ADVANCED DEVICES

Creating and growing businesses that solve issues faced by society and customers beyond the mobility domain

As a company reorganized to go beyond technologies and focus more on helping society and our customers, we are 1) collaborating on the sensing and actuation fronts, and 2) enhancing the value of systems through semiconductors that leverage our strengths derived from vertical integration. While creating new devices and systems, we aim to win the trust of our customers with an all-points approach to quality, cost, and delivery (QCD) in the expanding electrification market.

Yoshifumi Kato
Head of Business Group

Business Strengths

Creation of New Value with Sensing and Actuation

Within the business group, our core technologies in actuation (i.e., hands and legs) are combined with semiconductors (i.e., brains) and sensing (i.e., eyes) to create new devices and systems based on nimble concepts, enabling the development of "great-if-possible" solutions for issues faced by our customers.

Leadership That Drives Collaboration with Partners and External Production Contractors, in Addition to Internal Production of Semiconductors

In preparation for expansion in the electrification market, DENSO will internally produce Si and SiC power semiconductors that are key devices with world-first technologies. We will guide our supply chain to make the necessary improvements to cost competitiveness and supply capabilities.

On-Site Capabilities That Support Production Technologies Highly Resilient to Changes in Specifications and Volumes in New Product Domains

DENSO is broadening the scope of applications for new product domains where it is competitive, thanks to human resource development and handpicked young employees. DENSO leverages digital-twin technology and collaborative robots to build a production system that can be optimally organized and configured by changing production line shapes and locations in accordance with fluctuations in volumes for new products.

Business Strategy for 2022

DENSO contributes to the creation and proliferation of the next generation of mobility solutions by building robust supply chains and improving its internal production of mechatronics and semiconductors. At the same time, we are using and deploying core technologies in non-automotive fields, such as agriculture and factory automation, to address issues related to carbon neutrality, labor shortages, and an aging society.

Growth Strategy	DENSO aims to create new businesses, products and solutions, with the help of external partners and other business groups, going beyond the capabilities of its own business groups to solve problems at customers. Moreover, the Company is leveraging its strengths derived from vertical integration to spur growth and improve the value of systems for the DENSO Group with its semiconductor capabilities.
Strategy for Businesses Nearing Final Stages	We decide to continue operations after reviewing each product, centered on products for internal combustion engines, from the standpoints of whether we can continue to reliably supply quality products, whether we can maintain and improve competitiveness, and whether core technologies may tie in with new domains. When we decide to discontinue products, we make sure our customers are able to continue operations as our businesses near their final stages. We will continue to offer other products that align with our *Monozukuri* capabilities while eyeing carbon neutrality from the manufacturing to use stages.
R&D	DENSO aims to create new systems and devices that solve problems from a market-oriented perspective, going one step beyond *Monozukuri* that satisfies required customer specifications. The Company aims to offer new solutions for problems at customers and in society as a whole by fusing together components, software, and AI technology.
Monozukuri	DENSO develops and invests in production lines able to switch product types and volumes by sharing equipment in new domains with uncertainties that make it hard to anticipate volumes. The Company is concentrating skills and technologies on reforms to *Monozukuri* processes with the use of collaborative robots and digital-twin technology to facilitate workstyle reforms and alleviate labor shortages at production sites.

Outcome of Green and Peace of Mind Strategy

Objectives	Results
Expand lineup of individual products and advance entire projects in the CASE domain	Made steady progress toward commercialization by promoting new product concepts for the fields of electrification and safety
Reduce investments in products for internal combustion engines	Avoided major investments while gaining understanding of customers in contracting businesses for products used in internal combustion engines
Accelerate activities at head office and Group companies to reduce CO_2 emissions at plants	Began to shape up plans for conserving and creating energy at the Hirose Plant and DENSO HOKKAIDO CORPORATION

Efforts toward Quality

We are taking steps to ascertain quality-related risks that cannot be understood based on a product's required specifications alone by running simulations of how customers use our products and considering customer perspectives. We are also building quality into our highly reproducible product design and manufacturing processes at Group bases in Japan and around the world, in order to ensure equal quality in all of our products globally. All of us are working diligently to get a fresh start on quality by preventing quality-related risks from materializing and never forgetting our "Customer First" approach.

Specific Initiatives to Achieve Strategic Aims

Collaborative Production in Automotive Power Semiconductors

In April 2022, in order to meet growing demand for automotive semiconductors amid the rapid development and proliferation of electric vehicles, DENSO signed an agreement to collaborate on the production of power semiconductors at the 300-mm wafer plant operated by United Semiconductor Japan (USJC), the Japanese subsidiary of United Microelectronics Corporation, a leading chip foundry. Through this partnership, DENSO aims to produce high-performance power semiconductors with high cost efficiency by combining USJC's 300-mm wafer production technologies with DENSO's system-oriented IGBT* device and process technologies, with plans to launch IGBT production on 300-mm wafers in the first half of 2023. This initiative was selected by the Ministry of Economy, Trade and Industry for subsidies to cover the cost of projects for decarbonizing and upgrading production facilities for semiconductors essential to supply chains. This initiative aligns with the government's strategy to reinforce the production of semiconductors in Japan, and will contribute to the electrification of vehicles through the reliable procurement of power semiconductors that are essential in electrification efforts.

* IGBT = Insulated gate bipolar transistor

Resolving Social Issues through Our Businesses

Relevant SDGs

Contributing to Improvements in the Practicality of Electric Vehicles

DENSO has successfully developed and mass-produced the world's first high-efficiency cooling water control valve (MCV-e) as a prime example of the efficient control and use of thermal energy. Reducing energy consumption can result in longer driving distances for electric vehicles, shorter recharging times, and lower system costs. Our products including a new electrical current sensor, featuring a 40% smaller size with better current detection accuracy for detecting the discharge and charge current in batteries, have been adopted by Toyota Motor in its bZ4X model and by Subaru in its Solterra model. Our next-generation power modules with SiC diodes and SiC transistors are 30% smaller in volume and reduce power loss by 70% compared with previous products. These power modules have also been adopted by Toyota Motor for its new MIRAI model.
We will continue efforts to offer products that help realize a carbon-free society.

MCV-e

Electrical current sensors

SiC power cards