CHAPTER 5

EARTH, PEOPLE, AND SOCIETY

Mazda believes that both quality improvement and the exploration of partnerships for "co-creation with others" provide an essential foundation for its endeavors to solve issues faced by the earth, people, and society.

CONTENTS

QUALITY IMPROVEMENT

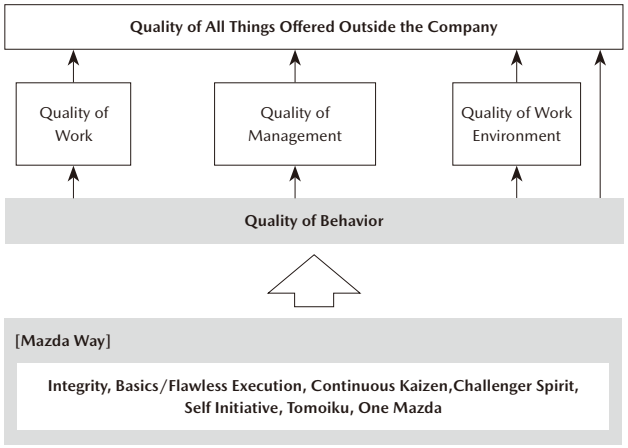
Basic Approach

Toward the realization of its Corporate Vision, Mazda believes that it is important to enhance the quality of "all things offered outside the Company," including products and services, to satisfy customers. The Company defines the Five Types of Mazda Quality: "quality of work," "quality of management," "quality of work environment,""quality of behavior," and "quality of all things offered outside the Company," which is underpinned by the preceding four. In line with its quality policy, Mazda further advances the efforts it has made and promotes united collaboration among all areas,continuing to enhance Mazda's unique value.

Mazda Quality Policy

Mazda Quality Policy
To enrich the lives of our customers
by providing products and services
that reflect steady and uncompromising work.

[Five Types of Mazda Quality]



Approach to Quality Improvement

To deliver customers safety, trust and excitement through automotive lifestyles, and to have customers continuously realize the value of its products, Mazda makes Groupwide efforts based on the three principles below:

1. Establishing consistent quality, from planning to production
2. Early detection and early solution of market problems
3. Building special bonds with customers—cultivating human resources capable ofconsidering and acting toward the happiness of customers

Vision for Quality Assurance

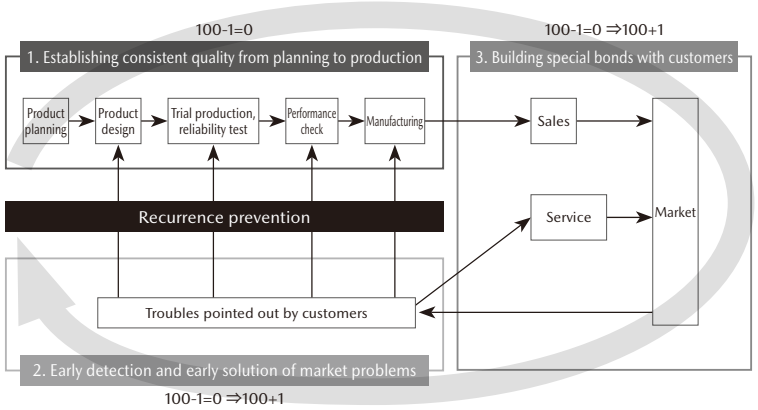
Vehicle production based on the "100–1=0" belief

1. Establishing consistent quality from planning to production:
"100–1=0" expresses Mazda's strong desire to provide good quality to all customers under the belief that if even only one out of 100 vehicles is found to be defective, the car has no value for the customer. Mazda pursues a kind of vehicle production that respects each vehicle as a certain customer's "one-and-only," and aims to achieve "zero defects." In keeping with the basic principles of manufacturing and based on a full understanding of its mechanisms, all related departments work in close collaboration to establish consistent quality in all processes, from planning to production.

Initiative for the process to change "100–1=0" to "100+1"

2. Early detection and early solution of market problems:
If an unpredictable problem arises in the market, it may result in loss of trust from customers ("100–1=0"). To avoid this, Mazda promotes quality assurance activities for the early detection and early solution of any trouble pointed out by customers.

3. Building special bonds with customers:
Mazda aims to build special bonds of ever-lasting trust with its customers by keeping contact with customers in good faith and with a sense of commitment to them ("100–1=0" ⇒ "100+1"). Toward this goal, the Company promotes human resource development by encouraging every employee to think about what they should do to make customers happy and to act accordingly.



Mazda Quality Management System (M-QMS*1)

To make faithful and unceasing efforts and constantly ensure quality in products, sales and after-sales services that can always satisfy the expectations and trust of customers, Mazda has established the Mazda Quality Management System (M-QMS) based on ISO 9001*2, and has applied it to the series of processes from product development to production, sales and after-sales services.

At overseas production sites, Mazda also promotes the establishment of systems that encourage local employees of new sites to make self-reliant efforts to improve quality, and encourages them to acquire ISO 9001, thereby promoting the quality improvement of Mazda vehicles, which are produced and sold worldwide.

Acquisition of ISO 9000 Series

Year of acquisition	Types of ISO certification	Certified organization, product, service, etc.
1994	ISO9002	Mazda Motor Corporation: Vehicles produced at Hiroshima Plant and Hofu Plant (First to be certified as Japanese automaker)
1996	ISO9001	Mazda Motor Corporation: Engineering, product development, manufacturing and after-sales service
2001	ISO9001	Mazda Motor Corporation: Accessories, KD, product planning, design Mazda Engineering & Technology Co., Ltd.: Specially equipped vehicles (TESMA), etc. (Application range expanded)
		Auto Alliance (Thailand) Co., Ltd.
2007	TS16949 (ISO9001 Sector certificate)	Changan Ford Mazda Automobile Co., Ltd. (now Changan Mazda Automobile Co., Ltd.), Changan Ford Mazda Engine Co., Ltd. (now Changan Mazda Engine Co., Ltd.)
2015	ISO9001	Mazda de Mexico Vehicle Operation, Mazda Powertrain Manufacturing (Thailand) Co., Ltd.
2016	ISO9001: 2015	Mazda Sollers Manufacturing Rus LLC
2018	ISO9001: 2015	Mazda Motor Corporation: Head Office, Hiroshima Plant and Hofu Plant, Mazda de Mexico Vehicle Operation, Auto Alliance (Thailand) Co., Ltd.
	IATF16949: 2016 (ISO9001 Sector certificate)	Changan Mazda Automobile Co., Ltd., Changan Ford Mazda Engine Co., Ltd. (now Changan Mazda Engine Co., Ltd.)

1. Establishing consistent quality, from planning to production

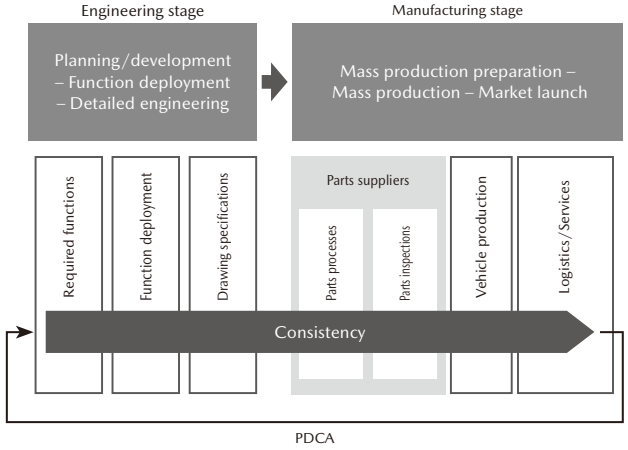
To satisfy the diverse needs of customers and offer greater trust, joy and excitement, Mazda is engaged in establishing a consistent quality level to be assured at all stages from planning/development to the delivery of products to customers.

Establishing Stable Quality

Not only to improve the performance of products but also to enhance the quality of new technologies including the initiatives to address environment issues, Mazda is committed to "process assurance." Process assurance is the approach of ensuring a consistent quality level at all stages from engineering (planning, product development) to manufacturing (purchasing, vehicle production, logistics, after-sales services). Based on the correct understanding of customer needs and expectations, the important elements necessary to ensure each function and performance are identified. The Company has established a system to maintain and manage them in every stage from engineering to manufacturing.

Furthermore, to allow customers feel driving pleasure through its products, Mazda identifies the functions and performance that embody "driving pleasure" for each stage from before getting in the car to after starting driving, so as to enhance consistency in establishing quality.

Consistent Process Assurance based on Major Characteristics



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 the efficiency improvement 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.

*1 M-QMS: Stands for Mazda Quality Management System

*2 ISO: Stands for International Organization for Standardization. ISO 9001 is a set of international standards for quality management and assurance.

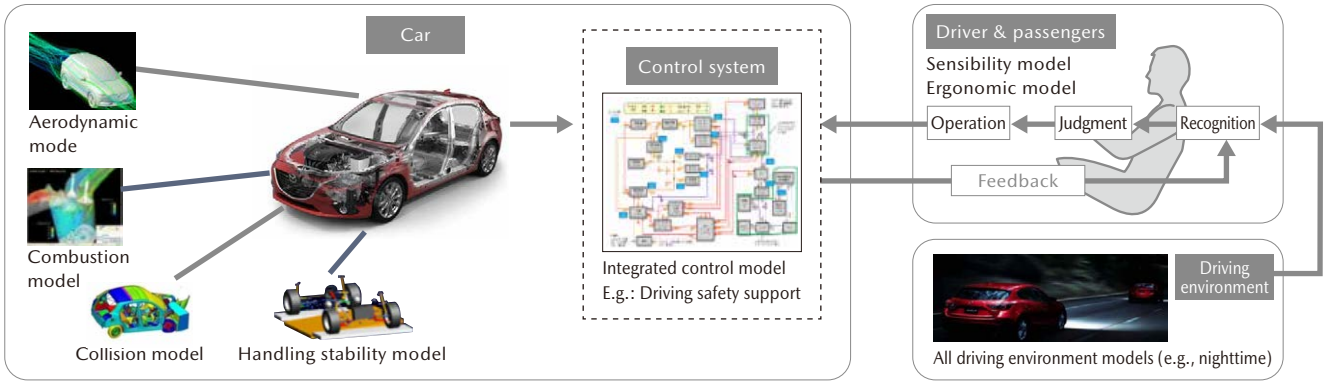
Model-Based Development (MBD)

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.

Mazda believes that to further promote model-based development, universities working on cutting-edge technologies, automobile manufacturers and suppliers that cooperate in manufacturing must concretize the SURIAWASE 2.0 concept, which seeks to enhance development efficiency by using virtual models across the engineering chain. In July 2021, ten companies became operating members, and the"Japan Automotive Model-Based Engineering center (JAMBE)" was established to spread MBD technology widely to the automobile industry nationwide. Mazda is also participating as one of the operating member companies, and will contribute to improve the international competitiveness of the Japanese automobile industry by realizing the advanced matching development "SURIAWASE 2.0" using models. (P93)

Model-Based Development

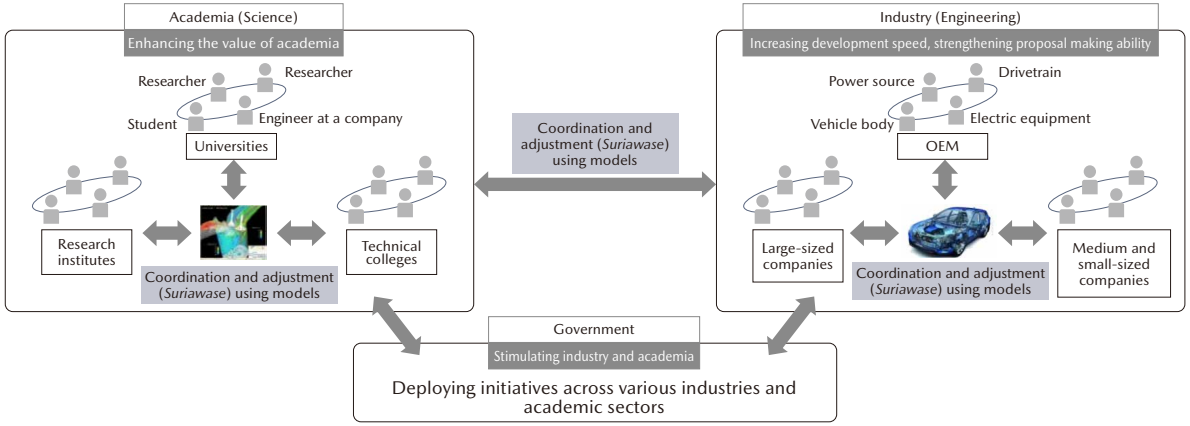
A technique to develop outstanding products by modeling (quantifying) and connecting all four elements of (1) the car, (2) control systems,(3) the driver & passengers, and (4) the environment without using an actual vehicle



What is advanced matching development SURIAWASE 2.0?

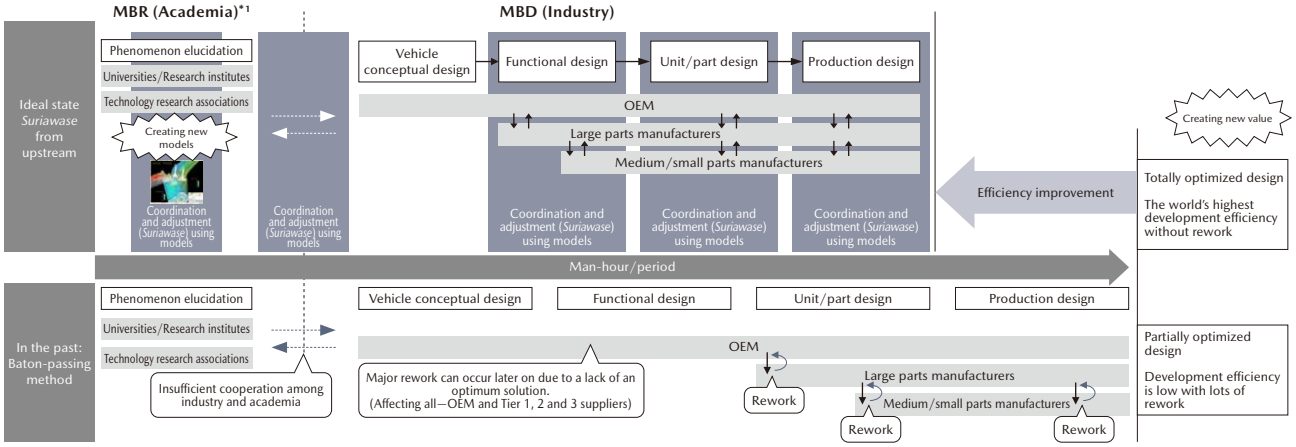
Created based on the SURIAWASE 2.0 concept presented in the materials prepared by the Ministry of Economy, Trade and Industry of Japan in 2017

SURIAWASE 2.0 is an initiative to enable academia and businesses (parts manufacturers and OEMs of all sizes) to share digital models across the board, linking academic research with development of parts, systems and vehicles, thereby allowing both sides to coordinate and make adjustments (Suriawase in Japanese) digitally from the initial stages of development, without using physical machines. This approach makes it possible to create the most-advanced development community in the mobility sector, able to carry optimal and high-grade monotsukuri efficiently and without rework.



Goal: Concretize Suriawase 2.0

Achieve the most efficient development processes in the world and create new value by innovating the research, development and production processes



*1 Model Based Research: An approach that applies model-based concepts to research

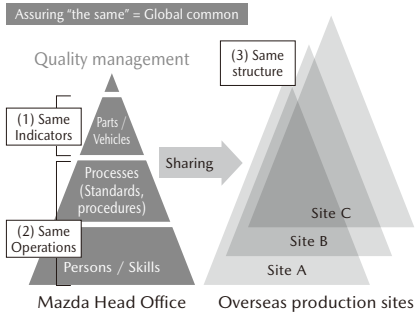
Referred to materials for the online forum to commemorate the start of the Japan Automotive Model-Based Engineering center (JAMBE)

Global Quality Assurance

To ensure the same quality on a global scale, Mazda has adopted the "global common" concept,under which overseas production sites establish the same quality by employing the same indicators, the same operations, and the same structures as those of the Mazda Head Office.

With the aim of achieving and maintaining the same quality into the future, the roles and responsibilities of the Mazda Head Office and overseas production sites have been clarified for management. As part of its efforts to secure the same quality on a global basis, Mazda works to establish common indicators of quality achievements and processes (standards and procedures) to be shared when conducting quality control of purchased parts or quality evaluation of finished vehicles. At the same time, initiatives are under way to develop human resources who can properly operate these processes. As part of its global quality assurance efforts, in cooperation with Mazda North American Operations, Mazda has developed a quality assurance system for a new joint-venture plant in Alabama, the United States. Under this system, Mazda commenced mass production of a new model in 2022.

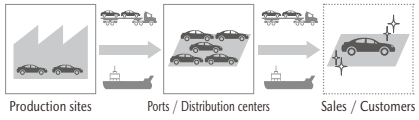
Initiative for Global Quality Assurance



Quality Assurance after Shipment

To ensure that the high quality at factory shipment is maintained until delivery to customers around the world, Mazda has introduced the same quality evaluation indicators to be applied,from production plants to distributors and dealers, with the aim of delivering products maintaining high quality to customers around the world under a consistent evaluation system.

Consistent evaluation system



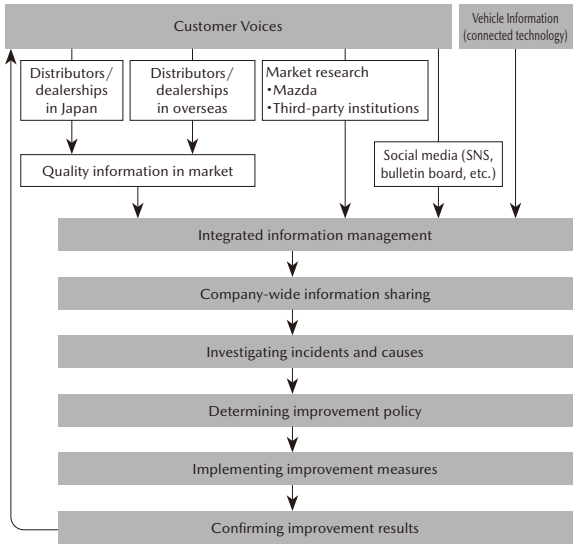
2. Early detection and early solution of market problems

Mazda strives to offer an enriched car ownership experience, in which customers can feel satisfied with the car and realize the value of the product. While respecting each vehicle as a certain customer's "one-and-only," the Company endeavors to ensure stable and speedy quality improvement and enhance the quality of present and future products.

Comprehensive and Speedy Quality Improvement

To enable early detection and early solution of market problems, Mazda has established a system for unified management of all items of quality information. Such information is gathered from distributors and dealerships in Japan and overseas and by employing the results of surveys by external institutions and conducting the Company's own market research. Under the system, the collected information is shared company-wide in real time. By using the system and closely monitoring daily progress, Mazda investigates quality related incidents and their causes, determines and implements improvement measures, and confirms the results. In this manner, Mazda works to achieve comprehensive and speedy improvement.

Quality improvement system



The Company also promotes quality improvement, capitalizing on the vehicle information collected through the utilization of connectivity technologies, in addition to conventional initiatives based on customer input.

<Examples of Surveys/Analyses>

- Gathering customer voices through Mazda-unique market survey
- Market surveys conducted by third parties
- Analysis of customer voices on social media
- Analysis of vehicle information obtained through connected technologies

Corporate Activities with Highest Priority on Customer Safety and Comfort

Mazda prioritizes safety and comfort of vehicles above all. Under a strict quality assurance system, Mazda conducts inspections on conformity with laws and regulations of each country and on functions to be used by customers, with a view to manufacturing vehicles that customers feel safe using.

This quality assurance system is maintained and managed by the development, production and quality divisions auditing each other from independent standpoints.

Recall Procedures (Overview)[*1]

- Registration with authorities in each jurisdiction, according to the laws and regulations of each country and region
- Disclosure to customers via direct mail, telephone, and other methods, and explanations at dealerships
- Disclosure of information on recalls on the Mazda Official Website

Number of recalls in FY March 2022 (in Japan) (P123)

*1 Recall procedures may vary among countries/regions.

3. Building Special Bonds with Customers —Cultivating Human Resources Capable of Thinking and Acting for the Happiness of Customers

To encourage every employee to think about what they should do to please customers and to act accordingly, Mazda places emphasis on cultivating a customer-oriented corporate culture/mind. Specifically, the entire Mazda Group is committed to promoting quality awareness-raising activities, quality control education, and QC (Quality Control) circle activities.

Under the impact of the COVID-19 pandemic, since FY March 2021, Mazda has continued these activities by shifting to an online format through active introduction of e-learning and video streaming.

<Major Activities>

Quality Awareness-Raising Activities

Mazda holds quality meetings on a regular basis. At these meetings, top management communicate their commitment to compliance and quality in their own words to all employees. This provides opportunities for individual employees to reflect on and think about their work, thereby enhancing their compliance and quality awareness.

Quality meeting materials

Material for 67th Quality Meeting 2022. 2.21

My thoughts on quality: Bringing smiles to the customers' faces

Smiling to Make My Customers Smile

Kazuhiko Sumi, Executive Officer, General Manager of Purchasing Division

Production stoppages and changes in the supply and demand balance of semiconductors due to COVID-19 restrictions and lockdowns had a severe impact on the procurement of parts and, consequently, the number of vehicles produced unavoidably decreased. Almost two years have already passed since the onset of these conditions in March 2020, and the affected departments have been making daily efforts to minimize their impact on production. Furthermore, the spread of COVID-19 and its prolonged duration have brought about drastic changes in the way we work, and I am sure all of you have experienced stress in one form or another as a result.

Nevertheless, I believe that we all want to deliver as many products to as many customers as possible and to bring smiles to their faces by making them feel their lives are a little brighter every day. To achieve that, it is imperative that we perform conscientious work of the highest standard. And to do that, we must be flexible and have some time to think and reflect, in other words, we need a certain amount of latitude that allows us to do this. But how, you may ask, can we find any such latitude at a time when the work environment is changing due to COVID conditions, at a time when we are also in the midst of a once-in-a-century transformation, and at a time when the level and speed of output required of us are increasing? Although some people may have different views, I believe it is a matter of "preparation."

As we all know, everything has a cause and effect. When a problem occurs, we learn to prevent a recurrence, and when a positive outcome occurs, we learn from it as a successful experience, and apply it in other similar situations. This accumulation of experience is our "preparation," and I believe that our experience enables us to perform conscientious work of the highest standard.

On the other hand, it might seem that the problems we encounter are not decreasing in the least. But the problems, in fact, are decreasing. They are just occurring in different forms. Why is that? I think it is because that on many occasions after learning the result, we become aware of the root cause in hindsight. While I may be stating the obvious, I often wonder if we had the foresight, what the result might have been. How often have you achieved good results by carefully imagining the scenario of a successful experience and putting it into practice?

While it is easy to express it in words, we are all well aware that executing it is not quite so easy. Although we may not be able to do something perfectly, the results are bound to be significantly different depending on whether or not we have insight into a situation. Having insight = being prepared. I believe that when we are prepared, we can find the necessary latitude as a matter of course, and this will naturally bring a smile to our faces. This is the kind of virtuous cycle I would like to create.

Quality is required in all actions and results - such as the quality of work, the quality of products including parts and vehicles, the quality of communication, and the quality of management. To achieve quality in these areas, we must create an environment that allows us to smile, so why not use our insight from past experience to prepare for that? To make our customers smile, let's start by wearing a smile ourselves. At times like right now, when changes in the environment like COVID-19 and a once-in-a-century transformation are challenging us, let our smiles prevail! At such times, I think the results will change naturally.

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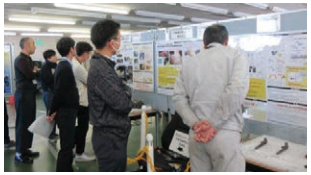
Sharing Past Cases

Mazda has undertaken an initiative to share lessons learned from past cases through exhibits of actual defective products and videos. This program is intended to encourage employees to think about past issues as issues concerning themselves and to improve their attitudes and behavior. Since its launch in FY March 2019, a total of 12,000 employees have experienced this initiative.

Employees share past cases



Quality Control Education

For the purpose of developing human resources capable of proactively finding/solving problems from a customer viewpoint and working for continuous improvement, quality control education is provided for employees. Quality education courses taught by internal instructors are offered, and employees take appropriate courses when their job type or management level changes.

Group-wide Quality Education Courses in FY March 2022

	Course	Objective
1	Quality program for freshmen	To understand basic quality control concepts (customer-oriented attitude, continuous improvement efforts)
2	Quality management elementary course	To apply the concepts, processes, and basic techniques of problem solving to daily operations, thereby obtaining problem-solving abilities
3	Quality management intermediate course	To become capable of applying and practically implementing specialized quality management techniques
4	Quality Improvement Seminar	To understand the current status and issues of Mazda's quality and learn the Mazda's vision for quality assurance

QC (Quality Control) Circle Activities

Mazda promotes QC circle activities to encourage members of each workplace to find and solve problems by themselves. QC circle activities, which have been implemented for over 60 years as key activities for the company, have evolved into global activities, being conducted not only inside Mazda but also at its suppliers and dealerships. The All Mazda QC Circle Competition held every year at the Mazda Head Office is now participated by QC circles of overseas sites, such as those in China, Thailand, and Mexico.

FY March 2022 All Mazda QC Circle Competition President's Award Quality Engineering Department (Hofu Plant) Dash Circle

Training Program to Deepen Employees' Understanding of the Mazda Brand

To enable Mazda employees to explain Mazda's products and communicate the concept of Mazda's monotsukuri, or product development and manufacturing, with their own words to Mazda's stakeholders, Mazda offers a training program for employees, designed to help them deepen, through test rides in the latest models,their understanding of not only each product's characteristics but also the spirit and philosophy common in all Mazda products.

4. Results of Quality Improvement Initiatives

Mazda's initiatives to improve quality have been highly praised worldwide.

FY March 2022 Results

Country	Name of the Study	Vehicle Type and Rankings	Name of Company
U.S.	Reliability/Road Test by Consumer Reports	2022 Automobile Brand Ranking: 2nd	Consumer Reports
	2021 Automotive Performance Execution and Layout (APEAL)*1	CX-5: 3rd among compact SUVs	J. D. Power
Japan	2021 Automotive Performance Execution and Layout (APEAL)*2	CX-3: 3rd among compact SUVs	J. D. Power

*1 The J.D. Power 2021 U.S. Automotive Performance Execution and Layout (APEAL) is based on responses from around 110,000 purchasers of new cars. The study was fielded between February and July 2021.

*2 The J.D. Power 2021 Japan Automotive Performance Execution and Layout (APEAL) is based on responses from around 20,000 purchasers of new cars. The study was fielded between May and June 2021.

EXPLORNG PARTNERSHIPS FOR "CO-CREATION WITH OTHERS"

To ensure that Mazda will continue to thrive and grow, we must cherish and cocreate Mazda's uniqueness together with everyone involved with it. While enhancing alliances with existing partners, Mazda will continue to explore new partnerships—even outside the auto industry.

Open innovation

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.

Objectives of open 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

Mazda has been promoting inter-company collaboration with other automakers and suppliers, etc. 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 related to technologies compatible with alternative fuels, (P22)

March 2019: Participated in D-Call Net*1

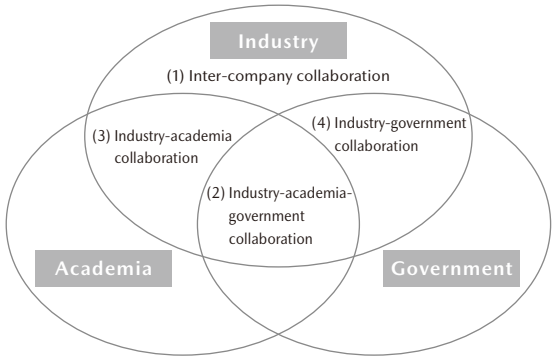
June 2019: Concluded a capital and business partnership agreement with MONET Technologies Inc.*2

April 2021: Reached an agreement to jointly develop technical specifications for next-generation vehicle communications devices and to promote the common use of communications systems*3

September 2021: Participated in the Japan Automotive Model-Based Engineering center (JAMBE)*4

November 2021: Participated in the Carbon Neutral Electricity Promotion Subcommittee in the Chugoku Region*5

System diagram of open innovation



(1) Inter-company collaboration	Collaboration with automakers and suppliers
(2) Industry-academia-government collaboration	Collaboration with local governments and companies (Hiroshima Council of Automotive Industry-Academia-Government Collaboration)
(3) Industry-academia collaboration	Joint research with universities Collaboration with government institutions and research institutions (participation in national projects)
(4) Industry-government collaboration	Participation in technology exhibitions organized by government authorities (dissemination of needs and seeds) Others (Model Based Development, Research Association of Automobile Internal Combustion Engines (AICE))

TOPICS Commencing Mass Production at Mazda Toyota Manufacturing

In August 2017, Mazda announced a joint plant construction alliance with Toyota Motor Corporation. In January 2022, with the commencement of mass production of CX-50 at Mazda Toyota Manufacturing (MTM), Mazda has established a production and supply system to deliver high quality products in a timely manner. At the ceremony commemorating the commencement of mass production, the President of Mazda expressed his appreciation for the people involved in setting up the new plant, the Huntsville, Alabama community, and the partnership with Toyota Motor Corporation. Mazda aims to become a company that is trusted and chosen by North American customers through sales reforms in North America,*1 products that meet local needs, and the start of mass production.

CX-50

*1 For the details of the sales reforms in North America, please refer to the Mid-Term Management Plan announced in November 2019.
https://www.mazda.com/en/investors/policy/mid-term/

*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.

*3 An agreement between Suzuki Motor Corporation, Subaru Corporation, Daihatsu Motor Co., Ltd., Toyota Motor Corporation, and Mazda Motor Corporation that the five companies will jointly develop and share safer and more convenient connected services with the aim of providing such services as early as possible.

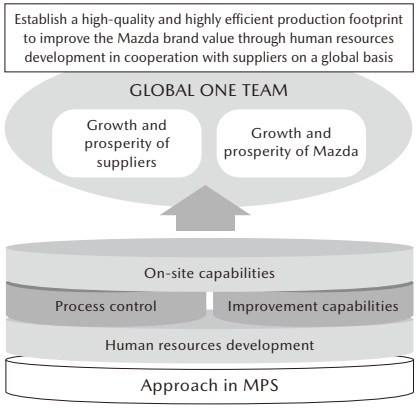
*4 An organization aimed at spreading Model-Based Develop (MBD) technology widely to the automobile industry nationwide. It was established in order to create the most-advanced development community in the mobility sector, with capabilities to carry optimal and high-grade monotsukuri efficiently and without rework.

*5 Set up as one of the special subcommittees under the Chugoku Region Carbon Neutrality Promotion Council, established by the Chugoku Economic Federation. The subcommittee carries out discussions to expand the supply and demand of carbon-neutral electricity in the Chugoku Region.

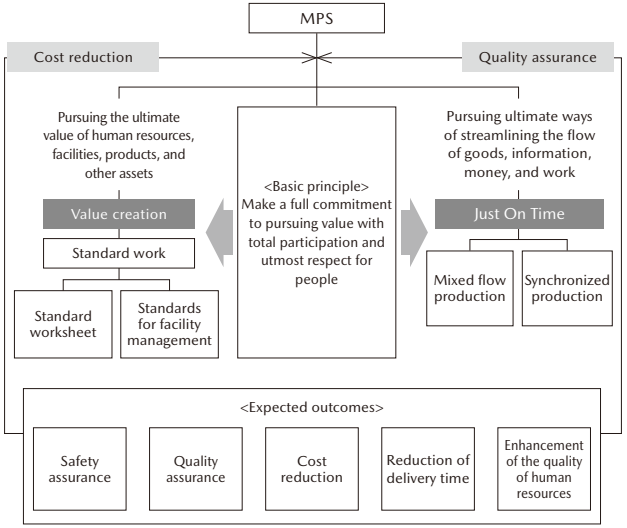
Implementation of the Autonomy Development Program That Supports the Autonomous Growth of Local Suppliers

Mazda has conducted 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 production activities that improve the Mazda brand value and to learn from each other at the same time. The program is designed to enhance human resources development as the key to the autonomous growth of local suppliers, for which the Jiba Achieve Best Cost (J-ABC) program as a foregoer was not clearly intended. In the Autonomy Development 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 are encouraged to create a system to develop human resources through practical project work toward the company-wide operation of the system. Launched at three model suppliers in August 2019, the program is being conducted at a total of 19 suppliers (as of September 2022), with seven Mazda Production System (MPS) Master Trainers appointed from five of those suppliers to lead other supervisors toward full in-house implementation of the program.

Vision to promote MPS



MPS flow chart



Program developed for local suppliers

•Autonomy Development program
Promote the autonomous growth of suppliers by providing the opportunity for learning, practice, and evaluation.

Training program	Outline	Period of training
(1) Top management training	MPS training Lectures and workshops	56 hours in seven days
(2) Promoter training		
(3) Management training	MPS training Lectures, workshops and site visits	80 hours in 10 days
(4) Supervisor training	Practical project work at suppliers	About one year of practice

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

In the course of transition to the Autonomy Development program in Japan, the Company has adopted the Global Manufacturing Network (GMN) at overseas production sites toward the autonomous growth of local suppliers. The four overseas production sites including AutoAlliance (Thailand) Co., Ltd. (AAT), Changan Mazda Automobile Co., Ltd. (CMA), Changan Mazda Engine Co., Ltd. (CME), and Mazda de Mexico Vehicle Operation (MMVO), engage in activities with 14 local suppliers in total as of September 2022. A total of 19 members from 12 suppliers have been appointed as MPS Master Trainers.

(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 activities have been conducted, 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 By establishing the Digital Monozukuri (Manufacturing) Education Research Center at Hiroshima University, Mazda has been conducting R&D activities related to innovative materials technology, data-driven control technology, and smart inspection monitoring. In March 2022, the construction of a material MBR*3 building and a data-driven technology research building was completed. Mazda will continue to accelerate activities with a view to the social implementation of development technologies in the future.

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.

Major initiatives

	Initiative	Details and results
Assisting elementary schools in providing programming education	Assisting local elementary schools in offering hands-on programming classes by following a curriculum designed under the leadership of Hirojiren and using videos and car-shaped robots (providing a series of educational materials, offering preparatory training to teachers, and assisting in teaching practical skill classes)	Provided support for programming education at elementary schools, which has become compulsory in Japan since FY March 2021, as an initiative to foster the next generation of innovators by assisting elementary schools in Hiroshima Prefecture in offering programming classes following a curriculum focused on the theme "Let's think about the future of our lives and cars." Created and provided learning videos on issues faced by automotive society and efforts to solve them, gave programming classes using crash-free car-shaped robots, and offered preparatory practical skill training to teachers working at the participating schools (with the participation of 1,270 students at 15 schools).
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
Efforts for the spread and expansion of next-generation liquid fuel	•Demonstration testing of next-generation biofuels •Studies on micro algae	•Started demonstration testing on the use of next-generation biofuels made of used cooking oil and micro algae collected locally for company and public vehicles in 2020 (in collaboration with Euglena Co., Ltd., FamilyMart Co., Ltd., UEDAYUSHI Co., Ltd., and YOSHIKAWAYUSHI Co., Ltd.) •In September 2022, started the use of next-generation biofuels for buses to transport players of soccer clubs, Sanfrecce Hiroshima and Sanfrecce Hiroshima Regina to their home games, expanding the initiative in the region across different industries. •In order to realize mass production of fuels that cannot be covered only by used cooking oil, Mazda has been promoting studies on micro algae culture with the support of the Japanese government in collaboration with partners, including the Institute of Microalgal Technology, Japan (IMAT), Hiroshima University, and Tokyo Institute of Technology, which established a research base on Osaki Kamijima Island in 2022.
Research and development of power source for vehicles	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 (sensibility) field	① Research and development of KANSEI (sensibility) technology and basic research on sensibility in collaboration with Hiroshima University ② Joint research on sensibilities with local suppliers ③ Overall coordination of sensibility activities by relevant local groups	① Completed the Center of Innovation (COI) program led by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) (FY March 2014 – FY March 2022). Will promote brain science studies through industry-academia collaboration at the global site of Hiroshima University's Center for Brain, Mind and Kansei Sciences Research (BMK Center) going forward. ② Aims to create and implement "new value for customers" in vehicle cabins by working with suppliers of interior and exterior materials. Currently working on the development of human model hypothesis by focusing on seven "sensibility axes" in the Model Based Development (MBD) by connecting human models and vehicle models related to sensibility in vehicle cabins. ③ Starting in FY March 2022, the eight regional support agencies worked closely together to provide more coherent support by leveraging the expertise of each agency for the projects since it had been difficult for individual agencies to provide support on their own. Also, strengthened the partnership with Hiroshima regional collaboration and support activities by the Hiroshima Kansei (Sensibility) Innovation Promotion Council as a special subcommittee on sensibility under the Hiroshima Council of Automotive Industry-Academia-Government Collaboration (Hirojiren).
Human resources 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 seven years since FY March 2017, a cumulative total of 7,079 individuals participated in the training (as of August 2022). 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.

Digital Monozukuri (Manufacturing) Education Research Center

Material MBR Building / Data-Driven Technology Research Building

Initiative to Develop Human Resources: Implementing Internship Programs

As an effort for human resource training through industry-academia-government collaboration, Mazda provides internships for technical college and university students. Since FY March 2016, Mazda has improved the organizational relationship with the schools to provide a program with different levels that cover students from lower grades up to the doctorate level. This is provided as a place of self-training with a focus on the foundation of innovative human resources, that is, high ambition and practical skills. Students can nurture their own ambition and dreams through the corporate ambition and philosophy, and improve their practical skills through cocreative work and practical training.

Although no internship programs were implemented due to the COVID-19 pandemic in FY March 2021, Mazda resumed some of the internship programs linked with joint research aimed at strengthening collaboration with schools subject to joint research and accelerating research as well as internship programs based on the proposal of themes of work experiences from universities and students as part of the practical online training program in FY March 2022.

A scene from a FY March 2020 internship program

*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.

*2 The 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: Kiyotaka Shobuda, Representative Director and Chairman of the Board of Mazda Motor Corporation

*3 Model Based Research

(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.

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.

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://www.nedo.go.jp/activities/ZZJP_100077.html (Japanese only)	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 https://www.nedo.go.jp/activities/ZZJP_100097.html (Japanese only)	Research on technology to make use unused energy*1 released as thermal energy into the atmosphere
Ministry of Economy, Trade and Industry / New Energy and Industrial Technology Development Organization / Green Innovation Fund Projects Coordination Office	Green Innovation Fund Projects / Development of Next-Generation Batteries and Next-Generation Motors https://www.nedo.go.jp/news/press/AA5_101535.html (Japanese only)	In addition to improving the performance and reducing costs of storage batteries and motor systems, efforts will be made to improve performance and save resources from the material level and to put advanced recycling technologies into practical use.

*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

University	Collaboration outline	Measures and activities
Hiroshima University	Next-generation automotive technology joint research course (since April 2015) Mazda has set up five joint research courses with the university (e.g., an internal combustion engine lab, the Algae Energy Creation Laboratory) 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 *Monotsukuri* (product development and manufacturing) through human resources development and research and development based on Model-Based Research (MBR) and Model-Based Development (MBD). 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. 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.	Opened next-generation automotive technology joint-research course (in April 2015) ・Internal combustion engine laboratory (opened in April 2015) ・Aerodynamics laboratory (opened in July 2016) ・Advanced materials laboratory (opened in October 2016) ・Algae energy creation laboratory (opened in April 2017)(P22) ・Model based development laboratory (opened in April 2019) 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. Regional empowerment and open innovation 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 (P91).
Hiroshima City University	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.	In FY March 2022, held a co-creation seminar that conducted formative activities on the theme "Eternal Flame" (Miyajima flame holder)."
Kyushu University	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. 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.	Opened the Mazda Next-generation Energy Storage Joint Research Department (in August 2017). 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 2021).
Kindai University	Agreement concerning comprehensive research collaboration (since December 2012) Cooperating in bolstering cutting-edge research development and in strengthening the technological capabilities of local industries.	Research Collaboration Promotion Committee ・Held meetings to discuss the progress of joint research projects and specific measures to strengthen cooperation.
University of Hyogo	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.	Set up an experimental station dedicated to research into applications of advanced analytical techniques.
Tokyo Institute of Technology	Mazda's participation in Tokyo Tech's Super Smart Society Promotion Consortium (from October 2018) In the consortium, industry, government and academia collaborate in accelerating the development of both essential technologies and human resources that are necessary to realize a super smart society (Society 5.0). Mazda has contributed to integrating physical-space technology and cyberspace technology toward a connection between people, the earth and society and to providing education about a combination of the most advanced sciences and technologies, including quantum science and artificial intelligence. Membership system (from April 2020) In April 2020, Tokyo Tech's Industry Liaison Member system shifted to the Membership system. Mazda pursues comprehensive information sharing and collaboration with the institute. Comprehensive Security Protection Agreement (from October 2016) The agreement defines comprehensive security protection rules that apply to technical consultation and other occasions. Lecture on automotive technology Along with Toyota Motor Corporation and Honda Motor Co., Ltd., Mazda has been commissioned to teach automotive technology courses at the School of Engineering every three years on a rotating basis.	Mazda's participation in Tokyo Tech's Super Smart Society Promotion Consortium (from October 2018) • Participated in matching workshops for exchange of information about research seeds and companies' needs, held twice a year, to promote the matching of joint research projects • Collected and disseminated the latest information on relevant technologies through free symposiums and seminars • Conducted joint research utilizing big data, machine learning, etc. (from FY March 2021) • Introduced and arranged internships Membership system (from April 2020) • Assisted in materializing joint research projects, held free seminars, etc. Comprehensive Security Protection Agreement (from October 2016) • Simplified the procedure for security protection during technical consultation Lecture on automotive technology • Structured and implemented the lecture based on the concept of Mazda's Monotsukuri

(4) Industry-government collaboration

Mazda efficiently promotes cutting-edge joint research and shares needs and seeds with suppliers 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 2022 Activity

Activity Organized an event to share information about Mazda's needs with the Kyushu Automotive and Motorcycle Industry Promotion Council and held the online event "Kyushu New Technology and New Methodology Exhibition in Mazda," with the participation of companies in the Kyushu Region.

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. This study group concluded its activities in March 2021, and in order to carry on the results of the study, ten companies became operating members, and the "Japan Automotive Model-Based Engineering center (JAMBE)" was established in September 2021 to spread MBD technology widely to the automobile industry nationwide. Mazda is also participating as one of the operating member companies, and it takes full advantage of its knowledge of virtual simulation and unique MBD that have been refined through Mazda Digital Innovation (MDI) 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. AICE is currently conducting basic research under a research scenario aimed at achieving carbon neutrality by 2050. 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.

*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 2021).