

Research and Development Strategy

Review by the Director in Charge

We value diversity in our technologies and personnel for making us more adaptable to rapid change and capable of creating new businesses

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Responsible for Research & Development,
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Reinforcing Our R&D Base with an Eye to the Future

In April 2020, the MGC Group undertook structural reforms to unify research organizations that were formerly attached to various divisions under the Research & Development Division, which manages Group R&D operations and distributes resources to over 100 research themes, with maximal results in mind. Over the past five years or so, we have been seeing a new system for more effective distribution of management resources and smoother information-sharing taking root across the Company.

Before assuming my current post, I was in charge of developing new products and applications for existing products in the Inorganic Chemicals Division, and later, in the Electronics Materials Division, I supported the development of new products and applications. Appropriately suggesting new products and upgrades of existing products to meet customer needs ahead of our competitors on the front lines of each business could immediately support profit, but it could also delay exploration of long-term themes and preparations to

shield us from potentially destructive innovation. To overcome the difficulty of achieving both short-term organic results and longer-term inorganic growth, it is important that the Research & Development Division take initiative in envisioning the future of each business, maintaining close ties with the respective divisions.

In January 2025, we reorganized the Research & Development Division to better support comprehensive R&D operations, from exploration of research subjects to setting strategic themes and creating new businesses from them, backcasting from our vision for an ideal future society. Under the new system, which unifies the exploratory function of R&D with the formation of business prospects, we are creating businesses that will contribute to the infrastructure of future society. Because it takes time for new businesses to start contributing to profit, as new businesses are sprouting one after another within our research organizations, I think it is important to carefully cultivate these young seedlings to enhance our business portfolio.

Promoting Diversity in Technology and Personnel for Emerging Innovation

We believe the key to successful execution of a research strategy is enabling innovation to emerge. While it is obviously important to respond quickly to technological challenges presented by our customers, if our solutions can be reproduced by our competitors given enough time, sooner or later we will lose that competitive advantage. Therefore, it is vitally important that we routinely sharpen our technological skills to encourage the emergence of innovation, so we can create unique molecular designs and synthetic and cultivation processes that no other company can copy, and visualize mass production using processes where we have the edge. In doing so, we increase our potential to quickly commercialize products that only MGC can offer as potential customer needs surface in the near future. Examples of such products are BT resin, which sustains the evolution of electronic devices, and ultra-pure hydrogen peroxide, which we marketed worldwide in the dawn of the semiconductor industry, anticipating customer needs. For those products, we refined technological seeds before markets appeared

and put our innovation power into practice, working to transform the world. In addition, as technology evolves and times change, previously low-profile products can be reevaluated positively. A case in point is the OPE low-dielectric resin we introduced in 2013. It had limited applications in the beginning, but with advances in telecom infrastructure and the spread of AI servers, its properties were reevaluated and demand for it is rising as a material for multilayer substrates.

I have been involved in the chemical industry for many years, and I strongly feel the complexity of the causes of various social issues. We are facing problems that lack clear solutions. That is why we have to maintain the diversity of our businesses and technologies. While that is a strength of the MGC Group, I know we have to promote the mobility and diversity of human resources going forward. We are working to further expand diversity by collaborating with academia and venture businesses, without insisting on doing everything on our own, to create seeds for future products.

Research and Development Strategy under MTMP 2026

Under the current medium-term management plan (MTMP 2026), we have identified MGC's strategic research areas for strengthening the resiliency of our business portfolio. We will focus on three target areas: mobility, ICT, and medical/food, due to their market growth potential and suitability for MGC. For each of the three areas, we will concentrate our investment of R&D resources by zeroing in on priority focus themes such as new BT laminate materials, new semiconductor cleaning solutions, OXYCAPT™, solid electrolytes, and continuous carbon fiber composite material.

Another objective of MTMP 2026 is to promote sustainability management. In pursuing this, we have added sustainability to the three target areas above, and we will also generously allocate R&D resources on research themes that can contribute to resolving the issue of climate change. We have set the following materiality KPIs for our fiscal 2030 targets: percentage of R&D cost contributing to increased resiliency of business portfolio, percentage of research personnel contributing to solving climate change issues, and percentage of DX human resources among research personnel. We review our progress on these KPIs regularly. Moreover, continuing the approach of our previous medium-term management plan (MTMP 2023), we will score all research themes based on an objective standard to allocate resources to promising themes and build a strong core of U&P businesses.

In January 2025, following a companywide review of the three target areas and climate change-related themes, the organization within the Research & Development Division responsible for creating and developing new businesses was reorganized by business domain to enable seamless execution from strategy formulation through to business development. This resulted in two groups: the ICT・Mobility・Sustainability Department and the Health Technology & Solution Department. Under this

organizational structure, we will accelerate the creation and development of new businesses, and generate new U&P businesses that are "Growing," "Winning," and "Sustainable."

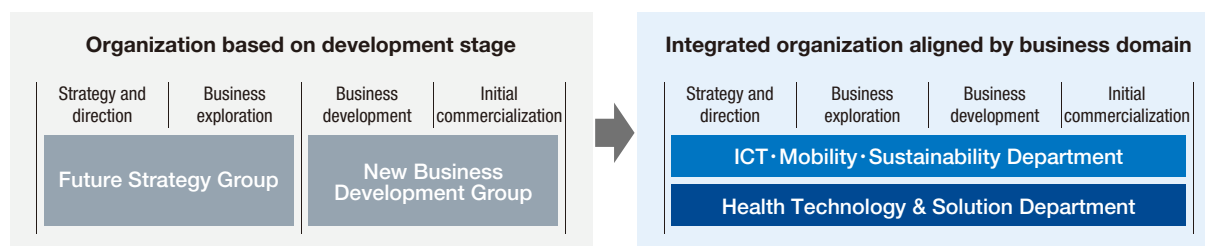
Cross-Functional Role of the Research & Development Division

To expand the lineup of core products in the U&P businesses, the Research & Development Division plays a cross-functional role, coordinating across the business divisions, itself (as Corporate R&D), and the Group companies, to propose new research themes and promote collaborative initiatives aimed at enhancing the product value of current research themes. Examples of such cross-functional activities include organizing the MGC Group Poster Presentation, in which MGC Group companies come together in one place to present overviews of their research and individual R&D results, and Mutual Observation Tours between Group companies. Collaboration between the companies has proven effective in areas such as increasing the speed of research, discovering projects that promise to add higher value, and invigorating interaction among research personnel.

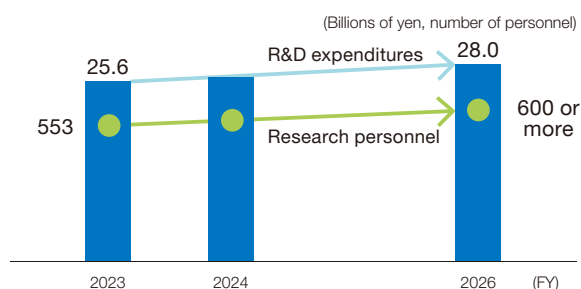


The First MGC Group Poster Presentation

Review of Organization for New Business Creation and Development

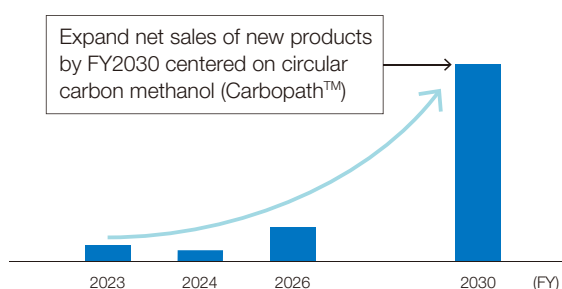


R&D Expenditures and Research Personnel*1



*1 Excluding Group companies

Net New-Product Sales*2



*2 Net sales of products launched within the past five years as of FY2024 and products scheduled for launch in FY2024 onward

DX Initiatives in Research and Development Activities

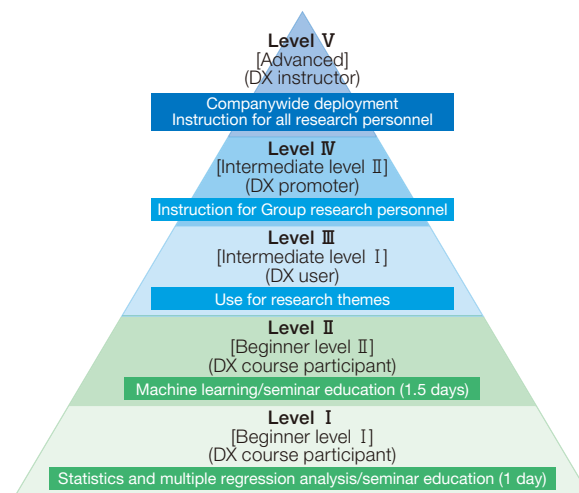
The Group is aiming to increase productivity across R&D activities in general by promoting DX. We started by launching a specialist team for DX analysis in 2021, and introducing a supercomputer. In fiscal 2024, while expanding the DX team, we installed an additional supercomputer to augment our capability. These initiatives have achieved outstanding results such as prediction of material properties using computational chemistry and analysis of synthetic reactions. In addition, using our in-house developed machine learning tool, MLAB, we have been able to dramatically speed up research activities by estimating optimal molecular structures, raw material compositions, and manufacturing conditions.

To enable all researchers to become proficient in using these DX-related technologies spearheaded by our specialist team, including researchers at our plants and Group companies, we are promoting level-specific education and use of the technology in actual research through on-the-job training. Specifically, we are conducting level-specific education, having classified five DX technology levels, I to V. By fiscal 2030, we are aiming to have 80% of all research personnel reach at least Level I DX personnel status.

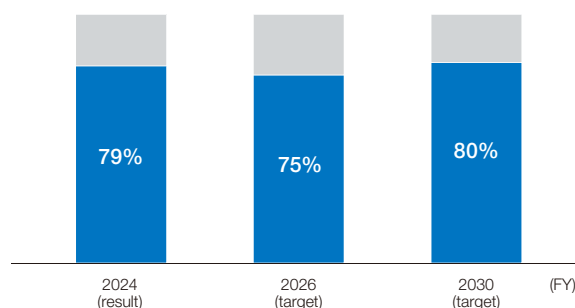
In fiscal 2024, the number of on-the-job type practical training projects increased, and we saw further advances with DX applied outside of the R&D area, for example in the production divisions of plants. At the MGC Group DX Technical Exchange Meeting, participants share these kinds of examples, helping to promote awareness of how DX can be applied effectively. The MLAB machine learning tool is to be deployed in Group companies from fiscal 2025.

Looking ahead, we aim to achieve routine use of DX technologies by all research personnel, so that they can proactively use digital technology to transform R&D. Our

first step is to establish a next-generation R&D approach that is accelerated by applying DX technologies before experiments to narrow down experiment conditions.



Percentage of DX Human Resources among Research Personnel (Level I Equivalent)



Employee Comments

In-House Development of the MLAB Machine Learning Tool

The MLAB machine learning tool was developed by the DX team that was launched in 2021. The tool is used to streamline the experimental process for molecular design and material development, which involves an enormous amount of trial and error. Research can be dramatically accelerated by using MLAB to predict experiment results in advance and narrow down experiment conditions. MLAB is equipped with specialized functions for chemistry that are not offered in commercially available tools. It is designed especially to enable simple and intuitive operation, even without knowledge of data analysis or programming. Another key feature is that researchers can use their own data to build a machine learning model that will deliver highly accurate predictions. We have created a powerful tool that can be applied across a wide range of research themes in the chemical industry.

MLAB was unveiled internally in August 2023. It proved immediately popular with many research personnel, who

found the tool to be exactly what they had hoped it would be. Following its announcement, a flurry of analysis activity using MLAB was seen in various laboratory and plant divisions, where it has already produced tangible results. I myself am striving to improve my analysis technique using computational chemistry and data science so that I can help to establish analysis technology as a foundational technology across the Group and further contribute to data-driven R&D.



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Intellectual Property Strategy

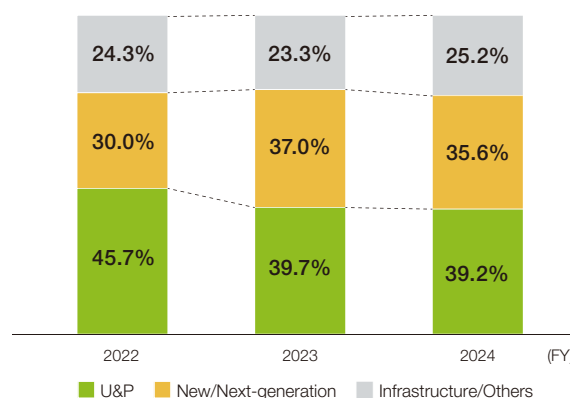
Intellectual property strategy is particularly important for chemical manufacturers pursuing sustainable growth. Acquiring patents, trademarks, and other intellectual property rights for new compounds, materials, manufacturing processes, and applications and analyzing information are core functions supporting innovation and growth. With the aim of creating intellectual properties based on the results of ongoing R&D activities, the Intellectual Infrastructure Center works to formulate intellectual property strategies aligned to the external environment surrounding research themes and their development stage. It also files patent applications and acquires patents based on the strategy, and conducts information analysis using an IP landscape. For example, over 70% of the patent applications were related to U&P businesses and new/next-generation businesses, showing that the results of R&D in the Company's focus areas are being relayed into the creation of a large number of intellectual properties, strengthening our competitive advantage. By further advancing the use of an intellectual property management system that utilizes digital technology, we will work to transition to data-driven intellectual property operations.

In our IP landscape, which combines external and internal information, we aim to propose R&D, business and management, and intellectual property strategies. One way we can utilize this is by taking an overview that combines external information on patents, documents, and public releases collected by AI, and internal information on intellectual property, R&D, and sales. This enables us to match social needs with the Company's unique technologies and resources (seeds). We are using this in analysis of technology trends in the field, analysis of potential competition, analysis of likely customers, and for discovering new applications for existing products.

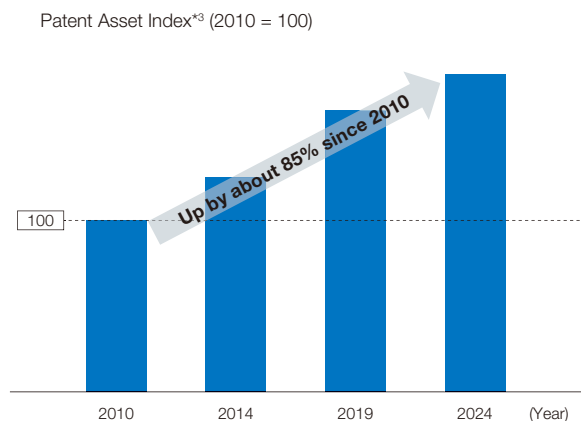
In this way, we are expanding the use of this system to business divisions as well. As an IP landscape initiative, we implemented a project to explore new R&D themes with members from other divisions, incorporating fresh perspectives beyond business sites and divisions into the proposal of R&D strategies. The objectives of IP landscape analysis have shifted from "trend surveys" to "strategic analysis," aiming to address the IP landscape in terms of strategies for R&D, business, and IP.

In this way, the Intellectual Infrastructure Center plays the role of a corporate division in that it also functions as a hub bringing together various business divisions, human resources, and businesses. We will look to promote the IP landscape inside the Company and provide a concrete demonstration of its effectiveness with the aim of seeing it used as a familiar tool to test employees' ideas and hypotheses.

Ratio of Patent Applications (Non-consolidated)



Trend in Total Patent Value of the Group



^{*3} An index that visualizes the technological strength and influence of an applied patent in global terms, obtained by objectively evaluating quality (value based on how often the subject patent is cited worldwide) and quantity (number of applications)
Source: H. Ernst and N. Omland, World Patent Information, vol. 33, pp. 34-41 (2011)

IP Landscape Survey Objectives

