GLASS FOR FUTURE

Nippon Electric Glass

Integrated Report 2021

For the year ended December 31, 2021

Corporate Philosophy

At Nippon Electric Glass, our corporate philosophy is a reflection of our founding mission, a statement of our devotion to creating products infused with the very best of human civilization for the betterment of society.

Our corporate philosophy

We strive to build a brighter future for the world by uncovering the unlimited possibilities of glass for more advanced creative manufacturing.

Firmly rooted in the traditions of our founding mission, the NEG corporate philosophy plots a path for our quest for sustainable growth.
Thanks to material design, melting, forming, and processing technologies, glass can be infused with different properties for a broad range of functions. We are dedicated to unlocking glass's potential to make life better and more comfortable for people and communities the world over.

Our slogan

GLASS FOR FUTURE

Our vision

The world's leading manufacturer of special glass

Our goal is to become the world's leading manufacturer of special glass, with the best talent, the best technology, and the best creative manufacturing ability.

At the same time, we strive to run our Company in a way that inspires pride among our workers and enables us to make a genuine contribution to the community.

The way we see it, creative manufacturing is achieved through state-of-the-art technological development, the highest quality standards, efficient production, and a steady supply of products, all underpinned by a fundamental dedication to environmental sustainability.

Our values

Customer first:
Everything is based on accurate understanding and complete satisfaction of customers' requirements.

Get the job done:
We are dedicated to completing every task properly.

Broad minds and open communication:
We think beyond existing norms and encourage frank communication among all departments and generations.

High ethical standards:
We are bound to act ethically and in good faith in all situations.

Consideration for the environment:
We are constantly aware of the need to be considerate of the environment, and strive to reduce our footprint.

Contents

Message from the Chairman

Quality manufacturing is the driving force behind carbon neutrality.

Masayuki Arioka
Chairman of the Board

In retrospect, the year 2021 was marked by a trial-and-error effort to maintain the functioning of the economy in the midst of the stringent safety measures implemented to fight the COVID-19 pandemic. As one significant example, the Tokyo 2020 Olympic and Paralympic Games were held in the absence of spectators.

Despite the pandemic, we experienced strong demand for display glass, glass fiber for use in resin-reinforced plastic for automobiles, and glass tubing for pharmaceutical and medical use including vaccine containers. In order to supply these products, we implemented comprehensive measures against the spread of the infection as we took steps to accommodate the strong customer demand. We are grateful to our stakeholders for their support, as we were able to achieve positive results that exceeded our expectations.

Against this background, the UN Climate Change Conference in Glasgow known as COP26, which concluded on November 13, 2021, agreed to reductions in coal-fired power generation in order to limit the global temperature rise to 1.5 degrees. Some believe this target is inadequate and yields to the interests of the various signatory nations, but I think the efforts to reduce CO_2 emissions for the future of this planet shared by all of humanity are now on a clear forward trend.

Glass, which is the heart of our business, is one of the oldest materials made by humankind, as evidenced by the excavation of glass artifacts from archaeological sites thousands of years old. Since glass manufacturing requires that the glass be heated to very high temperatures, the history of glass is linked to the history of energy. Wood served as that source of energy in ancient Roman times when the glass industry first prospered. Later, glass makers moved their operations to the undeveloped parts of the Roman Empire in their quest for timber, which also served to expand the glass industry to neighboring countries.

However, it wasn't possible to make high-quality glass products in large quantities until the emergence of the Industrial Revolution. The Industrial Revolution arrived with the invention of electrical devices as well as coal energy, the steam engine, automated machinery, and incandescent light bulbs. In the glass industry, the conversion from wood to coal energy led to quantitative growth, while the invention of electrical devices led to the production of glass for electronic devices, which contributed to qualitative growth.

The subsequent development of the electronics industry, which contributed to the widespread adoption of household appliances, required ever higher quality and even more types of highly functional glass. This marked the arrival of the real energy revolution. At the time of our founding in 1949, that energy came from coal. During that time, our workers would be black from coal soot at the end of their shifts. Some say that when no showers were available, the workers would bathe in the factory pond before returning home.

Soon after, pollution control measures were adopted and improvements to product quality were needed. As a result, coal was no longer used and cleaner forms of energy such as heavy bunker C and bunker A oil, kerosene, and LPG energy were substituted for use in glass production. Then, in 2010, we adopted natural gas as our fuel and completely halted the use of heavy oil. Now, in search of cleaner and higher quality glass, we are taking steps to convert to using electricity for all the energy required by our glass manufacturing operations.

At Nippon Electric Glass, our history of improving the quality of glass has also set us on the path to reducing our CO_2 emissions. That is why we, as a manufacturer of special glass, are leading the way towards carbon neutrality. This has not been an easy task, as energy conversion in the glass industry leads to significant changes in equipment and operating conditions. Although high technical hurdles remain, we are confident that our strong focus on making glass of ever higher quality will pave the way to our goal of carbon neutrality.

Products and Business Fields

The special glass products we develop are not always noticeable. Our glassware, however, a familiar product that makes life more comfortable, is used in our homes, offices, hospitals, and throughout the community.

Outside

Contributing to the sustainable growth of cities across many industries

In addition to the popular building materials and fire-rated glass we offer, our products are used for applications in many industries. For example, our glass tubing for pharmaceutical and medical use is in demand in the medical sector, while our materials for wind power generation are used by the energy industry.

Renewable energy

- Glass fiber for wind turbine blades

- Cover glass for space-based solar power systems

Shopping centers

- FireLite™ fire-rated glass

- Invisible Glass™ for use in showcases
- GlassOre™ Glass Brick

Hospitals

- Glass tubing for pharmaceutical and medical use

- LX Premium, radiation shielding glass

Train stations

- Lamion™ for train station platform doors

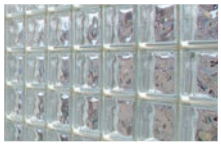
- Neopariés™ glass-ceramics building material

Digital cameras

- Cover glass for image sensors
- IR absorbing glass

Building materials

- Glass blocks



- Alkali-resistant glass fiber for cement reinforcement

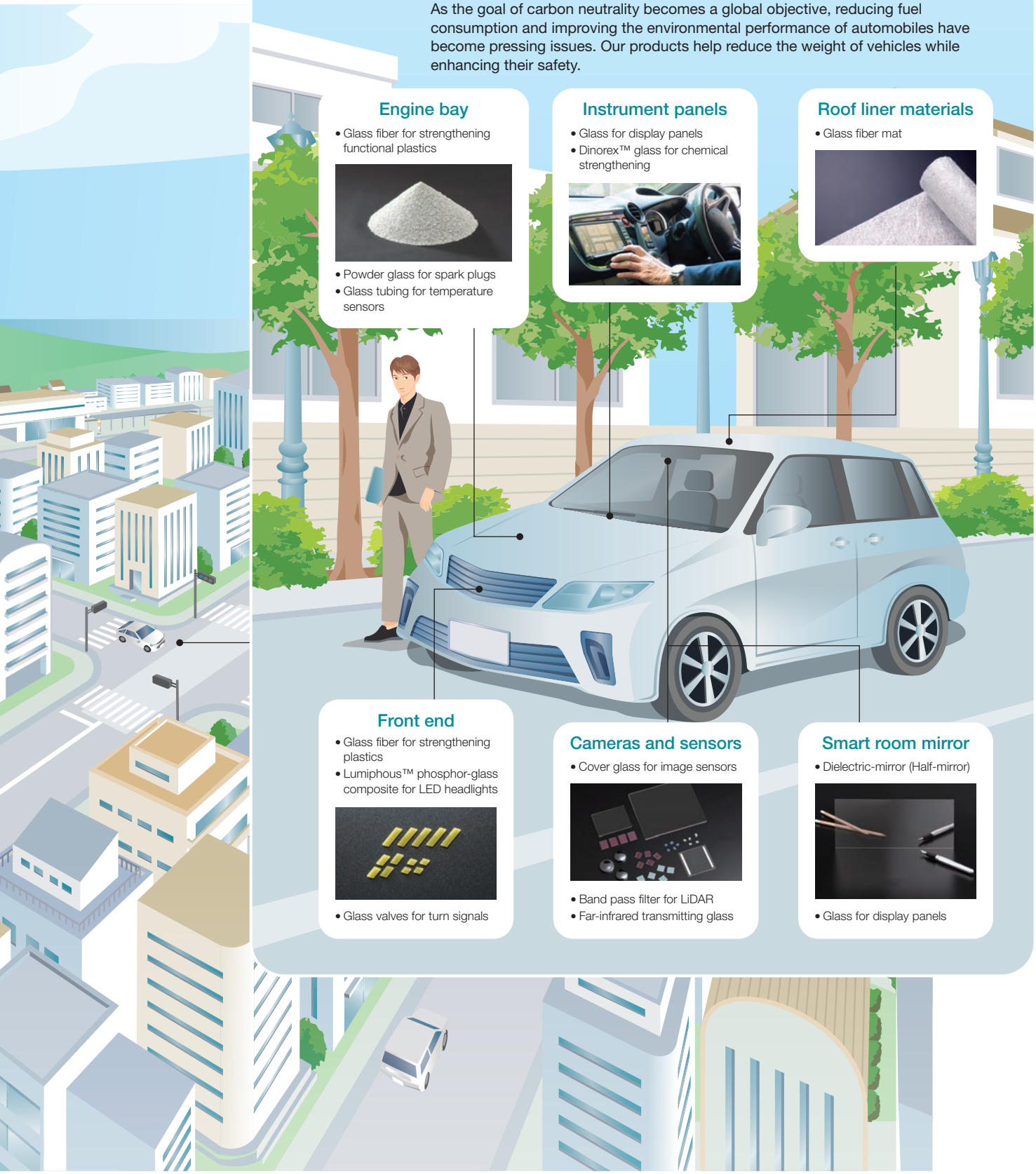
Offices

- Glass for optical communication devices
- Lamp reflectors for projectors

Automotive

Supporting the evolution of motor vehicles with advanced technologies renowned for their reliability

As the goal of carbon neutrality becomes a global objective, reducing fuel consumption and improving the environmental performance of automobiles have become pressing issues. Our products help reduce the weight of vehicles while enhancing their safety.



Engine bay

- Glass fiber for strengthening functional plastics

- Powder glass for spark plugs
- Glass tubing for temperature sensors

Instrument panels

- Glass for display panels
- Dinorex™ glass for chemical strengthening

Roof liner materials

- Glass fiber mat

Front end

- Glass fiber for strengthening plastics
- Lumiphous™ phosphor-glass composite for LED headlights

- Glass valves for turn signals

Cameras and sensors

- Cover glass for image sensors

- Band pass filter for LiDAR
- Far-infrared transmitting glass

Smart room mirror

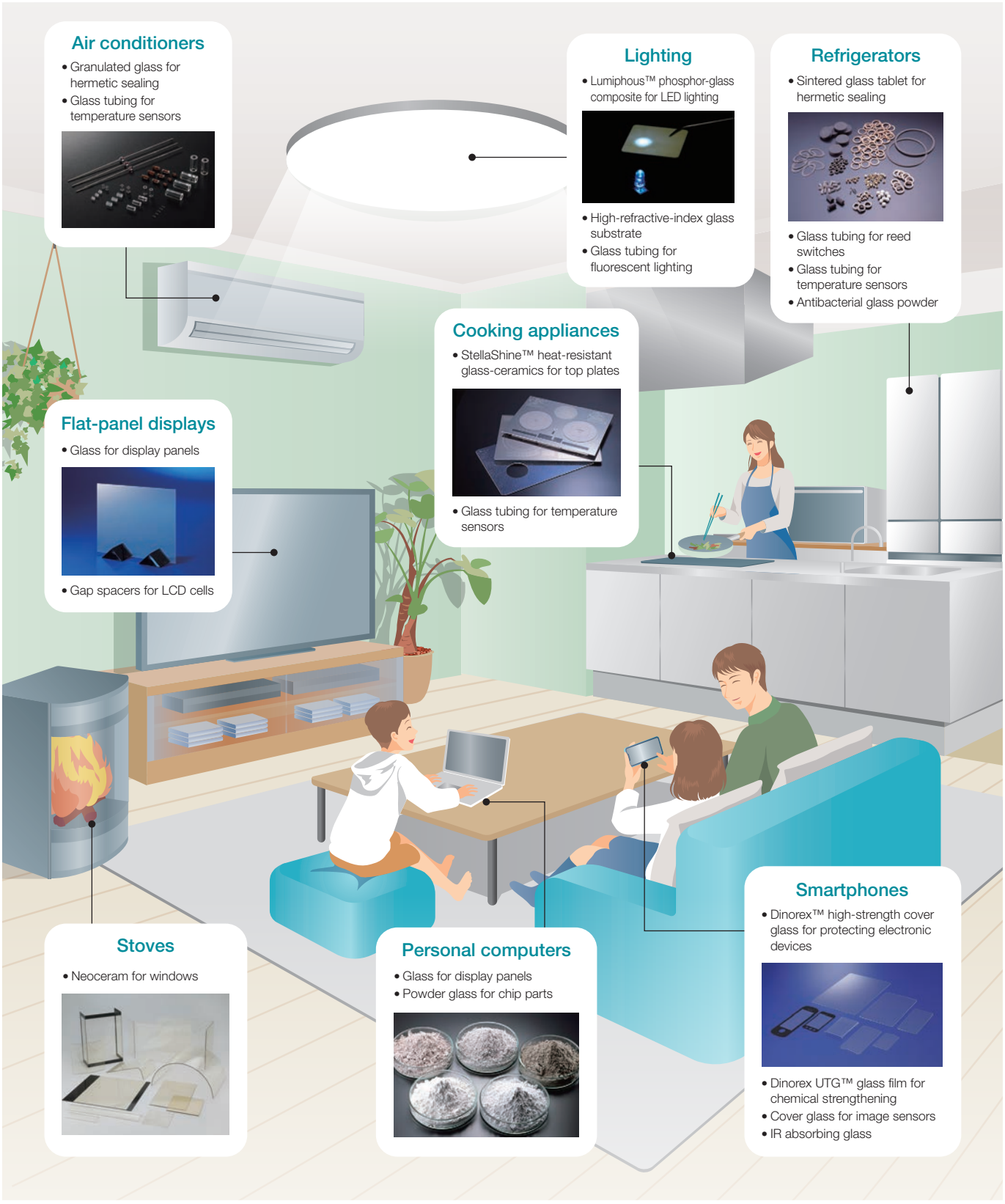
- Dielectric-mirror (Half-mirror)

- Glass for display panels

Inside

Assured safety and security for daily life

To support the comforts of modern life, our products offer high resistance to heat, thermal shock, and environmental factors as well as high strength, low weight, and excellent electrical insulation, among other features.



Air conditioners

- Granulated glass for hermetic sealing
- Glass tubing for temperature sensors

Lighting

- Lumiphous™ phosphor-glass composite for LED lighting

- High-refractive-index glass substrate
- Glass tubing for fluorescent lighting

Refrigerators

- Sintered glass tablet for hermetic sealing

- Glass tubing for reed switches
- Glass tubing for temperature sensors
- Antibacterial glass powder

Cooking appliances

- StellaShine™ heat-resistant glass-ceramics for top plates

- Glass tubing for temperature sensors

Flat-panel displays

- Glass for display panels

- Gap spacers for LCD cells

Stoves

- Neoceram for windows

Personal computers

- Glass for display panels
- Powder glass for chip parts

Smartphones

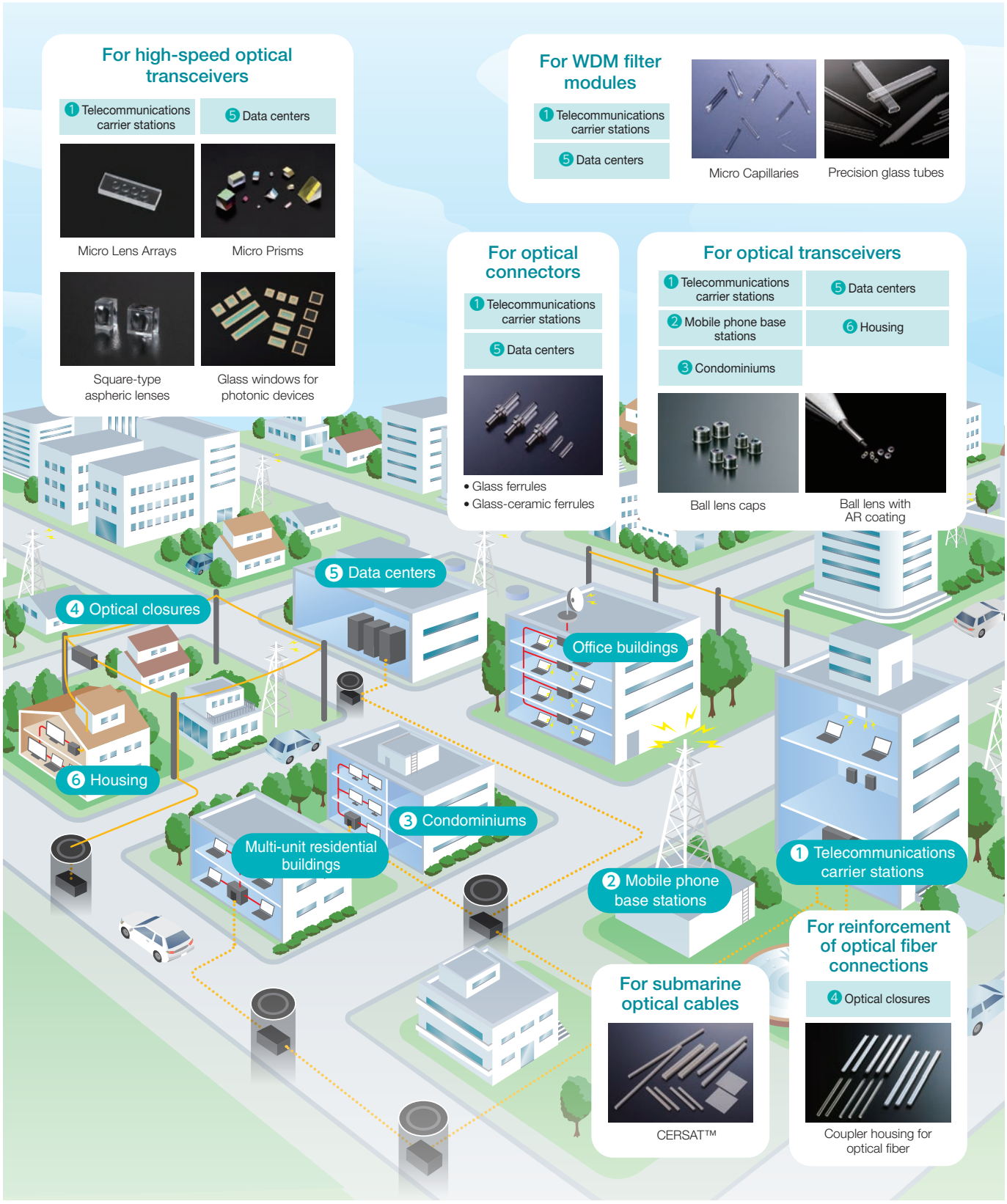
- Dinorex™ high-strength cover glass for protecting electronic devices

- Dinorex UTG™ glass film for chemical strengthening
- Cover glass for image sensors
- IR absorbing glass

Network

Supporting technological innovation in an increasingly sophisticated information-reliant society

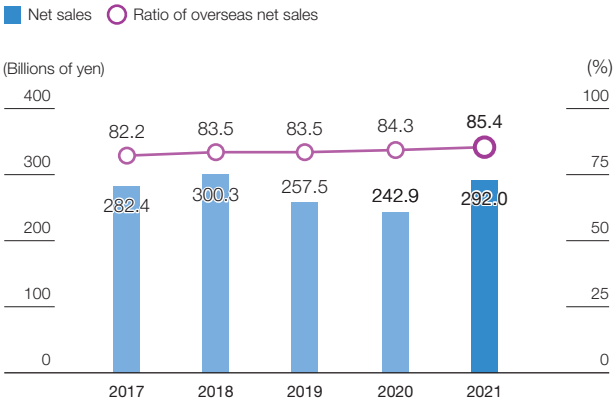
Our glass must exhibit superiority in terms of optical properties, formability, workability, dimensional accuracy, and airtightness in order to improve the stability, reliability, and convenience of communication.



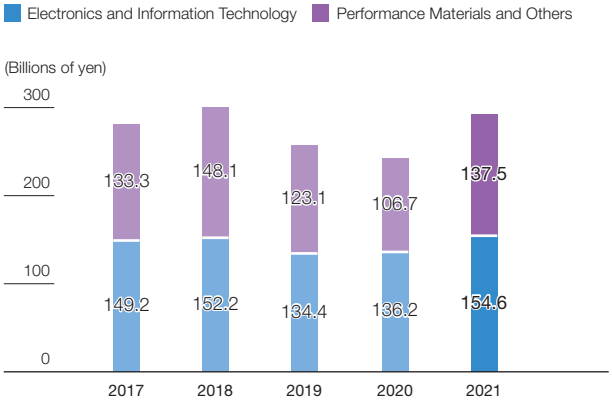
Financial and Non-financial Highlights

Financial Highlights (Consolidated)

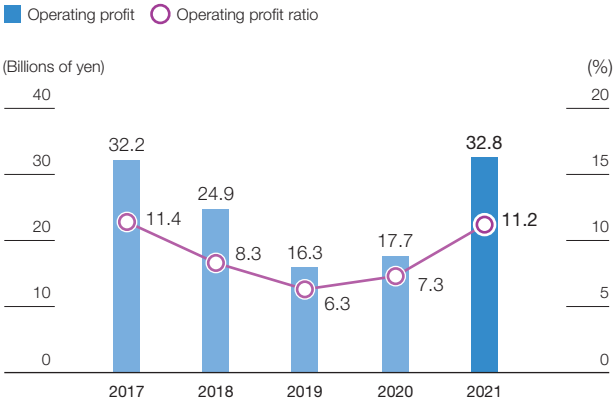
Net Sales, Ratio of Overseas Net Sales



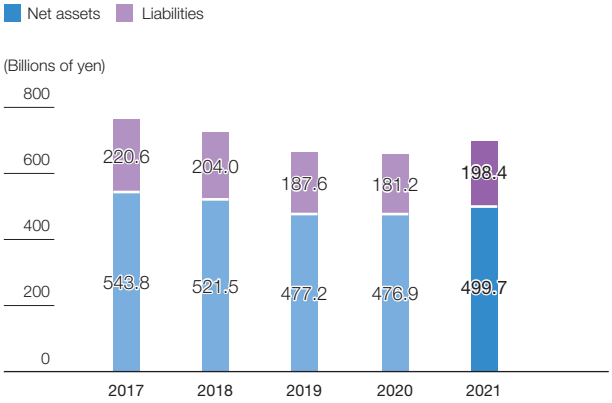
Sales by Business Segment



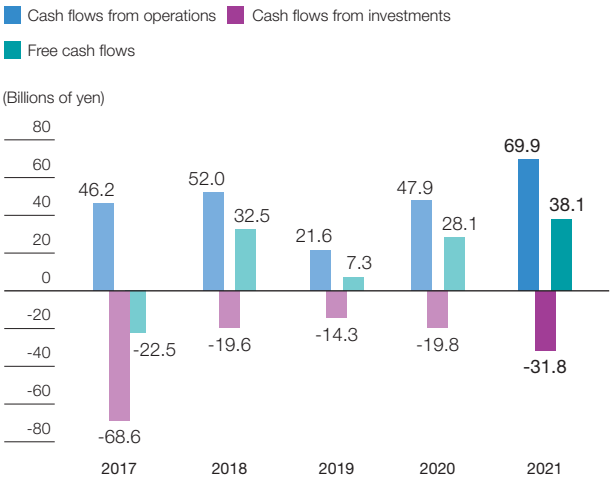
Operating Profit, Operating Profit Ratio



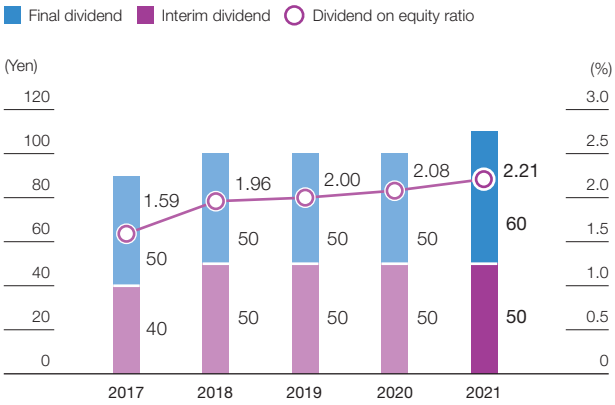
Net Assets, Liabilities



Cash Flows



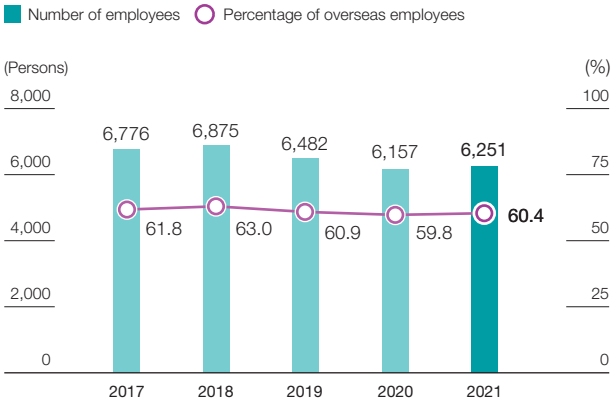
Cash Dividends per Share[1], Dividend on Equity Ratio



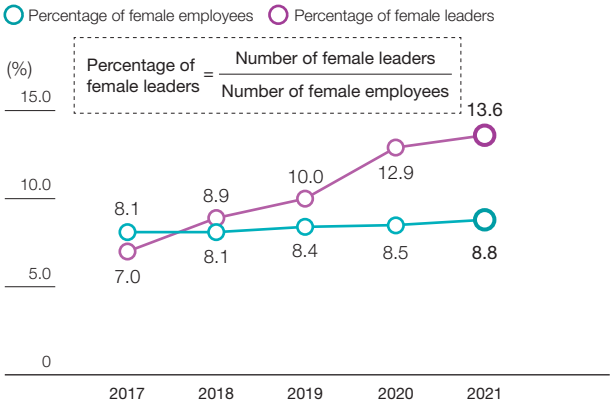
[1]Per share of common stock amounts are retroactively adjusted for subsequent stock consolidation. On July 1, 2017, common shares were consolidated at a ratio of 5 to 1 based on the number of shares held by shareholders of record as of June 30, 2017.

Non-financial Highlights

Number of Employees, Percentage of Overseas Employees (consolidated)

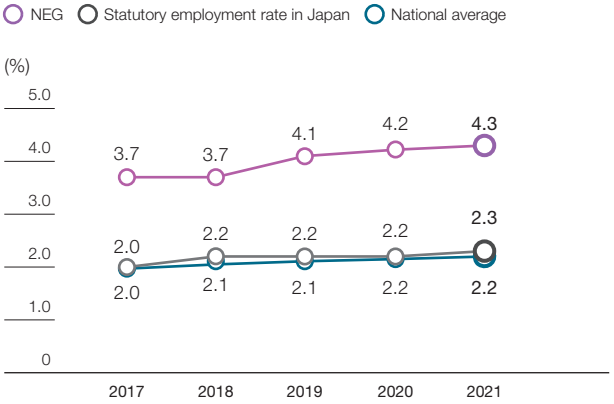


Percentage of Female Employees and Female Leaders (NEG)[2]

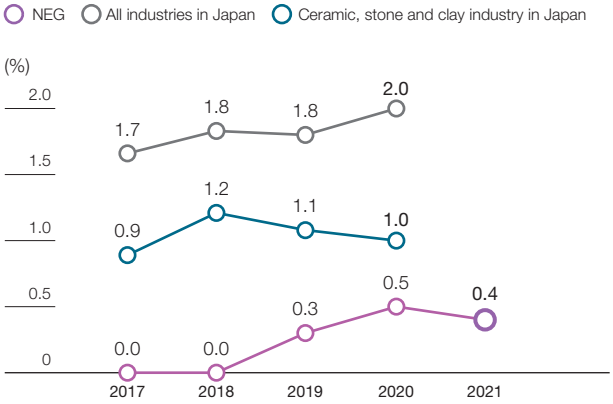


[2]A female leader is a female employee who oversees and manages subordinates.

Percentage of Employees with Disabilities (NEG and consolidated subsidiaries in Japan)

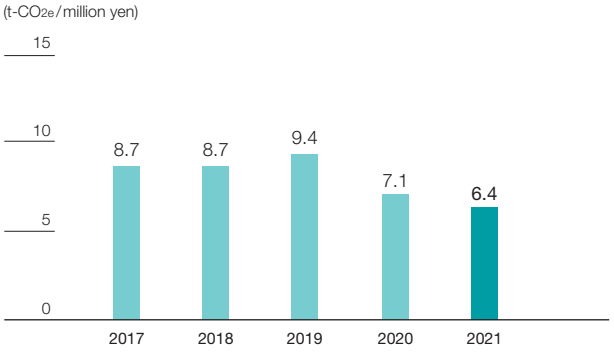


Industrial Accident Frequency Rate (NEG)[3]



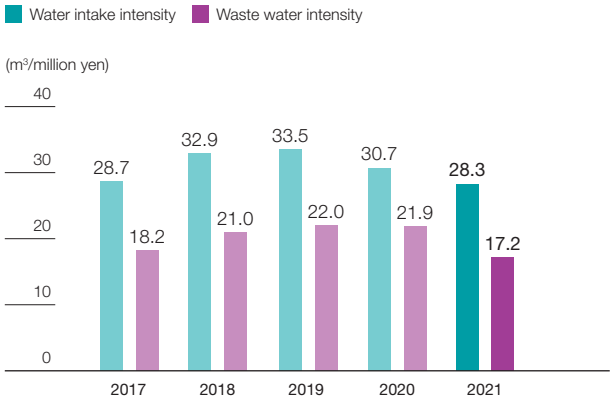
[3]Aggregation period: January 1–December 31 annually for NEG; April 1–March 31 of the following year annually for all industries and for the ceramic, stone and clay industry

CO_2 Emissions Intensity (to consolidated sales)[4]



[4]The figures for fiscal 2020 have been revised.

Water Intake / Waste Water Intensity (to consolidated sales)



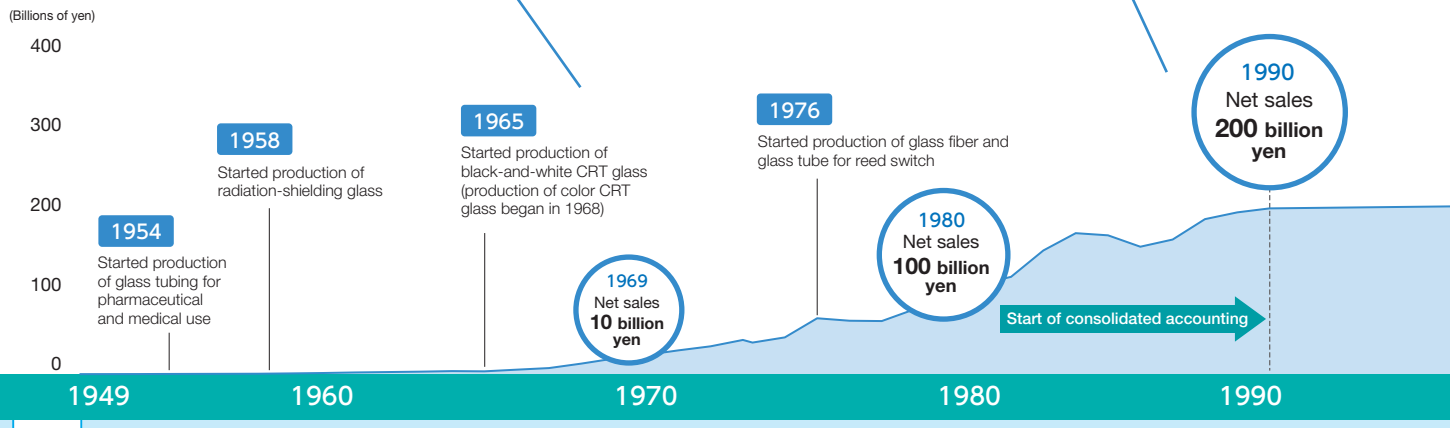
History of Transformations and Advances

Applying technologies to expand our business as a leading special glass manufacturer

We started out as a manufacturer of hand-blown glass for vacuum tubes for radios and after succeeding in automatic forming of tube glass, moved on to mass produce such products as glass tubes for fluorescent lighting. In 1965 we enlarged the scale of our business to include producing glass for CRTs. Businesses were launched around glass-ceramics, glass fiber, glass for electronic devices, and more.

Promoting global business as overseas markets expand

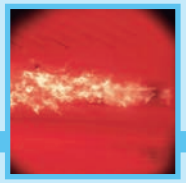
In the 1990s we set up a global production and supply system to meet global demand for CRTs, and grew into one of the world's leading CRT glass manufacturers. As LCDs started to become prevalent in the latter half of the 1990s, we made strategic preparations to adapt to the changing marketplace.



Technological Advances

1951
Automated production of glass tubing using the Danner process

1974
All-electric melting furnaces with no fuel-derived CO_2 emissions brought online



1993
Japan's first oxy-fuel firing furnaces were brought online

Sustainability Transitions

1960
Introduced a melting furnace with electric melting process

1971
Established Notogawa Plant
Introduced cutting-edge environmental equipment (eco-friendly model factory)

1974
All-electric melting furnaces with no fuel-derived CO_2 emissions brought online

1980
One of the first six firms in Japan to establish a special-purpose subsidiary company to employ people with disabilities

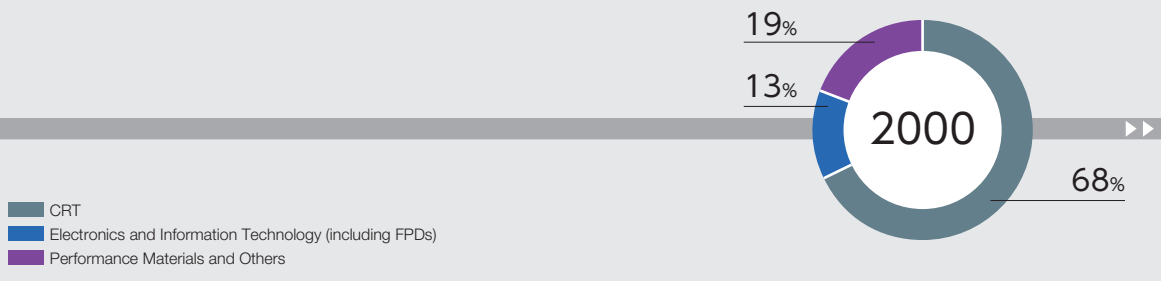
1993
Japan's first oxy-fuel firing furnaces were introduced, resulting in a reduction of CO_2 emissions and improvement of heat efficiency

1994
Electronic Products Group acquired ISO 9002 certification for three product classes including powder glass

1998
Recycling system for glass collected from used televisions became operational

1999
Acquired ISO 14001 certification for all plants in Japan

Changes in Business Composition



The End of the CRT and changeover to LCDs

To meet the rapid growth of the LCD market, in 2000 we started producing glass substrates for LCDs using an overflow process. Year by year we were able to produce larger, higher quality substrates to meet the demands for increasing complexity in the LCD market. Business also expanded in glass fiber for strengthening high-function plastics and glass tubing for pharmaceutical and medical use.

Building a new axis for growth to become the world's leading manufacturer of special glass

We acquired production facilities in Europe and the United States from U.S.-based PPG Industries to expand our glass fiber business. This business grew into a major business for the Company alongside the LCD glass business. We also released new products such as cover glass for smartphones and a phosphor-glass composite, and developed unique products such as glass ribbon and glass with a zero CTE (coefficient of thermal expansion).

1991 CRT glass production facility established in Malaysia

1998 Started production of glass fiber in Malaysia

2002 LCD substrate glass processing facility established in Gumi, South Korea

2009 Started production of glass for chemical strengthening

2013 Started production of Lumiphous™ phosphor-glass composite

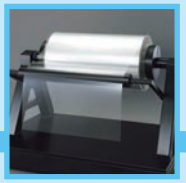
2016 Acquired the European glass fiber business from U.S.-based PPG Industries

2017 Acquired the U.S. glass fiber business from U.S.-based PPG Industries

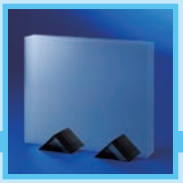
2019 Started production of flat glass fiber

2000 | 2010 | 2021

2000
Production of LCD substrate glass by applying the overflow process



2008
Roll-to-roll process achieved for ultra-thin (50 μm) sheet glass



2019
Establishment of an innovative manufacturing process in LCD glass

2000
Implemented "Environmental Business Plan"

2006
Acquired ISO 17025 certification for reliable analysis of traces of environmentally harmful substances

2007
Concluded a comprehensive university-industry collaboration agreement with the University of Shiga Prefecture (ongoing)

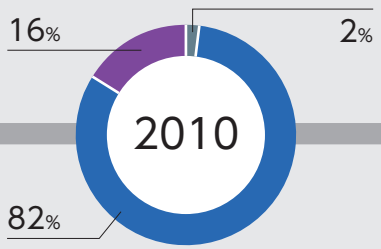
2010
Fuel conversion (complete discontinuance of use of heavy oil and switch to LPG/natural gas), resulting in huge reduction in CO_2 emissions

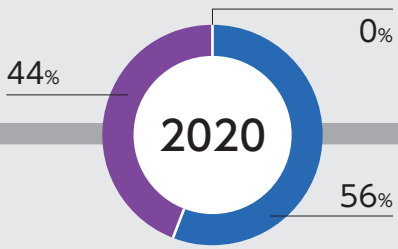
2011
Developed reprocessing of dust collected from kiln exhaust gas into raw material at a plant in Japan

2015
Participated in visiting lectures sponsored by Otsu City (ongoing)

2018
Purchased carbon offset credits (J-Credit) issued by a forestry association in Shiga Prefecture to contribute to local environmental conservation

2019
Certified with top rating (three stars) as a company embracing Shiga Prefecture Biodiversity Initiative





Strengths of Nippon Electric Glass

Over the years, we have developed a wide range of glass technologies including material design and evaluation, melting, forming, and processing. These technologies are brought together in our production facilities, which are the foundation for the development of new applied technologies. It is through these technologies that we can create unique, high-function glass products.

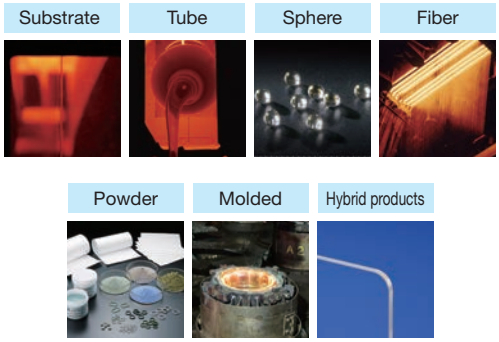
Manufacturing Strength

Creativity

Creating new value with glass that takes a variety of forms and functions

Glass is an exceptional material that takes a variety of forms and functions based on how the chemical elements are combined or formulated. The texture and luster are its best attributes. Glass from our production line takes many forms and shapes and is used in wide variety of fields.

Variety of Forms



Technologies

Combining basic technologies and applied technologies for the commercialization of high-quality glass

We conduct basic research that covers material design and evaluation, process design and development, and commercialization. We also perform computational science research (including data analysis that utilizes ICT and AI). We develop new products that take advantage of our precision forming and processing, and applied research on ultra-thin substrate forming.

Basic Glass Technologies

Material design and evaluation

Process design and development

Melting

Our melting technology and the design of our melting furnaces involve advanced and precise furnace operations—for example, controlling combustion and temperature while reducing environmental burdens. These technologies help us to produce high-quality glass.

Forming

One thing that sets our Group apart from the competition is our wide range of forming technologies. These technologies enable us to achieve high dimensional accuracy and high productivity. We can use the most suitable forming method for each product and respond to the various needs of our customers.

Human Resources and Organizational Structure

Responding rapidly with solutions for customers through organizational and employee competence

Since the Company's founding, we have prided ourselves as glass manufacturers on an ethos of no-nonsense dependability. There is very little distance between top management and floor supervisors, and over the years we have maintained an open-minded corporate culture that values transparency. This atmosphere empowers our employees and gives us organizational strength, bolstering the Company in many ways and supporting its growth.

Various Human Resource Development Programs

Promoting multi-faceted opportunities for skill improvement, plus on-the-job training

OJT + Level-specific training / Global human resource training / Skills training / Self-development programs that include acquiring industry certification

Developing personnel capable of world-class performance in every challenge

Functions

Optical	Electromagnetic
Light absorption, wavelength conversion, optical thin film	Insulation, dielectric, conductive film, magnetism
Thermal	**Mechanical**
Heat resistance, fire prevention, low-temperature sealing	High strength by chemical strengthening or crystallization
Chemical	**Others**
Acid resistance, alkali resistance, sustained release of chemicals	Gas barrier, plastic and cement reinforcement

Processing

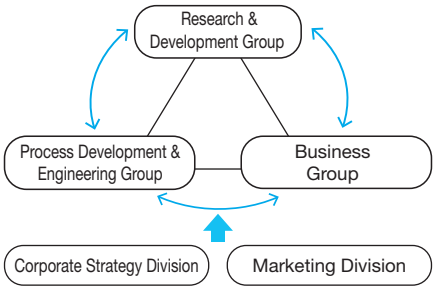
New functions and features are given to glass through a variety of working processes. These processes include reforming by heating and softening, crystallizing by firing, coating films, precision cutting and polishing, and compounding with crystals or organic substances.

Commercialization research

Applied Technologies

Precision forming and processing	Ultra-thin substrate forming	Hybrid technologies (use of thin film and laminating with other materials)
Ultra-large substrate manufacturing	Crystallization	

Supporting Seed Technologies and Responding to Needs Organizationally



Our well-coordinated system of development is facilitated by smooth information-sharing among the three groups and supported by the Corporate Strategy and Marketing Divisions

Value Creation Utilizing Our Strengths

Expanding the fields for our products to meet society's needs in a new era

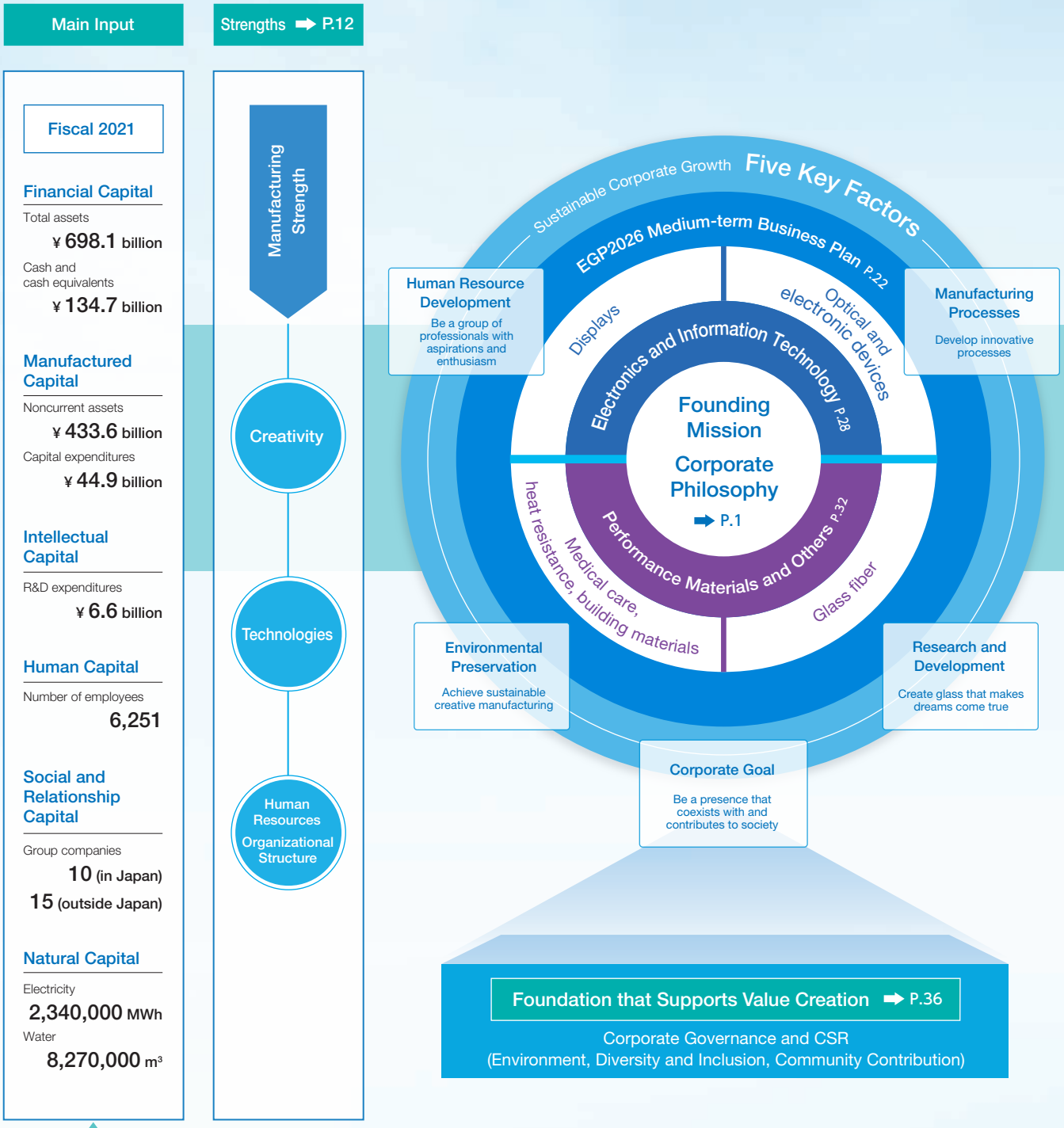
Since the Company's founding in 1949, our efforts have been focused solely on improving glass technologies, developing and supplying the products that each age demands, and expanding the domains for our efforts. Our aim going forward is to contribute to a better world through the manufacturing of the highest quality glass to meet society's needs.

Fields of Application and Markets

Automotive	• Lightweight materials • Lighting • Displays • Driving automation (cameras, sensors, etc.) • Electronic devices
Energy	• Secondary batteries • Renewable-energy systems
Medical Care	• Advanced pharmaceutical containers • Advanced medical equipment and facilities
Semiconductors	• Next-generation semiconductor materials (small, high definition, high performance) • Semiconductor manufacturing equipment
Displays	• High-performance displays (high definition, thin and lightweight, flexible)
ICT	• Optical communication devices (for next-generation high-speed communications)
Social Infrastructure	• High-function fire-rated equipment • High-performance structural materials (safe, durable, lightweight)
Home Appliances and Housing Equipment	• High-function home appliances, housing materials • Multifunction wall materials

Value Creating Process

Utilizing six resources of capital for our business operations, we pursue the unlimited possibilities of glass while providing value to society through our innovative products. We will continue our efforts to realize sustainable societies.



Product Areas

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- Automotive
- Energy
- Medical Care
- Semiconductors
- Displays
- ICT
- Social Infrastructure
- Home Appliances and Housing Equipment

Global Operations

➡ P.60

- U.S.A.
- Europe
- Asia
- Japan

Main Output

Fiscal 2021

Financial Results

Net sales
¥ 292.0 billion

Operating profit
¥ 32.8 billion

Cash dividends
¥ 110 /share per year
(DOE 2.2%)

Intellectual Property

Number of acquired patents
2,969

Diversity and Inclusion

Percentage of employees with disabilities
4.3%

Health and Productivity Management Outstanding Organization
Certified 4 years in a row

Community Contribution

Number of participants in community activities
Approx. 200 people

Environment

Sales of environmentally friendly products
Approx. ¥ 90 billion

Creation of Social Value

- Reduction of environmental impact
- Utilizing natural energy
- Innovations in ICT
- Advancement in medical care
- Improvements in safety and comfort of daily life
- Advancement in transportation
- Creating a robust and durable social infrastructure
- A fair work environment and human resource training to develop tomorrow's leaders

Meeting society's challenges

Sustainable Development Goals (SDGs)

SUSTAINABLE DEVELOPMENT GOALS

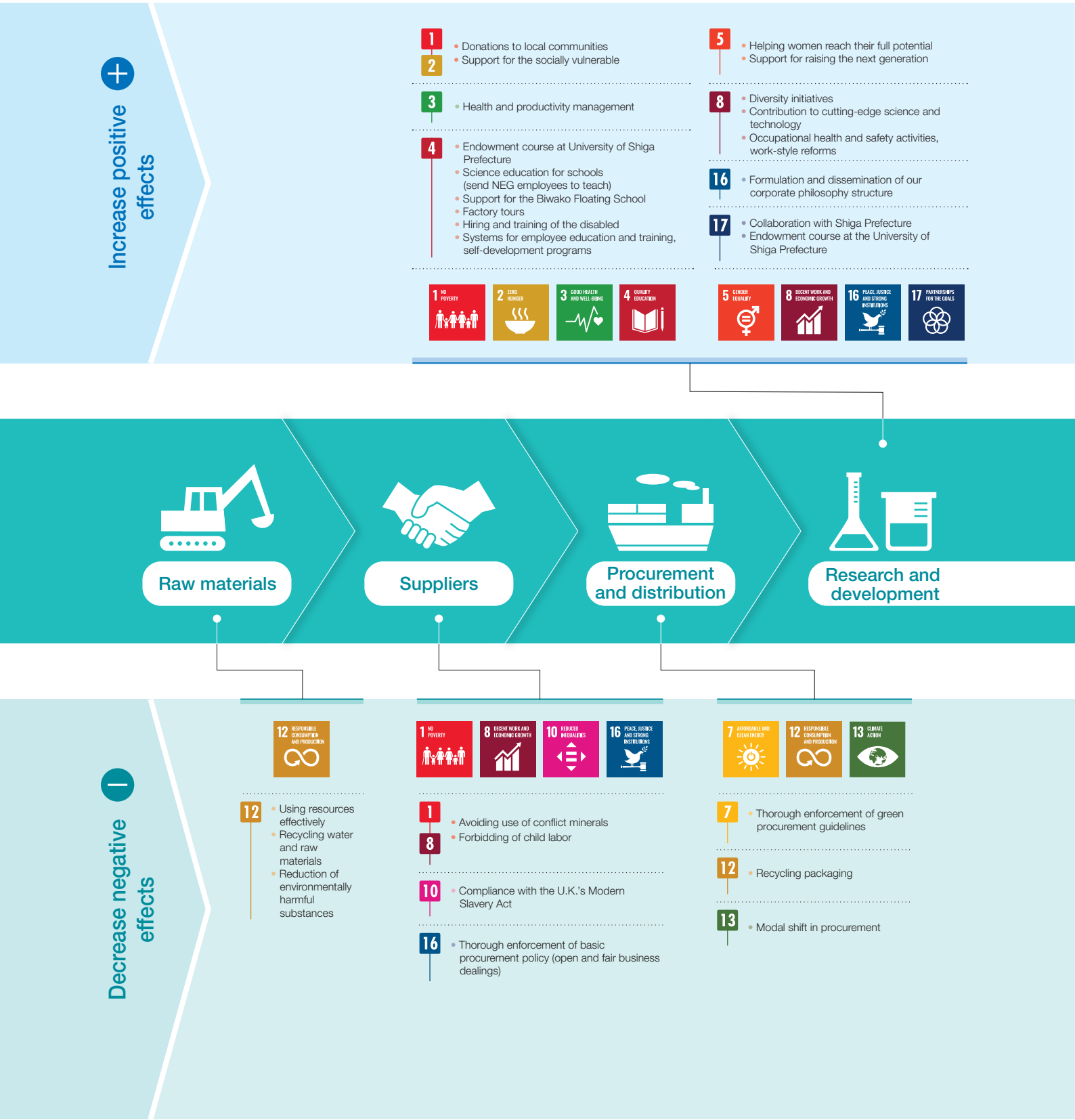
Our Goal

➡ P.1

The world's leading manufacturer of special glass

Value Chain

In each process of the value chain, we strive to increase the positive effects of our business activities and minimize the negative effects. We will continue to work hand-in-hand with our stakeholders in order to raise corporate value, solve society's problems, and achieve the SDGs.



3
- Glass tubing for pharmaceutical and medical use
- Radiation-shielding glass for patient diagnosis
- Flat-panel detector glass for X-ray diagnostic devices
- Antimicrobial glass

7
- Resin-reinforced glass fiber to reduce the weight of automobiles
- Resin-reinforced glass fiber for wind turbine blades
- Glass substrates for FPDs, G-Leaf™ ultra-thin glass
- Lamion™ lightweight composite material
- Lumiphous™ phosphor-glass composite

9
- ARG Fiber for reinforcement in construction
- Development and sales of glass for optical communication and electronic devices

11
- Lamion™ for train station platform doors
- FireLite™ fire-rated glass for fireproof public facilities
- Glass fiber for reinforcement in construction
- Glass fiber for resin railroad ties

Production

3
- Manufacturing using no harmful substances
- Preventing pollution of the atmosphere, waterways, and soil
- Health and safety activities
- Employee health improvement activities

6
- Strict control of wastewater (protecting water quality)

10
- Human rights initiatives
- Committee on Human Rights Issues
- Shiga Prefecture Human Rights Issues Liaison Committee (corporate board member)
- Compliance with the U.K.'s Modern Slavery Act
- Compliance with Japan's Equal Employment Opportunity Act

Sales

12
- Recycling water and raw materials
- Capture and reuse of exhaust gas
- Pursuit of highly efficient manufacturing
- Extending the life of facilities

13
- Global warming mitigation measures (e.g., reduction of CO_2 emissions)
- Environmental education

15
- Supporting local forestry association activities
- Removal of invasive fish species in Lake Biwa
- Forest conservation around factories

16
- Thorough compliance
- Human rights initiatives

Product use

12
- Recycling packaging

13
- Modal shift in shipping
- Joint shipping with customers (e.g., reciprocal utilization of trucks)

Final product disposal

12
- Reuse of waste glass

Message from the President

M. MATSUMOTO

Motoharu Matsumoto
President

Under EGP2026, our new Medium-term Business Plan, we will expand the scale of our business.

We achieved the goals of our EGP2021 plan in a rapidly changing business environment.

In fiscal 2021, the spread of the COVID-19 pandemic continued to have a negative impact on our corporate operations, but the benefits of the vaccination led to a gradual recovery in economic activity. On the other hand, this was a challenging year to navigate, as raw materials and components remained in short supply and the supply chain remained disrupted. Despite these circumstances, we managed to sustain our business operations in an effort to achieve our management goals as the final phase of EGP2021, our three-year Medium-term Business Plan. The spread of the COVID-19 pandemic led to the introduction of new ways of working internally as well as outside the Company. This new environment prompted us to work more closely with our customers, respond in a detailed manner to customer requests, and always offer solutions one step ahead of the competition. In addition, we worked to multiply the benefits of the technological innovations we have long been implementing in our manufacturing operations.

As a result, we were able to achieve results in fiscal 2021 that exceeded those of the preceding fiscal year while absorbing cost increases from soaring raw materials and fuel costs and logistics rates. Sales grew along with increased shipments of our flagship glass products for flat panel displays and glass fiber products as well as strong and stable shipments of glass for electronic components and for medical care, and heat-resistant glass. Operating profit, ordinary profit, and profit attributable to owners of the parent company all recorded significant increases compared to the previous year.

In the final year of our EGP2021 plan, we attained our sales objectives while exceeding our targets in terms of both operating profit and operating profit ratio. Notably, our operating profit ratio was 11.2%, which exceeded the 10% that we consider necessary for investment to support sustainable growth. We have thus been able to establish a base that allows for a smooth launch of EGP2026, our new Medium-term Business Plan.

Continuing to grow our business under EGP2026

EGP2018, our first Medium-term Business Plan introduced in 2015, saw us expand our Performance Materials and Others sector in an effort to improve our business portfolio. For our EGP2021 plan, we focused on strengthening our business foundation while promoting innovations in process technology, which put our Company on a stronger footing. Looking ahead to our EGP2026 plan, we intend to use this sturdy foundation as a springboard to expand our business.

Our slogan for both our EGP2021 and EGP2026 plans is "Strong Growth," which expresses our intentions quite clearly. We are emphasizing stronger R&D and human resource development, vigorous factories, and a robust supply chain. We intend to make our Company resistant to the more volatile business environment that is likely to appear in the future.

For our EGP2026 plan, we have made an adjustment from our previous three-year plan to the current five-year plan, which represents a noteworthy shift. The glass industry utilizes fairly large-scale facilities, and the transition from the planning to operation phases often exceeds two years. We have come to realize that this process cannot be measured adequately in three years. Moreover, the R&D process from inspiration to commercialization also takes a considerable period of time, while long-term planning is required to provide appropriate training and assignment of our human resources. We have therefore extended our business plans to a five-year term in order to incorporate all these elements into our medium-term business plans with greater specificity. We can also characterize our EGP2026 plan by the fact that we have backcasted every business from our vision of their desired state five years from now in order to identify the issues that need to be addressed in fiscal 2022.

Targeting record sales in fiscal 2026

For the final year of our EGP2026 plan, we adopted a sales target of 400 billion yen. In fiscal 2010, the Company posted record sales of 390 billion yen, but our new target exceeds even that. Our target for operating profit was set at 45 billion yen on the assumption that we intend to maintain a minimum operating profit ratio of 10% even if our sales grow. All the markets we are involved in are expected to grow at a stable rate. Looking to our display business, it is clear that all areas of society are increasing their use of flat panel displays. As one example, demand for automotive displays is steadily increasing with the increased adoption of electric vehicles.

As evidenced by the display business and the policies encompassed by our EGP2026 plan, we believe that the display business has much growth potential, as do our other markets including the glass fiber business; the optical and electronic device business; and the medical, heat-resistant, and building materials businesses. We are responding to this prospective growth by incorporating investments up to two years in advance. Looking to our targets three to five years ahead, we intend to reflect the results of this fiscal year and the next into these future investments.

Building a robust supply chain

We have identified five priority measures under our EGP2026 plan, including strengthening our business platform, making flexible investments, promoting new businesses, promoting carbon neutrality initiatives, and executing our human resources strategy. All these measures are essential for achieving sustainable growth; consequently, we are communicating these priorities to our investors and other stakeholders as we address them in a comprehensive manner within the Company.

With regard to our first priority measure, strengthening our business platform, our first step was to establish a robust supply chain. Against the backdrop of challenging economic conditions, disruptions in logistics, and labor shortages, it has become difficult to secure the needed equipment, materials, fuel, packaging materials, and even personnel. We intend to address these needs in a steadfast manner by predicting procurement risks, securing stable suppliers, and establishing multiple logistics routes.

In addition, as for our effort to create robust factories, it appears that conventional initiatives are insufficient in light of the increasing sophistication of processes and the intensification of climate change. Consequently, we will focus on establishing a system that enables prompt recovery in the event of an emergency by providing ongoing education and training while developing backup systems. The need to update aging equipment is also a critical issue, and we intend to proactively meet our needs five or even ten years in advance as part of this upgrade cycle.

Seeking to improve competitiveness while promoting carbon neutrality

Our second priority measure is making flexible investments. Although many of the investment plans we have marked for implementation in the current and next fiscal year are already in progress, we will remain adaptable to change regarding the decisions to be made in the third fiscal year and beyond. We will make capital investments in a timely manner by determining whether we can remain competitive in a particular business and process, whether the local interests are served, and whether geopolitical risks are present.

Looking to our third priority measure, promoting new businesses, we are placing a special focus on the development of an all-solid-state sodium-ion secondary battery. This battery does not incorporate the rare metal lithium, so it entails less risk in terms of material procurement, while its inorganic oxide composition means that it cannot ignite and generate toxic gases. In addition, its excellent cycle characteristics offers several advantages, including resistance to deterioration. The key to the future of this product is the provision of high energy density. We remain focused on further development of this innovation with the goal of commercializing it during the term of our EGP2026 plan.

With regard to our fourth priority measure, promoting carbon neutrality initiatives, we developed a concrete plan last year and formulated a schedule extending until 2030. By that date, we anticipate having reduced our CO_2 emissions (Scope 1 + 2) by 36% relative to 2018 and by 60% for emissions intensity (Scope 1 + 2). Thereafter, we will continue to implement our plan in a steadfast manner. We believe that our improved competitiveness will enable us to prevail over our global competitors.

We should remember that it is individuals who must implement these priority measures. Our fifth priority measure is to execute our human resource strategy, which is to hire diverse personnel with the knowledge and skills required for future business development, to create a workplace environment in which employees can work with complete peace of mind, and to continue training our personnel.

As mentioned, we intend to achieve sustainable growth and carbon neutrality through flexible investment and through the development of new businesses even as we strengthen our business foundation over the next five years.

In recent years, our shareholder composition has changed, and a wider range of individuals hold our shares. While I am thankful for the spreading support for management and am personally very grateful as a management executive, I once again feel the weight of responsibility for shareholder returns even as we fulfil the desire to continuously grow our business. In keeping with our policy of maintaining a stable dividend, we have not reduced our dividend for the preceding 20 years, and we have either increased our dividend or kept it unchanged each fiscal year. Going forward, we remain committed to maintaining a minimum dividend on equity ratio of 2% while enhancing shareholder returns through the flexible acquisition of treasury stock.

We look forward to your continued support as we pursue these endeavors.

New Medium-term Business Plan “EGP2026”

Slogan

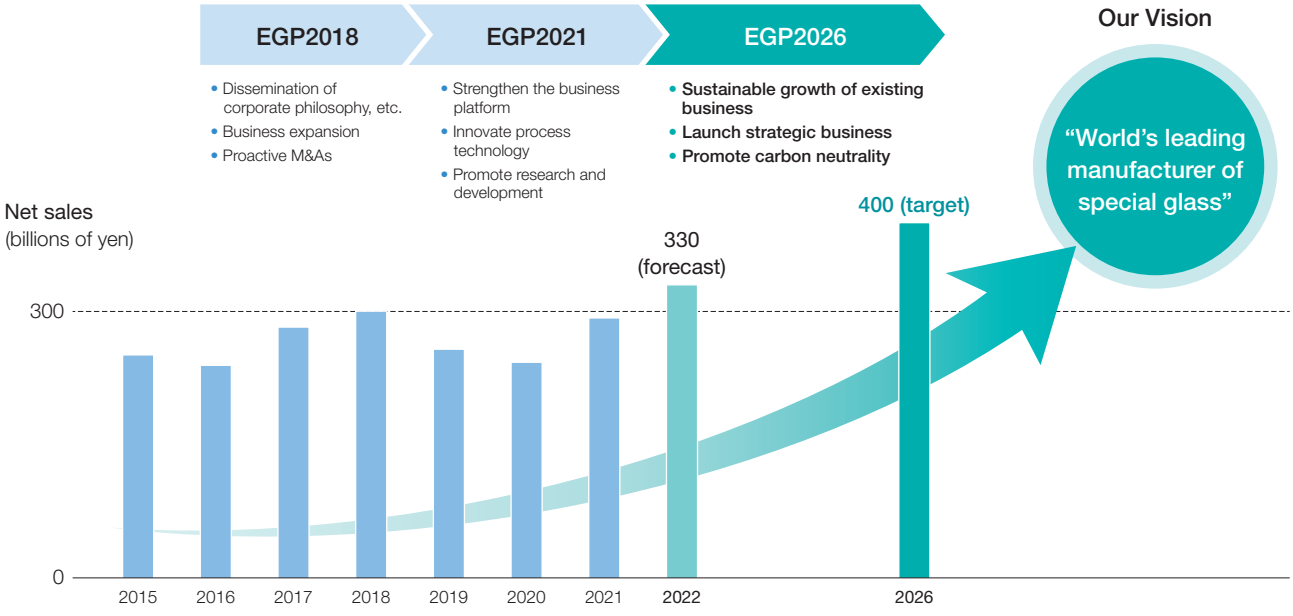
“Strong Growth”

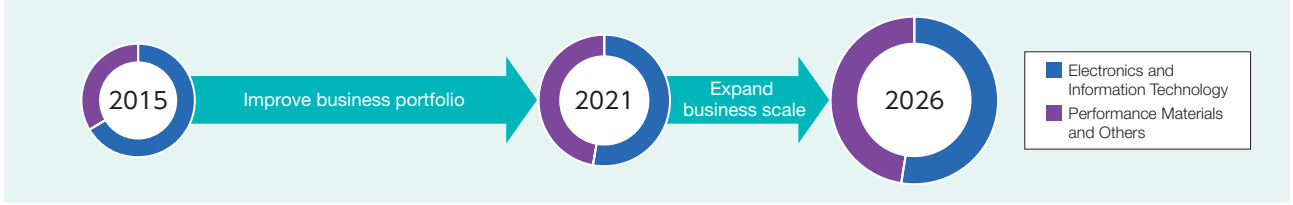
Completing all work by changing ourselves and speeding up

Basic policy	We aim to become the world’s leading manufacturer of special glass by strengthening our corporate structure and manufacturing the world’s most environmentally friendly glass.
Period	January 1, 2022, to December 31, 2026 (5 years)
Management targets	Net sales: **400** billion yen Electronics and Information Technology: **210** billion yen — Display glass, optical and electronic devices, and related products Performance Materials and Others: **190** billion yen — Glass fiber, medical care, heat resistance, and building materials Operating profit: **45** billion yen / Operating margin: **11** % / Target year: **Fiscal 2026**

We are steadily implementing strategies for growth to achieve our targets in each business field.

Note: For our strategies and growth prospects for each field, see “Business Overview” on pages 28–35.





Priorities Measures for Growth

1 Strengthen the business platform

- **Establishing a robust supply chain**
  In order to respond to procurement risks arising from economic conditions and disruptions to logistics, as well as environmental and compliance risks, we will seek out multiple capable suppliers and logistics routes and monitor our business partners.
- **Reinforcement of plants**
  To establish plants that are resistant to disasters and malfunctions, we will introduce advanced and highly efficient equipment and reinforce our backup systems.
- **Continuing basic research and development**
  We will undertake research on materials and process development utilizing computational science; construct networks and engage in joint research with universities and research institutes inside and outside Japan; introduce facilities for those purposes; hire personnel from inside and outside Japan; and expand our networks.

2 Flexible investment

- **Investing with agility in response to market growth and customer needs**
- **Promoting the digital transformation and realizing of smart factories**
  Using digital technologies such as AI and IoT, we will promote timely collection and analysis of manufacturing process data; promote process automation to improve productivity, reduce human errors, and reduce the burden on employees.
- **Proactively pursuing M&A**
  In addition to pursuing organic growth, we will proactively pursue M&A with businesses that are expected to create synergies with our existing businesses without any delay.

3 Promote new businesses

- **Commercialization of new products such as all-solid-state sodium-ion secondary batteries**
  For information on the development of all-solid-state sodium-ion secondary batteries, see “Special Feature: Developing an All-solid-state Sodium-ion Secondary Battery” on pages 26–27.
- **Expanding our substrate glass, cover glass, and LTCC material businesses in the semiconductor field**
- **Proactively using of cooperation and alliances with other companies**

4 Promote carbon neutrality

- **Balancing the electrification of all our processes while improving our competitiveness**
  By electrifying all processes and updating our equipment, we will improve our competitiveness while helping to minimize global warming.
- **Investing in and procuring renewable energy**
- **Developing technologies for hydrogen energy and other carbon-free energy sources**
  Our initiatives to achieve CO_2 emissions reduction targets and carbon neutrality are presented in “Special Feature: Our Initiatives for Carbon Neutrality” on pages 50–51.

5 Human resource strategy

- **Recruiting and training personnel with advanced knowledge and skills**
  We will proactively seek to acquire specialized personnel from a long-term perspective while improving our fundamental technology, product development technology, and process development technology.
- **Encouraging diversity in our human resources hiring and promotions**
  We will create a work environment that welcomes women, foreign nationals, members of the LGBTQ community, and people with disabilities. We will improve our human resources development programs in order to acquire a broad range of personnel with the diverse values required for business growth.
- **Creating comfortable and motivating workplaces**
  We will improve work efficiency through work style reforms, reduce the burden on our employees, create a pleasant workplace that enables our diverse personnel to derive satisfaction from their work, utilize RPA and other IT tools, and expand our telework and flextime systems.

Financial Policy, Profit Distribution Policy

Financial policy

- Achieving an operating margin exceeding 10%
- Maintaining a strong balance sheet
- Improving the efficiency of asset use by streamlining total assets
- Managing from the perspective of cash flows

Profit distribution policy

- Maintaining stable payment of dividends [maintaining a minimum dividend-on-equity ratio (DOE) of 2%]
- Growing the dividends according to business performance, financial conditions, etc.
- Adopting a flexible approach to acquisition of treasury shares

Research and Development

Uncovering the Unlimited Possibilities of Glass

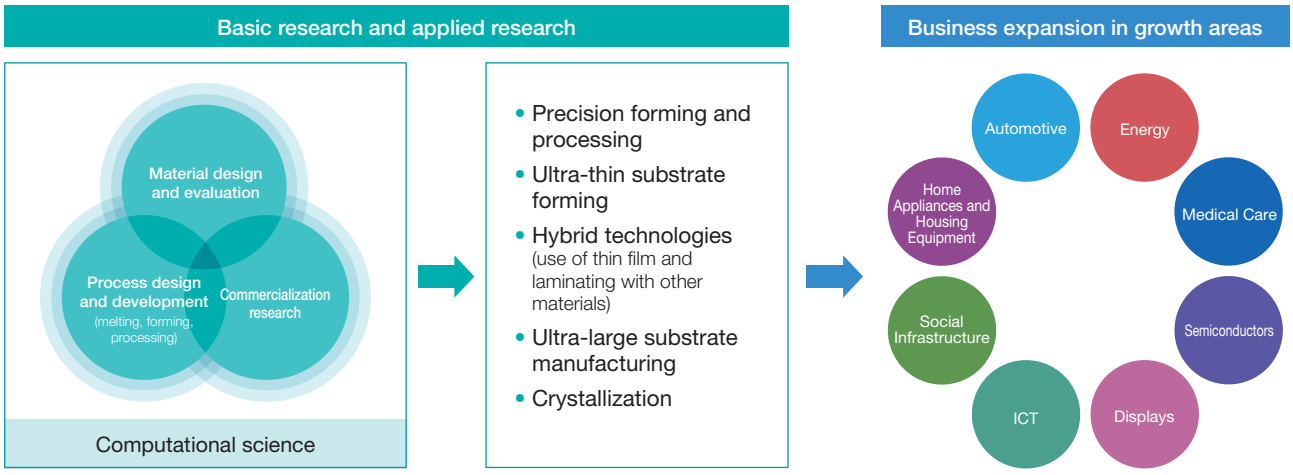
Glass is a unique material that can be customized into different shapes with a wide variety of functions by modifying its composition and altering the various forming and processing methods used. By combining our accumulated glass technologies with original ideas, we continue to deliver a variety of high-performance glass products matching contemporary needs.

R&D Policy

We pursue basic research encompassing material design and evaluation, process design and development, commercialization built on trial production and product refinement, and computational science, which includes ICT and AI-driven data analysis. We engage in product development by combining basic and applied research such as precision forming and processing and ultra-thin substrate forming. Looking ahead to business development in growth areas such as automobiles, ICT, medical care, and displays, we have dedicated ourselves to developing glass that provides value to society.

Under our EGP2026 Medium-term Business Plan, we are committed to continuing with our fundamental R&D as a priority measure targeting the sustainable growth of our individual businesses, categorizing this initiative as “strengthening the business platform.” In an effort to achieve our goal of carbon neutrality by 2050, we are working on our conversion to all-electric melting furnaces and on the development of using hydrogen and other CO_2-free energy sources. Among our strategic development initiatives, we are targeting next-generation technologies, products, and processes; environment-friendly products such as high modulus glass fibers for turbine blades in wind power applications; and an all-solid-state sodium-ion secondary battery. To commercialize these new products, we are concurrently developing products, technologies, and manufacturing processes in an integrated manner.

R&D and Business Development



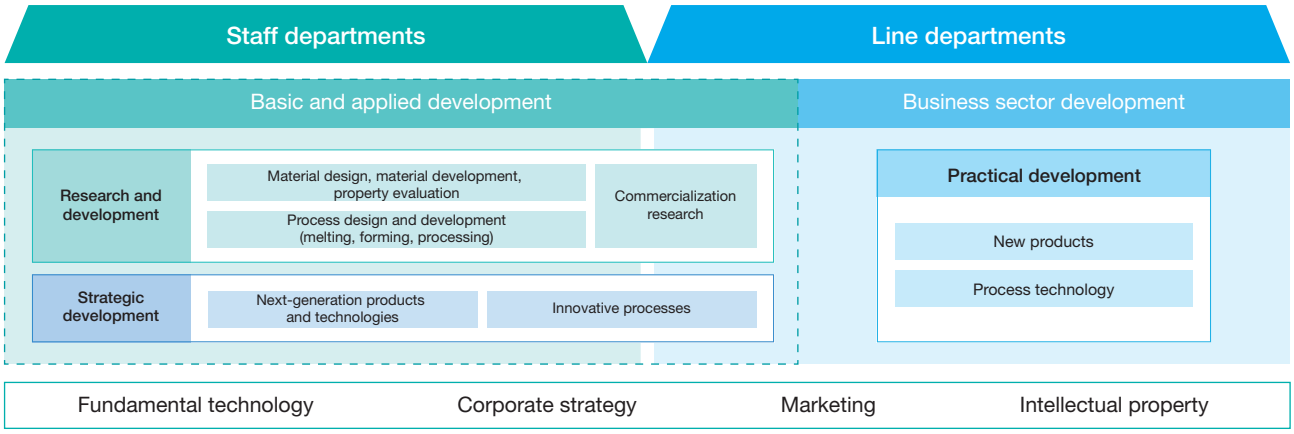
R&D Organization

Our Research & Development Group and the Process Development & Engineering Group, as staff departments, engage in R&D in the areas of material design and development, property evaluation, and process design and development. Meanwhile, our line departments carry out practical development such as product commercialization, product improvement, and development of advanced functions.

The staff departments and the line departments collaborate on strategic development aimed at resolving medium-term development issues. Our Fundamental Technology Division collaborates with institutions around the world in the area of material science, the foundation of our glass research. Our Corporate Strategy Division supports other departments in relation to information analysis and planning.

In order to commercialize the results of R&D more rapidly and in a broader manner as a company-wide marketing effort, we have established our Marketing Division to collect and analyze information related to markets, products, and technologies; promote our products and technologies; and disseminate information as a means of acquiring customers.

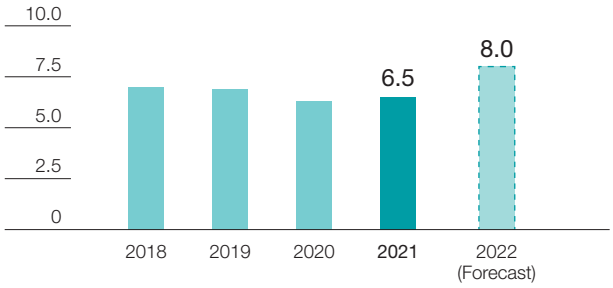
Collaboration between Departments



R&D Investment

We are working tirelessly in R&D in order to realize our corporate philosophy: "We strive to build a brighter future for the world by uncovering the unlimited possibilities of glass for more advanced creative manufacturing." We also aim to integrate and evolve our manufacturing processes and product development, and reflect the results in our management strategy in order to realize medium-and long-term growth. Our R&D expenditure was 6.5 billion yen in fiscal 2021. We will continue boosting our R&D activities.

R&D Expenditure (Billions of yen)



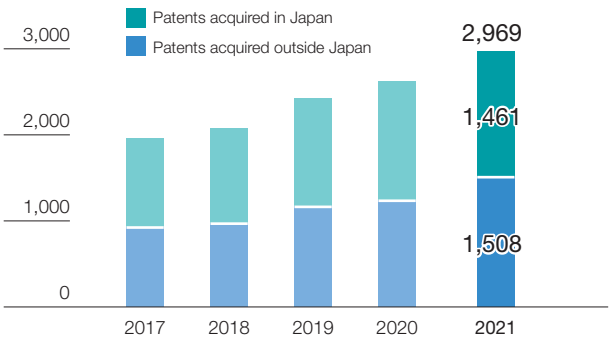
Intellectual Property

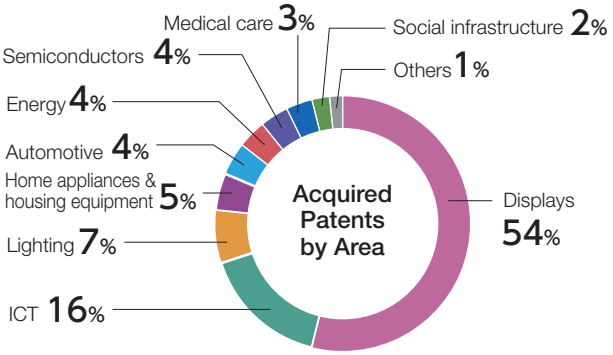
The intellectual property initiative we have developed incorporates a policy intended to provide a competitive advantage and contribute to corporate development. It achieves this by promoting glass manufacturing, research and development of glass products and processes, and the construction of an integrated system incorporating all these aspects. The objective is to protect and implement the technological advantages thus generated as intellectual property.

In order to become the world's leading manufacturer of special glass, it is essential that we leapfrog our competitors by developing new functional materials and products and imbue them with greater performance through highly efficient processes. As a means of protecting and applying these new technologies as intellectual property while discouraging competitors from infringing on our rights, we are taking timely steps to acquire patents with a broad scope of claim in order to discourage potential violations of our intellectual property.

Through these efforts, we are expanding and strengthening our effective patent network while tailoring it to the territories and scope of business we are targeting.

Number of Acquired Patents





Special Feature
» Product

Developing an All-solid-state Sodium-ion Secondary Battery:

Contributing to the Emergence of a Society Committed to Sustainability

Development Division,
Research & Development Group
Kei Tsunoda

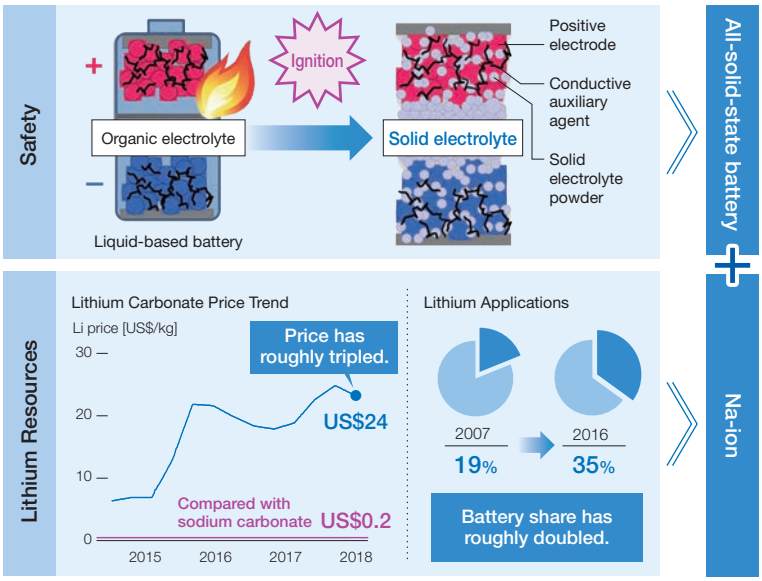
Development Division,
Research & Development Group
Hideo Yamauchi

Development Background

The lithium-ion (Li-ion) secondary (rechargeable) batteries currently on the market have two major disadvantages. The first is safety; because Li-ion secondary batteries incorporate a flammable organic solvent as the electrolyte, a risk of ignition exists from thermal runaway during fast charging.

The other disadvantage is the issue of access to resources; currently, the demand for Li-ion secondary batteries has been increasing as many economies seek to decarbonize and conserve energy in an effort to address global warming. As a result, lithium, a rare metal, is in short supply as a raw material and prices have soared.

To address these two problems simultaneously, we undertook development of an all-solid-state sodium-ion (Na-ion) secondary battery. We have designed this battery with a non-flammable solid electrolyte incorporating sodium ions as the carrier ions, a formulation that entails no resource risk.



Advantages of the All-solid-state Na-ion Secondary Battery

The main advantage of this innovative battery is that the main components of the battery — the positive electrode, electrolyte, and negative electrode — consist entirely of inorganic oxides. Oxide-based batteries have excellent thermal stability, which provides a significant advantage in battery safety. However, a major problem arises when integrating active materials such as positive electrodes and negative electrodes with solid electrolytes. It is very difficult to integrate hard inorganic oxides, and it is not possible to form a good ion conduction path. As a result, the interfacial resistance inside the battery increases, making it difficult to demonstrate the expected advantages of an all-solid-state battery, such as operation below room temperature and rapid charge/discharge characteristics.

Therefore, sulfide-based batteries that can be integrated by applying pressure to relatively soft materials were developed early on. However, we have succeeded in demonstrating the industry's first an all-oxide all-solid-state Na-ion secondary battery that functions at room temperature.* We achieved this by employing our glass-ceramic technology to integrate active materials and solid electrolytes, a task previously considered difficult. This battery is quite safe and presents no risk of ignition or generation of harmful gasses even if pierced with a nail or blade or the like.

Moreover, its output voltage of 3 volts is comparable to that of current Li-ion secondary batteries, thus making it suitable for use with a variety of devices.

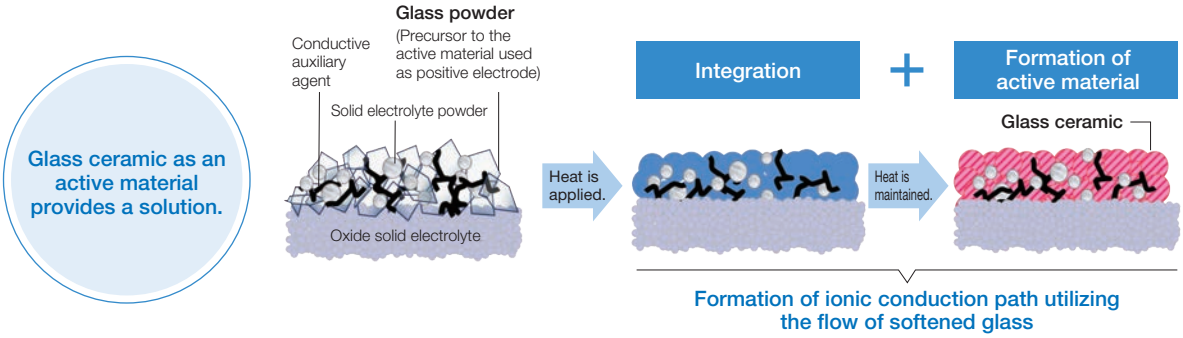
Another advantage is its composition: as it comprises only abundant materials such as sodium and iron, it requires no rare metals or rare earths such as lithium or cobalt. As well, it can use lightweight and inexpensive aluminum as a negative electrode current collector, something not possible with current Li-ion secondary batteries.

*Please refer to our press release of November 18, 2021.

Glass-ceramic Technology Enables the Integration of Electrolytes and Active Materials

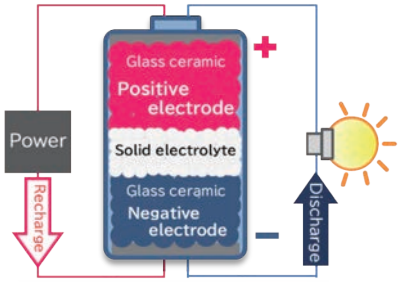
When heated, glass exhibits decreased viscosity and demonstrates a softening flow behavior peculiar to glass. Thanks to this characteristic and the airtightness inherent in glass, glass is useful for sealing and bonding electronic components. When the temperature is increased further, crystallization occurs in which the crystal structure of the atoms is rearranged into a more stable crystal structure as an energy state.

By utilizing the properties of our special glass, we have succeeded in integrating an active material with a solid electrolyte.



The Formula for Reducing Internal Resistance: V=E-rI

The mathematical expression shown above represents the relationship between the electromotive force of the battery and its internal resistance. For a battery with an electromotive force E, if the internal resistance r of the battery is high, the real voltage V will decrease by the amount rI multiplied by the current I. Reducing internal resistance is the most important factor in improving battery performance.



In 2017, we became **the first in the industry** to demonstrate the use of all-solid-state Na-ion secondary battery **at room temperature** incorporating glass ceramic as the positive electrode. **We have devised a proprietary method** of precipitating glass-ceramic powder on a solid electrolyte and firing and integrating the glass powder so that it functions as a positive electrode. An oxide ceramic called beta-alumina is used as the solid electrolyte. Beta-alumina has good sodium ion conductivity and is equivalent to conventional organic electrolytes. This achievement was very well received: in addition to receiving the Technical Encouragement Award from the Ceramic Society of Japan, an associated paper submitted to the American Ceramic Society became the No. 1 most downloaded paper of that year.

In 2019, we were able to further reduce the internal resistance of the battery and confirm that this battery could operate successfully even at a temperature as low as -20°C. This achievement earned high praise, and the associated paper published under Scientific Reports in the UK scientific journal *Nature* was downloaded more than 6,000 times in one year, becoming the third most downloaded paper of the year. We also improved the interface contact between the components in order to increase the exchange of sodium ions between the glass ceramic used for the positive electrode and the solid electrolyte. This reduced the interface resistance between the positive electrode and the solid electrolyte, which allowed more electricity to flow.

Recently, by developing a new glass ceramic as a negative electrode to replace the dangerous metal sodium, **we were able to develop a battery incorporating only inorganic oxide components** while achieving room-temperature operation.

Envisioning Practical Applications

One of our top priorities is to continue our current research on ways to improve the energy density, cycle characteristics, and rapid charge/discharge characteristics required of these batteries in all applications.

We believe that our all-solid-state Na-ion secondary battery will make an indispensable contribution to the emergence of a sustainable society in the future. As special glass professionals, we are focused on developing innovative materials, but in order to commercialize and create a market for this device in the future, we must strengthen cooperation with our partners sharing the same objectives. We remain dedicated to further improving the performance of this battery and are actively cooperating with research institutes and other companies with a view to eventual commercialization.

Business Overview

Electronics and Information Technology

Display-related Business

We aim to further enhance our competitiveness through technological innovation.

Director and Senior Vice President,
Group General Manager of Display Glass Group

Tomonori Kano

Main Products

Glass for flat-panel displays (FPDs)

The main type is 0.4 to 0.5 mm in thickness and approximately 2,200 by 2,500 mm (8.5 generation) in size. This product is widely used for displays used in liquid crystal display (LCD) and organic electroluminescence (EL) televisions, PCs, smartphones, in-vehicle displays, wearable devices, digital signage, and other devices.

G-Leaf™ ultra-thin glass

This glass is as thin as 0.2 mm (200 μm) or less and can be bent like a film. By taking advantage of its flexibility and lightness, this product is being put into practical use in electronic devices.

Dinorex™ glass for chemical strengthening

This product is used as a cover glass for smartphones, tablets, in-vehicle displays, and other applications. It protects screens from scratches and impacts. We also manufacture Dinorex UTG™ ultra-thin glass that can be used for foldable devices.

The Business Environment

The display market expanded significantly in 2021 due to increased telecommuting and a trend toward staying at home during the continuing COVID-19 pandemic. Display-related products are also expected to show steady growth in 2022 during the on-going shift to a new lifestyle that makes use of digital technologies. In the panel industry, the production capacity of organic light-emitting diodes (OLEDs) and liquid crystal displays (LCDs) is expected to increase, mainly in China.

Our Strengths

We use the overflow process to manufacture glass for flat panel displays (FPDs), as well as ultra-thin glass and glass for chemical strengthening. Since our manufacturing method avoids contact with both sides of the glass substrate, we can produce thin and large flat glass sheets of high surface quality without the need for surface polishing. Currently, we have mass production technology for FPD glass capable of producing panels of all sizes up to the 10.5 generation. We will build new manufacturing facilities for 10.5-generation glass in Xiamen, China in the first half of fiscal 2022 in order to establish a consistent production system handling all processes from melting and forming through to processing.

We also manufacture ultra-thin glass G-Leaf™ with a maximum thickness of 0.2 mm (200 μm) that is flexible enough to be bent like a film, so we are developing applications for flexible devices and other devices. By applying this ultra-thin glass technology, we have developed the Dinorex UTG™ glass for chemical strengthening with a thickness of 0.025 mm (25 μm), which is the thinnest glass in the world.

We will also expand the innovative manufacturing process technologies that we have developed to other products, which will improve productivity, reduce energy consumption, and reduce CO_2 emissions. This way, we intend to enhance our competitiveness in terms of cost and quality, as well as to contribute to achieving carbon neutrality. We are proud to have earned the trust of our customers by always responding with sincerity to their requests through our sales skills and technological development capabilities.

Corporate Strategies

- Enhancing our competitiveness by expanding our innovative manufacturing process to other products and promoting carbon neutrality
- Expanding production and sales in the booming Chinese market, and growing market share
- Expanding sales of ultra-thin glass as a cover glass for foldable devices
- Promoting the development of new products other than displays by applying our overflow technology to various other glass materials

Business Overview

In fiscal 2021, the production facilities for FPD glass in our domestic plant were shut down due to power failures that occurred in December 2020, but we were able to restore them during the first quarter of fiscal 2021 (January to March 2021), and other bases also enhanced their productivity steadily throughout the year. This enabled us to absorb the startup cost of the third investment in Xiamen, China. In terms of sales, continued strong demand triggered the full-scale sales of 10.5-generation glass, resulting in shipments exceeding those of the previous fiscal year.

The shipments of glass for chemical strengthening declined due to the sluggish demand for smartphones and other devices.

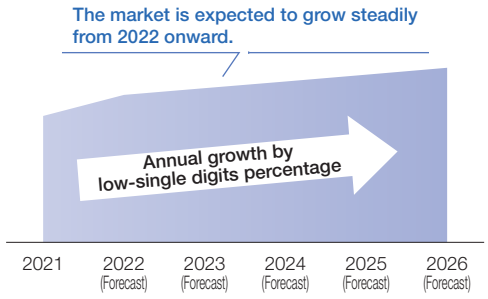
New Medium-term Business Plan EGP2026

The most important issue of EGP2026 is to expand our market share by enhancing our advantage against our competitors. For that purpose, we will aim at carbon neutrality, improve quality, and reduce costs by expanding our innovative manufacturing process in this business. In fiscal 2022, the first year of EGP2026, we will construct facilities for immediate production capability through the third investment (for melting and forming) and fourth investment (for processing) in Xiamen, China. The demand for large-sized glass is expected to continue growing in China. By making good use of the capabilities of each base in China (mainly in Xiamen), we intend to strengthen their presence in the Chinese market.

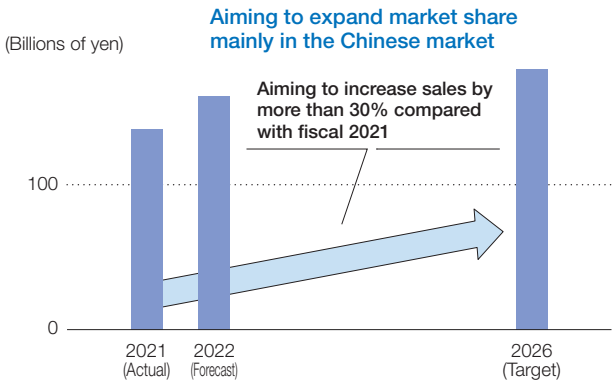
Moreover, we will need to make our workplaces robust against disasters and problems. By learning from the significant damage caused by the power failure accident mentioned earlier, we will renew facilities, expand backup facilities, prepare a business continuity plan (BCP), and make other necessary preparations in terms of hardware and software.

In the display market, devices based on new technologies are expected to emerge one after another. We will apply our overflow technology to the quality expected for such new type displays, and capture new demand.

Outlook of Demand for FPD Glass (Area Basis, Estimated by the Company)

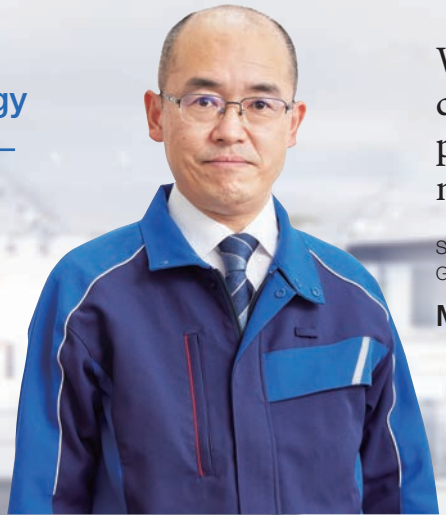


Growth Image of FPD Glass Business (Sales)



Electronics and Information Technology

Optical and Electronic Device-related Business



We will promote early commercialization of new products and strengthening of marketing.

Senior Vice President
Group General Manager of Electronic Products Group

Masahiro Kobayashi

Main Products

Glass for optical devices

We provide a variety of products used in optical communication networks, data centers, and other locations, such as lens caps, micro prisms, micro lens arrays, and micro capillaries.

Glass for electronic devices

This product is used for home appliances, automobiles, and a variety of industrial equipment including semiconductors. A vast range of applications are available, including cover glass for image sensors; flat glass sheets used in the semiconductor manufacturing process; powder glass used in various electronic components for purposes such as sealing, coating, and insulation; precision glass tubes; and phosphor-glass composite for LED lighting (Lumiphous™).

The Business Environment

Glass for optical devices

In 2021, the market slumped because investments in the communication infrastructure in China slowed down. However, an increase in demand for high-speed communication, such as 5G, is expected to expand the installations of base stations and data centers on a medium-to-long-term basis. Moreover, trunk line systems such as submarine cables and access networks in North America are undergoing steady improvement.

Glass for electronic devices

The rate of technological innovation for devices in the home appliance, automotive, and semiconductor sectors is fast and the product cycle is therefore shorter than it is for other businesses. Applications of glass in 5G communication, healthcare, and other business fields are continuously expanding and the functions expected from glass are also becoming more sophisticated.

Our Strengths

We engage in wide-ranging in-house efforts focused on material development, product development, and process development, which enables us to surpass our competitors in terms of speedy and quality industrialization and commercialization. In addition, our production system and quality assurance system can handle glass melting and forming; processing; incorporating high added value (including coating and compounding); and analysis. As a result, we have earned high praise from customers in terms of our quality and stability of supply. Our strong relationships of trust with our customers and our high brand equity in the marketplace lead us to a high market share.

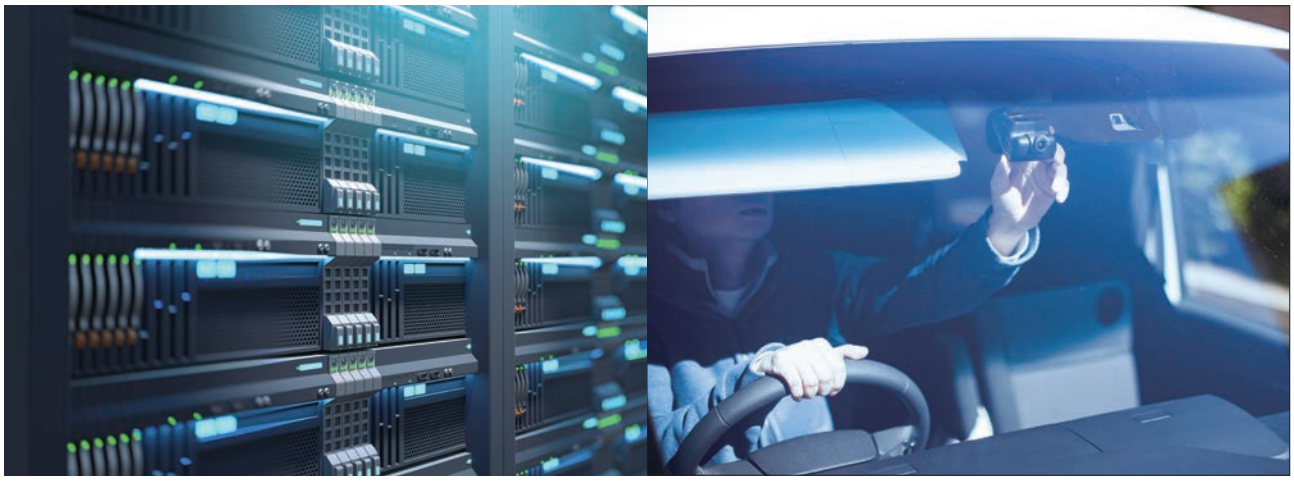
Corporate Strategies

- **Establishing a supply system that meets market needs by timely investments in promising growth areas**
- **Finding new customers and expanding sales by strengthening collaboration with our Marketing Department**
- **Promoting product development and commercialization by strengthening internal and external collaboration**

Business Overview

With regard to glass for optical devices, in fiscal 2021, the market slowed down and our shipments declined. With regard to glass for electronic devices, on the other hand, our products related to electronic components and semiconductors that are used for home appliances, digital cameras, automobiles, and other devices sold well following the economic recovery from the COVID-19 pandemic.

We have been commercializing products that cope with rapid changes in social infrastructure. New products that we have developed include materials for optical devices expected for use with deep-ultraviolet LED for medical use, LD for 5G optical communication, aerospace sensors and other devices, and materials for low-loss LTCC suitable for 5G communication.



Materials for low-loss LTCC

New Medium-term Business Plan EGP2026

The home appliance sector is expected to grow steadily on a medium-to-long-term basis. The automotive sector is expected to show growth related to electronic components and semiconductors along with the progress of CASE (Connected, Autonomous, Shared/Service, Electric). Moreover, the healthcare sector is also expected to increase market share thanks to growing social needs.

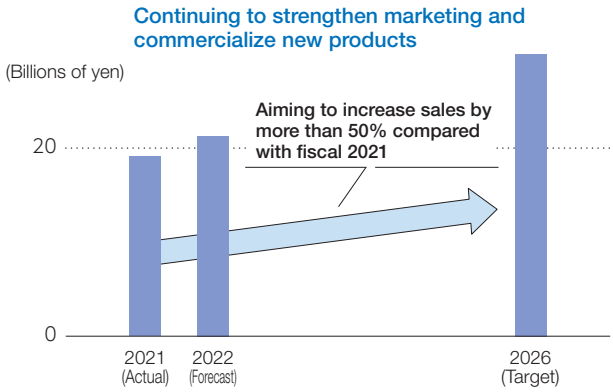
In such market environments, we aim to increase sales and profits by expanding the sales of existing products and commercializing new products early under EGP2026.

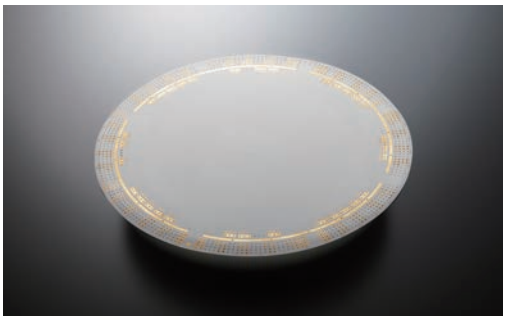
For our existing products, we will improve their quality, enhance their characteristics, and reduce their costs to establish a supply system that meets market needs. In particular, we will invest in promising growth areas, such as semiconductor, automotive, and healthcare-related sectors, in a timely manner.

We also intend to expand our customer base by taking advantage of our trust relationship with customers to obtain new opportunities early and lead them to development and commercialization, as well as by strengthening promotion utilizing market analyses, exhibitions, and websites in collaboration with our Marketing Department.

As for development, we aim to expand our businesses in the next five years by proceeding with commercialization of new products including infrared transmitting glass, glass for augmented reality (AR) and mixed reality (MR), and glass substrates used in the semiconductor manufacturing process. We continue to strengthen internal and external collaboration, as well as to actively collect information so as not to miss out any chance of mergers and acquisitions (M&A).

Growth Image of Optical and Electronic Device Business (Sales)





Glass substrate for probe card for semiconductor inspection

Performance Materials and Others

Glass Fiber-related Business

We will further advance environmental considerations and globally provide products that contribute to a decarbonized society.

Senior Vice President
Group General Manager of Glass Fiber Group

Norio Nakamura

Main Products

E glass fiber

Our main product. By combining E glass fibers with resin, fibers enhance the strength, rigidity, heat resistance, and other characteristics of resin molded products. E glass fiber plays an active role in a wide range of fields, including automobile parts and housing equipment. The dimensional stability, electrical insulation, and other properties of E glass fiber help to evolve electrical and electronic components in terms of compactness, thinness, and other advantages.

High modulus glass fiber

High modulus glass fiber has a higher elastic modulus than E glass fiber and is thus suitable for applications requiring high strength and high rigidity, such as wind turbine blades for wind power generation.

ARG fiber

ARG fiber has excellent alkali resistance and can be mixed with cement products. Glassfiber reinforced concrete (GRC) is reinforced with glass fibers, so it can be used for complicated, fine design structures or other structures in which building exterior wall materials or reinforcing bars cannot be inserted. In addition, GRC is used to repair and reinforce waterways and bridge piers, as well as to prevent tunnel walls from falling off. It is also used for utility poles and for other purposes.

The Business Environment

The demand for automobile parts applications, which account for the majority of our glass fiber sales, drastically declined due to the COVID-19 pandemic in 2020. However, the tide turned and, following the recovery of economic activities, strong demand continued throughout the year 2021. As environmental awareness increases, the major shift from internal combustion engine vehicles to electric vehicles (EVs) and eco-friendly vehicles is occurring. Moreover, in response to the demand for improved fuel economy, automobile parts will become lighter and EV parts will be developed, leading to increased use of glass fiber for use in reinforced plastic.

With regard to wind turbine blade applications, demand is expected to grow over the long term, with the progress of wind power generation projects proceeding apace around the world arising from global activities for carbon neutrality.

Our Strengths

With production bases in Japan, Malaysia, the U.S.A., and Europe, we operate a global production and supply system that enables us to supply products, provide services, and engage in rapid development. In addition, from our customers, we have earned praise and gained trust for our technologies related to the development of binding agents (surface treatment agents) for application to the surfaces of glass fibers in order to form strong bonds between the glass fibers and resin. This has enabled us to continue increasing our market share as well as our competitiveness.

In terms of environmental technology, for the technology for melting glass fibers, we have been increasing the percentage of electric heating and reducing heating by burning fossil fuels. In particular, we have been implementing all-electric melting, which uses only electricity to melt glass fibers, for over 40 years. We employ manufacturing technologies with a low environmental impact.

For more than 20 years, our plants in Japan and Malaysia have been reusing all of the waste glass generated in our production processes. In the industry, waste glass is normally disposed of in landfills, but we have led the industry in establishing a production system committed to recycling.

Corporate Strategies

- **Building a global supply system by increasing production capacity at our Malaysian Plant and strengthening the competitiveness of our plants in Europe and the U.S.A.**
- **Expanding market share in automobiles, electrical and electronic components, housing equipment, infrastructure, and other growth areas**
- **Pursuing environment-friendly manufacturing (improving long-term competitiveness by improving yield and energy efficiency and improving our glass melting technology)**

Business Overview

In fiscal 2021, economic activities were rapidly recovering along with the increase in COVID-19 vaccinations. In such circumstances, our businesses were affected by soaring component prices, disruption in international logistics, and other factors, but strong demand for high-performance resin applications for automobile parts continued. Demand for other wide-ranging applications including housing equipment, civil engineering, and construction was also proceeding steadily. We restarted the facilities that were stopped for production adjustment immediately after the COVID-19 pandemic outbreak in 2020 and took action by strengthening sales activities, resulting in a significant increase in shipments compared with those of the previous fiscal year.

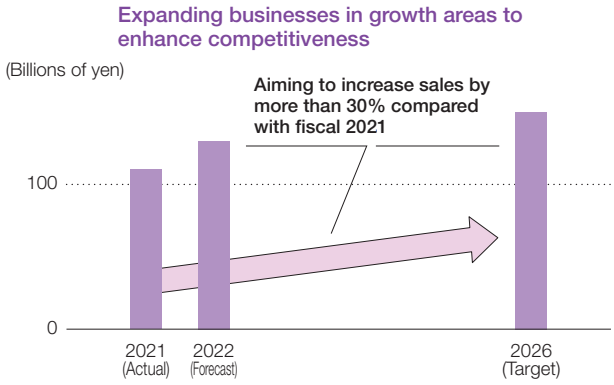
New Medium-term Business Plan EGP2026

Under our previous Medium-term Business Plan EGP2021, in the U.S.A., we consolidated our three plants into two plants, reviewed our production types, conducted labor saving for our production lines, and implemented other structural reforms, through which we were getting results steadily. However, rapid restart of economic activities made it difficult to secure our workforce, which affected our production. In Europe, we were able to recover profits by streamlining the organization. In terms of development, we got results through development and sales promotion for new products such as Flat Glass Fiber and Wet Chopped Strands for roofing materials.

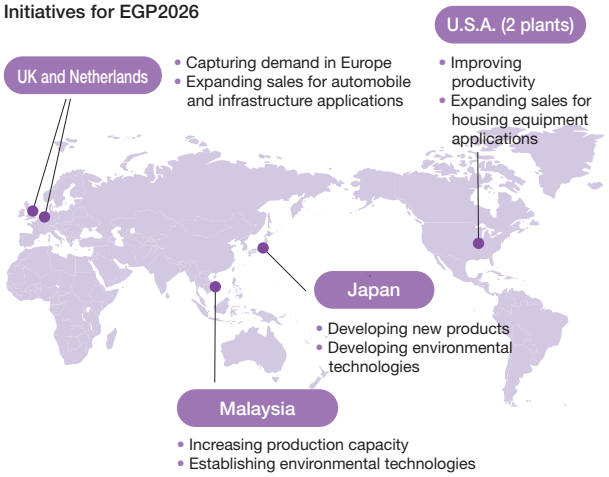
Under EGP2026, we aim to further expand our businesses through the activities shown in the figure below, based on our activities over the last three years.

Moreover, to achieve carbon neutrality and secure our competitiveness on a medium-to-long-term basis, we will increase electricity usage for glass melting furnaces and switch to all-electric melting to shift to highly efficient production, low energy consumption, and low CO_2 emissions.

Growth Image of Glass Fiber Business (Sales)



Initiatives for EGP2026



Performance Materials and Others

Medical Care, Heat Resistance, and Building Material-related Business

We continue to actively invest to cope with expanding health care markets.

Senior Vice President
Group General Manager of Consumer Glass Products Group

Akira Kishimoto

Main Products

Glass for medical care

Borosilicate glass tubing has excellent acid and chemical resistance and high strength, making it well suited as a material for ampules, vials, and other medical containers. LX Premium, with its exceptional radiation-shielding properties, is used in medical facilities to protect medical personnel from radiation exposure.

Heat-resistant glass

Thanks to its exceptional thermal shock resistance and mechanical strength, this glass is used in heater and fireplace windows, the top plates of cooking appliances, and other housing equipment.

Glass for building materials

Our glass for building materials comes in a variety of shapes with a variety of properties. They include fire-rated glass, glass-ceramic building materials, and glass blocks.

The Business Environment

Glass for medical care

With the growing sophistication of medical care worldwide, demand is increasing for high-grade pharmaceutical glass tubing with excellent chemical resistance and processability. In addition, we saw added demand for vaccine containers to combat the COVID-19 pandemic, so our glass tubing for pharmaceutical and medical use business is required to expand production and supply capacity. Moreover, the market for radiation-shielding glass is expected to enjoy stable demand.

Heat-resistant glass

In 2021, home renovations were booming mainly in Europe and the demand for replacement cooking appliances and stoves was growing, which helped the market to continue to be favorable. The market conditions are expected to remain stable.

Glass for building materials

In 2021, the market was also affected by the cancellation and postponement of construction projects due to the spread of COVID-19 pandemic, but this market is expected to exhibit a moderate recovery from 2022 onward.

Our Strengths

We remain committed to developing technologies related to glass composition, melting, and forming in order to develop a high-quality product line beyond the capabilities of our competitors.

Our glass tubing for pharmaceutical and medical use exhibits world-class quality in terms of properties such as chemical durability, glass homogeneity, and forming accuracy. Our products have earned the trust of the pharmaceutical industry across Japan and around the world.

Meanwhile, our radiation-shielding glass offers excellent shielding, is available in larger sizes, and contributes to sophisticated medical care and improved safety. We are also working on products that take advantage of the characteristics of our glass-ceramic, which is unique in the industry.

We are promoting other notable products such as top plates for cooking appliances, stove windows, and fireproof windows made of Neoceram, which has an excellent coefficient of thermal expansion and an expansion coefficient of almost zero.

Corporate Strategies

- **Glass tubing for pharmaceutical and medical use**
  Responding to demand by further expanding the production capacity at our Malaysian Plant
- **Heat-resistant glass**
  Establishing a mass production system to expand sales of top plates for cooking appliances to the European market; developing applications that take advantage of the properties of our world's first colorless and transparent zero-expansion glass-ceramics Cerapure™
- **Glass for building materials**
  Strengthening promotion and expanding sales of our FireLite™ fire-rated glass for fire protection applications in collaboration with our Marketing Department

Business Overview

In fiscal 2021, shipments of glass tubing for pharmaceutical and medical use increased compared with the previous fiscal year as a result of demand for vaccine containers to combat the COVID-19 pandemic, in addition to strong global demand for glass tubing for pharmaceutical and medical use. Shipments of heat-resistant glass for cooking appliances and stoves increased compared with the previous fiscal year. As for glass for building materials, "heat-resistant glass-ceramic" was classified as a general specification of fire protection equipment for windows in accordance with the revised notice from Japan's Ministry of Land, Infrastructure, Transport and Tourism in 2019. This has made it no longer necessary for us to obtain approval individually from the Minister with regard to our heat-resistant glass-ceramic for use with some window types, which has helped FireLite™ to be widely adopted as fireproof glass in commercial and residential buildings.

New Medium-term Business Plan EGP2026

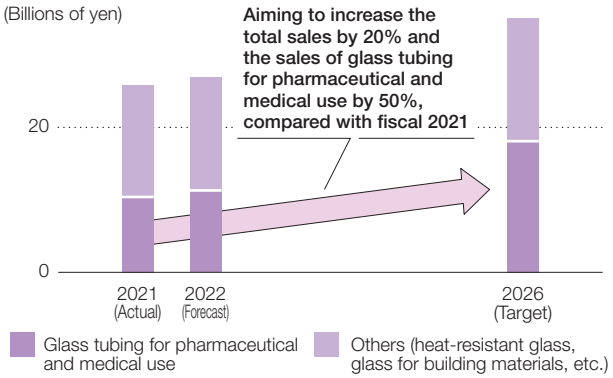
For the five years of EGP2026, we will automate the production, inspection, and packaging processes to establish stable and highly efficient factory systems. We will also strive to develop manufacturing process technologies to achieve carbon neutrality, which the entire company works on.

As for glass tubing for pharmaceutical and medical use, we increased production capacity in Malaysia in October 2020, but we still have been unable to catch up with demand. In addition to improving the productivity of existing facilities, we will make an additional investment to increase production capacity in Malaysia in order to capture demand from overseas including China.

In the area of heat-resistant glass, we have secured human resources, facilities, and other necessary resources, reduced lead times, and instituted a product development system in order to expand sales of top plates for cooking appliances to European customers. We continue our efforts to establish a mass production system and expand sales.

With regard to glass for building materials, thanks to its high fireproof performance, fire-rated glass is increasingly adopted in public facilities such as schools, hospitals, and transportation facilities. In conjunction with our Marketing Department, we will strengthen promotion strategies and highlight the appeal of our excellent product characteristics to enhance our presence in the construction industry.

Sales Increases in Medical Care, Heat Resistance, and Building Material-related Business



Applications of FireLite

Family support center Shibuya-ku
Child-rearing Neuvola

Tokyo Aquatics Centre