



Message from the
Executive Officer in Charge

Improving our R&D systems and speeding up the research-to-business process on new themes in response to accelerating, radical changes in our market environment

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Research theme evaluation system and other applications raise organizational efficiency and expedite decision-making

In the chemical industry, the process of turning a research theme into a business has been described as the “work of a decade.” These days, however, if a given project isn’t planned over a three-year period, we will fall behind the accelerating pace of change in our market environment.

To speed up R&D processes, we established and implemented a scoring system for evaluating research themes in 2022. By applying the same evaluation criteria to all research themes, we’re now able to more objectively set their order of priority in distributing resources. This also raises consciousness among our researchers about investment effects and encourages consensus building in their respective labs in deciding what to do about themes showing slower progress. It effectively assesses research themes and increases the frequency of assessments. In addition to regular monthly briefings by each lab, research

progress meetings, in which executives of the Research & Development Division and general managers of research laboratories meet, are now held monthly rather than quarterly. This has smoothed the coordination of opinions and decision-making and is giving us a great sense of velocity. Researchers have more opportunities for direct talks with executives, and apparently recognize the advantages of a system that allows them to proceed with management’s blessing.

In line with this, the perceived efficiency and speed of laboratory processes rose steadily during the previous three-year management plan, and I think we will be able to demonstrate specific results toward our goal of “new business creation” over the coming three years of the new Medium-Term Management Plan.

Three priority targets and a business field map to visualize R&D strategy

Under the current Medium-Term Management Plan, we will accelerate selection and focus in R&D efforts with results of the previous plan and development delays for new businesses in mind. First, the Research & Development Division sets the desired R&D direction for the medium to long term and projects how we can contribute to the society we desire for 2030 and 2050. Backcasting from these projections sparks in-depth discussions on the creation of new businesses. After this kind of review, the new Medium-Term Management Plan focuses on ICT and mobility for their substantial growth in recent years, and on the medical/food area for its market size in proportion to population with little volatility effect to secure diverse profit generators.

To assist in creating products that can differentiate MGC from competitors in our targeted areas, we built a business field map to visually represent the relationships among market trends, growth fields, proprietary basic technologies, and progress toward commercialization. To do this, we inventoried the technologies we have been

building as our foundation, our human capital, IP, and the like, and added views of inter-business synergies and collaborations with other companies and academia. Using this field map, we’ve made long and short lists of basic technologies to complement the organic development of technologies in-house.

With recent progress in generative AI, statistical science and computational chemistry, including MI, our R&D environment is substantially changing, and we project that change will continue to accelerate. MGC is promoting initiatives to ensure we incorporate such changes in our operations and expand that effort to the entire Group in the near future.

Now, in the first year of our new Medium-Term Management Plan, I understand that we are in a crucial phase that will significantly influence our future. With this understanding, we will generate new research themes in priority fields and work to develop them into new businesses, training DX personnel and applying and deepening our IP landscape.

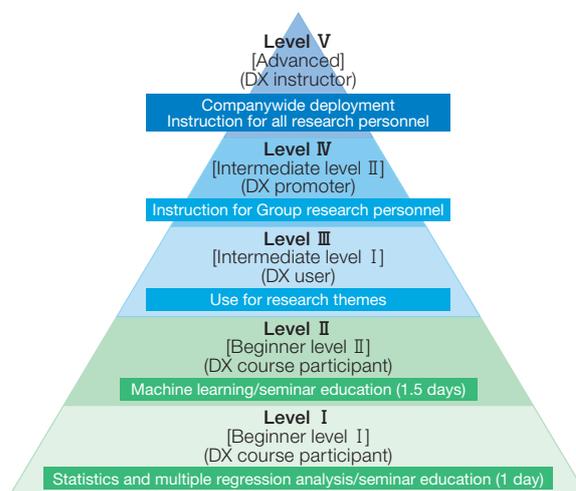
DX Promotion

DX Education Program in the Research Field

The launch of the DX team specializing in DX analysis and introduction of a supercomputer in 2021 made it possible to perform more advanced large-scale computation. This has produced remarkable results in predicting molecular structures with target properties and analyzing synthesis reactions using computational chemistry. In addition, using in-house developed data science software, we have been able to help speed up research and development by estimating optimal molecular structures, raw material compositions, and manufacturing conditions. We have also started work on automating and autonomizing experiments.

We are deploying these DX technologies not only for specialist teams, but for all research personnel. Specifically, we are conducting level-specific education, having classified five DX technology levels, I to V. By fiscal 2026, we are aiming to have all research personnel reach Level I DX personnel status. We are deploying DX technologies across the entire Group, aiming to achieve next-generation

research and development that is accelerated by applying DX technologies before experiments to narrow down the experiment conditions.



Intellectual Property Strategy

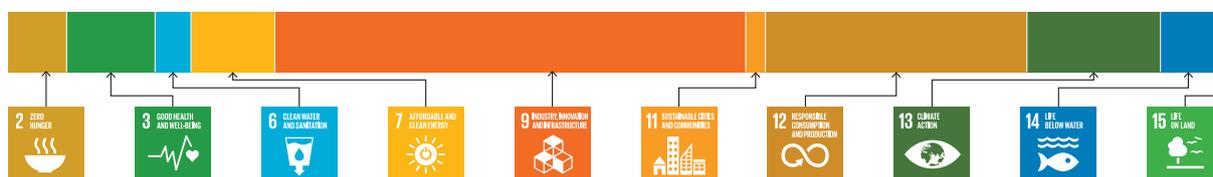
Intellectual property strategy is particularly important for chemical manufacturers pursuing sustainable growth. Acquiring patents and trademarks and the like for new compounds, materials, manufacturing processes, and applications and analyzing information are core functions supporting innovation and growth. With the aim of creating intellectual property based on ongoing research and development activities, the Intellectual Infrastructure Center works with research and development divisions 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 75% of the patent applications were related to differentiating businesses and new/next-generation businesses, which received priority allocation of management resources under the previous Medium-Term Management Plan, showing that the Company's competitive advantage has been strengthened through numerous research and development results. In addition, an overview based on the perspective of SDGs clearly shows that we have a wide range of technology corresponding to the various SDGs. 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.

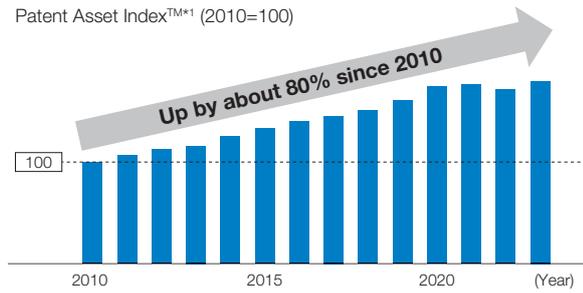
In our IP landscape, which combines external and internal information, we aim to propose research and development, business and management, and intellectual property strategies. One way we can utilize this is by taking an overview that combines external information on patents, documents and public releases, collected by AI, and accumulated internal information on intellectual property, research and development, 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 from research and development to business divisions.

In the near future, AI will quantitatively indicate the suitability of our research fields and themes including SDGs, and support the formulation of research strategies, thereby enhancing the value of the MGC Group's intellectual property and contributing to the Group's Mission of "creating value to share with society."

Total Patent Value (Patent Asset Index^{TM*}) of the MGC Group Identified from the Perspective of SDGs (As of December 31, 2023)



Trend in Total Patent Value of the Group



*1 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)

Ratio of Patent Applications

(Non-consolidated, fiscal 2023 results)



Promotion of SMART-FACTORY

MGC aims to balance ensuring safety, the foundation of its production activities, with environmental protection and efficient production. We are constantly pursuing our targets for all of these by raising the level of technical capability of employees engaged in production activities, and by introducing and continually improving the latest facilities (hardware) and systems (software).

We will focus on initiatives aimed at the realization of the SMART-FACTORY, which ensures advanced stabilization, improved productivity, and safety by promoting the technical improvement of processes and facilities, as well as the use of digital technologies in the form of sensors, systems, and mobile devices.

In fiscal 2023, we engaged in highly efficient production saving resources and energy by utilizing digital data accumulated in our data management systems, and focused on developing human resources who are able to utilize data. Furthermore, we conducted trials of quality forecasting and predictive analytics systems and operational

support and work support systems using AI, and are gradually implementing them. In our visual inspection system for corrosion of pipes in plants by applying Human in the Loop Machine Learning, which is in operation in the Niigata Plant, we have introduced new knowledge acquired during operations and we are now expanding the scope of application. In addition, we have fitted predictive analytics systems based on data analysis to some of our equipment, which enables us to respond to anomalies that were not able to be predicted with the previous alarm management approach. Data on plant operation is being used to build a SMART-FACTORY database and connect systems with the aim of coordinating with SMART-OFFICE for optimizing supply chains.

Through the utilization of these new technologies, we are realizing a higher level of plant operations, including stable operations through prevention of accidents and other problems and improved efficiency in routine operations.

Toward the Realization of SMART-FACTORY

