




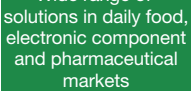


## Specialty Chemicals

<p><b>Inorganic Chemicals</b></p> <p>Primarily focused on cleaning agents for semiconductors</p> 	<p>Hydrogen peroxide</p> <p>Electronic Chemicals (EL Chemicals)</p> <p>Super-pure hydrogen peroxide    Hybrid chemicals</p> <p>Global market share</p> <p><b>#1 Super-pure hydrogen peroxide</b></p> <p>Secures supply capacity matching the growth of customers in response to robust demand from overseas semiconductor manufacturers. Also globally builds development facilities adjacent to customers and continuously provides products contributing to the speedy resolution of problems.</p>
<p><b>Electronic Materials</b></p> <p>Top manufacturer of substrate materials for IC plastic packaging</p> 	<p>Cyanate monomers</p> <p>BT resin</p> <p>BT Products</p> <p>Copper-clad laminates (CCL)</p> <p>Prepreg</p> <p>Global market share</p> <p><b>#1 BT products</b></p> <p>Captures new demand as 5G progresses, and steadily responds to robust demand in the semiconductor industry. Establishes and strengthens a marketing system conscious of end customers, and offers a wide range of high-performance products, primarily targeting the mid-range and high end of the market.</p>
<p><b>Optical Materials</b></p> <p>Contributes to higher performance of smartphones with world-leading refractive index</p> 	<p>Raw materials (External procurement)</p> <p>Optical resin/polymer</p> <p>Global market share*1</p> <p><b>#1 Optical resin/polymer</b></p> <p>Continues careful technical service along with timely development and introduction of new grades with the aim of further expanding share in the smartphone area, and also focuses on development of materials aimed at applications other than smartphones, such as sensing applications.</p> <p>*1 As a highly refractive resin (concave lens)</p>
<p><b>Engineering Plastics</b></p> <p>Develops engineering plastics</p>  	<p>Methanol    Formalin</p> <p>MX-Nylon (MXD6)</p> <p>Bisphenol A (External procurement)</p> <p>Iupital™ (Polyacetal resin) (POM)</p> <p>Reny™ (High-performance polyamide resin)</p> <p>Polycarbonate resin (PC)</p> <p>PC sheet</p> <p>PC film</p> <p>Global market share</p> <p><b>#3 Polyacetal resin (POM)</b></p> <p>Conducts management globally overseeing production, sales and technological development through business restructuring, and seeks to optimize management resources throughout the entire Group while making swift management decisions.</p> <p>Supply capacity*2</p> <p><b>#3 Polycarbonate resin (PC)</b></p> <p>Performs business restructuring to make MEP*3 a consolidated subsidiary focusing on the PC business, while increasing the percentage of high-value-added products such as highly transparent grades, and shifting toward a structure less susceptible to market conditions. Promotes research of PC mass-production technology using CO<sub>2</sub> as a raw material.</p> <p>*2 As the Mitsubishi Group    *3 Mitsubishi Engineering-Plastics Corporation</p>
<p><b>Oxygen Absorbers</b></p> <p>Wide range of solutions in daily food, electronic component and pharmaceutical markets</p> 	<p>AGELESS™</p> <p>RP System™ PharmaKeep™ Anaero Pack™</p> <p>Global market share</p> <p><b>#1 AGELESS™</b></p> <p>Aims to expand market share in the food area and also focus on the expansion of sales overseas. Also, provides total solutions for maintaining quality for non-food areas such as pharmaceuticals, medical parts, electronic components, and cultural property protection.</p>

# Basic Chemicals

### Energy Resources and Environment

Applies domestic natural gas exploration and development technology, and develops it for other energy businesses

Chemicals company

Only 1

### Geothermal power generation

Utilizing more than four decades of experience and accomplishments that distinguish us as a unique chemicals company, contributes to the reduction of GHGs through the supply of clean energy, and establishes a base for stable earnings.

\*4 Only the Niigata Plant's methanol pilot is currently operational \*5 Joint venture

### Methanol, Basic Chemicals I, Life Science

First in Japan to produce methanol using natural gas as raw material

Production capacity\*6

#3

### Methanol

Establishes a competitive position through active overseas expansion and a total business model encompassing the manufacturing process, catalyst technology, a global sales network and the manufacture of derivatives. Uses accumulated technology to focus on the establishment of processes for manufacturing methanol from CO<sub>2</sub>.

\*6 Total for all affiliates using MGC technology

### High-Performance Products, Basic Chemicals II

Manufactures competitive products and derivatives using proprietary technology

Global market share

#1

### Meta-xylenediamine (MXDA)

By building a new plant in Europe, where demand is greatest, establishes a more stable and competitive supply chain. In addition to stable growth of conventional infrastructure applications, accelerating expansion into environmentally friendly applications such as wind power blades.

Global market share

#1

### MX-Nylon (MXD6)

As momentum for extension of quality assurance and food waste reduction increases in the food packaging material field, aims to establish a position by providing recyclable barrier material friendly to the global environment. Also strengthens downstream deployment such as weight reduction of vehicles by replacing metal parts with resin.

Global market share

#1

### Aromatic aldehydes

Decided to increase its production capacity in response to steady growth in demand. Also focuses on marketing activities, aiming to diversify applications, add value, and further strengthen relationships with customers by shifting from seed-oriented development to product development that reflects customer needs.

Global market share<sup>\*7</sup>

#1

### JSP Foamed plastic

Backed by the tailwind of weight reduction in automotive parts, supplies next-generation products supporting energy-saving and recycling requirements. Seeks to increase sales backed by heightened needs for energy-saving housing in applications of residential insulation material. Expands overseas operations in flat panel display protective materials.

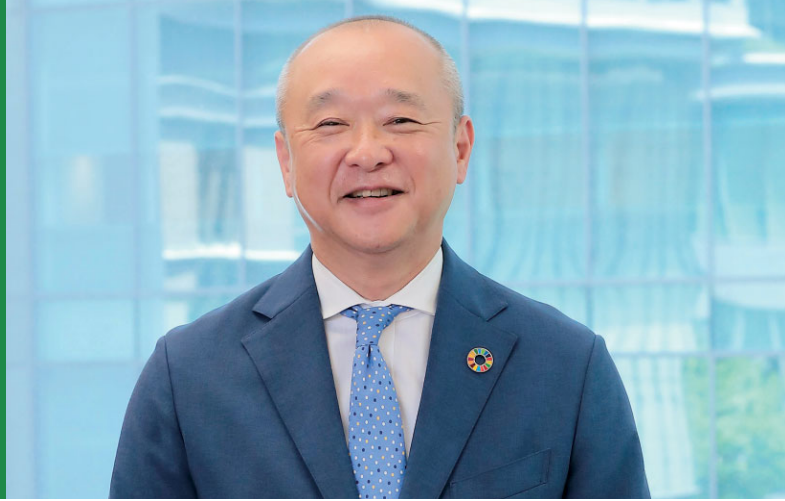
\*7 For automotive use

(Global market share, etc. are estimates made by the Company)

We will prepare an environment that can respond sensitively to changes in the market, and make new value proposals.

### Ryozo Yamaguchi

Director, Managing Executive Officer  
In charge of Specialty Chemicals Business Sector



### Slumping demand due to changes in the external environment. Starting work on business reorganization and revision of production and sales methods

In fiscal 2022, the Specialty Chemicals Business Sector had a strong start, mainly reflecting a rush to secure inventory due to supply chain disruptions. However, from the second quarter, demand retreated rapidly, especially in China, and stay-home demand due to the COVID-19 pandemic slowed. From July onward, demand for semiconductor-related products slumped, and in autumn, Europe and the United States showed clear signs of an economic slowdown. Due to the unevenness of supply and demand globally, in some products negotiating positions became stronger on the customer side, while in products such as polyacetal we were able to maintain sales volume even after passing through high raw material costs to our prices.

From another perspective, these changes in the business environment offer opportunities to promote differentiation and increase added value. In fact, there has been increasing activity for rebuilding supply chains and revising sales methods, not only in MGC, but in the industry itself. We recognize the necessity of observing the market with greater care than before, and exercising flexible judgment regarding when, to whom, and what kind of approach to take.

In our business portfolio reform, we focused on increasing the competitive capabilities of our engineering plastics. Among them, the polyacetal business saw strong effects from business reorganization in South Korea, where the reforms have happened first. We have continued to make changes, clearly demarcating manufacturing, sales, and business management roles between our subsidiaries, and we are now concentrating our management resources in preparation to ensure that our double brand strategy for Lupital™ and Kepital™ will work well. I am confident that we can expect significant synergies going forward. Meanwhile, having made Mitsubishi Engineering-Plastics Corporation a consolidated subsidiary in April 2023, we reorganized it to specialize in the polycarbonate business, which has been lacking momentum. With this change, we are driving forward the strategy of integrating manufacturing, sales, and technology, and we see recovering our competitive edge as an urgent priority.

### We are promoting reforms aimed at transitioning to a highly profitable structure. We are also focusing on environmental technologies

To realize a business structure that is able to respond to rapid changes in society, the Specialty Chemicals Business Sector is working to refine the points that differentiate it from other companies, while attempting to explore uncharted “blue ocean” markets. Therefore, our ability to engage with markets and identify partners is becoming increasingly important. With this in mind, in April 2023 we reorganized the Planning & Development Division, which oversees our development activities from an organization based on business divisions to one based on markets and functions. To take the example of the Electronics Materials Group, the person in charge of the development of electronic chemicals used in the front-end process of semiconductor manufacturing and the person in charge of BT materials used in the back-end process are working on the same team. By combining the perspectives of both the front-end and back-end processes for semiconductor manufacturing, we would like to broaden our dialogue with customers and come up with new value proposals for new chip architectures.

Furthermore, to promote strategies and measures flexibly, we set quantitative indicators for each business. We are building a structure that enables the Business Administrative Division, Corporate Planning Division, and the Finance & Accounting Division to coordinate and monitor the progress of each project across all aspects.

In the final fiscal year of the Medium-Term Management Plan, our top priority is to prepare a foundation to support improvements in the PC business. We aim to change our focus from quantity to quality, and get structural reforms on track as soon as possible. Meanwhile, semiconductors have come to be viewed as international strategic goods, and we therefore have started discussing optimal supply structures for related products in the lead up to our next Medium-Term Management Plan.

Over the medium term, we will strengthen environmental technologies for applications such as carbon neutrality and plastic recycling. Creating specific technologies and services aligned to the needs of society and markets is the proper mission of specialty products. By supplying added value, we will win recognition in the market and achieve the goal of balancing social and economic value. With a sound concept of a decent scale that contributes to the further advancement of society over the medium to long term, we will transition to a highly profitable structure.

## Basic Information

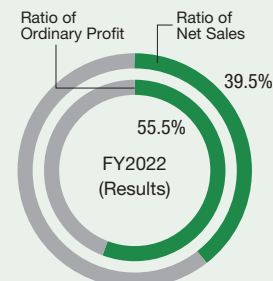
**Business Lines:** Inorganic chemicals, engineering plastics, optical materials, electronic materials, oxygen absorbers

### Major Group Companies:

TAIXING MGC LINGSU CO., LTD., SAMYOUNG PURE CHEMICALS CO., LTD., MGC PURE CHEMICALS AMERICA, INC., MGC PURE CHEMICALS SINGAPORE PTE. LTD., MGC PURE CHEMICALS TAIWAN, INC., MGC Filsheet Co., Ltd., THAI POLYACETAL CO., LTD., MITSUBISHI GAS CHEMICAL ENGINEERING-PLASTICS (SHANGHAI) CO., LTD., MGC Electrotechno Co., Ltd., MGC ELECTROTECHNO (THAILAND) CO., LTD., Mitsubishi Engineering-Plastics Corporation, KOREA ENGINEERING PLASTICS CO., LTD., THAI POLYCARBONATE CO., LTD., RYODEN KASEI CO., LTD., TAI HONG CIRCUIT INDUSTRIAL CO., LTD., GRANOPT CO., LTD., MGC AGELESS Co., Ltd., Yonezawa Dia Electronics Co., Inc.

**Number of employees:** 4,069

### Ratio of Net Sales and Ordinary Profit



## Overall Policy under the Medium-Term Management Plan

### Overall Policy

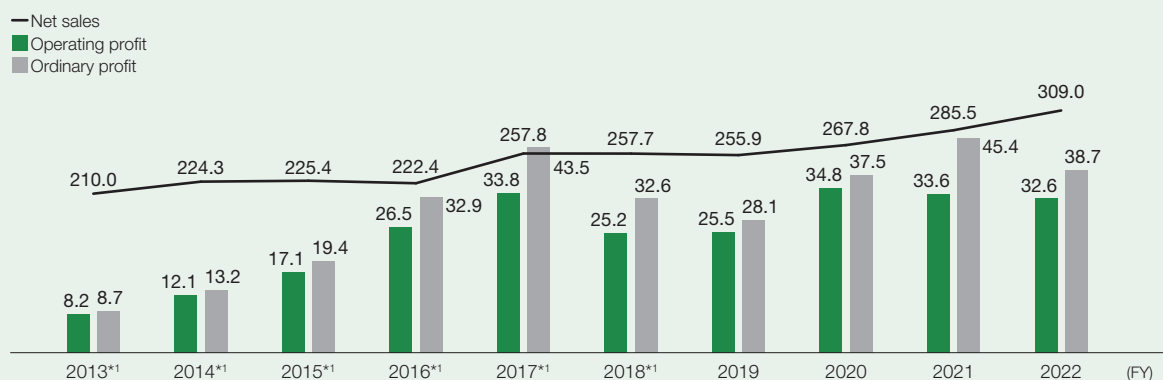
- Increase ratio of high-value-added products, strengthen cost competitiveness
- Continue capital investments in growth markets

### Numerical Targets (Announced in May 2021)

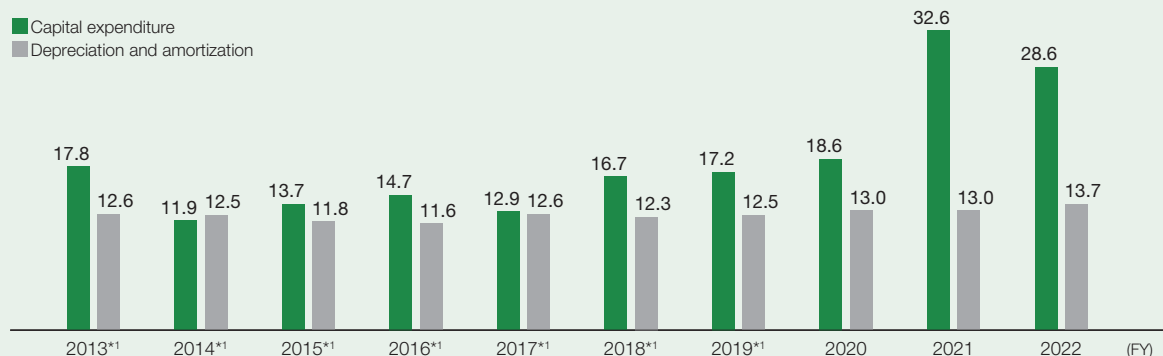
Net sales	Operating profit	Ordinary profit
¥330.0 billion	¥49.0 billion	¥53.0 billion

## Performance

### Net Sales / Operating Profit / Ordinary Profit (Billions of yen)



### Capital Expenditure / Depreciation and Amortization (Billions of yen)



\*1 Aggregate of former segments (Specialty Chemicals/Information and Advanced Materials)

### Classification of Product Lines under the Medium-Term Management Plan

<b>New/next-generation businesses</b>	<b>Differentiating businesses</b>
Main products in development <ul style="list-style-type: none"> <li>• XR materials</li> <li>• Post-5G materials</li> <li>• Materials for EVs</li> </ul>	<ul style="list-style-type: none"> <li>• Electronic chemicals</li> <li>• Optical resin/polymer</li> <li>• IC plastic packaging BT materials</li> <li>• Polyacetal</li> <li>• Ultra-high refractive lens monomers</li> </ul>
<b>Unprofitable businesses or those needing rebuilding</b>	<b>Foundation businesses</b>
None	<ul style="list-style-type: none"> <li>• Polycarbonate, sheet film</li> <li>• Hydrogen peroxide</li> <li>• Oxygen absorbers</li> </ul>

### Business Strategy

**Differentiating businesses**

#### Electronic chemicals (EL chemicals)

### Further strengthening the global supply system. Finding new opportunities in high-level needs for customized products

MGC's electronic chemicals are comprised mainly of super-pure hydrogen peroxide, which is used for washing and etching silicon wafers for semiconductors, and hybrid chemicals, which are custom products for specific processes such as residue removal. For super-pure hydrogen peroxide, we have strengthened our global supply system by bolstering and increasing our production in Japan and overseas to keep pace with the growth of the semiconductor industry. For hybrid chemicals, our main strength is our research and development system, which works closely with customer needs. We have research and development locations in Tokyo and South Korea, and we will also establish bases in the United States, Taiwan, and China to accelerate our development speed in order to handle advanced technologies and new semiconductor materials.

We have also established the Electronic Chemicals R&D Group as a specialist organization to develop new applications and promote strategies for intellectual



**Hirokazu Hanawa**  
General Manager,  
Inorganic Chemicals Division,  
Specialty Chemicals Business Sector

property. We have actively posted young employees overseas as part of efforts to pick up on the latest technology trends.

With the development of an information society, which is represented by Society 5.0, we plan to enhance our position in the super-pure hydrogen peroxide market by strengthening both our manufacturing capacity and cost competitiveness. We will increase our operational efficiency at every step, from plant construction to raw material procurement, production, and logistics. Since super-pure hydrogen peroxide is an integral part of washing silicon wafers and is also a chemical with low environmental impact, it is unlikely that it will be replaced by competitive new products. In hybrid chemicals, the level of the solutions sought by customers is becoming increasingly advanced. This trend presents a huge opportunity for MGC, which has been working on product development in direct collaboration with the world's leading semiconductor manufacturers.

**EL Chemicals: Transition in Net Sales**  
(FY2020=100)



FY	Net Sales (FY2020=100)
2020	100
2021	~110
2022	~120
2023 (FY Forecast)	~130

**Super-Pure Hydrogen Peroxide Production Sites**



Location	Production Capacity (tons/year)	Notes
South Korea	282,000	
China	90,000	Operation started in 2022
Taiwan	90,000	Production increase planned
Singapore	30,000	
Japan (Yokkaichi, Yamakita, Saga)	61,000	Production increase planned
United States	140,000	Production increase planned

## Differentiating businesses

### Optical materials (optical resin/polymer)

#### Responding to increasing functionality of smartphone cameras while expanding into new fields such as VR, automotive, and monitoring cameras

MGC's optical resin/polymer has been widely used as materials for camera lenses in smartphones and other devices, as they are highly regarded for their distinctive combination of a high refractive index<sup>\*2</sup> and low birefringence,<sup>\*3</sup> which are unmatched by competing products. Recently, demand is expanding for applications such as automotive and monitoring cameras, and VR devices for experiencing the metaverse. Customer demands increase in sophistication each year, placing a burden on development. Therefore, we are always delighted when we achieve the functional requirements for optical characteristics and so forth. Using a portal website, the laboratories, plants, and business divisions are able to share information in real time, enabling customer needs to be reflected rapidly in our in-house technology seeds.

In 2022, we established a joint venture with Taoka Chemical Co., Ltd. with the aim of further optimizing the production systems, including raw material monomers. In the same year, we also expanded our polymerization plant for optical resin/polymer within the Kashima Plant as part of efforts to ensure supply stability.

#### Noriyuki Kato

General Manager, Business Development Department, Optical Materials Division, Specialty Chemicals Business Sector

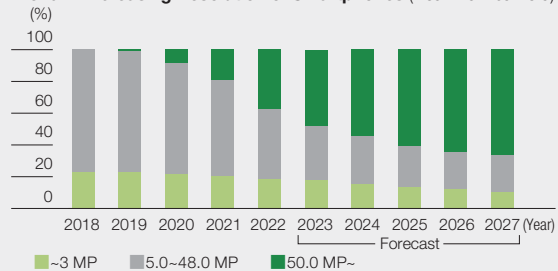


In the society of the future, with the seamless merging of virtual and real spaces, the quality of image information used for input will be important, so the areas in which optical resin/polymer can contribute will continue to expand. We are also working on development of a technology for collecting and recycling the molded pieces generated by customers' injection molding processes.

\*2 The characteristic of light bending inside a material. Using materials with a high refractive index allows lenses to be made thinner.

\*3 Lower birefringence contributes to clearer images.

#### Trend in Increasing Resolution of Smartphones (Rear main camera)



Source: Materials by Techno Systems Research Co., Ltd. published in June 2023

## Differentiating businesses

### Engineering plastics

#### We will pursue synergies through a new structure having consolidated MEP and accelerate the development of highly competitive products

In the polycarbonate (PC) business, which is positioned as a foundation business, in April 2023 we started a new structure with Mitsubishi Engineering-Plastics Corporation (MEP) as a consolidated subsidiary. This new structure is intended to accelerate development of highly competitive products through rapid decision-making led by the Company.

Recently, competition has been increasing in the largest market, China. As profits become increasingly difficult to secure with our existing sales portfolio, we are focusing on developing and expanding sales of products that are resilient to the impact of market fluctuations and demonstrate the Company's competitive strengths. We will maintain this course, while making full use of the management resources of MEP and the Company to drive the development of applications that lead to solutions for customers' issues.

In polyacetal (POM), which is positioned as a differentiating business, business performance has been favorable, reflecting customers' approval of the stable supply capacity and product quality of our three

## Foundation businesses

#### Ichiro Koyanagawa

Executive Officer, General Manager, Engineering Plastics Division, Specialty Chemicals Business Sector



production sites in Asia, as well as our detailed technical service capabilities. From April 2022, supervisory function for the POM business has been assigned to wholly owned subsidiary Global Polyacetal Co., Ltd. (GPAC), to create an integrated structure for managing production, sales, and development. Under this structure, we will develop products with higher added value, such as medical applications, for global markets.

#### MEP's strengths

- Customer-focused technical services
- Marketing functions (Business locations: 27 in Japan and overseas)
- Manufacturing base offering superior cost competitiveness  
Make THAI POLYCARBONATE a consolidated subsidiary of Company as well

#### GPAC's strengths

- Customer-focused technical services
- Use of regional headquarters sales companies, such as KOREA POLYACETAL
- Manufacturing bases offering superior cost competitiveness (THAI POLYACETAL, KOREA ENGINEERING PLASTICS, etc.)

We will further strengthen differentiating businesses while contributing to carbon neutrality over the medium to long term.

### Naruyuki Nagaoka

Director, Managing Executive Officer  
In charge of Basic Chemicals Business Sector



### Smoothly executing an investment strategy designed to further strengthen differentiating businesses

Fiscal 2022 was a year with an extremely uncertain outlook. However, through steady execution of our policies and appropriate pricing strategies, among other measures, we have achieved ordinary profit of ¥30.5 billion, coming close to the ¥31.0 billion target for the Basic Chemicals Business Sector under the current Medium-Term Management Plan.

Our investment strategy was aligned with the key corporate strategy of further strengthening differentiating businesses. We proceeded without delay to construct a new MXDA plant in Europe and to increase production capacity of aromatic aldehydes at the Mizushima Plant, and these actions have been supported by steady demand. We plan to start production of MXDA in 2024. While there has been some impact from rising construction costs, we are confident of being able to reflect this in the product pricing. At the Mizushima Plant, we produce aromatic aldehydes. A bottleneck issue here was resolved in April 2023 with the improvement of production processes, and construction of the new plant is scheduled for completion in November.

Within our business portfolio, the formalin business has been classified under unprofitable businesses or those needing rebuilding. In August 2022, we stopped production of formalin at our Yokkaichi Plant and stopped production of formalin, paraformaldehyde, and hexamine at our Niigata Plant in May 2023. Furthermore, in April 2022, we established MGC Woodchem Corporation, building an integrated production system spanning from formalin down the value chain to adhesives. In May 2023, we announced the transfer of the Company's formalin sales business to MGC Woodchem.

Meanwhile, the purified isophthalic acid (PIA) business continued to be unprofitable due to worldwide oversupply, and we examined restructuring it, including the possibility of stopping it during the Medium-Term Management Plan period. However, we decided to maintain a certain level of production from a perspective of optimizing our overall product chain, including the raw material meta-xylene and xylene separation co-products. If we become able to shift production of meta-xylene to a higher-value-added European MXDA plant in the near future, we will revisit the idea of scaling down or stopping production of PIA.

### Directing overall awareness of the organization towards market needs. Increasing successful examples of differentiating businesses

The Basic Chemicals Business is situated in the upstream zone of the value chain. With no direct interface with trends in final products, the business structure has a strong orientation towards technology seeds. However, this orientation has been changing as the Company has clearly set out its contribution to carbon neutrality and is moving toward execution. Currently, nobody can see clearly whether we are truly meeting market needs when we incorporate the larger trend of carbon neutrality into specific details. This is why we have recently been increasing opportunities for dialogue with diverse people involved in our value chain. As a result, the orientation of our overall awareness as an organization is gradually but palpably changing from technology seeds to market needs.

Looking back, differentiated products such as MXDA and MX-Nylon have arisen from technology seeds, but by maintaining close contact with customers through detailed technical services, they have stimulated latent demand. It had taken time for these products to be sought by society. However, when the time was right, their market developed, and now we are market leaders in their field. We are working to realize successful examples like this more quickly. For example, in the CFRP<sup>\*1</sup> business using our specialty resin and recycled carbon fiber and so forth, we have formed a consortium between Japan U-PiCA Company, Ltd. which became a wholly owned subsidiary in March 2023, as well as JSP Corporation and other Group companies, and having accurately grasped market needs, we are now preparing a comprehensive structure covering from upstream to downstream.

I see it as my mission to lay the foundations for the future. An example of such foundations is Circular Carbon Methanol. Currently, we are proceeding to examine possibilities for various materials, including CO<sub>2</sub>, waste plastic, and biomass. It may take some time for this initiative to generate significant value; however, there is no doubting the strong demand from society for this technology. Over a five- to ten-year span, we aim to develop this into a differentiating business that will be a supporting pillar for the Group in the future.

\*1 Carbon fiber-reinforced plastic

## Basic Information

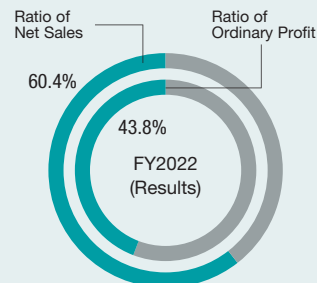
**Business Lines:** Natural gas chemicals, xylene chemicals, energy resources and environment, life science

### Major Group Companies:

JAPAN FINECHEM COMPANY, INC., JSP CORPORATION, MGC Terminal Company, Inc., TOHO EARTHTECH, INC., Japan U-PICA Company, Ltd., MGC SPECIALTY CHEMICALS NETHERLANDS B.V., Japan Saudi Arabia Methanol Company, Inc., METANOL DE ORIENTE, METOR, S.A., BRUNEI METHANOL COMPANY SDN. BHD., Japan Trinidad Methanol Company, Inc., Yuzawa Geothermal Power Corporation, MGC Advance Co., Ltd., FUDOW COMPANY LTD., MGC Woodchem Corporation, MGC ADVANCED POLYMERS, INC.

**Number of employees:** 5,521

### Ratio of Net Sales and Ordinary Profit



## Overall Policy under the Medium-Term Management Plan

### Overall Policy

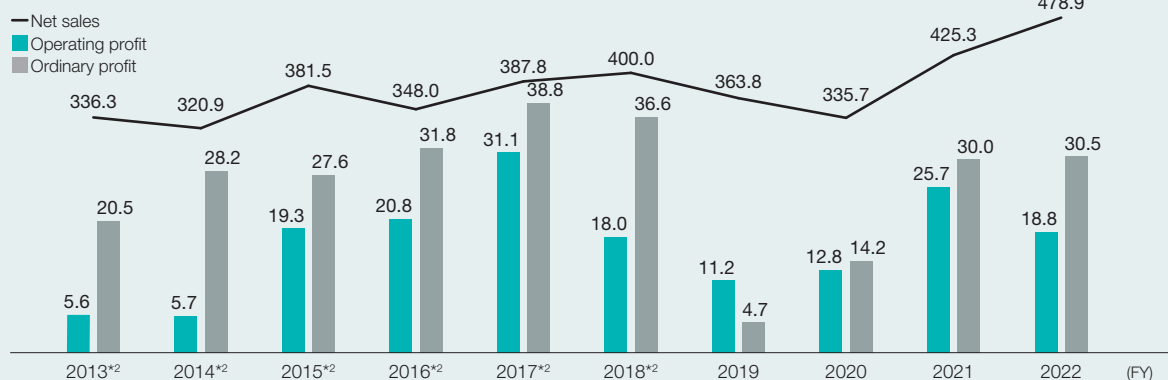
- Turn products and businesses that respond to societal demands into business opportunities
- Reduce volatility through portfolio reforms and rebuilding of unprofitable businesses

### Numerical Targets (Announced in May 2021)

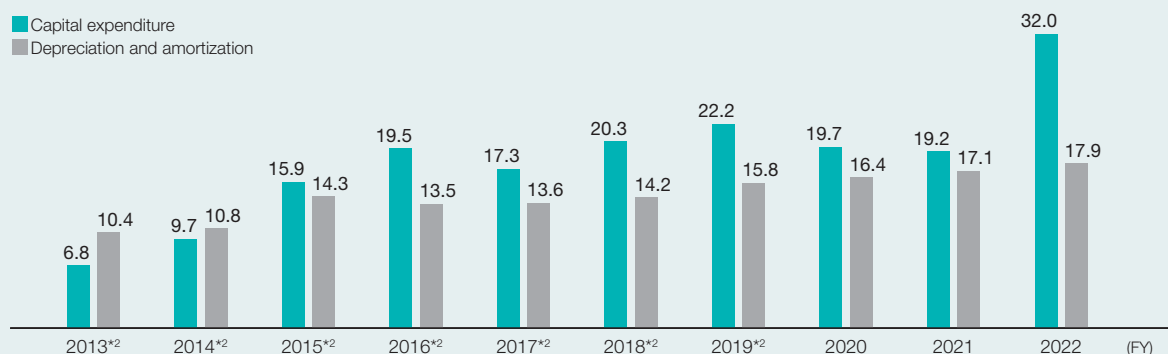
Net sales	Operating profit	Ordinary profit
¥410.0 billion	¥25.0 billion	¥31.0 billion

## Performance

### Net Sales / Operating Profit / Ordinary Profit (Billions of yen)



### Capital Expenditure / Depreciation and Amortization (Billions of yen)



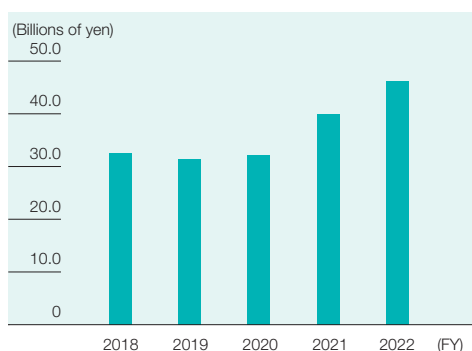
\*2 Aggregate of former segments (Natural Gas Chemicals/Aromatic Chemicals)



## Classification of Product Lines under the Medium-Term Management Plan

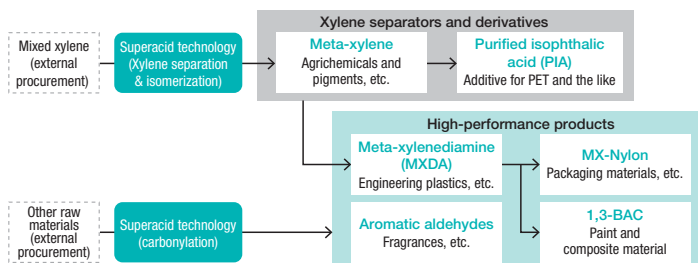
<b>New/next-generation businesses</b> Main products in development <ul style="list-style-type: none"> <li>• Bio-products</li> <li>• Contract manufacturing of antibody drugs</li> <li>• Carbon fiber composite material</li> <li>• Neopulim transparent polyimide resin</li> <li>• Methanol fuel cells</li> </ul>	<b>Differentiating businesses</b> <ul style="list-style-type: none"> <li>• MXDA</li> <li>• Aromatic aldehydes</li> <li>• MX-Nylon</li> </ul>
<b>Unprofitable businesses or those needing rebuilding</b> <ul style="list-style-type: none"> <li>• Formalin and polyol products</li> <li>• Xylene separators and derivatives</li> </ul>	<b>Foundation businesses</b> <ul style="list-style-type: none"> <li>• Methanol</li> <li>• Energy resources and environmental businesses</li> <li>• Ammonia and methylamines</li> <li>• MMA products</li> <li>• Foamed plastic (JSP)</li> </ul>

### Sales Trend for High-Performance Products



### MXDA Operations

MXDA, which we began producing in 1970, has been exhibiting its unique functions in special nylon films, polyurethane paint, and epoxy resin curing agents. Using MXDA as a main ingredient we have been expanding our product line to include MX-Nylon with a superior gas barrier and 1,3-BAC which are quick to cure and don't yellow under ultraviolet light.



## Business Strategy

### Differentiating businesses

#### MXDA

**Plant construction in Europe is in progress as planned. Meeting growing demand related to wind power generation**

As a major supplier of MXDA, which is highly resistant to salt water and chemicals, we hold over 90% of the world market, producing it for over half a century. It is mainly used in paint for structures that must resist corrosion, such as bridges, marine structures, ships and plants.

We have begun constructing a new production base in Europe, where demand is highest, with a plan to start operation in July 2024. Prices for energy and raw materials have risen substantially due to the continuing Ukraine conflict, but we project that the new plant will produce MXDA with a competitive advantage on a par with that of our existing plant. When production begins, we plan to sell not just in Europe but also in other regions of high potential demand, like the Americas, the Middle East and Africa. We will satisfy growing demand for MXDA as an epoxy resin curing agent, which is used for rapidly growing wind power generation facilities as well as for conventional infrastructure applications.

We will promote research on possible MXDA uses for solvent-free paint and water-based paint that emit

low VOCs<sup>\*3</sup>, as well as applications for direct air capture (DAC) of CO<sub>2</sub> to allow for multifaceted contributions to environmental preservation. In the future, we will also produce MXDA and 1,3-BAC<sup>\*4</sup> using green hydrogen and ammonia to raise their profile as environment-friendly products.

\*3 Volatile organic compounds

\*4 1,3-bis(aminomethyl)cyclohexane. This is widely used as an epoxy resin curing agent for composite materials and paints.

**Ryoji Otaki**  
 Division Director,  
 High-performance Products Division,  
 Basic Chemicals Business Sector



## Differentiating businesses

### MX-Nylon

#### Exploring its strength as an environment-friendly product. Creating value matching seeds and needs at the Group's global convention

MX-Nylon is an original MGC material featuring an excellent barrier against oxygen and CO<sub>2</sub> and superb chemical resistance. Used as a raw material in food and beverage packaging, it delays deterioration of flavor and quality, and extends "best-by" periods. Adding fiberglass and other toughening agents in the resin processing stage can produce materials with extremely high strength and stiffness, which are currently used as structural components in the automotive and industrial machine industries.

We have many people involved in research and development, production and sales of MX-Nylon meet twice a year at a global convention. The participants share information on trends in market changes and legal restrictions by nation or region, potential risks and future prospects. Based on that they explore new applications of MX-Nylon and create initiatives to marry seeds with needs.

I am excited to be exploring the strengths and possibilities of MX-Nylon as an environment-friendly

**Takahiro Takano**  
General Manager,  
Polymer Materials Department,  
High-performance Products Division,  
Basic Chemicals Business Sector



product. I will work to make MX-Nylon the de-facto standard in various industries by drawing attention to what it can do, like reducing food waste by extending "best-by" dates and improving fuel efficiency by making vehicle parts lighter. In 2022 MX-Nylon produced at the Niigata Plant received the ISCC PLUS certificate. To capitalize on this opportunity we will begin manufacturing and selling ISCC PLUS-certified MX-Nylon with sustainable raw materials, including plant-derived raw materials as per a mass balance approach.



## Differentiating businesses

### Aromatic aldehydes

#### Superacid realizes unprecedented high quality. Pursuit of market-oriented development of fragrances

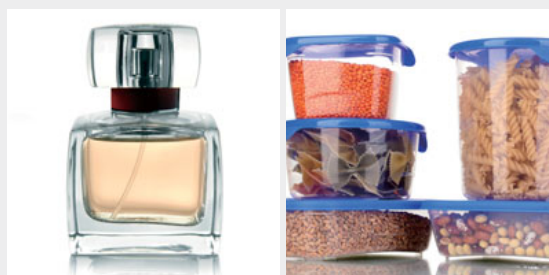
MGC produces and sells more than ten types of aromatic aldehydes. With these it has been making stable annual growth of about 5%, mainly for resin additives and fragrances. Our products are excellent in purity and safety, and highly evaluated as raw materials also for agricultural chemicals and pharmaceuticals. The superb quality is made possible by an original production technology employing a continuous-reaction system with a superacid, which is extremely difficult to handle, as a catalyst. The catalyst is collected and reused inside the system, so very little is wasted, and large volumes of the product can be reliably produced. This is just one example of our large fund of technical expertise built up over the years, leaving our competitors far behind.

To address diverse customer needs and issues, through dialogue with them we customize their orders into unique products. This is a special feature of our business. Production facilities capable of producing a wide variety of products while assuring reliable high quality are our strength as well.

**Haruya Kubo**  
General Manager,  
Chemicals Department,  
High-performance Products Division,  
Basic Chemicals Business Sector



It's not easy to match the needs of prospective customers with the seeds, such as the technologies and facilities we own. Because of that, high-performance custom products, the results of those matches, are indispensable to customers. Now we are surveying and understanding the market needs for fragrances with which aromatic aldehydes are highly compatible, while steadily working to expand the areas covered by the R&D capabilities and production technologies of MGC.



Whenever speedy solutions are needed, we will consider alliances with other companies and even M&A as alternatives.

### Yoshinori Isahaya

Director, Managing Executive Officer  
Responsible for Research & Development,  
in charge of Intellectual Infrastructure  
General Manager of Intellectual Infrastructure Center



### Unification of research systems improves the perceived speed of progress and balance in marketability

To build an earnings structure that adapts to change in the external environment, for the current Medium-Term Management Plan we instituted a new segment called “new/next-generation businesses.” In new-product development we used to create research themes under the four-internal-company system, with organic growth in mind. Certain research themes were looking to the next generation and did not belong to any specific company. Calling them “corporate research,” we explored new materials.

Looking at a market environment that has been rapidly changing beyond imagination in recent years, we abolished the internal company system in 2020. With optimization of the entire Group in mind, we brought together research laboratories that used to be under the internal companies and the Advanced Business Development Division, which used to be one of the administrative divisions, now under the Research & Development Division. We expanded R&D investment in the fields projected to have high medium-to long-term growth potential. At the same time we aim for growth that is not simply the extension of existing businesses.

Next-generation research used to carry challenges like differences in speed between the research team and the internal company overseeing the research when it is ready for commercialization. Under the current system, however, all research themes, including those for the next generation, became visible on a single assessment measure and assessment frequency, the senses of speed and marketability are better balanced, and the sensitivity to return on investment has increased.

Research themes and product development projects that we’ve been working on for a long time need new time frames for management. To do that, we’ve stopped insisting on doing everything on our own and would rather look into alternatives, like business and capital alliances with other companies and even M&A, depending on the themes. We flexibly adjust how research should be conducted and how each internal organization should be run as we assess performance and the sense of speed. That said, we avoid going too fast to the point of impairing the creativity of the researchers, considering it important to maintain our free, open-minded culture that allows for playfulness.

### Creating businesses of different wavelengths by staying close to customer issues at a deep level

For those of us involved in new/next-generation businesses, innovation means combining existing A and B to create C, a new value. So people in administrative divisions doing office work can innovate as well as our technical employees. Within MGC people with diverse viewpoints and ideas get together to improve one another and create new value by having fun with it. If all our employees are looking in the same direction, we can’t generate C by combining A and B. By looking at things from different viewpoints, it’s easier to be inspired, leading to innovation. I often advise employees, “You can’t find a solution if you stay in your lab or office.” By getting out to the market side and talking with customers with development agility in mind, we can deepen our understanding of the essences of issues even the customers aren’t aware of.

We used to win customer approval just by suggesting a single new material. Today it’s a new era, when we can’t receive an order without suggesting a string of upstream-to-downstream solutions. So we are considering a business model in which we decide on the core part of a business that we will take charge of, then share profits with leading business partners handling other parts.

When I was head of the Corporate Planning Division, I was deeply involved in drawing up the current Medium-Term Management Plan, and determined five target fields backcasting from 2030-2050 by imagining changes in society and technological trends for those years. To get to the exit sooner, we will further narrow our research and development subjects in the target areas more precisely. We are creating several businesses of different wavelengths, for example, with a portfolio of products with different cycles and characteristics, and making our R&D organizations capable of handling environmental changes with resilience and flexibility.

## New/next-generation businesses

### Solid electrolytes

#### Development of $\text{LiBH}_4$ \*<sup>1</sup> and carborane-based solid electrolytes for application in various fields

With the proliferation of electric vehicles and electronic devices, the rechargeable battery market is projected to grow and the field's technological trends are drawing attention. We are developing solid electrolytes for all-solid-state Li-ion batteries\*<sup>2</sup>, a type of next-generation rechargeable battery. Solid electrolytes are divided into three categories depending on the main ingredient: sulfides, oxides and complex hydrides. Our development focus has been complex-hydride electrolytes. Their advantage is that they are softer than other solid electrolytes, making them easier to use in producing precision electrodes. They also minimize startup investment by sharing existing production equipment for liquid Li-ion batteries.

MGC has developed a method for producing  $\text{LiBH}_4$  solid electrolytes, but much has been desired in terms of Li-ion conductivity for high output, as needed by electric vehicles. As a solution we developed carborane-based solid electrolytes, a type of complex-hydride electrolyte, that achieve Li-ion conductivity on a par with sulfide-

#### Takuo Ohshida

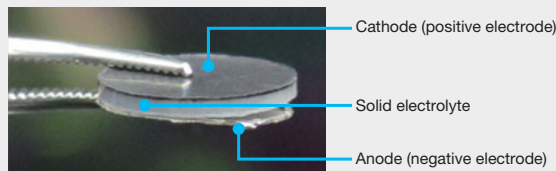
Associate General Manager,  
New Business Development Department,  
Research & Development Division



based solid electrolytes. With mass production of this electrolyte in mind, we plan to supply it at low cost through a liquid-phase mass-production process that is unique to a chemical maker. Now we are working with universities to assess the properties of carborane-based solid electrolytes and explore new applications for it. We will continue to explore applications for both  $\text{LiBH}_4$  and carborane-based electrolytes that employ their respective characteristics with a wide range of uses in mind, from stationary batteries to electric vehicles.

\*1 Lithium borohydride. This compound reacts with water and alcohol to generate hydrogen, and is generally used as a reducing agent.

\*2 Conventional liquid Li-ion batteries use an electrolytic solution for conductivity. On the other hand, all-solid-state batteries use solid electrolytes rather than liquid electrolytes.



## New/next-generation businesses

### OXYCAPT™

#### Supplying the healthcare industry with the world's only multilayer plastic container with a glass-like oxygen barrier

The syringes\*<sup>3</sup>, vials\*<sup>4</sup> and other glass containers used in healthcare provide an excellent oxygen barrier, but they break easily and are low in pH resistance, to name a couple of disadvantages. In work to create plastic alternatives, a weaker oxygen and UV barrier has been a challenge. Taking on this challenge, MGC began developing a better plastic alternative in 2012. We promoted projects that apply our own multilayer molding technology for beverage containers using MX-Nylon and non-crystal oxygen-barrier plastics we have developed. In 2019 we commercialized OXYCAPT™, the world's first container that has the advantages of both glass and plastic. In addition to its excellent gas barrier, it features minimal leaching of inorganic materials, and is currently in testing by pharmaceutical companies in Europe and the U.S. for official adoption. When OXYCAPT™ is in wide use, we believe we can offer the healthcare industry new environmental value, because its low weight can reduce CO<sub>2</sub> emissions in addition to preventing container breakage during production and transportation.

In May 2022 we announced that we have opened

#### Tomohiro Suzuki

Associate General Manager,  
New Business Development Department,  
Research & Development Division



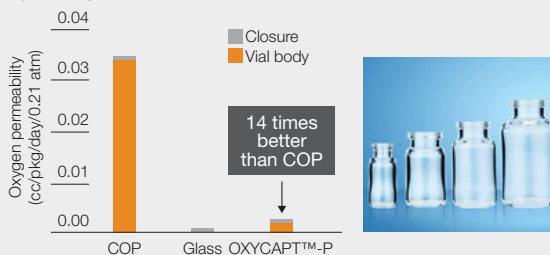
talks with Becton, Dickinson and Company of the U.S.\*<sup>5</sup> concerning a business alliance. We are discussing specifics, including joint development of syringes. We are also focusing on applying OXYCAPT™ characteristics to low- and ultra-low-temperature storage of biopharmaceuticals and applications in regenerative medicine.

\*3 The cylindrical part of the injection syringe, excepting the needle

\*4 Sealed container for injectable medicine

\*5 A world-leading company for medical equipment

#### 10-mL Vial



• Measurement device: MOCON OX-TRAN® 2/61  
• Conditions: 23°C/ In 100% RH, Out 50% RH