for vehicles), enhancing catalyst efficiency.
In 2009, Mazda developed the world's first single-nanocatalyst,*2 that achieves both cleaner exhaust characteristics and higher durability while reducing the use of precious metals for vehicle catalysts by around 70% compared with the conventional figure in Mazda, and started introducing this technology in mass-produced vehicles. p
Furthermore, Mazda succeeded in an additional 30% to 40% reduction in the consumption of precious metals needed for single-nanocatalyst. The technology was first introduced into the Demio (Mazda2 overseas) with SKYACTIV-G launched in 2011 and has been progressively introduced to Mazda vehicles globally. This technology, originally developed for gasoline engines, is also suitable as a catalyst in diesel particulate filters that remove soot from diesel engines and is employed in Mazda's clean diesel engine SKYACTIV-D.
Mazda will continue promoting efforts to reduce consumption of precious metals and clean exhaust gas.

(For details, see the URL)
http://www.mazda.com/en/innovation/technology/env/other/singlenano_tech/

p Model of precious metal dispersion by new catalyst technology



*1 As of March 2016, according to Mazda data
*2 Catalyst featuring the single-nanotechnology to control finer materials structures than nanotechnology

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.

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). q

Measures Related to Application of IMDS

- To ensure that suppliers enter IMDS data appropriately, the Company publishes and distributes guidelines each year.
- 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.

VOC Reductions: VOCs 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 1999 Mazda developed a deodorizing filter with the capacity to remove aldehydes (adopted as either standard or optional in core vehicle models).
- In new models, starting with the Demio (Mazda2 overseas) 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 new CX-5, launched in 2016, conforms with the indoor aerial concentration guidelines of Japan's Ministry of Health, Labour and Welfare.

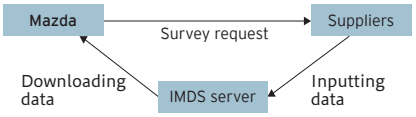
Reduction of Vehicle Noise

Mazda has established its own noise standards, which are even stricter than the most recent legal requirements, and the Company is working to make its vehicles produce less noise during driving*4 by applying the in-house noise standards to all of its vehicles, including both passenger vehicles and commercial vehicles.

The Roadster RF(MX-5 RF overseas) and the new CX-5 conform to the new car noise emission regulations (UN R51-03).*5

Mazda also intends to expand its application to subsequent models. r

q How IMDS Works



r Example of Anti-Noise Measures: The new CX-5

Reduced engine noise

- Optimization of torsional damper pulley
- Increased rigidity surge tank
- Optimization of front cover and oil pan tie rigidity
- Reduced oil pump noise
- Use of full-floating structure for the exhaust manifold insulator
- Use of steel crankshaft
- Optimization of the main shaft bearing structure (use of the lower block structure)
- Optimization of the fastening structure of the cylinder head cover
- Optimization of the cylinder head and block structure
- Use of a natural sound smoother
- Insulation of engine sound
- Reduction in the vibration at the time of combustion through the reduction of the compression ratio and the increase in the number of combustion stages

*1 International Material Data System
*2 Registration, Evaluation, Authorization and Restriction of Chemicals
*3 Volatile Organic Compounds
*4 Driving noise comes from a variety of sources such as powertrains (the engine, the exhaust system, the air intake system, the drive train) and the tires.
*5 Vehicle regulations stipulated by the UNECE World Forum for Harmonization of Vehicle Regulations (WP.29), which is established under the UN Economic Commission for Europe.

Promoting Resource-Saving Initiatives

Product Development and Design with Consideration for Recycling Needs

Mazda builds resource-saving initiatives into every phase of the lifecycle of its vehicles, based on the three Rs: reduce, reuse, and recycle. Many limited resources are used to manufacture vehicles, such as steel, aluminum, plastics and rare metals.
Mazda established the Recyclable Design Guidelines in 1992, and is incorporating three Rs design into all vehicles currently under development.
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

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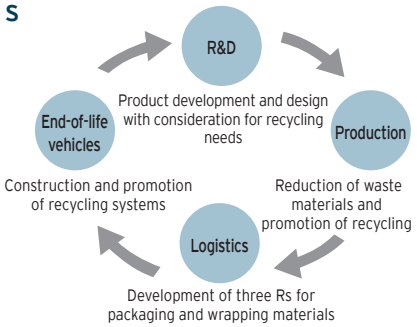

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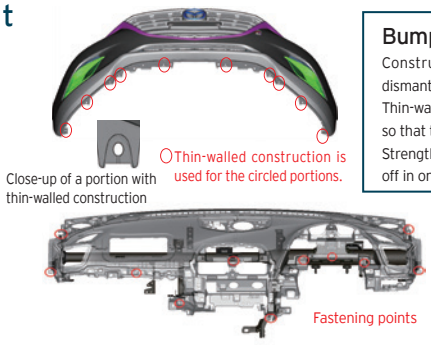
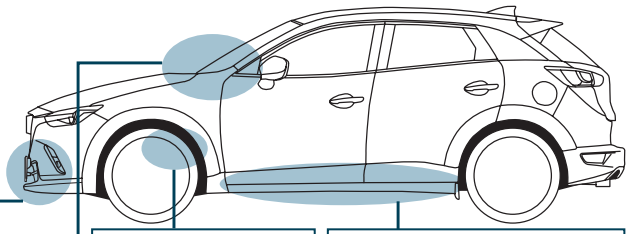


Bumpers
Constructed to enable swift removal in one piece during dismantling
Thin-walled construction used for bumper underside fastenings so that they can be easily removed by pulling strongly
Strengthened bumper apertures so that bumpers can be pulled off in one piece without breaking



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

Dashboard Insulator
Noise insulators and noise absorbers are both made of thermoplastic felt

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 produced new vehicle parts from plant-derived materials on a commercial basis, which have the potential to facilitate society's shift away from the use of fossil fuels and reduce CO_2 emissions.
In 2014, Mazda developed bio-based engineering plastic featuring high-quality finish without paint, suitable for vehicle exterior parts. By developing paint-less technology for interior and exterior parts taking advantage of the characteristics of this material, the Company achieved not only the excellent environmental performance of the material but also a high-quality finish that could not be achieved with conventional paint, and succeeded in contributing to the environment and improving costs by abolishing the painting process. Mazda has incorporated interior and exterior parts that adopt this technology in the Roadster/MX-5 (interior), the CX-9 (interior and exterior), the Axela/Mazda3 (interior), the Demio/Mazda2 (interior), the Roadster RF/MX-5RF (interior and exterior), and the new CX-5 (interior and exterior). The Company also intends to use the technology for subsequent models.

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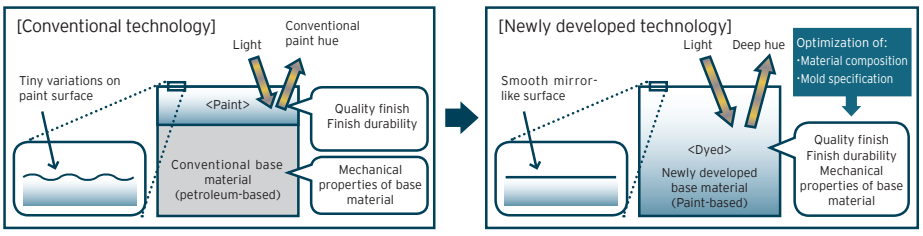


Other examples of the use of bioplastics

- Radiator tank: Demio (overseas: Mazda2), equipped with SKYACTIV-G and launched into the market in 2011, and subsequent models
- Air-cooled inter cooler (part of the resin tank): CX-9, new CX-5 (except for certain markets)

v

Bumper-to-Bumper Recycling of ELVs

With the goal of sustainable and efficient use of resources, Mazda became the first automaker in the world to make a practical application*2 of the technology for horizontal recycling of ELV (used and discarded bumpers) into material for new vehicle bumpers.

u Examples of parts that use bio-based engineering plastic featuring high-quality finish without paint and that are suitable for exterior vehicle parts

Interior parts

- Shift panel
- Cup holder bezel
- Center louver bezel
- Instrument bezel
- Door switch panel
- Louver bezel for rear seat air conditioning equipment
- Door decoration panel
- Instrument panel decoration panel
- Console side decoration panel
- Rear garnish

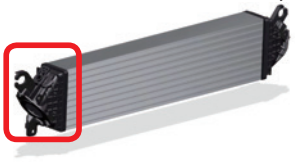
Exterior parts

- Sail garnish
- Door pillar garnish
- C pillar garnish
- Quarter garnish
- Side garnish

v Models with Radiator Tank Adopting Bioplastics

Premacy/Mazda5 (gasoline)
CX-5
Atenza/Mazda6 (diesel)
Axela /Mazda3 (diesel)
Demio/Mazda2
CX-3
Roadster/MX-5
CX-9
New CX-5

Air-cooled inter cooler (bioplastics used in the section of the resin tank framed in red)



*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 As of August 2011, according to Mazda data [Cooperating companies] Yamako Inc., Takase Synthetic Chemical, Inc.