

Quality Improvement

Exploring Partnerships
for "Co-Creation with Others"

EXPLORING 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,

Objectives of open innovation

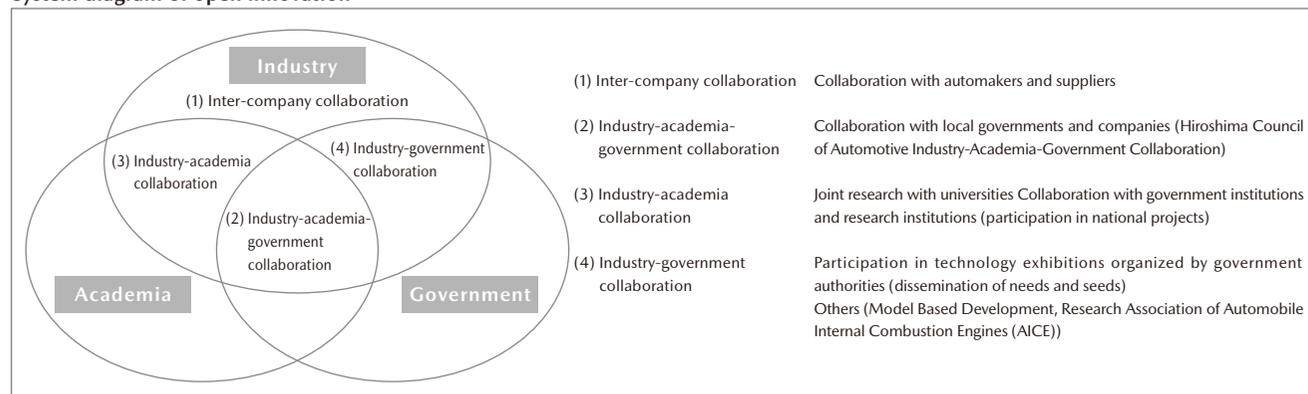
[Achieve the growth of the Mazda Group]

- 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

System diagram of open innovation



the Company will achieve the growth of the Mazda Group and contribute to society, thereby fulfilling the Corporate Vision.

(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}

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 **CX-50** 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.



^{*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 Development (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.

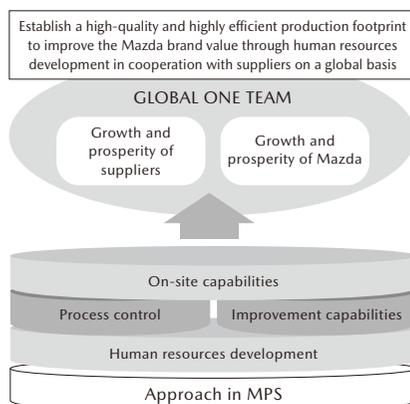
^{*5} Set up as one of the special subcommittees under the Chugoku Region Carbon Neutrality Promotion Council, established by the Chugoku Economic Federation. The subcommittee carries out discussions to expand the supply and demand of carbon-neutral electricity in the Chugoku Region.

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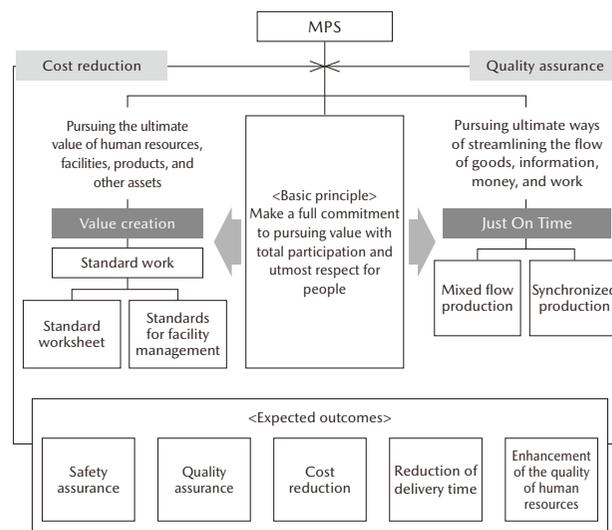
Implementation of the Autonomy Development Program That Supports the Autonomous Growth of Local Suppliers

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.

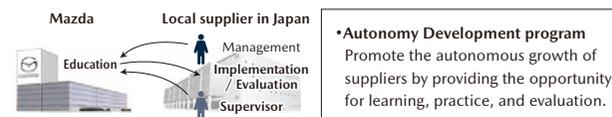
Vision to promote MPS



MPS flow chart



Program developed for local suppliers



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,

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, Sanfrece Hiroshima and Sanfrece 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) ^{**} advanced in the field of combustion and catalysts.
Research and development in KANSEI (sensitivity) field	① Research and development of KANSEI (sensitivity) 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 "sensitivity 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 (Sensitivity) 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) ^{**} 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.

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 Monozukuri (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.

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 <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). 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) <ul style="list-style-type: none"> 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 <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	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) <ul style="list-style-type: none"> 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) <ul style="list-style-type: none"> Assisted in materializing joint research projects, held free seminars, etc. Comprehensive Security Protection Agreement (from October 2016) <ul style="list-style-type: none"> Simplified the procedure for security protection during technical consultation Lecture on automotive technology <ul style="list-style-type: none"> 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).