



Chemicals Company Fluorochemicals Business Briefing

AGC Inc.

Chemicals Company, Performance Chemicals General Division

December 23, 2020

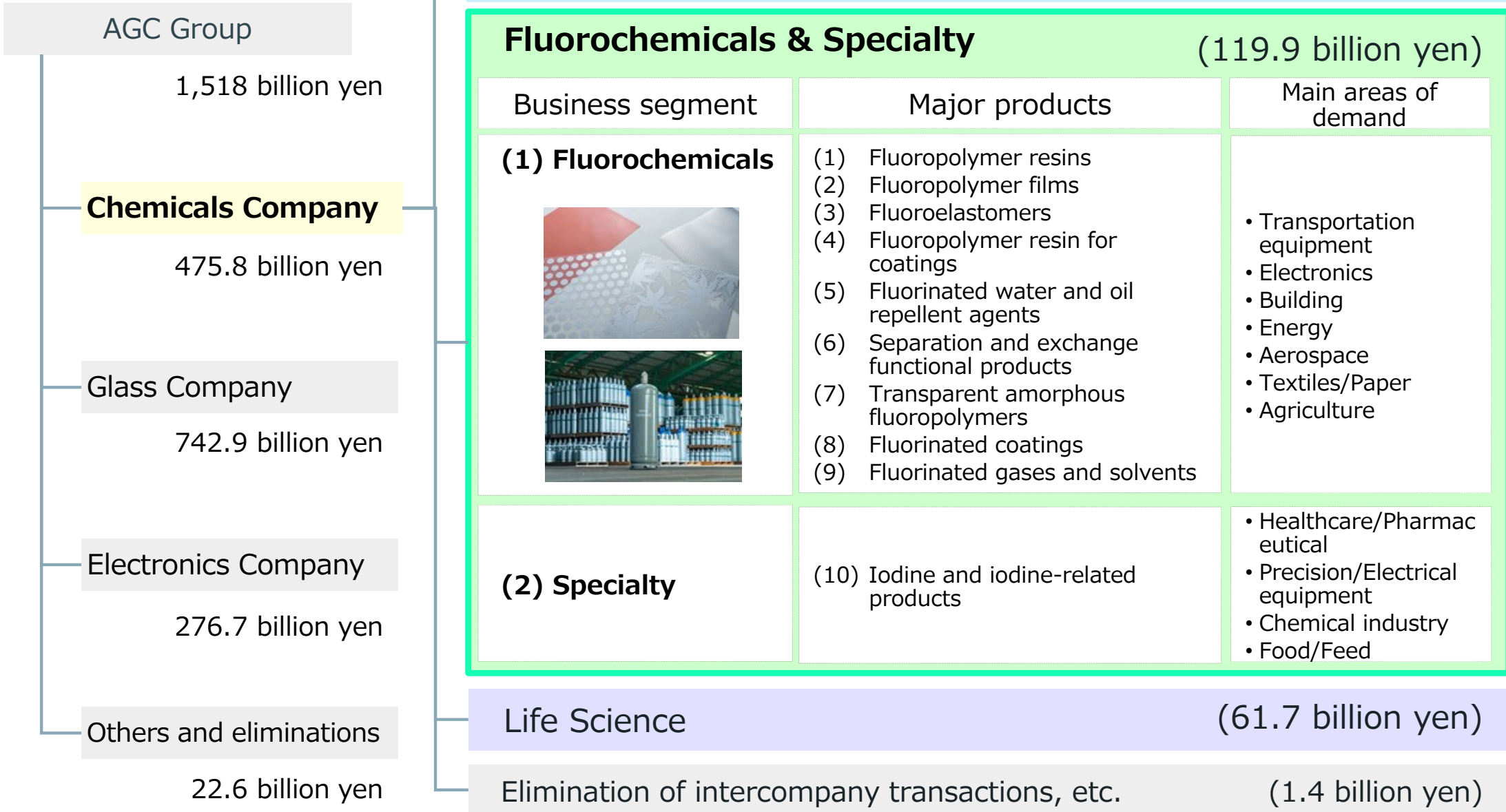
Your Dreams, Our Challenge

- Positioning of Fluorochemicals within the Chemicals Company**
- Overview of Fluorochemicals Business**
- Strengths of AGC's Fluorochemicals**
- Growth Strategy for 2025**
 - **Growth strategy of Fluorochemicals Business**
 - **Contributing to sustainability material issues**

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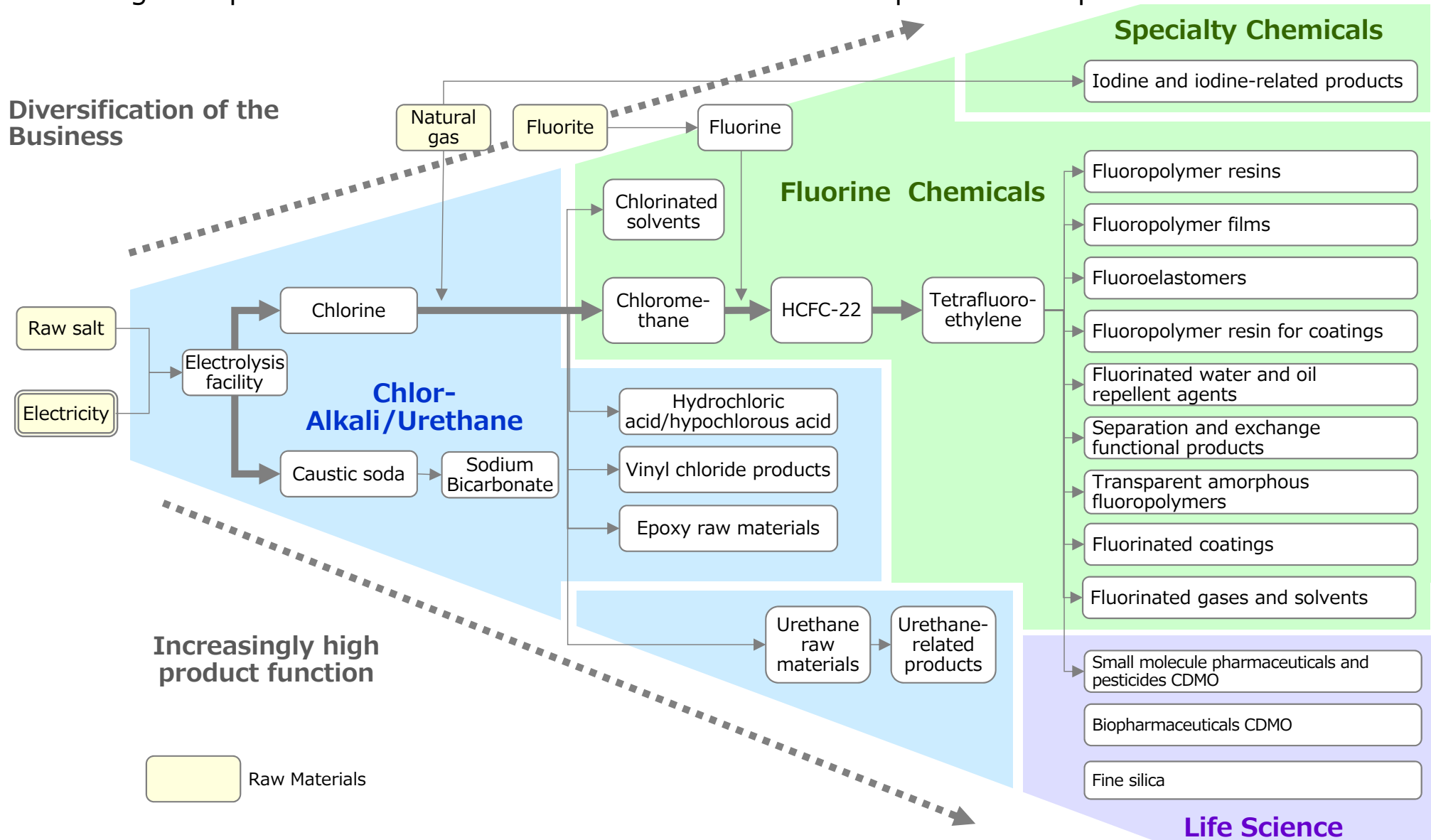
Chemicals segment business scale

(Net sales for the fiscal year ended December 2019)



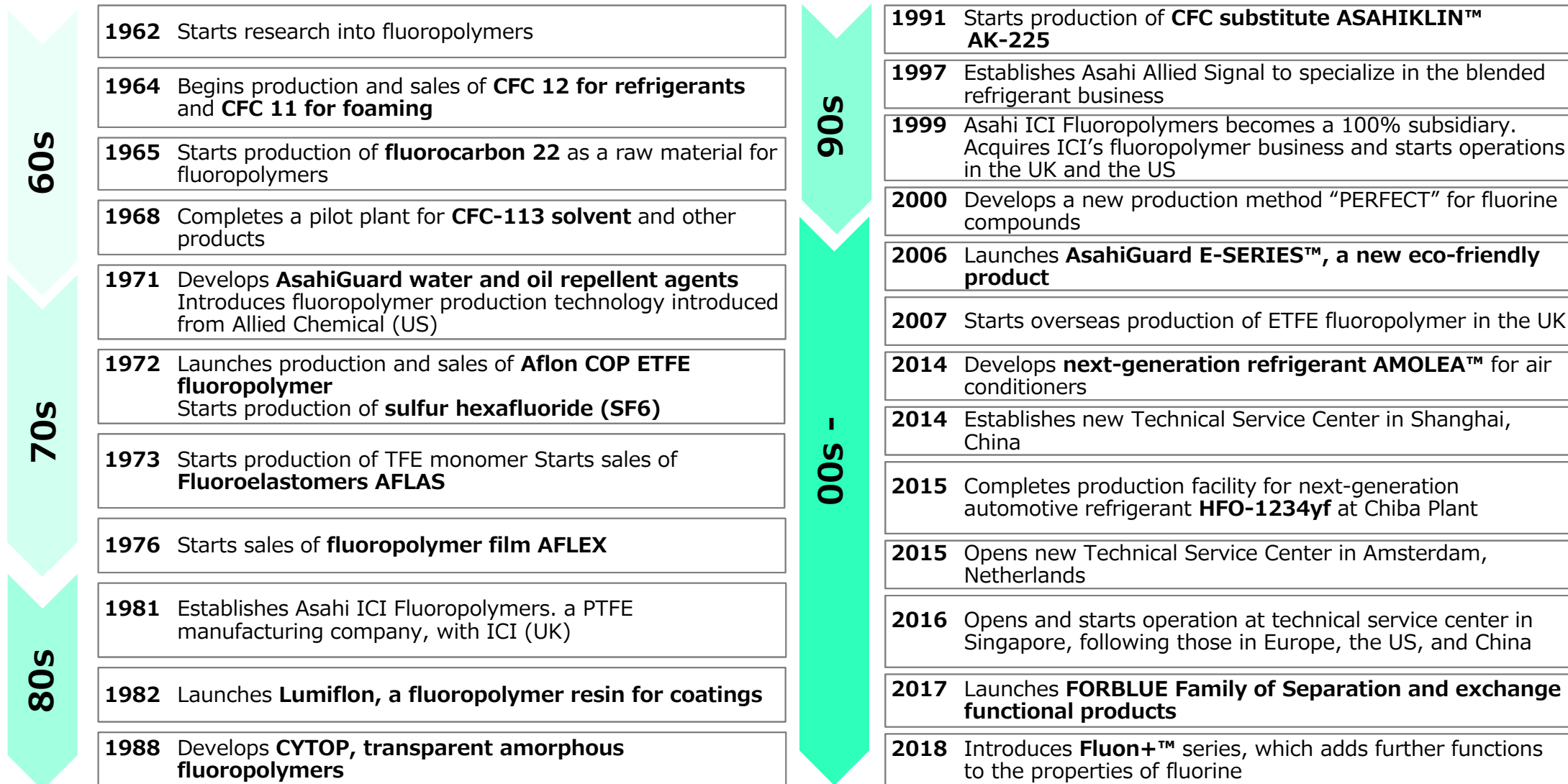
Product Flow in the Chemicals Segment

- The fluorochemicals Business is positioned downstream in AGC's chemical chain.
- Offering the optimal solution for customer needs with a wide product lineup



History of AGC's Fluorochemicals Business

- AGC's fluorochemicals Business started from making active use of chlorine.
- We have established a unique presence in global markets.



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Features of Fluorochemicals Business

(1) Excellent properties of Fluorochemicals

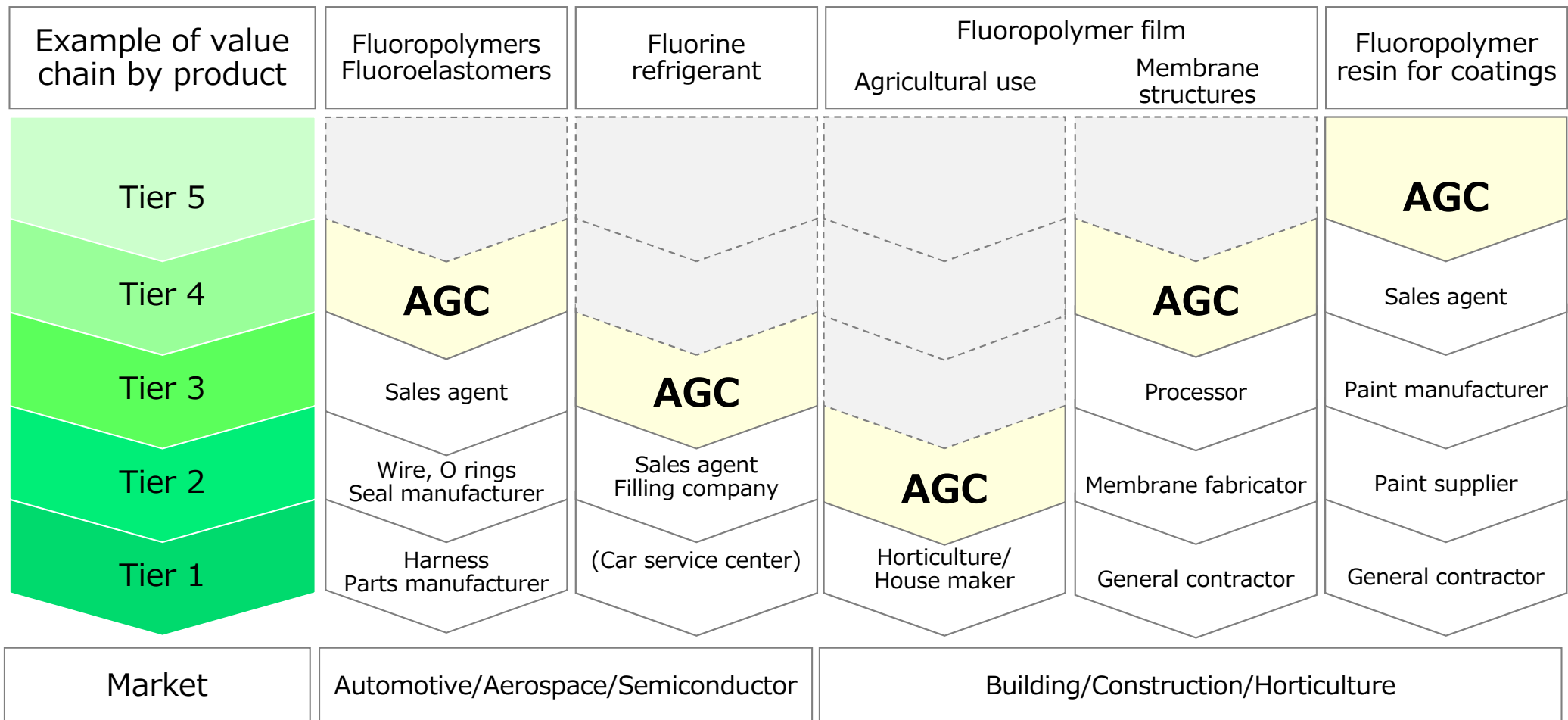
- Our products are used in a wide range of industrial fields due to their extremely unique and superior properties.
- We continue to develop new markets with the technology to control properties.

Major properties and sample applications for Fluorochemicals		Heat resistance Resistance to cold	Chemical resistance	Weatherability Durability	Water and oil repellency Anti-stick properties	Mechanical properties	Electrical properties	Optical properties
Automobiles Transportation equipment	Oil filters				●			
	Wire coatings/fuel hoses	●		●		●	●	
	Oscillation components	●	●	●	●		●	
	O rings	●	●	●				
Electronics Telecommunications	Semiconductor packaging	●			●		●	
	Semiconductor manufacturing equipment		●	●				
	Optical lenses				●			●
	Touch panels			●	●			
	Film for LED production processes				●			
	Printed circuit boards	●			●			
	Wire covering	●		●		●	●	
Building materials	OA equipment components	●			●			
	Coatings			●	●			
	Interior/exterior materials			●	●			
	Metal construction material coatings			●	●			
Energy	Roof/exterior/membrane structures			●	●			
	Solar cell materials			●			●	
Infrastructure Plants	Power plant cables	●	●			●		
	Bridge/tower coatings			●				
Industrial materials	Chimney/pipe sealing		●	●				
	Various sealants	●	●					
Healthcare & lifestyle industries	Tubes/hoses	●	●					
	Surgical gowns/medical masks				●			
	Food packages/containers				●			

Features of Fluorochemicals Business

(2) Supply chain

- These products are positioned upstream of the supply chain, which is difficult to recognize from the final consumer product side.

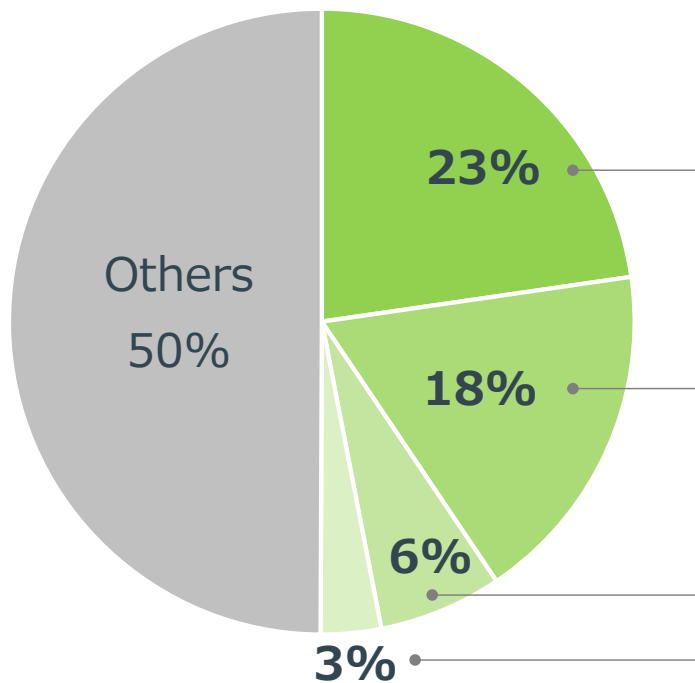


Features of Fluorochemicals Business

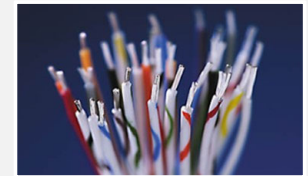
(3) Main demand areas

- About 50% of the main demand areas are transportation equipment (automobiles, railways, and aircraft), electronics, building, and energy.
- The other half consists of bottom-up demand in diverse and specialized demand sectors.

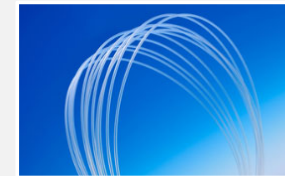
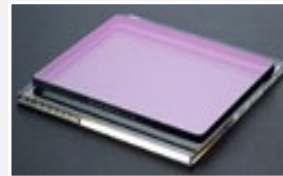
Sales ratio by application (2019)



Transportation equipment



Electronics



Building



Energy

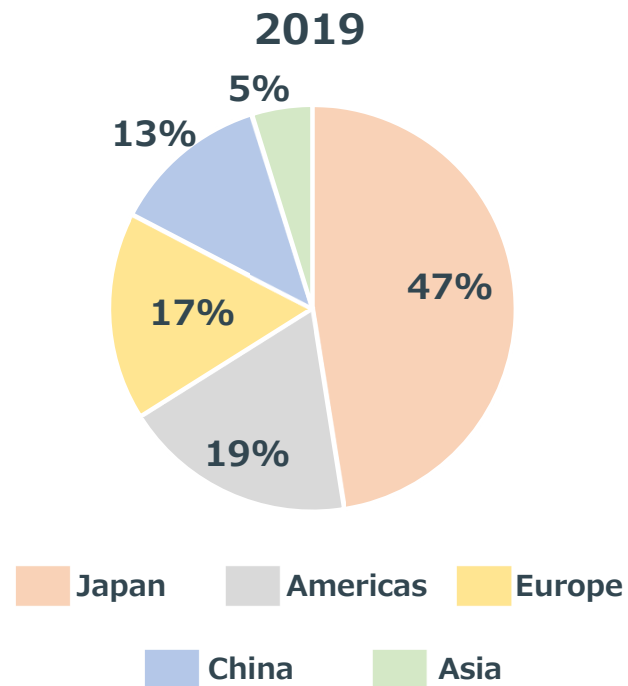


Features of Fluorochemicals Business

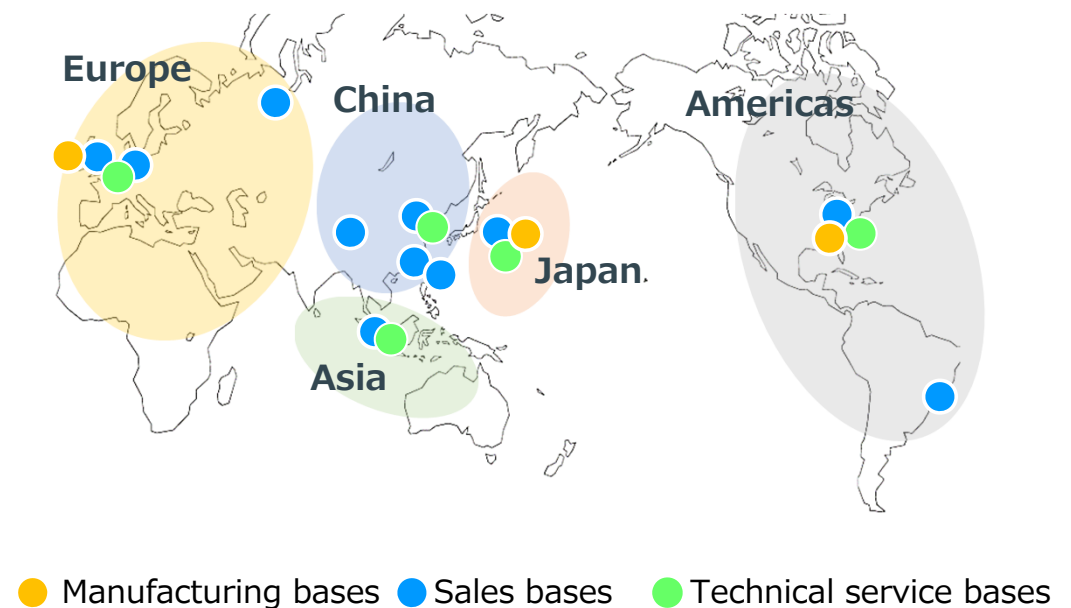
(4) Sales regions

- Because of the wide range of applications, overseas sales account for about 50% of the total, and the consumption areas are distributed globally in the regions where each industry is located.
- Sales and technical service bases expanding globally in addition to manufacturing bases in Japan, Europe and Americas
- Demand in each region is expanding in a balanced manner

Breakdown of sales by region



Global Fluorochemicals Business sites



Outlook for demand

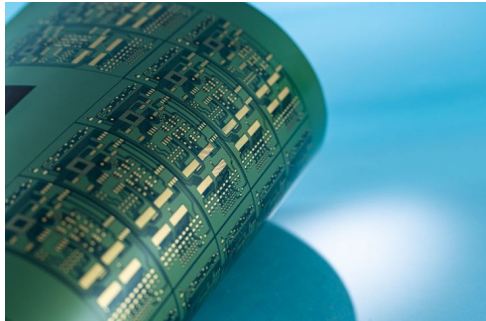
- Due to the impact of COVID-19, recovery to the 2019 level is expected to take some time, especially for aircraft.
- On the other hand, we aim to increase earnings toward 2025 **by expanding demand and expanding new applications in the fields of electronics, transportation equipment, building, energy, etc., mainly in emerging countries.**

Demand area	Outlook for demand	Major products								
		Resins	Film	Elastomers	Fluoro-polymer resin for coatings	Water and oil repellent agents	Separation and exchange functional products	Transparent amorphous fluoro-polymers	Coatings	Gas solvents
Semiconductor	Demand for 5G-related products and data centers remains strong and expect ongoing growth	●	●	●			●	●	●	●
Building	Construction work was suspended one after another but recovered by the end of the year. We expect a global recovery in 2022.		●		●					
Automobiles	Asia to recover first, led by China. It will recover to the level of 2019 from 2024 to 2025.	●		●	●	●	●			●
Aircraft	Great damage from changes in the flow of people. It will take several years to recover to the level of 2019.	●	●	●		●				●

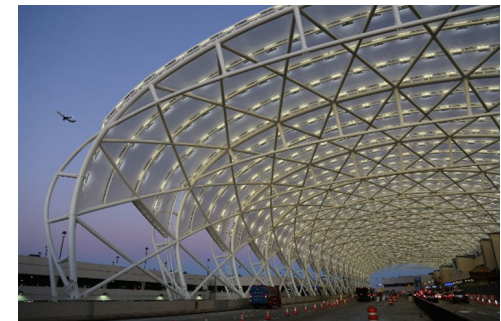
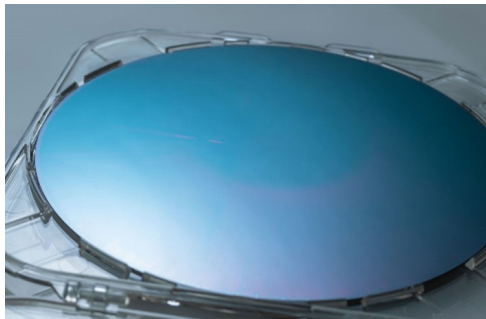
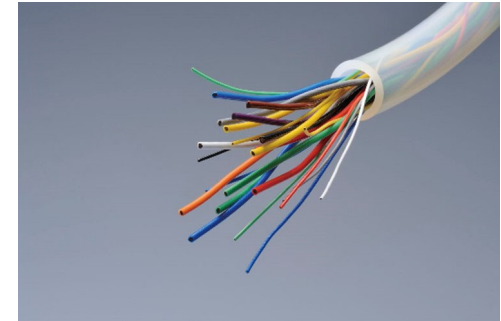
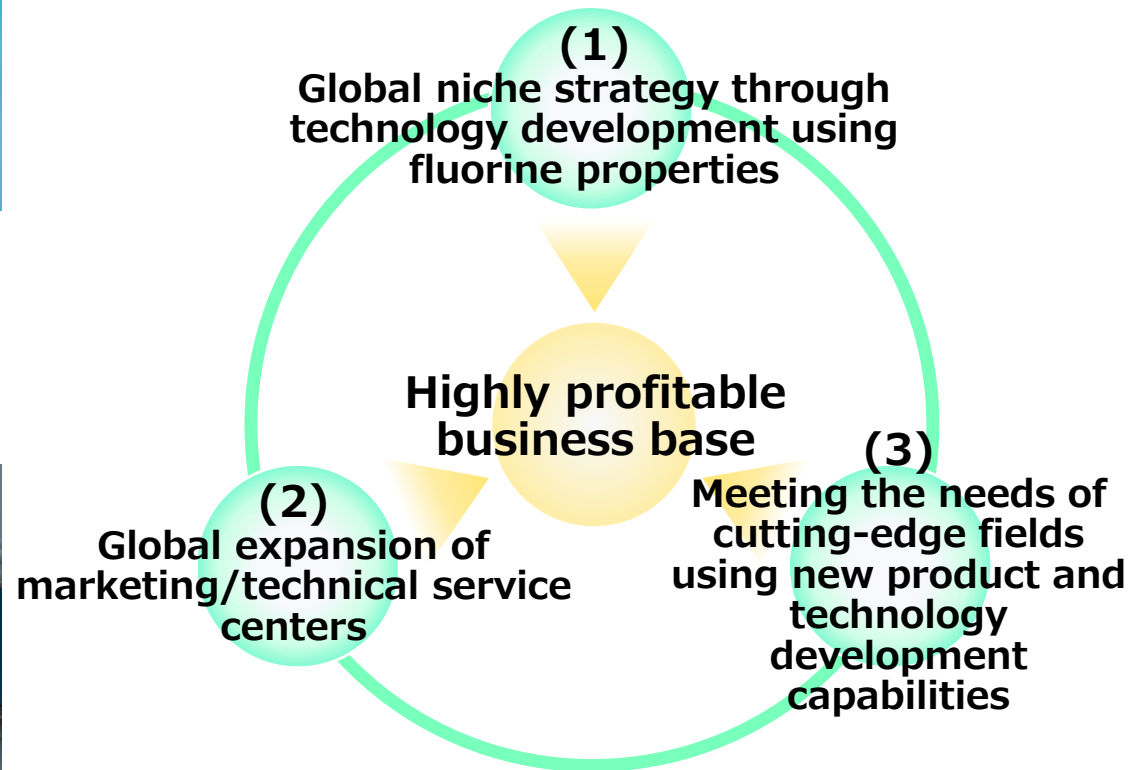
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Strengths of AGC's Fluorochemicals Business

- Global niche strategy targeting the top position in specific markets by developing high-performance materials and leveraging mass production technology
- Globally expanding functions for production, marketing technical service centers and product development
- Capture demand in global niche markets, including cutting-edge needs, and establish a highly profitable business base



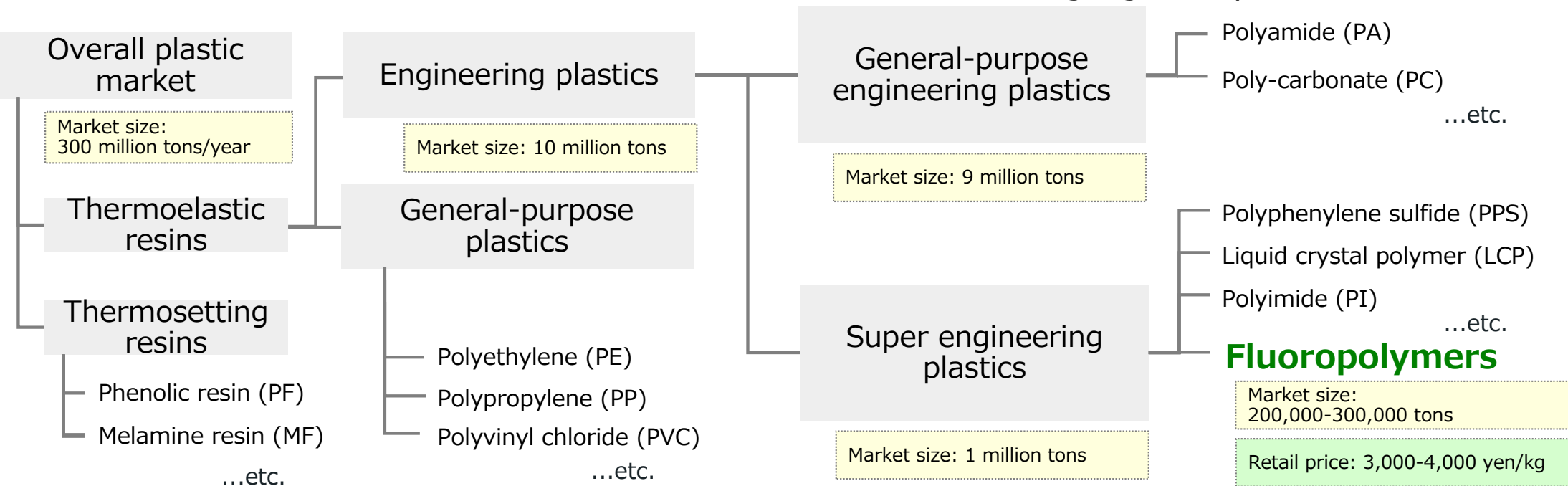
Strengths of AGC's Fluorochemicals Business



Strengths of AGC's Fluorochemicals

(1) Global niche strategy

- **Global niche strategy** through technological development using the exceptionally unique properties of fluorine compounds
- Fluoropolymers are used for applications with special properties among engineering plastics, and the price range is higher than that of general-purpose engineering plastics.
- Production involves **difficult-to-handle intermediates** creating high entry barriers



AGC manufactures three products, ETFE, PTFE, and PFA, using TFE* as a raw material. It has **the No. 1** share in the global market** for ETFE.

⇒ ETFE is a **highly processable material** with the properties of fluoropolymers. Can be easily molded into various shapes such as hoses and tubes and can also be processed into film.



Strengths of AGC's Fluorochemicals

(2) Marketing and technical service centers

- Globally expanding functions for production, marketing, technical service, and product development
- To focus on medium- and long-term themes, we are considering the establishment of structure for strategic planning in each geographical area.



Strengths of AGC Fluorochemicals

(3) Development of new products and technologies to meet cutting-edge needs

- Higher performance of products in growing markets such as automobiles and semiconductors will lead to higher specification requirements for materials.
- We are developing new products and technologies based on fluorine technologies developed over many years to meet these needs.

Example of the automotive industry

(Examples of current uses)

Consumable materials

Expansion of interior space and weight reduction to improve automobile comfort



Technological innovation

- Installation of cables and hoses around the engine to minimize wiring and piping design space
- Switching metal hoses to lightweight materials

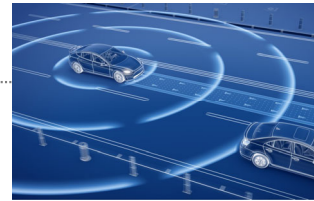
Essential materials

Lightweight cables and fuel hoses with high heat and chemical (oil) resistance



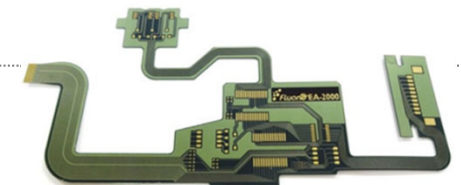
(Examples of future uses)

Transition to autonomous driving



Radars for collision prevention equipped with sensors capable of processing huge amounts of data

Materials with high electrical properties such as insulation and low transmission loss are used for sensor components.



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Growth strategy of Fluorochemicals Business

- Contributing to the sustainable society based on the further deepening and developing fluorine technology for social issues such as environmental problems.

1975

- Develops **FORBLUE™ Flemion™ ion exchange membrane** for salt electrolysis
Establishes an alternative to the mercury method. **Wins Okochi Memorial Production Prize.**



1980

- Successfully develops **Lumiflon™, a solvent-soluble fluoropolymer resin for coatings.**
Contributes to reduction of VOC* emissions by extending paint life.



1991

- Starts production of **ASAHIKLIN™ AK-225,** a CFC substitute with small ODP**
EPA Stratospheric Ozone Protection Award



2017

- **AMOLEA™,** a new environmentally friendly refrigerant that curbs global warming
Obtains **1224yd** international certification.
GSC Award* Minister of the Environment Award**



2020

- **AMOLEA™ AS-300,** an environmentally-friendly fluorinated solvent that reduces Global Warming Potential (GWP) to under "1" rewarded **GSC Award*** Minister of the Environment Award**



Examples of fluorine technology cultivated by AGC

- ❑ Polymer synthesis and polymerization technology
- ❑ Molecular design technology
- ❑ Molding and compounding technology
- ❑ Film forming technology
- ❑ Mass production technology

SUSTAINABLE DEVELOPMENT GOALS

*VOC: Volatile Organic Compounds **ODP: Ozone Depletion Potential
***GSC: Green and Sustainable Chemistry Award

Growth strategy of Fluorochemicals Business

- Set material sustainability issues that contribute to solving issues with AGC's Fluorochemicals

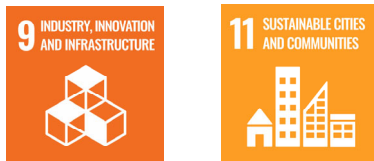
① Safe and secure society

Issues: Solving food, water problems, realizing a healthy and long-lived society

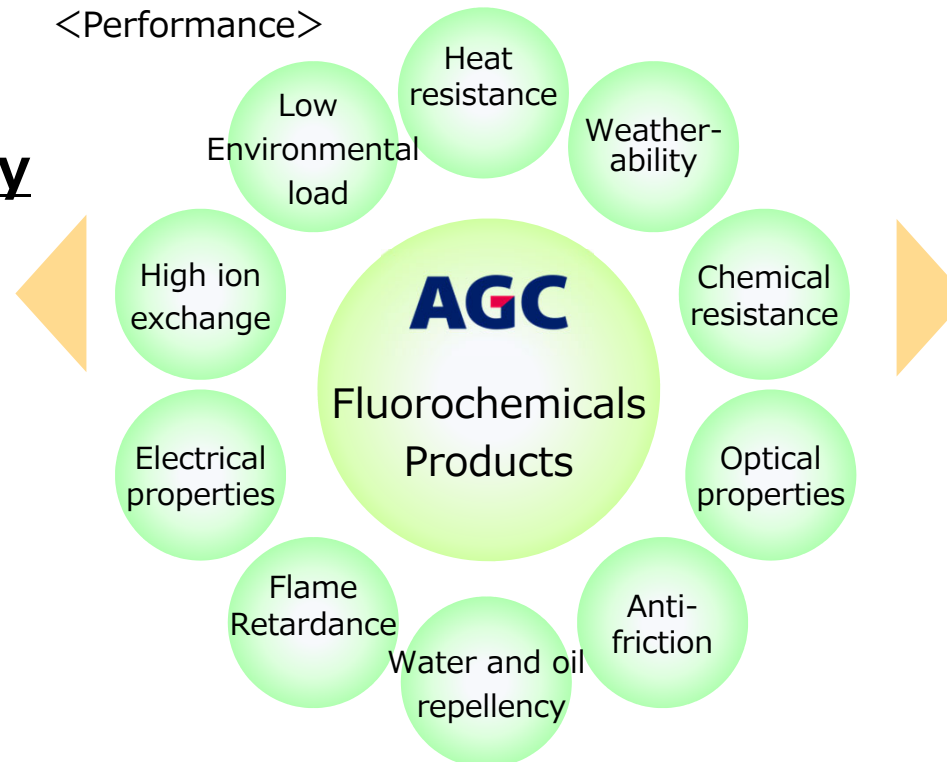


② Comfortable society

Issues: Development of social infrastructure and smart society



<Performance>










③ Environmentally-friendly society

Issues: Development of a hydrogen society, addressing environmental protection



Addressing material sustainability issues

- Addressing material sustainability issues represents a business opportunity
- Developing new products and technologies that can contribute to solving social issues and promoting mass production technologies

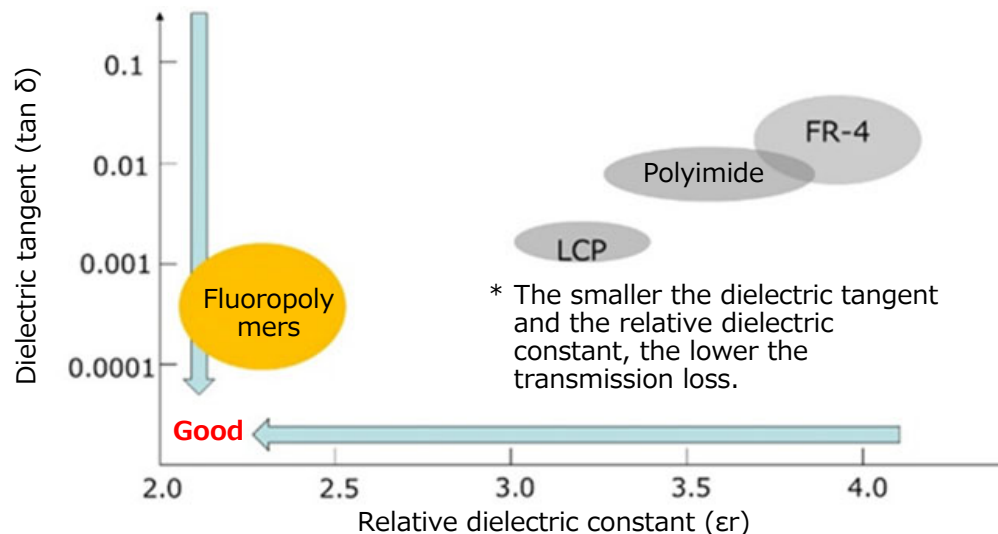
Examples of products and application fields	Performance achieved	Examples of material sustainable issues to which AGC can contribute to resolving			
		Comfortable society (Development of social infrastructure and smart society)		Environmentally-friendly society (Development of a hydrogen society, addressing environmental protection)	
					
<p>Fluoropolymer Fluon+™ EA2000</p> <p>- Materials for next-generation high-speed communication devices requiring low transmission loss</p> 	<ul style="list-style-type: none"> • Low transmission loss • Low dielectric constant • Adhesiveness and dispersibility 	●	●		
<p>Fluorine-based electrolyte polymer for fuel cells</p> <p>- Materials for power generation systems of fuel cell vehicles (FCV), etc.</p> 	<ul style="list-style-type: none"> • High durability due to high molecular weight • High ion exchange performance 			●	●
<p>AMOLEA™ series of new refrigerants and solvents</p> <p>- Refrigerant gas, cleaning agents, and solvents for various air conditioners and refrigeration equipment -</p> 	<ul style="list-style-type: none"> • Low GWP* ODP** • Energy saving and thermal stability • Cleaning power and safety 			●	●

Solutions that help solve material sustainability issues

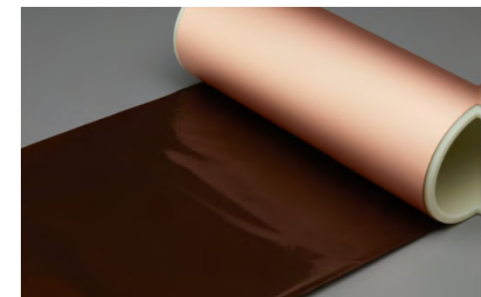
(1) Low transmission loss fluoropolymer for next generation high speed communication printed circuit boards Fluon+™ EA2000



- Fluoropolymer Fluon+™ EA-2000 with low transmission loss characterized by low dielectric constant and low dielectric loss tangent.
- Adhesiveness and dispersibility that overturn the concept of existing fluoropolymers.
- Printed circuit boards using this product **can reduce transmission loss by 30% or more compared to existing materials.**
- Printed circuit board/flexible printed circuit board applications suitable for Fluon+™ EA-2000.
 - Automotive radar, flexible printed circuit boards for 5G smartphones, millimeter-wave devices.
- Dielectric constant and dielectric tangent



Fluon+™ EA-2000/PPE laminated CCL

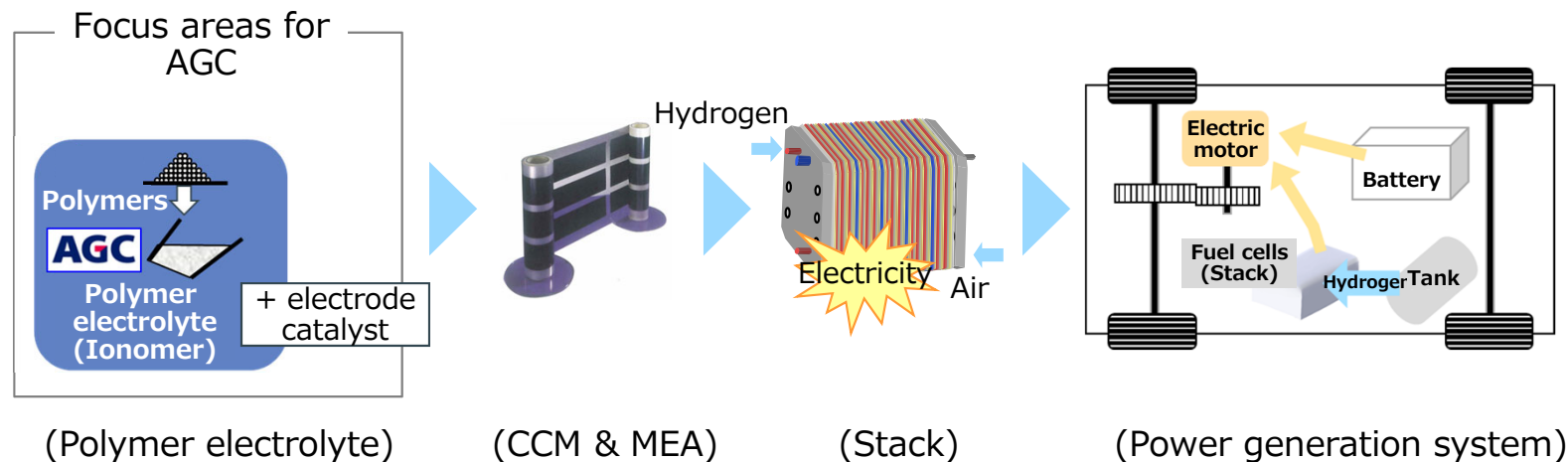
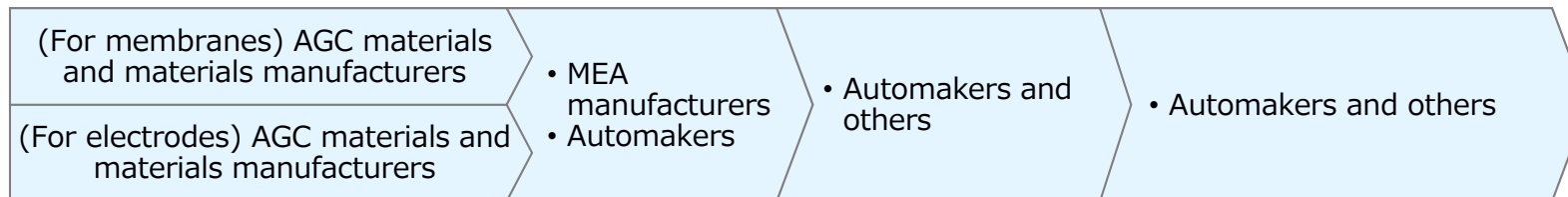


Fluon+™ EA-2000 coat RCC

(2) Fluorine-based electrolyte polymer for fuel cells (PEMFC ionomer)



- Supplying fluorine-based electrolyte polymer (PEMFC ionomer) for fuel cell membranes, an essential component of fuel cells.
- Demand increase accelerated due to the spread of fuel cell vehicles (FCV) and technological development aimed at realizing a hydrogen society.
- AGC achieves No.1 position based on the excellent performance for high power generation and durability.



Solutions that help solve material sustainability issues

(3) Environmentally friendly refrigerant AMOLEA™ series



➤ Growing demand for environmentally friendly new refrigerants with extremely low GWP* against the backdrop of global warming

1123 blend

A prime candidate for next-generation refrigerants with the potential to replace refrigerants in 70% to 80% of the global market. Expectations are high that the refrigerant developed based on AGC's unique technology will drive market growth, particularly for residential air conditioners. Final stage of toxicity evaluation in progress.

1234yf

Medium-pressure refrigerant for mobile air-conditioners. The only production facility in Japan has been established by the original manufacturing method. Exiting from OEM supply.

1224yd

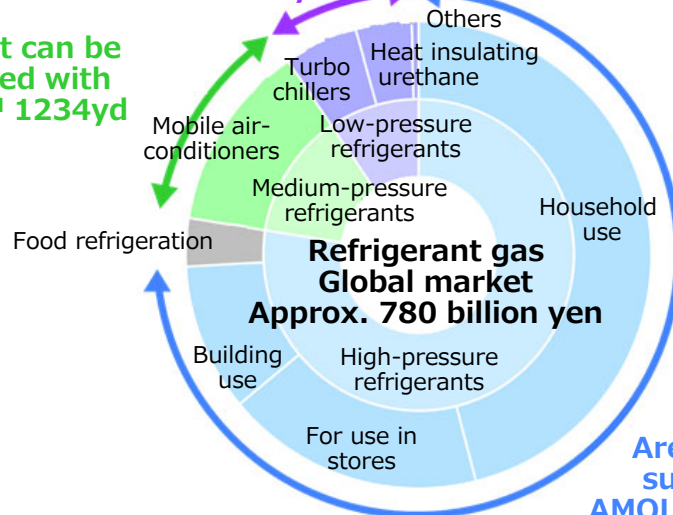
Low-pressure refrigerant for turbo chillers, etc. Application and production patents and production facilities have been established. New facilities started operation in July 2020.

Target market

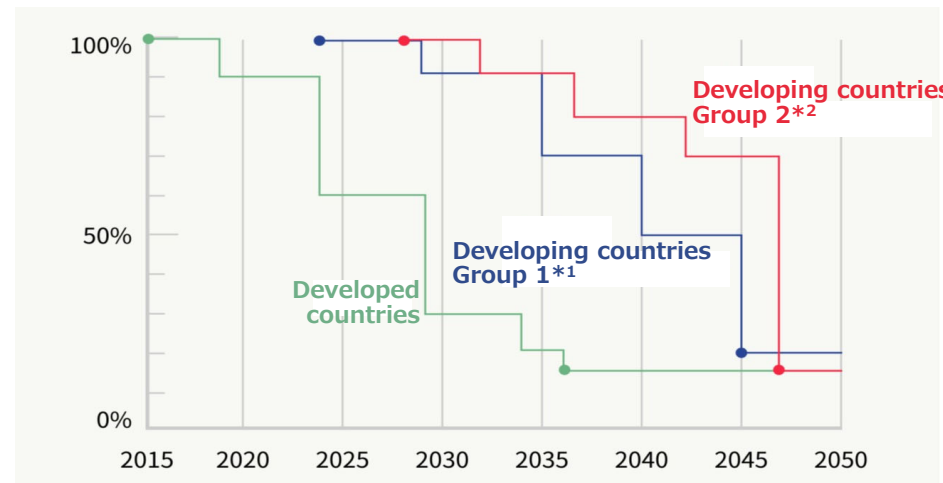
HFC reduction schedule

Areas that can be substituted with AMOLEA™ 1224yd

Areas that can be substituted with AMOLEA™ 1234yf



HFC reduction time schedule - HFC consumption limit (GWP conversion) -



*1: Developing countries that do not belong to Group 2

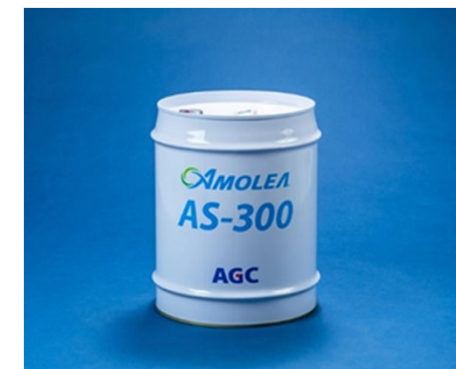
*2: India, Pakistan, Iran, Iraq and the Gulf states

Solutions that help solve material sustainability issues

(4) Low GWP* next-generation fluorinated solvents AMOLEA™ AS-300



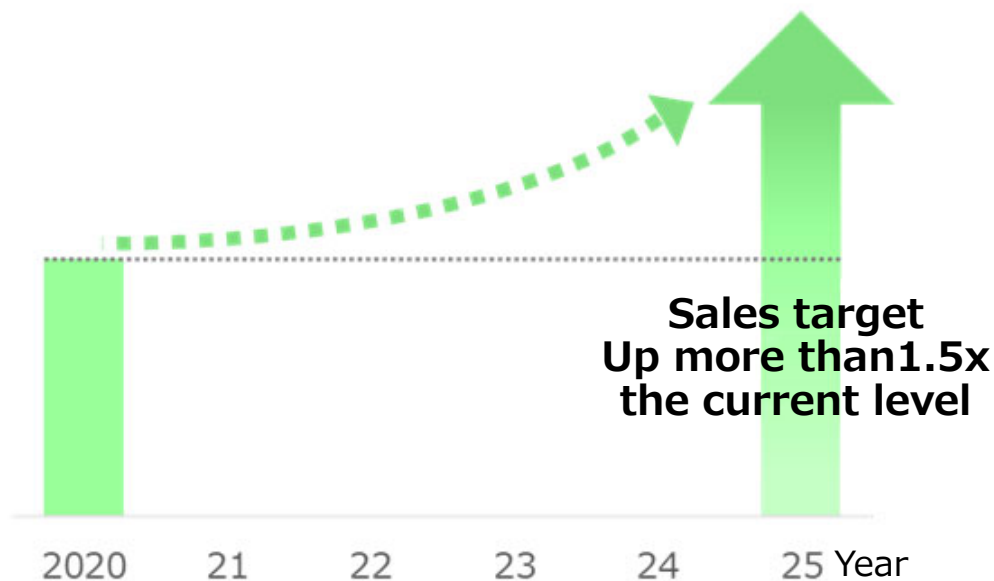
- Global concern about the environment caused chemical substances such as ozone layer depletion and global warming has led to a growing trend toward the introduction of environmental regulations on chemical substances.
- AGC will respond promptly to environmental issues and **aggressively develop alternatives based on the recognition that environmental regulations are business opportunities.**
- AMOLEA™ AS-300 **combines cleaning power with a boiling point suitable for cleaning and has a GWP of less than 1.** The world's most innovative next-generation fluorinated solvent with not only cleaning power and safety but also environmental performance.



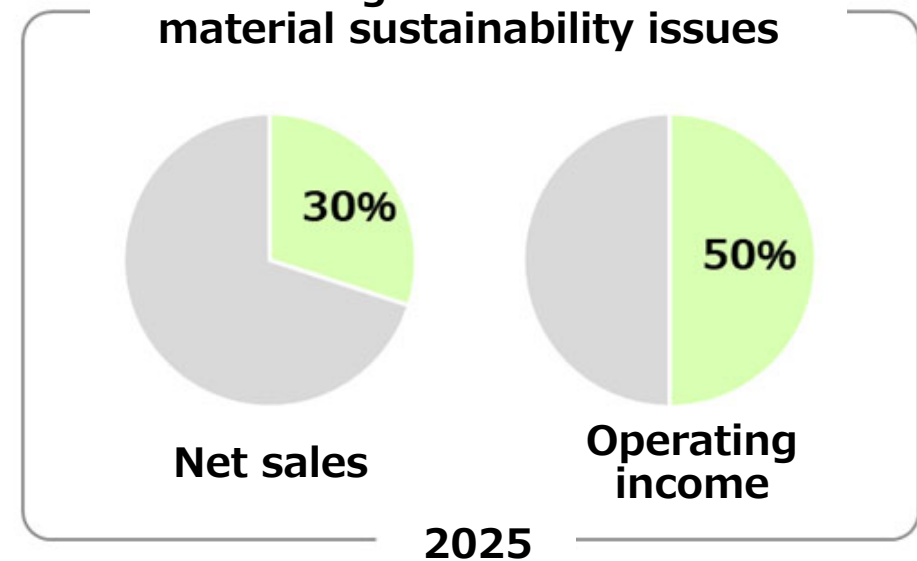
Addressing material sustainability issues

- **Approximately 50% of the “investment in new facility expansion” in the mid-term management plan period will be allocated to “new product groups contributing to material sustainability issues”.** We aim to **expand sales in 2025 by 1.5 times or more of the current level,** centering on the growth of those areas.
- We assume “product groups that contribute to material sustainability issues” will account for **approximately 30% of sales and 50% of operating income in our targets for 2025.**

Sales target for 2025



Percentage of new product groups contributing to the resolution of material sustainability issues



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**Chemistry
for a Blue Planet**
AGC Chemicals

AGC
Your Dreams, Our Challenge