

INNOVATION

Mazda has been committed to manufacturing unique cars that fascinate people with the pleasure of driving, brightening customers' lives through car ownership, and offering cars that are sustainable for the earth and society. To this end, the Company has been developing unique technologies and enhancing cooperation with business partners, universities and research institutions, and administrative organs.

Mazda-unique Innovation

With the aim of developing innovative vehicles that exceed the expectations of its stakeholders, Mazda has promoted company-wide efforts to review the vehicle-manufacturing processes from scratch. These efforts were highly appreciated both inside and outside Japan.

Innovation in Base Technologies "Skyactiv Technology"

Mazda engages in research and development with the aim of creating the most functional products with the maximum efficiency. Skyactiv Technology,^{*1} which the Company began introducing in models in 2011, achieved comprehensive improvements in base technologies, such as improving the efficiency of powertrain components including the engine and transmission, reducing vehicle body weight, and improving aerodynamics. The Company launched the CX-30, following the Mazda3 equipped with the Skyactiv-X (see p. 9), which is set to become the world's first^{*2} commercial new-generation gasoline engine to use compression ignition, and the new-generation Skyactiv-Vehicle Architecture. In FY March 2021, the Company introduced cars newly equipped with its electrification technology, e-Skyactiv.

Skyactiv-Vehicle Architecture

New-Generation Vehicle Structural Technologies

Skyactiv-Vehicle Architecture was developed and enhanced focus on the human-centered design philosophy to leverage the human body's inherent ability to balance itself. Mazda reviewed every component and function -- seats, body, chassis, NVH performance, etc. -- approaching development and commercial implementation from a viewpoint of total vehicle optimization. (An example is the seats, which are designed to keep the pelvis upright, maintaining the spine's natural "S" curve). This technology improves the body's balance in driving operations and allows the driver to control the car more easily, enhancing the ultimate *Jinba-ittai* driving feel.

a

a SKYACTIV TECHNOLOGY

Name	Features
SKYACTIV-G	Highly efficient direct-injection gasoline engine
SKYACTIV-D	Highly efficient clean diesel engine
SKYACTIV-X	New-generation gasoline engine
SKYACTIV-DRIVE	Highly efficient automatic transmission
SKYACTIV-MT	Highly efficient manual transmission
SKYACTIV-VEHICLE ARCHITECTURE	New-generation vehicle structural technologies
SKYACTIV-VEHICLE DYNAMICS	Vehicle dynamics control technologies
e-SKYACTIV	Electrification technologies

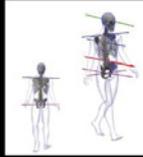
b

b A seat that keeps the pelvis upright to maintain the spine's natural "S" curve

Ideal condition in a car seat

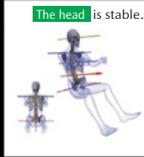
The dynamic balancing capability can be demonstrated as in the case of walking.

While walking



The pelvis is positioned in the opposite direction from the upper part of the body.

Ideal condition in a car seat



The head is stable.

•The seat keeps the pelvis upright to maintain the spine's "S" curvature.
 •The seat transmits the force from the road surface to the pelvis and causes the pelvis to move regularly, continuously, and smoothly.

■ Ideal condition while walking and in a car seat

*1 It covers all Mazda's base technologies such as the engine, transmission, chassis and body.

*2 As of August 2017, according to in-house investigation.

Skyactiv-Vehicle Dynamics Improves Comfort, Handling, and Stability

Mazda has been pushing ahead with the development of Skyactiv-Vehicle Dynamics, a series of vehicle dynamics control technologies. These technologies provide integrated control of the engine, transmission, chassis and body to enhance the car's *Jinba-ittai* driving feel—a sense of connectedness between the car and the driver.

In July 2016, the Company released the first technology in the Skyactiv-Vehicle Dynamics series, G-Vectoring Control (GVC),*¹ which was followed by the second technology, G-Vectoring Control Plus (GVC Plus), introduced in October 2018. GVC Plus uses the brakes to add direct yaw moment control. As the driver steers out of a corner by returning the steering wheel to the center position, GVC Plus applies a light braking force to the outer wheels, providing a stabilizing moment that helps restore the vehicle to straight line running. The system realizes consistently smooth transitions between yaw, roll and pitch even under high cornering forces, improving the vehicle's ability to accurately track sudden steering inputs and crisply exit corners. In addition to improving handling in emergency collision avoidance maneuvers, GVC Plus offers a reassuring feeling of control when changing lanes on the highway and when driving on snow or other slippery road surfaces. In FY March 2021, the Company also introduced electric G-Vectoring Control Plus (e-GVC Plus), which is designed to enhance the consistency of vehicle response to control inputs in all directions and realize seamless transitions between G forces, taking advantage of its electrification technologies.

Monotsukuri Innovation

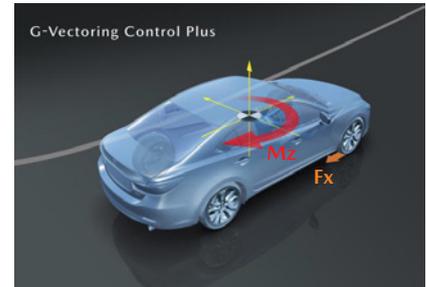
Looking five to 10 years into the future, Mazda has implemented *Monotsukuri* Innovation for efficiently developing and manufacturing products. Shared development methods and manufacturing processes are made possible by using bundled product planning for models to be introduced in the future, spanning market segments and model classes.

Optimized structures for each function are shared across all car lines and laterally spread to each car line based on bundled product planning. A flexible production system is used to produce products engineered based on a common architecture concept in a highly efficient and flexible manner. Mazda is aiming to raise operational efficiency by building a flexible production process that can handle changes in volumes and can quickly introduce new models with a minimum of investment.

Through *Monotsukuri* Innovation, the Company's products since the CX-5, launched in 2012, and Skyactiv Technology have achieved improved efficiency in terms of both product development and manufacturing facility investment as well as significant improvements in vehicle costs. Through design based on common architecture under *Monotsukuri* Innovation, Mazda is able to promptly apply the latest technologies and designs to all of its products. In new-generation technology development, the Company is working to enhance the efficiency of development processes through bundled planning and computer modeling-based development.

C

C G-Vectoring Control Plus (GVC Plus) operation image*



*Mz: restoring moment, Fx: braking force

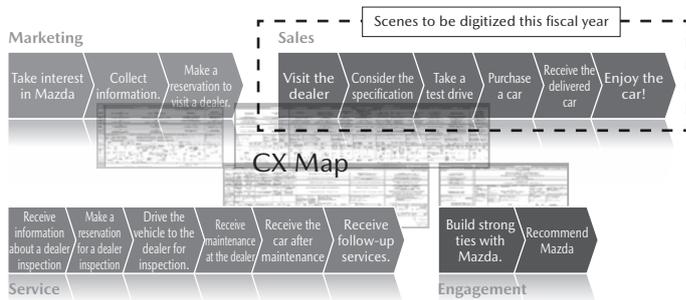
*1 The world's first control system to vary engine torque in response to steering inputs in order to provide integrated control of lateral and longitudinal acceleration forces and optimize the vertical load on each wheel for smooth and efficient vehicle motion. (As of June 2016 for mass production vehicles, according to in-house investigation)

Mazda Digital Innovation (MDI)

Since 1996, Mazda has been pushing ahead with the Mazda Digital Innovation (MDI), an initiative aimed at reforming work processes by introducing the latest IT technologies. In April 2016 MDI Phase 2 began, in response to the advancement of IT technologies such as IoT and AI and the diversification of customer needs. The Company has been committed to operational reforms capitalizing on state-of-the-art IT technologies, based on innovation through the CX Map, which depicts the Ideal Customer Experience (CX) as a flow of Marketing Sales Service Engagement. The Company strives to provide closer and more proper support for customers by improving the efficiency of the work of sales staff through the use of tablet devices. The Company continues working to realize a customer experience that meet the needs of various customers, offering them not only peace of mind and satisfaction but also excitement.

Global Master CX Map depicting the Ideal Customer Experience (CX)

The CX Map specifies the ideal CX. To achieve the ideal scenes, ideal operation using state-of-the-art technologies and data is defined in detail.



Improving the Efficiency of the Work of Sales Staff through the Digitization of Sales Operation

Mazda is promoting the following two initiatives in the Japanese market to improve the work efficiency of the work of sales staff, thereby have time to spare.

1. Development of information infrastructure

Mazda uses customer and vehicle information at various places, such as shops and the Headquarters. While the individual use of information is efficient, it sometimes breeds inefficiency because it requires time and effort to enter data and find necessary data.

Accordingly, the Company has put in place a system to organize and consolidate information scattered in the relevant departments so that it is shared between customers, shops, and the Headquarters. Sharing and using the same information help to create more time for the sales staff. The Company is also in the process of building a base of consistent support tailored to individual customers.

2. Introduction of business meeting support tools

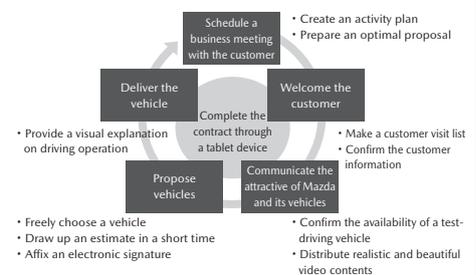
Mazda provides seamless treatment of customers, using a well-organized information infrastructure and tablets in a series of business meeting settings, from a visit to the dealer to the purchase of a vehicle.

Before a shop receives customers, their information on transaction history, inquiries, and questionnaires is shared so that any sales staff member can make an optimal proposal for and engage in optimal communication with them.

After a shop receives customers, computer graphics and videos, capable of reproducing real beautiful colors of an actual vehicle, are used to provide easier-to-understand explanations of products' functions and technical information.

Since information necessary for a business meeting, such as information on the trade-in vehicle and automobile insurance, is consolidated, a sales staff member can conduct negotiations for estimation, assessment, and final conditions, using just a single tablet device, without leaving the customers' side.

All contracts can be speedily completed with an electronic signature on a tablet based on the accumulated information of customers.



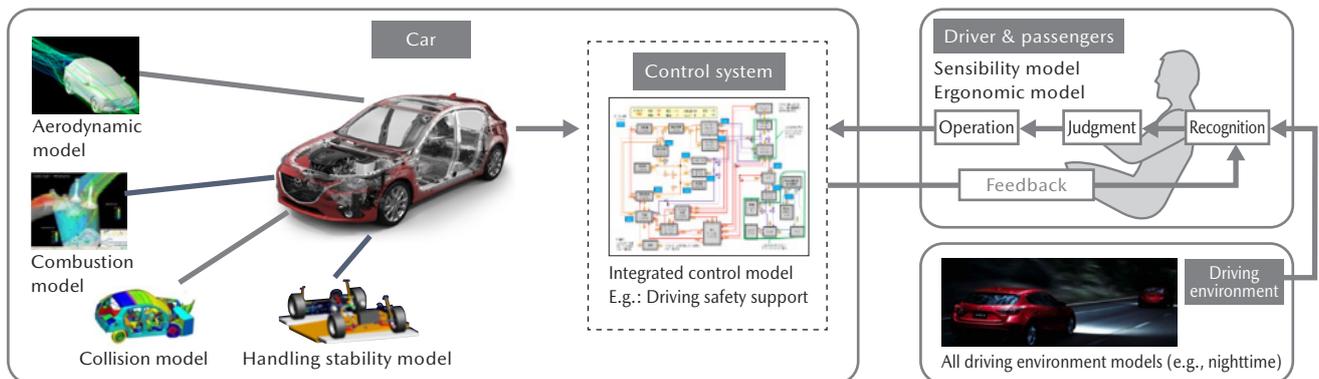
Model-Based Development (MBD)

d

Cars are being called on to provide increasingly advanced and diverse functions, while vehicle architecture and control systems are becoming more and more complex. Model-based development, which uses computers to efficiently replicate development processes, is essential to keep developing complex systems quickly and with limited resources. Model-based development involves creating computer models of the vehicle, control systems, drivers, passengers, driving environments and other development subjects, and conducting development via thorough computer simulation. It is an efficient method of optimization. By carrying out model-based powertrain and vehicle development through simulations from design to vehicle evaluation, Mazda strives to reduce the number of prototype parts and actual unit verification, in order to develop complex, highly sophisticated technologies and products with minimum resources while also ensuring quality.

d Model-Based Development

A technique to develop outstanding products by modeling (quantifying) and connecting all four elements of (1) the car, (2) control systems, (3) the driver & passengers, and (4) the environment without using an actual vehicle



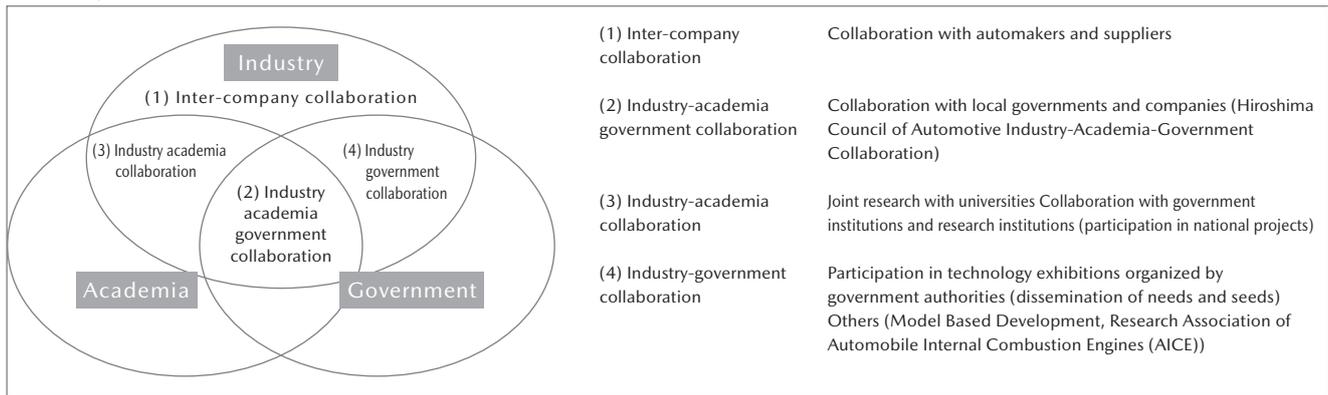
Open innovation

e

Mazda has promoted collaboration with companies, universities and government authorities, aiming to efficiently resolve business issues by obtaining new knowledge from outside the Company and to achieve the sustainable growth of society and businesses (open innovation).

The business environment in which companies operate is becoming increasingly competitive due to stricter environmental and safety regulations, new competitors from other industries, and diversification of the mobility business. Through open innovation, the Company will achieve the growth of the Mazda Group and contribute to society, thereby fulfilling the Corporate Vision.

System diagram of open innovation



Objectives of opening innovation

- [Achieve the growth of the Mazda Group]
 - Improve engineering capabilities, improve the brand value, and increase R&D efficiency
- [Contribution to society]
 - Achieve a sustainable society, advance *monotsukuri* or product development and manufacturing (share knowledge and skills), and enhance regional empowerment

(1) Inter-company collaboration

f

Mazda has been promoting inter-company collaboration with other automakers and suppliers to enhance their manufacturing and engineering capabilities and create synergies.

Collaboration with partners who work with Mazda

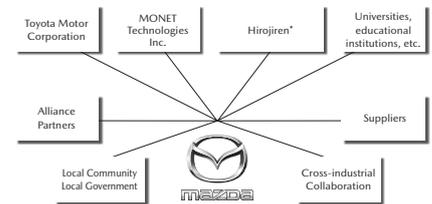
While working hard together with its partners to realize our shared dreams, the Company wants to enable them to feel proud of their connection with Mazda, and emotionally attached to the brand. This will turn Mazda into the brand it wants it to be, connected to all stakeholders, including customers, by the strongest of bonds. On the basis of mutual trust with Toyota Motor Corporation and various other companies, the Company plans to promote active collaboration.

[Collaboration examples] (For examples in the environmental area, see p.65.)

March 2019: Participated in D-Call Net^{*1}

June 2019: Concluded a capital and business partnership agreement with MONET Technologies Inc.^{*2}

Partnership strategies



* Hiroshima Council of Automotive Industry-Academia-Government Collaboration

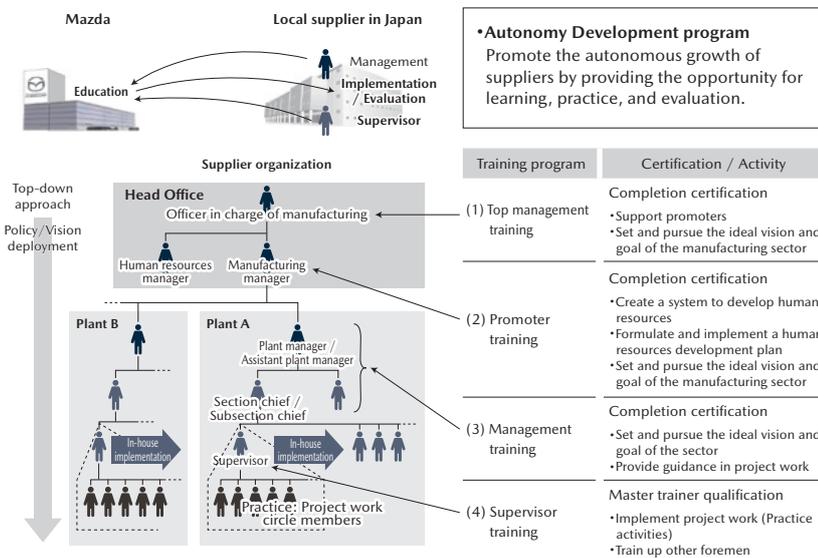
^{*1} An advanced automatic collision notification system that uses vehicle connectivity technology.
^{*2} A company that works to create an environment to promote MaaS (Mobility-as-a-Service), aiming to encourage the widespread use of next-generation mobility services and to resolve Japan's social mobility issues. The MONET shareholder structure is as follows: SoftBank Corp., Toyota Motor Corporation, Hino Motors, Ltd., Honda Motor Co., Ltd., Isuzu Motors Limited, Suzuki Motor Corporation, Subaru Corporation, Daihatsu Motor Co., Ltd., and Mazda Motor Corporation.

Implementation of the Autonomy Development Program That Supports the Autonomous Growth of Local Suppliers

Mazda has rolled out its J-ABC (Jiba [“local”] Achieve Best Cost) program for local suppliers in and around Hiroshima Prefecture since 2004. This program aims to identify wasteful, unnatural or problematic manufacturing processes based on the approach employed in the Mazda Production System (MPS) and to work cooperatively with the suppliers to resolve issues in manufacturing processes. This program has also enhanced potential for improvement at manufacturing sites in connection with Mazda’s *Monotsukuri* Innovation activities (see p. 123). It has helped increase productivity and reduced production costs by around billions of yen per year while also contributing to reduce environmental impact through energy and resource conservation.

In parallel with the J-ABC program, the Company has launched the Autonomy Development program aimed at promoting the autonomous growth of local suppliers since 2019. This program was created for local suppliers based on the approach adopted in the Global Manufacturing Network (GMN), which has been promoted since 2013 to enable each production site in Japan and overseas to autonomously carry out high-quality and highly efficient product activities that improve the Mazda brand value and to learn from each other at the same time. In the program, promoters are assigned to play a leading role in promoting understanding of the approach in the MPS through top management training and promoter training. Local suppliers learn how to create a system to develop human resources through practical project work toward its implementation in their companies. Launched at three model suppliers in August 2019, the program is being conducted at a total of 13 suppliers as of September 2020, including eight companies in the first group*1 and two companies in the second group*2.

Program developed for local suppliers

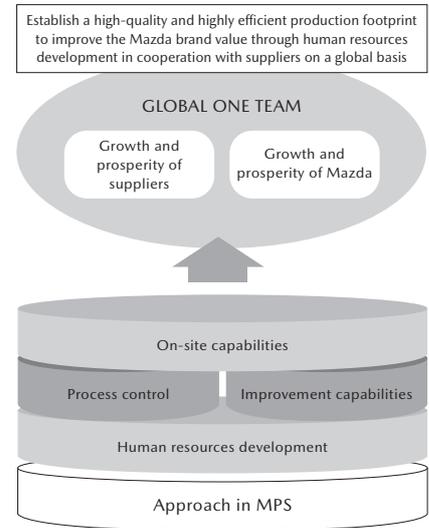


Implementation of the Autonomy Development Program at Overseas Production Sites and Their Local Suppliers

As the importance of overseas production sites increases along with its attempt to establish a global production footprint, Mazda has promoted activities to improve manufacturing capabilities based on the knowhow obtained through the J-ABC activities with a view to improving quality and productivity jointly with local suppliers. Currently, the A-ABC (ASEAN Achieve Best Cost) program and the M-ABC (Mexico Achieve Best Cost) program are implemented at AutoAlliance (Thailand) Co., Ltd. (AAT) and Mazda de Mexico Vehicle Operation (MMVO), respectively. In the course of transition to the Autonomy Development program in Japan, the Company has gradually deployed the Global Manufacturing Network (GMN) at overseas production sites toward the autonomous growth of local suppliers.

Conceptual diagram of the Mazda Production System (MPS)

•Vision to promote MPS



*1 Launched in the first group in 2019

*2 Launched in the second group in 2020

(2) Industry-academia-government collaboration

Mazda, in establishing the Industry-Academia-Government Collaboration Secretariat, has promoted collaboration with local companies, universities and government authorities. Through collaboration among government, academia and industry, the Company has contributed to the local community in terms of developing new creative technologies and nurturing human resources capable of bringing about innovation.

Hiroshima Council of Automotive Industry-Academia-Government Collaboration (Hirojiren) *1

As a company which has its research & development and production facilities mainly in Hiroshima Prefecture, Mazda believes that cooperation with local business and industry is very important. Under this belief, Mazda is collaborating with the Chugoku Bureau of Economy, Trade and Industry, Hiroshima Prefecture, Hiroshima City, Hiroshima Industrial Promotion Organization, and Hiroshima University to support local automobile-related companies and promote innovation and the vitalization of the region. Toward achieving the 2030 Industry-Academia-Government Collaboration Vision established in 2015, various initiatives are implemented, such as creating new frameworks to support local businesses, investigating next-generation automotive societies, and raising awareness in society. In FY March 2019, a research program proposed by Hiroshima Prefecture was selected to receive a subsidy under the Cabinet Office's Project for Revitalization of Local Universities and Regional Industries.*2 As part of the program, the Digital Monozukuri (Manufacturing) Education Research Center was established in Hiroshima University. The center started R&D activities to create innovative multi-functional composite materials and a smart system using data-driven control technology and sensing technologies, with a view to social implementation of these inventions.

h

h Digital Monozukuri (Manufacturing) Education Research Center



The 2030 Industry-Academia-Government Collaboration Vision Upheld by Hirojiren

- Transform Hiroshima into a hub that attracts people seeking innovative automotive technologies and dynamic car culture, and a place that continually produces technologies that amaze the world.
- Industry, government and education sectors work together to nurture human resources capable of innovation across all generations, and enliven the region through *Monotsukuri* (product development and manufacturing).
- Develop Hiroshima's unique Industry-Academia-Government Collaboration into a leading model for "regional empowerment" in Japan, serving also as a benchmark for the rest of the world.

*1 A council that promotes industry-academia-government collaboration. Motivated by the strong hope and enthusiasm for encouraging the manufacturing industry in Hiroshima, its member organization have voluntarily joined Hiroshima Council of Automotive Industry-Academia-Government Collaboration, to consider what manufacturing ought to be and to leverage innovation that will lead to industrial development. Hiroshima Council of Automotive Industry-Academia-Government Collaboration implements various activities, such as studies on future energies and technology exchange with suppliers.

*2 Hiroshima Prefecture Special Committee to Promote the Project for Revitalization of Local Universities and Regional Industries was set up. (Chairperson: Hidehiko Yuzaki, Governor of Hiroshima Prefecture, Project manager: Masamichi Kogai, Representative Director and Chairman on the Board, Mazda Motor Corporation)

Major initiatives

	Initiative	Details and results
Supporting suppliers' personnel recruitment	Delivering a special lecture on vehicle development, exhibiting vehicles, and proposing/implementing booth layout at a job hunting preparation seminar (February 2019)	To support suppliers' recruitment activities, delivered a special lecture on vehicle development through co-creation activities with the suppliers, displayed Mazda vehicles, and proposed and demonstrated a booth layout that can effectively show how suppliers are connected to mass produced vehicles at a job hunting preparation seminar (participated in by 23 companies).
Co-creation and technology exchange with suppliers	(1) Local companies co-creation subcommittee (2) Industry-academia collaboration subcommittee (3) Administrative organs collaboration subcommittee	(1) NVH performance assessment of a benchmark vehicle, and research on a lightweight frame structure (2) Innovation training (3) Review of the creation of collaboration synergies and the next-generation vision
Studies on future energies	The Energy Work Group held "Symposium on Next Generation Liquid Fuel for Automobiles 2019" (August 2019)	Focusing on biomass-derived, carbon-neutral liquid fuel, known as a future energy source for automobiles, experts in each of the industry, government, and academia sectors explained its potentials and practical applications, to think about energy in the future.
Research and development of internal combustion engines	Applying the combustion research results to product development	The combustion research results achieved through the Hiroshima University-Mazda joint study course on next-generation automotive technology were utilized in the development of the next-generation Skyactiv-X gasoline engine. Model-Based Development (MBD)*1 advanced in the field of combustion and catalysts.
Research and development in KANSEI (sensitivity) field	(1) Sensibility-based <i>monotsukuri</i> (product development and manufacturing) in collaboration with local communities (2) Joint research on sensibilities with local suppliers (3) Overall coordination of sensibility activities by relevant local groups	(1) Created a technology that quantifies places where human eyes are focused (real-time saliency mapping) and a method that measures the sense of anxiety, and had them tried at various companies toward social implementation. The hands-on experience of real-time saliency mapping was provided at the Future Vehicle Technology Experience Workshop (held in November 2019). (2) Gained a new insight on integrated texture of car interior and smart designing of car space (space innovation) by analyzing the results of real-time saliency mapping of car interior parts conducted on general subjects and clarifying the sensitivity of passengers to the parts. (3) Deployed sensibility technology in the food industry in Hiroshima Prefecture, including establishing its protocol toward the development of new product package.
Human resources MBD development in Model-Based Development (MBD)*1 field	Aiming to enhance the research & development capabilities of local companies, opening basic courses for the development of human resources with MBD/CAE abilities	MBD/CAE training courses were planned and organized for all manufacturing companies, including both auto suppliers and non-automobile industries, in collaboration with the Hiroshima Digital Innovation Center. In the past four years since FY March 2017, a cumulative total of 3,500 individuals participated in the training. Of these training courses, the MBD process training course was certified as a Course on IT-Skill Training to Meet the Era of the Fourth Industrial Revolution by the Ministry of Economy, Trade and Industry.

*1 Model Based Development: Development process employing simulation technologies.

(3) Industry-academia collaboration

Mazda has a system to efficiently offer advanced training through collaboration with educational institutions such as universities and research institutions.

Participating in World-Leading National Projects and Joint Studies

Mazda participates in world-leading national projects and joint studies with external research institutions, with the aim of solving social problems facing the automobile industry.

Relevant government institutions/organizations	Project name	Outline
Ministry of Economy, Trade and Industry / New Energy and Industrial Technology Development Organization / Innovative Structural Materials Association	Development of Innovative New Structural Materials Technology https://isma.jp/en/	Research and development on structural materials, bonding technology, etc., to fundamentally reduce the weight of automobiles and other transportation equipment, for the purpose of reducing CO ₂ emissions
Ministry of Economy, Trade and Industry / New Energy and Industrial Technology Development Organization / Thermal Management Materials and Technology Research Association	Research and development on innovative technology to utilize unused thermal energy http://www.thermat.jp/english/	Research on technology to make use unused energy*1 released as thermal energy into the atmosphere

* 1 In Japan, refers to the energy consumed in the living environment, industry, and transportation fields and released as unused heat energy into the atmosphere

Collaboration with Universities

Through enhancing collaboration with universities in various fields, Mazda aims to solve a broader range of issues from a wider perspective, thereby contributing to society.

University	Collaboration outline	Measures and activities
Hiroshima University	<p>Next-generation automotive technology joint study course (since April 2015) Mazda has set up five joint study courses with the university (e.g., an internal combustion engine lab, the Algae Energy Creation Lab) to find solutions to long-term technological issues and to develop human resources to implement the solutions. Industry-academia collaboration activities have been promoted to enable Hiroshima to lead Japan in <i>Monotsukuri</i> (product development and manufacturing) through human resources development and research and development based on Model-Based Research (MBR) and Model-Based Development (MBD).</p> <p>Comprehensive collaboration agreement (since February 2011) Through collaboration in broad areas, from technologies related to research and development and production to social science fields such as planning, management, and marketing, proactively conducting joint research.</p> <p>Regional empowerment and open innovation Mazda contributes to regional empowerment and human resources development of the Chugoku region and Hiroshima Prefecture, and to global sustainable development goals (SDGs) through collaboration with Hiroshima University and local communities and participation in national projects, etc.</p>	<p>Opened next-generation automotive technology joint-study course (in April 2015)</p> <ul style="list-style-type: none"> Internal combustion engine lab (opened in April 2015) Aerodynamics lab (opened in July 2016) Advanced materials lab (opened in October 2016) Algae energy creation Lab (opened in April 2017)(see p. 65) Model based development lab (opened in April 2019) <p>Comprehensive collaboration agreement (since February 2011) Proactively conducted joint research, from exploring research themes to finding solutions. Also cooperated in examining the ideal form of internship, and decided the method of accepting interns and setting themes for human resources development.</p> <p>Regional empowerment and open innovation</p> <ul style="list-style-type: none"> Participated in the Co-Creation Consortiums in the Material Model Based Research Division and the Data-Driven Smart System Division of the Digital Monozukuri (Manufacturing) Education Research Center (see p. 128).
Hiroshima City University	<p>Mazda and Hiroshima City University Faculty of Arts Co-Creation Seminar (since May 2017) Set up a co-creation seminar with the university, aiming to develop human resources who are capable of creating new manufacturing for a new era, and make Hiroshima a place to generate human resources for manufacturing that Hiroshima can boast to the world.</p>	<p>In FY March 2020, held a co-creation seminar that conducted formative activities on the theme "Utsuroi (the play of light and shade)."</p>
Kyushu University	<p>Establishment of a joint research department (since August 2017) Mazda has set up a joint research department with the university to find solutions to long-term technological issues and to develop human resources to implement the solutions.</p> <p>Inter-organizational collaboration regarding next-generation automotive technologies (since May 2011) Mazda has been working together with the university to reinforce research and development projects and to encourage academic research and education activities.</p>	<p>Opened the Mazda Next-generation Energy Storage Joint Research Department (in August 2017).</p> <p>Delivered a special lecture on introduction to automotive science in the Department of Automotive Science of the Graduate School of Integrated Frontier Sciences (in April 2019).</p>
Kindai University	<p>Agreement concerning comprehensive research collaboration (since December 2012) Cooperating in bolstering cutting-edge research development and in strengthening the technological capabilities of local industries.</p>	<p>Research Collaboration Promotion Committee</p> <ul style="list-style-type: none"> Held meetings to discuss the progress of joint research projects and specific measures to strengthen cooperation.
University of Hyogo	<p>Concluded an agreement on joint research using Spring-8, a large synchrotron radiation facility (May 2016) Cooperating in the development of innovative materials and product development technologies using radiation analysis techniques.</p>	<ul style="list-style-type: none"> Set up an experimental station dedicated to research into applications of advanced analytical techniques.
Tokyo Institute of Technology	<p>Industry Liaison Member (since August 2013) Technology transfer through joint research, for the purpose of improving the quality of research and education and promoting application of research and education results. Contributing to the creation of new industries and promotion of innovation.</p> <p>Participation in Tokyo Tech Academy for Convergence of Materials and Informatics (since April 2019) Contributing to human resources development based on Model-Based Research (MBR) and Model-Based Development (MBD) by participating in Tokyo Tech Academy for Convergence of Materials and Informatics established with the aim of developing human resources for manufacturing who are highly versed in materials engineering and information engineering.</p>	<p>Industry Liaison Member (since August 2013)</p> <ul style="list-style-type: none"> Searched for research seeds and arranged matching them with the development needs. Participated in technology exchange seminars and hosted inhouse seminars by faculty members. Implemented joint study on algae energy. <p>Participation in Tokyo Tech Academy for Convergence of Materials and Informatics (since April 2019)</p> <ul style="list-style-type: none"> Dispatched a company advisor to cooperate in the formulation of an educational program based on the approaches in Model-Based Research (MBR) and Model-Based Development (MBD) and supported students as a mentor.

(4) Industry-government collaboration

Mazda efficiently promotes cutting-edge joint research and shares needs and seeds with customers through collaboration with government authorities.

Business Matching Meetings for Suppliers and Universities (Collaboration with Administrative Organs)

Mazda organizes business-matching meetings in collaboration with the local administrative organs, in which information on technological needs and seeds was exchanged between suppliers, universities and public research institutes.

FY March 2020 activities

1. Organized the Three Northern Tohoku Prefectures (Aomori, Iwate, and Akita) Automotive Technology Exhibition at Mazda.
2. Organized the Yamaguchi Prefecture Auto Technology Introductory Exhibition and Briefing at Mazda after participating in the Yamaguchi Prefecture Automobile Meeting and holding a needs sharing meeting.

Promotion of model distribution in the automotive industry

Mazda has participated in the Study Group for Ideal Approaches to Model Utilization in the Automobile Industry organized by the Ministry of Economy, Trade and Industry since its launch in November 2015. The Company works on initiatives with other automakers and parts manufacturers to spread Model Based Development (MBD), a development technique to achieve the advanced development and performance assessment process for automobiles through virtual simulation. In April 2018, the Company agreed on the Enrichment of SURIAWASE 2.0*¹ for the Automobile Industry (an industry-academia-government joint strategy project policy), and announced that the Company would continue with the initiatives to enrich MBD and harmonization areas, etc. In addition, Mazda formulated the guidelines for smoothly promoting model distribution between companies, based on the results of activities implemented by the study group thus far. In December 2018, the study group and ProSTEP iVip,*² an international standardization organization, jointly announced these guidelines to the world, as international rules originating from Japan.

In this study group, the Company takes full advantage of its knowledge of virtual simulation and unique MBD that have been refined through Mazda Digital Innovation (MDI) (see p. 124) to contribute to activities for increasing the global competitiveness of the Japanese automotive industry.

Basic and Applied Research on Technologies for Internal Combustion Engines and Cleaner Exhaust Emissions

Mazda participates in the Research Association of Automobile Internal Combustion Engines (AICE*³), a new joint research organization in the Japanese automobile industry. AICE was established on April 1, 2014, with the support of the Ministry of Economy, Trade and Industry to enable automobile manufacturers to conduct basic and applied studies jointly with universities and research institutions on themes common to automobile manufacturers, and to use the research results to accelerate their in-house development activities. Taking advantage of its participation in AICE, Mazda is promoting its development of technologies for internal combustion engines and cleaner exhaust gases, with a view to achieving improved fuel economy and reduced exhaust emissions. Beginning in April 2019, the Company has expanded the scope of its development efforts to include mechanical resistance reduction and heat management technologies.

*¹ SURIAWASE 2.0 is an initiative to enhance the harmonization of development processes by taking advantage of an MBD process that uses virtual simulations instead of physical machines across entire supply chains in Japan. A Study Group for Ideal Approaches to Model Utilization in the Automobile Industry was organized in November 2015 by the Ministry of Economy, Trade and Industry, to further enhance the international competitiveness of the automotive industry. https://www.meti.go.jp/english/press/2018/0404_001.html

*² An international standardization organization based in Germany. Its membership comprises 185 companies, primarily automakers in Europe, the United States and Japan, as well as airlines and software companies. ProSTEP iVip works to develop and promote international rules regarding CAD and MBD.

*³ Research Association of Automobile Internal Combustion Engines, participated in by nine Japanese auto manufacturers and two organizations (as of April 2020).