The MGC Group views social issues in anticipation of 2050 from the perspective of sustainability, such as climate change, the international situation and the advancement of technology. We have established target areas associated with these long-term social issues. We develop products that will usher in a new era through management resources supporting diverse businesses, and through a differentiation strategy premised on the balance of social and economic value, which we then endeavor to provide to various target areas. Through this process, we will fulfill our Group mission of “Creating value to share with society.”

Value Created by the MGC Group

Social issues in anticipation of 2050

- Changes in international situation
- Demographic changes
- Advancements in ICT/mobility
- Climate change

Management resources supporting diverse businesses

Uniquely among chemical companies, engages in businesses ranging from natural gas development to power generation using renewable energy

Differentiation strategy

Pursue distinction

Mission

Creating value to share with society

Value created by the MGC Group

- Biodiversity crisis
- Environmental impact reduction
- Diversity
- Behavioral changes

Management strategy for balancing social and economic value

Promotion of cross-value innovation

Strengthen discipline and foundation supporting business activities

Uniqueness and Presence
Target areas associated with these long-term social issues

Output leading to a new era

Contribute to development of ICT/mobility society

Outcomes addressing social issues through business

Solve energy and climate change problems

Solve medical and food problems

Balance social and economic value

ICT

Mobility

Energy

Infrastructure

Medical/Food

Electronic chemicals (EL chemicals)

ICT plastic packaging BT materials

Optical polymers

Foamed plastic

Engineering plastics

Methanol

Energy resources and environmental businesses

MXDA

Oxygen absorbers

MX-Nylon (MXD6)

Antibody drugs

Aromatic aldehydes

Business Operations and Main Products
The MGC Group has always insisted on its uniqueness. Passing down that DNA for generations, making the most of the breadth of technologies that allow us to offer all kinds of compounds, from upstream basic chemicals to downstream specialty chemicals, the Group has established a strong industrial presence with the unique, innovative products we develop.

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MGC Group Business Models

Behind our operations offering groups of products with large shares of the world market, we employ two business models. First is the basic chemicals model for methanol and other products that cover upstream supplies. We secure our cost advantage by operating in locations close to the necessary raw materials and employing our own technology for high-production cost efficiency, and downstream the products to make derivatives with high added value. Going forward, we are sharpening our competitive edge mainly by producing our raw materials using carbon-neutral processes.

Our second business model is for specialty chemicals used in downstream fields, such as electronic and optical materials and oxygen absorbers. These products have high growth potential despite short product cycles, so we conduct business using technology development systems that allow us to respond quickly to customer needs. The common strength of these models is our deployment of a broad range of original technology of all varieties, from fundamental to applied technologies. The same applies to building the product chain. The basic MGC strategy is to demonstrate our uniqueness and presence through advantageous procurement of raw materials and the use of differentiated technologies.
Refractive index\(^*1\)

Primary applications
- Materials for smartphones and other compact camera lenses

Balances high refractive index with low birefringence, contributing to enhanced camera functionality

*1 As compact camera lens materials

Optical polymers

BT products

Global market share
- Proprietary material meeting all evolving needs of IC plastic packaging market

Primary applications
- IC plastic package substrates

Balanced high refractive index with low birefringence, contributing to enhanced camera functionality

Super-pure hydrogen peroxide

Global production capability ensures a stable supply of high-quality products to meet the needs of the most technologically advanced customers

Primary applications
- Cleaning agents for semiconductors, etching agents, resist stripping agents

Super-pure hydrogen peroxide

Global market share
- #1

Primary applications
- Cleaning agents for semiconductors, etching agents, resist stripping agents

Primary applications
- Materials for smartphones and other compact camera lenses

*1 As compact camera lens materials

Polyacetal resin (POM)

Global market share
- #3

Primary applications
- Automotive components, electronic components, office automation equipment

Engineering plastics offering superior wear resistance, low friction and chemical resistance

Polycarbonate resin (PC)

Supply capacity\(^*2\)

World rank
- #3

Primary applications
- Automotive components, electronic components, office automation equipment

Also developing high-value-added products that are lightweight, highly transparent and high strength

Foamed plastic

Global market share\(^*3\)
- #1

Primary applications
- Automotive components, precision equipment packaging, thermal insulators for housing, food packaging materials

Superior weight saving, flexibility and durability

AGELESS™

Global market share
- #1

Primary applications
- Food products (confectionery, processed meat products, etc.)

Maintain extensive customer base as pioneer of food freshness agents

*2 As the Mitsubishi Group

*3 For automotive use
The MGC Group’s innovative businesses are sustained by a technological foundation reinforced and expanded for over half a century, the corporate culture that supports it, expertise in development and commercialization of natural resources and energy, strategic partnerships, and a safety-oriented culture, the most basic prerequisite for quality manufacturing. By taking full advantage of these five management resources, MGC works to be an excellent company with uniqueness and presence that no other company can easily match.

**Technological Foundation**

Inquiring minds in tireless search of cutting-edge technologies are part of the MGC Group DNA. Diverse original technologies represent the primary source of our competitive advantage.

The creation of unrivaled technologies and our effort to enhance them for applications are embedded in our Group’s DNA, while original technologies are our greatest strength. A typical example of our fundamental technologies is that for xylene separation using superacid catalysis in an original proprietary process. The technology that allows us to efficiently produce meta-xylene of high purity has led to development of highly competitive derivatives. On the other hand, a representative example of our applied technologies is an optical polymer with both a high refractive index and a low birefringence. It is meeting market needs as an optical material allowing for thinner, higher-definition camera lenses.

**Over 90%**

Products based on technologies developed in-house (by product category)

Over 90% of our products were developed in-house. We have built our own technological platform that can be used for researcher-initiated R&D and other ventures. Our potential derives from a cornucopia of core technologies that can be combined, expanding without limit.

**About 40%**

Percentage of MGC products that hold the largest share of their respective world markets

With original products based on in-house technologies proving highly competitive due to their high-quality and functionality, MGC enjoys top shares of a wide range of markets worldwide.

**Up by about 70% since 2010**

Total patent value (Patent Asset Index*4)

Patents are intellectual property that we produce through daily research and development work. The total patent value of the MGC Group is only growing as we actively focus effort on R&D themes that will lead to solutions and meet the needs of the times.

Examples of Applications of Fundamental Technologies: Xylene Product Flow

- Mixed xylene → Superacid technology (Meta-xylene separation & isomerization)
- Meta-xylene → Aromatic technology (Agrichemicals and pigments, etc.)
- Hydrogenation technology → Aromatic aldehydes (Fragrances, etc.)
- Oxidation technology → Meta-xylene diamine (MXDA) Engineering plastics, etc.
- Hydrogenation technology → Hydrogenation technology
- Polymerization technology → Meta-xylene diamine (MXDA) Engineering plastics, etc.
- Compounding technology → MX-Nylon (MXD6) Packaging materials, etc.
- Compounding technology → Compounding technology
- High-performance polylamine resin "Renca" Automotive parts, etc.

*4 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)

The Group has five fundamental technologies: catalysts, synthesis, polymer science, functional products, and biotechnology.

Catalysis is a fundamental technology essential in producing substances economically through chemical synthesis. MGC’s catalyst technology originates in the development of a catalyst for methanol synthesis. Strenuous research and development effort and applications have continued to this day, leading to commercialization of many original synthesis processes.

At the same time, our downstream work has resulted in high-molecule polymerization technology, typically applied to create engineering plastics. By applying technology to evaluate and mold plastics, we develop functional designs for mechanical characteristics and optical properties.

In addition, we develop functional products by combining multiple raw materials into compounds to manifest additional functions.

In our research and development work to advance applications for methanol, we came up with a microbe culture technology that produces useful substances using methanol as a nutrition source. From there we have developed a range of biotechnologies.

As described here, the MGC Group is characterized by having a wide range of technologies from upstream to downstream in the value chain.
Corporate Culture

We cultivate a welcoming corporate culture, where open discussion is part of the daily routine. An enterprising spirit rooted in entrepreneurism is another unique trait of MGC.

As the product of a merger of two technology-based firms, MGC has worked to be a professional organization where individuality is valued and employees respect each other’s differences. This history led to our welcoming corporate culture, where open discussion is part of the daily routine and each employee is given discretion. Since its founding MGC has cherished the pursuit of uniqueness as a way of offering entirely new kinds of value to society. This applies to our global operations as well. We were the first Japanese firm in the chemical industry to enter the Saudi Arabian market, in 1980, and have since expanded operations in many developing nations. An enterprising spirit rooted in entrepreneurism is another unique trait of MGC.

Natural Resources and Energy

Our geothermal power business employs prospecting technologies we developed through exploring for natural gas. We entered the biomass energy generation business in 2022.

The MGC Group does businesses involving various renewable energy technologies. Right from our founding, we developed oil and gas fields on our own mining properties in Niigata Prefecture, and we continue to supply natural gas produced in those two fields to our Niigata Plant. Applying this excavation technology to our own geothermal energy development business, we are constructing a third power station in Iwate Prefecture. In 2016, we entered the natural gas power generation business in Fukushima Prefecture. We supply the energy we generate from LNG to the offices and plants of the MGC Group via our wholly-owned subsidiary, MGC ENERGY Company Limited. In 2022, we entered the biomass power generation business in the city of Abashiri in Hokkaido, using waste from Japanese forest thinning.

### History of Overseas Operations

<table>
<thead>
<tr>
<th>Year</th>
<th>Country/Region</th>
<th>Industry/Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>Saudi Arabia</td>
<td>Methanol</td>
</tr>
<tr>
<td>1984</td>
<td>U.S.</td>
<td>Trading</td>
</tr>
<tr>
<td>1987</td>
<td>Indonesia</td>
<td>Hydrogen peroxide</td>
</tr>
<tr>
<td>1992</td>
<td>Venezuela</td>
<td>Methanol</td>
</tr>
<tr>
<td>1995</td>
<td>Thailand</td>
<td>Engineering plastics</td>
</tr>
<tr>
<td>2006</td>
<td>Brunei</td>
<td>Methanol</td>
</tr>
<tr>
<td>2013</td>
<td>Trinidad and Tobago</td>
<td>Methanol</td>
</tr>
<tr>
<td>2021</td>
<td>Netherlands (MXDA)</td>
<td></td>
</tr>
</tbody>
</table>

In a corporate culture that encourages the challenger spirit, we conduct overseas business under an original strategy, applying the production and operation technologies that we develop. Since about 1970, we have secured our competitiveness abroad by establishing joint ventures with local firms. We contribute to the growth of local economies through technology transfers and operator training to maintain stable production.

### Map of MGC Group Energy Businesses

- **Sumikawa**
  - Supplying steam for a quarter-century since operations began in March 1995
  - Energy output: 50,000 kW
- **Wasabizawa**
  - Operations began in May 2019
  - Energy output: 46,599 kW
- **Azuma and Adatara**
  - Survey under preparation
- **Abashiri Biomass Power Plant**
  - Generators 2 and 3
  - Operation schedule: August 2022 and February 2023
  - Combined planned energy output: 19,800 kW
- **Appi**
  - Construction commenced in August 2019
  - Planned energy output: 14,900 kW
- **Zao**
  - Under survey
- **Fukushima Natural Gas Power Plant**
  - Operation began in April 2020
  - Energy output: 118,000 kW

#### About 70 years

How long we have been developing natural gas

Since we succeeded in developing water-dissolved natural gas in Niigata Prefecture in 1953, we have been continuing independent natural resource development, while conducting joint exploration for crude oil and natural gas with other energy development firms. We have been doing business in geothermal energy for over 40 years.

Employee satisfaction

As part of an initiative to create supportive workplaces that give employees job satisfaction, we conducted an employee awareness survey in July 2021. We are working to apply the survey results to promote measures for cultivating a strong sense of work fulfillment and job satisfaction.

*5 From employee awareness survey results. The subjects were at employees of MGC (non-consolidated), excluding those lent to subsidiaries (effective replies: 71.9%).

**75%**

*5 Employee satisfaction*
Partnerships

Alliances and collaborations with various partners reinforce the management foundation of the MGC Group, which enjoys a strong industrial presence globally.

The key to success in growing the Group’s overseas operations is partnerships with local firms and companies in other industries. Alliances and collaboration with other firms not only help reduce the time and funds required for any operation, but also encourage innovation in the chemical field and create growth opportunities for employees as well. A case in point is joint production of methanol in a nation with over 40 years of experience in natural gas production. This gives us hope of building a foundation for CCUS*. To achieve the long-term goal of carbon neutrality by 2050, we are promoting an all-Japan collaboration system with various partners for value co-creation.

*A: CCUS: CO2 capture, utilization and storage; involves technologies to capture and store emitted CO2 and technologies to use stored CO2 as an ingredient for chemical products and other uses.

Recent Alliances and Co-creation Initiatives to Achieve Carbon Neutrality

- Joint discussion on operations for effective CO2 use, mainly in Niigata region (2021, with JAPEX)
- Reliable procurement of clean ammonia (2021, with UBE, Sumitomo Chemical and Mitsui Chemicals)
- Proposal “Development of Technology for Producing Functional Chemicals from CO2,” adopted by NEDO (2022, with Tosoh) (Development of production technology for CO2-based function enhanced soluble polycarbonates and monomers)
- JBJ dialogue-based sustainability linked loan program (2022, with Development Bank of Japan)
- Beginning joint study on social deployment of circular carbon methanol utilizing CO2 (2022, with Tokuyama)

A Culture of Safety

Under the philosophy that ensuring safety is the top priority of our business activities, we are enhancing our Responsible Care (RC) activities.

A core social mission for every manufacturer is to foster a culture of safety. Based on the philosophy that ensuring safety is the top priority of our business activities, MGC has formulated a Safety Code of Conduct, and undertakes RC activities to achieve zero accidents and zero occupational injuries. In our manufacturing divisions we introduced in fiscal 2021 our LINK Activities, an expanded company-wide safety campaign that includes process safety and disaster prevention during exploration and research, and safety assurance in our construction and bottling/canning work, in addition to general occupational health and safety, while conducting RC auditing to monitor progress. We use process safety and disaster prevention assessment tools to make numerical assessments of the penetration of our culture of safety and security levels for each business site, and promote kaizen initiatives.

Lost time injury frequency rate*7 (non-consolidated)

In order to maintain zero occupational injuries, MGC regularly conducts training, drills, and occupational health and safety risk assessments. In addition, each workplace continuously engages in tasks such as 5S activities, hazard prediction, and proposals for addressing Hiyari Hatto (near-miss) incidents to bolster day-to-day safety measures.

*7 Frequency rate: Number of occupational injury casualties per one million working hours

Promotion of RC Activities

RC activities, which are voluntary, are carried out to harmonize business activities with global environment preservation through ensuring the environment, safety and health in all stages of product life cycles from development, manufacture, distribution, use and final consumption to disposal. We began this effort in 1995, when the Japan Responsible Care Council was established, and have been working ever since to cultivate our culture of safety setting medium-term goals.
Address Social Issues Through Business

In the Medium-Term Management Plan, we established a vision for the next five to ten years of each business sector. We believe that we can play a role in transforming industry and society to unlock their potential through the creation of new value through MGC’s unique products to help solve social issues.

Electronic Chemicals
Global semiconductor demand will continue to grow in future, and the electronic chemicals essential for their manufacture are also expected to see significant growth. The MGC Group seeks to further increase the purity of electronic chemicals used in the semiconductor cleaning process, while contributing to the miniaturization and increased functionality of semiconductors.

Optical Polymers
The optical materials offered by the MGC Group are primarily used in camera lens materials for smartphones and so forth. In the area of ICT and mobility, applications and markets such as sensing devices for visualization of objects not perceptible to the naked eye are expected to expand.

Methanol
Methanol, currently used as a chemical raw material, is also expected to be utilized as a hydrogen transport medium. MGC, which is the only comprehensive manufacturer of methanol in the world, has developed a circular carbon methanol (CCM) production process using CO₂ as a raw material, and is currently proceeding with initiatives aimed at its commercialization.

Electrical Plastics
The MGC Group’s laminate materials have maintained the world’s top market share by improving IC plastic packaging performance, optimizing form factor, and ensuring ease of use. MGC will continue to contribute to the early diffusion of ultra-high-speed communications and the advent of IoT society through promoting research that anticipates trends in the semiconductor industry.

Engineering Plastics
Polycarbonate (PC) and polyacetal (POM) are materials that have contributed to making automobiles and electronic devices more lightweight and extending their life. In recent years, they have been used instead of existing materials in a wider variety of industries. MGC has started development of PC manufacturing technology using CO₂ as a raw material.

Foamed Plastic
Foamed plastic, being lightweight with excellent vibration absorbency, contributes to the improvement of both collision safety and fuel efficiency, mainly as an automotive material. As the shift to EVs accelerates, areas in which it is used are expanding, such as rear seat cushion material and front seats.
MXDA has properties for preventing the deterioration of metal. It is used as an epoxy curing agent in coatings for construction and industrial pipes, and its applications have recently expanded to include maintenance of wind power. MGC is also engaged in the development of high-efficiency DAC*2 technology using MXDA.

**Energy Resources and Environmental Businesses**

The MGC Group is a unique chemical manufacturer in the geothermal power-generation business, and is also participating in natural gas power-generation projects. In future, we aim to contribute to realizing new energy systems that combine CCS technology, for the capture and storage of CO2, and CCU technology, which utilizes it as a resource.

**Oxygen Absorbers**

AGELESS®, a quality-improving agent preventing food deterioration by absorbing oxygen, brought about a revolution in the storage and transportation of food. Going forward, we will focus on development of fresh food applications with the aim of reducing food waste and loss, and contributing to addressing the hunger problem. Applications in pharmaceutical and industrial areas are also increasing.

**Antibody Drugs**

Based on our culture technology, we have established basic manufacturing techniques for antibody drugs, and perform contract process development and manufacture of bio-pharmaceuticals. From the perspective of security, the importance of domestic production of pharmaceuticals is increasing, and we will contribute to the stable supply of pharmaceuticals as a reliable domestic manufacturing base.

**Aromatic Aldehydes**

Aromatic aldehydes are used in diverse applications including fragrances and resin additives. MGC’s manufacturing process has the advantage of high purity due to it being able to efficiently extract target substances. For this reason, demand for these products, which can be safely used for applications such as food packaging and fragrances, is increasing.

**MX-Nylon (MXD6)**

MX-Nylon, which has superior gas barrier properties, is a material that reduces food waste and also contributes to the weight reduction of PET bottles and automotive components. At present, we are actively engaged in environmental initiatives such as the reduction of GHG emissions through the transition to plant-derived raw materials.

**Solve Energy and Climate Change Problems**

Taking advantage of our many years of experience developing natural-gas fields and producing methanol, we are working to commercialize our carbon-negative*1 technology. We are concentrating effort on R&D related to methanol synthesis from CO2 as well as on CO2 capture, utilization and storage. We also endeavor to contribute to addressing issues related to energy and climate change in a way that is unique to the MGC Group as a chemicals company, such as the use of methanol and ammonia as a hydrogen carrier, geothermal power generation, which no other company in the chemicals industry is doing, and materials development to help extend the life of wind power-generation equipment.

*1 State in which absorption of greenhouse gases is greater than emissions of same in business operations.

**Solve Medical and Food Problems**

In light of accelerating global population growth and aging, the MGC Group is expediting development of product groups that will lead directly to the enhancement of preventive and predictive medicine and the improvement of medical productivity. As for addressing food-related challenges, in 1977 we began marketing an oxygen absorber that extends the storage life of foods, and have been improving it for over 40 years. Taking full advantage of the management resources of the Group, we will continue to develop advanced technologies to help extend healthy life expectancy and support sustainable food management.

*2 Direct Air Capture is a technology that captures CO2 directly from the air.