



Innovation by Chemistry

TORAY IR Day

Medium-Term Management Program Project AP-G 2025

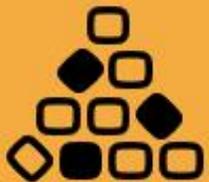
Resins & Chemicals Business

June 9, 2023

Kazuhiko Shuto

Vice President, General Manager, Resins & Chemicals Division

Toray Industries, Inc.



I. Overview of the Resins & Chemicals Business

II. Review of the Medium-Term Management Program, Project AP-G 2022

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IV. AP-G 2025 Strategies for the Resins Business

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VI. Contribution to Realization of a Sustainable Society

VII. Target for FY 2025

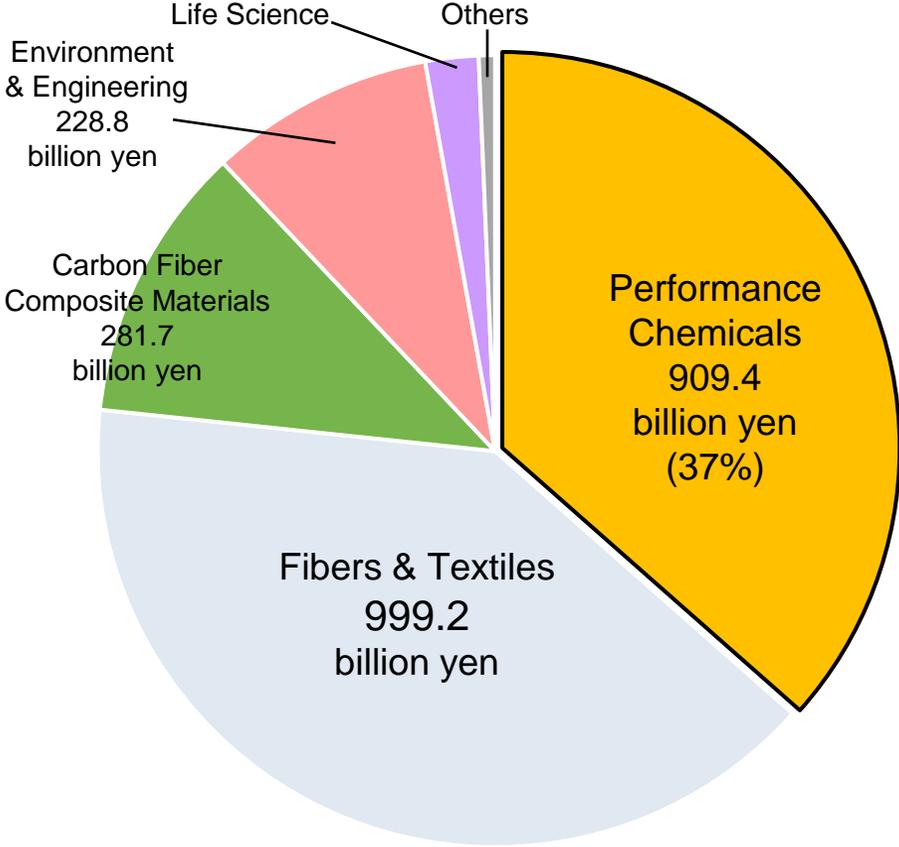
(Reference) Revising Revenue Target of Performance Chemicals Subsegment

I

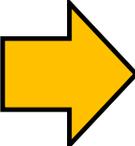
Overview of the Resins & Chemicals Business

1. Position within the Performance Chemicals Segment

Breakdown of revenue by segment (FY 2022)



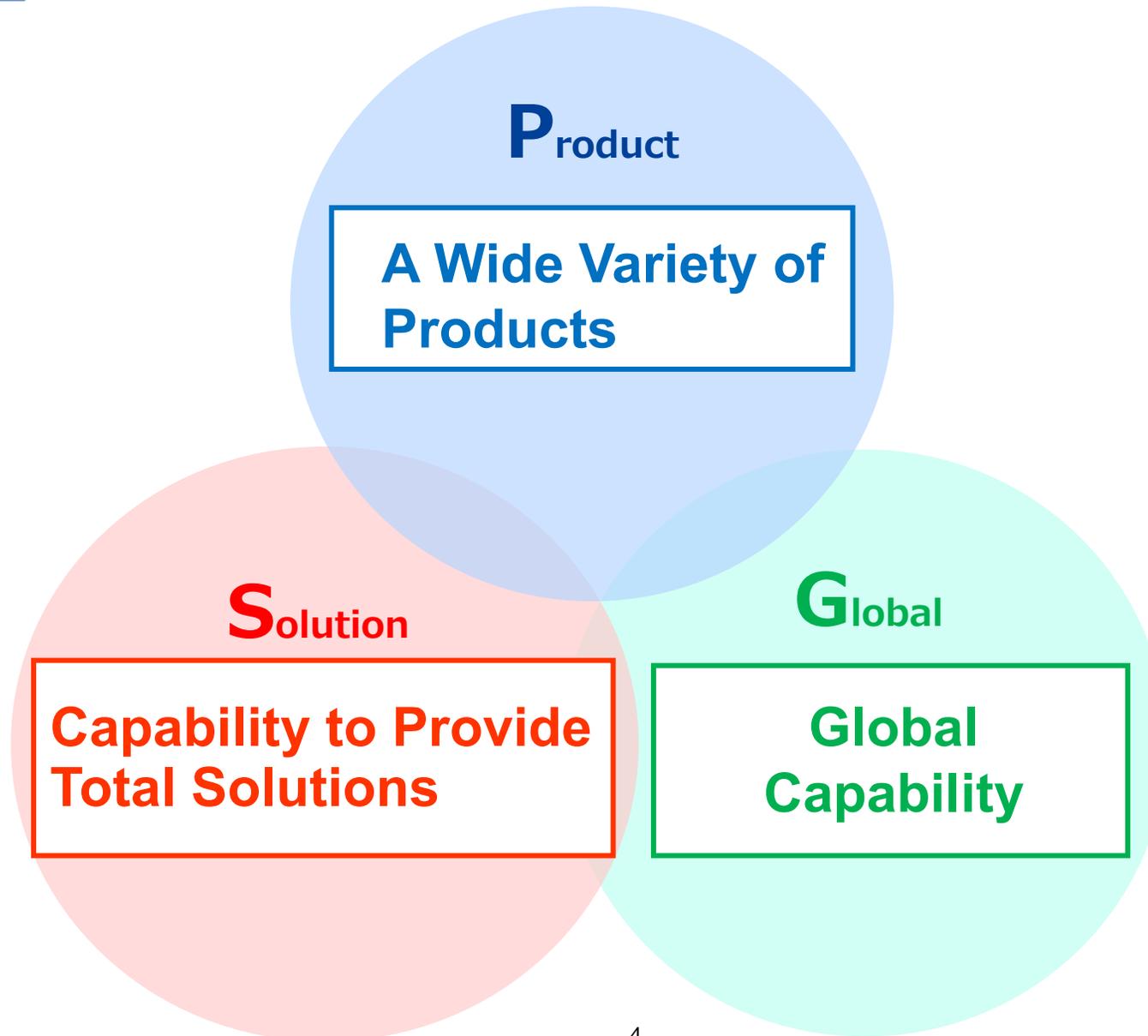
**Total of Toray Group:
2.5 trillion yen**



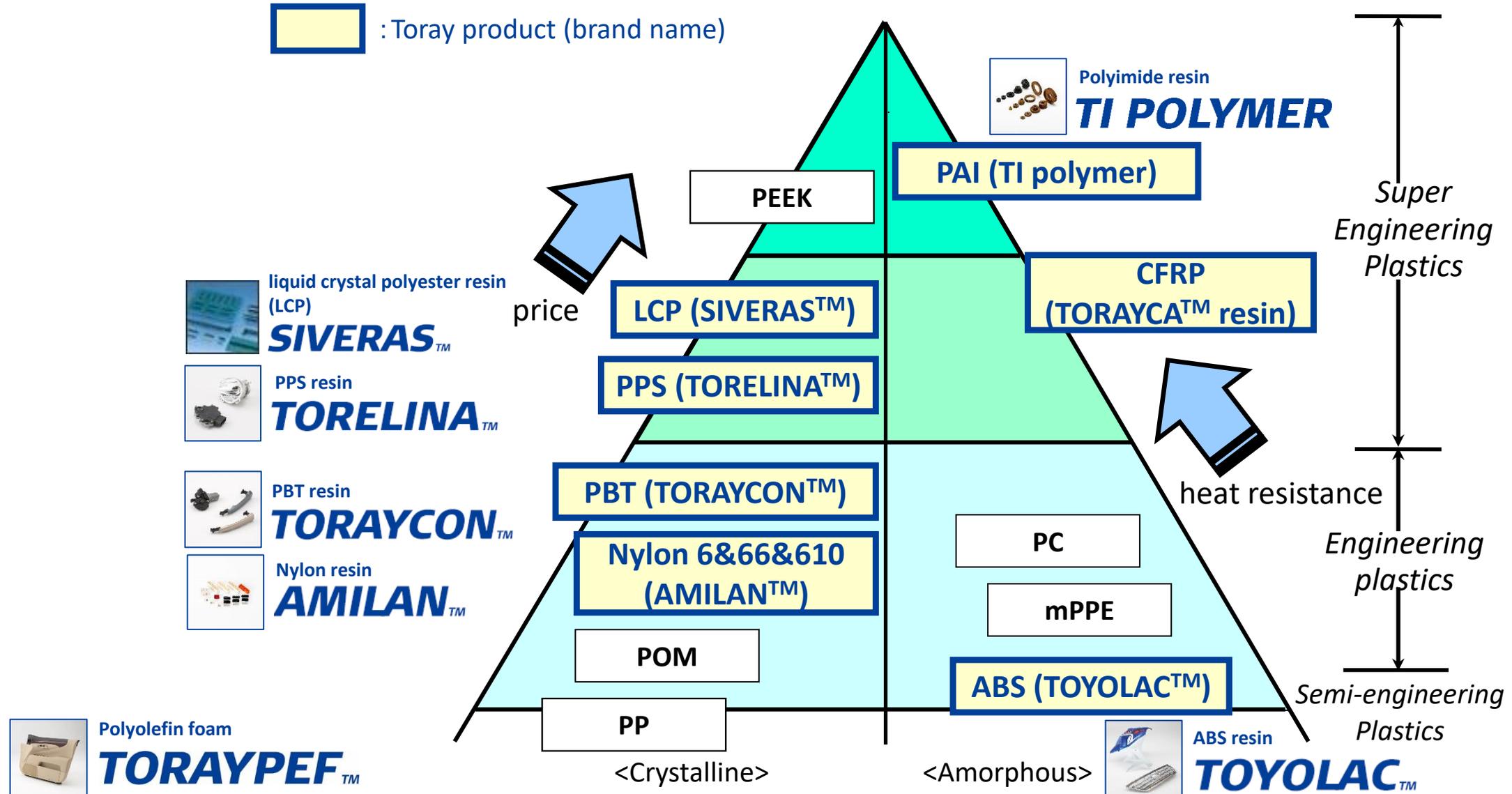
	Revenue
Resins & Chemicals	419.5
Films	321.5
Electronic & Information	55.2
Trading	54.7
Reconciliation	-433.9
Total	909.4

About 17% of consolidated revenue

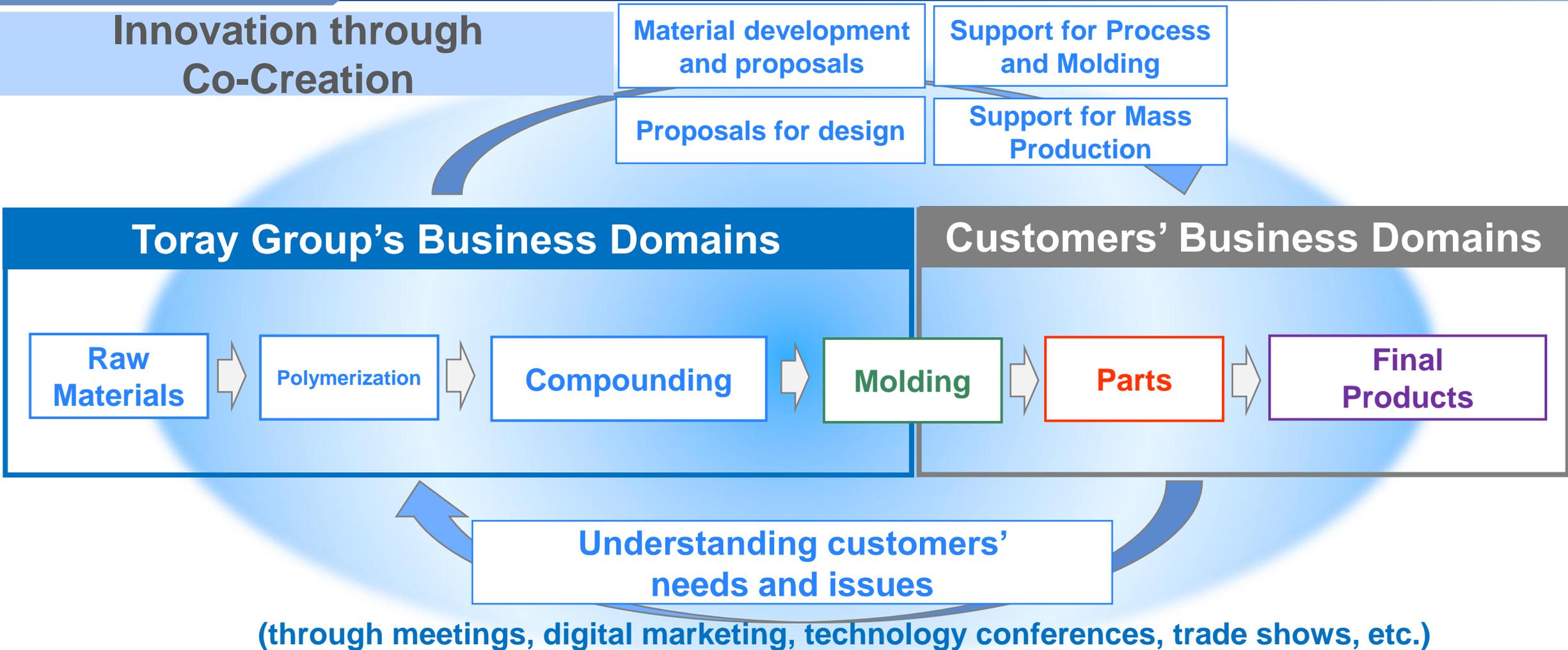
2. Introduction to the Resins Business – Strengths



2. Overview of the Resins Business –Product Line-up



2. Overview of the Resins Business –The Value-Creation Process, Proposal of Solutions to Customers



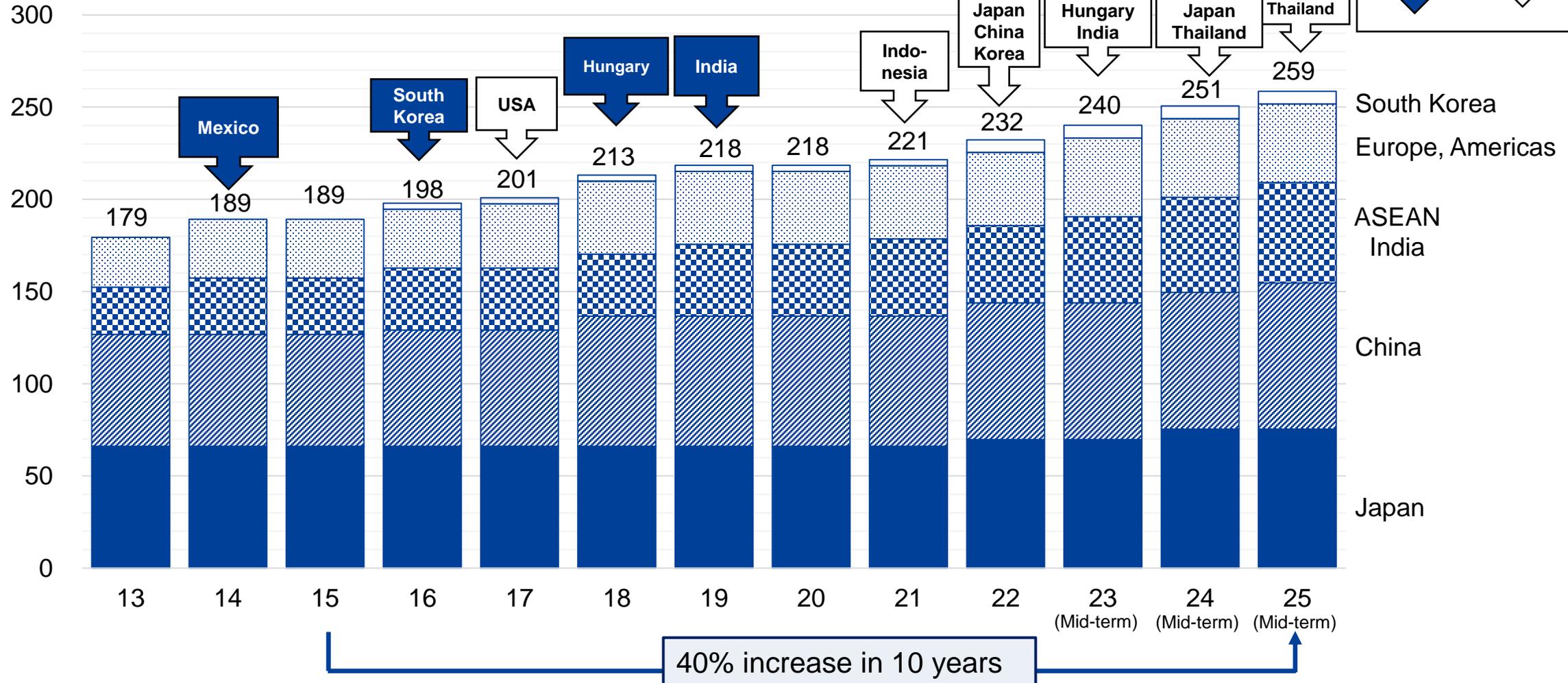
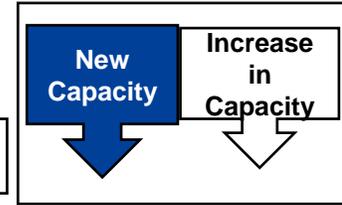
Provide Total Solutions to Support Customers' Product Development Comprehensively

2. Overview of the Resins Business –Global Sites

<Trend in production capacity of resin compounding>

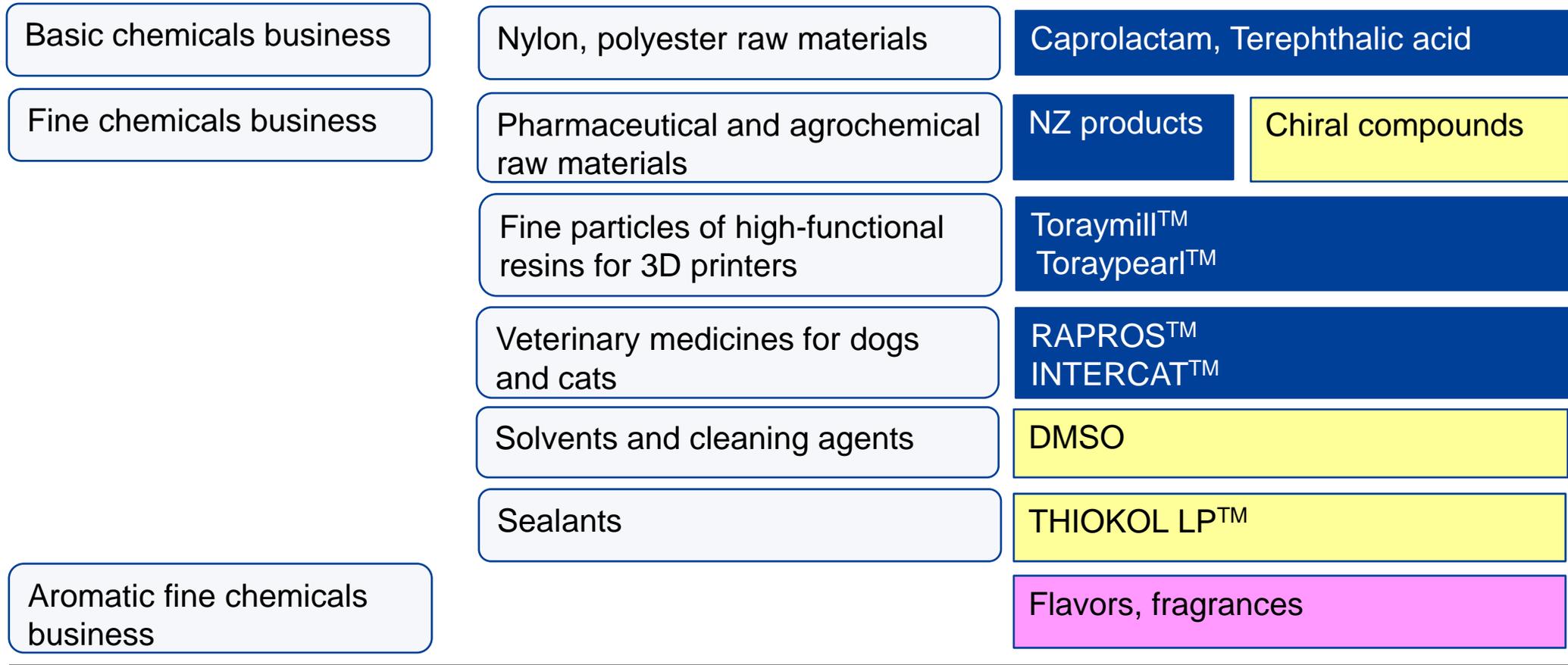
(K tons)

Increase of capacity in growth regions



3. Overview of the Chemicals Business

Basic chemicals business consisting of raw materials for synthetic fibers and plastics, fine chemicals business consisting of pharmaceutical and agrochemical raw materials and industrial materials and aromatic fine chemicals business



Toray Products

Toray Fine Chemicals products

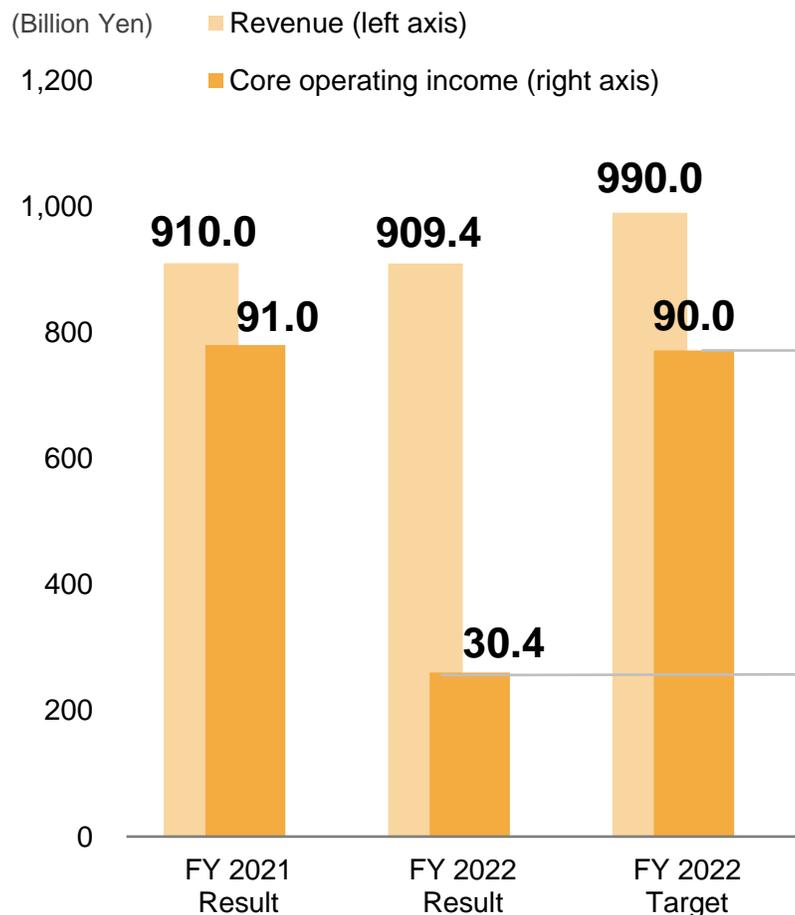
Soda Aromatic Products

II

Review of the Medium-Term Management Program, AP-G 2022

1. Variance Analysis of AP-G 2022

The Performance Chemicals Segment Variance Analysis



In FY 2021, market demand was strong overall due to the recovery from COVID-19, and there was substantial overachievement of the target. However, the core operating income was **-13.0 billion yen below the target in FY 2022***. There were several factors that led to decrease in sales volume such as delay in recovery in automobile production volume, continued zero-COVID policy in China, and customers' adjustment in procurement from the accumulated inventory in the supply chain.



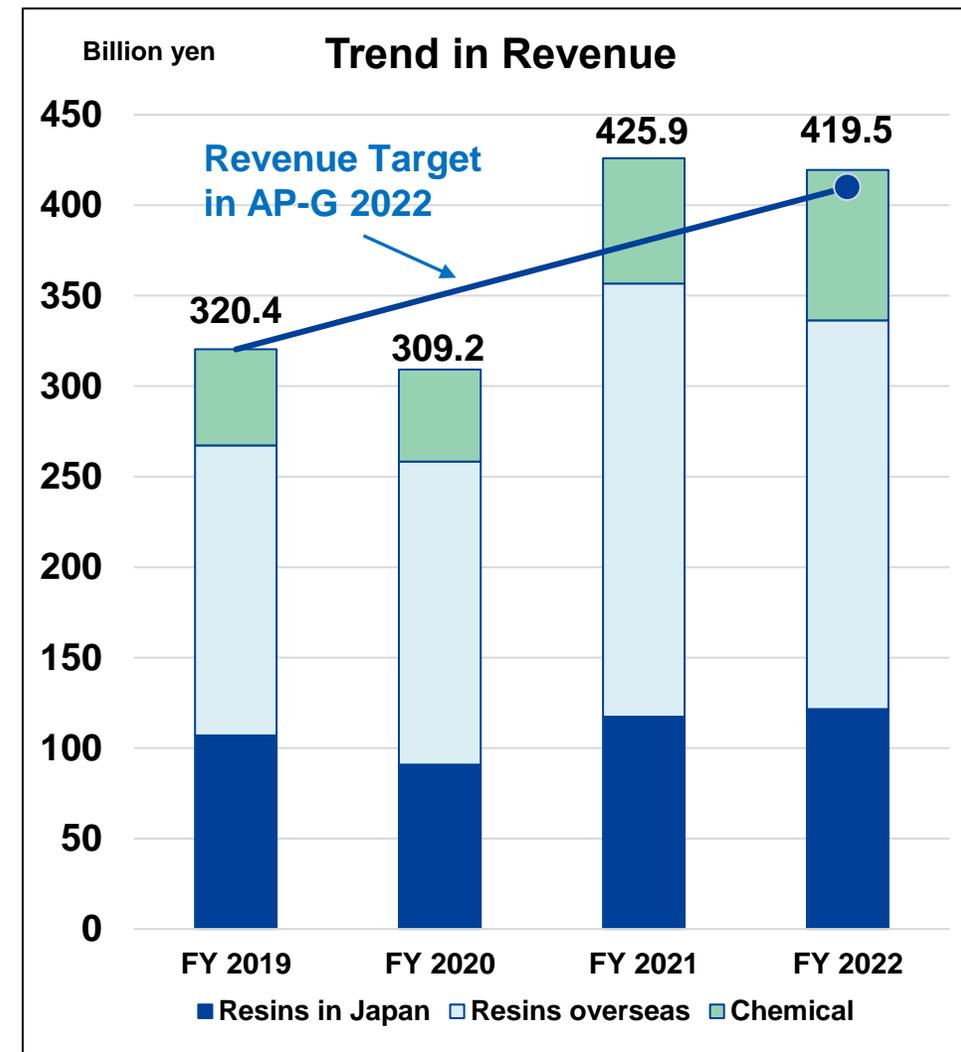
*For FY 2020-2022 total, **achieved the medium-term target**. The fine chemicals business performed strongly, and we were able to capture the recovery demand from COVID-19 by expanding production capacity at TPM and by expanding sales of PPS resins.

2. Summary of AP-G 2022

(1) Summary of AP-G 2022

	Basic Policies	Summary of Results
1	Expand businesses in growth areas(next generation mobility, etc.)	Achieved the target by sales in applications such as xEV and agricultural chemicals.
2	Expand sales of high value-added products globally	High-functional ABS resins performed strongly in FY 2020-2021 but slowed down due to downturn in the market situation. There was strong performance in the PPS resins and the fine chemicals business. Made a decision to ramp up the PPS resin production line at TAK.
3	Strengthen upfront development capabilities, total solution proposal capabilities	Began marketing online and expanded solution proposal utilizing CAE analysis.
4	Promotion of measures toward realizing a sustainable society	Material recycling of airbag scrap materials, development of depolymerization technology using subcritical water. Full-fledged efforts in these areas will be made in AP-G 2025.

(2) Trend in Revenue



III

Business Environment and Basic Policies of AP-G 2025

Business Environment and Basic Policy

Business Environment

- (1) Increasing need for sustainability measures
- (2) Economic recovery from the pandemic and increase in competition from competitors' production capacity increases
- (3) World population growth, declining birthrate and aging population in developed countries
- (4) Advancement of digital society

Basic Policy

Contributing to building a sustainable world by creating high value-added products

(1) Enhancing governance (business operation prioritizing quality and compliance)

(2) High-added-value creation

- Business expansion in growth market (next-generation vehicles, semiconductor, pharmaceutical and agrochemical raw materials, veterinary medicines)
- Global expansion of PPS resins TORELINA™ as well as fine chemical products, shift to high-performance products with ABS resins TOYOLAC™
- Development of innovative technologies, enhancement of total solution proposal, marketing leveraging DX

(3) Contribution to realization of a sustainable society

- Development and sales expansion of sustainable materials (recycled/ bio-based) and marine biodegradable resins

IV

AP-G 2025 Strategies for the Resins Business

1. Enhancing governance: Promotion of Recurrence Prevention Measures in Response to the Inappropriate Actions Relating to the UL Certification

(1) Progress on UL certification

Completed recertification UL for necessary grades and ISO9001. Will continue with recurrence prevention, solid quality control system, and enhancement of compliance awareness

(2) Actions on the recurrence prevention measures in response to the recommendations of the Expert Committee

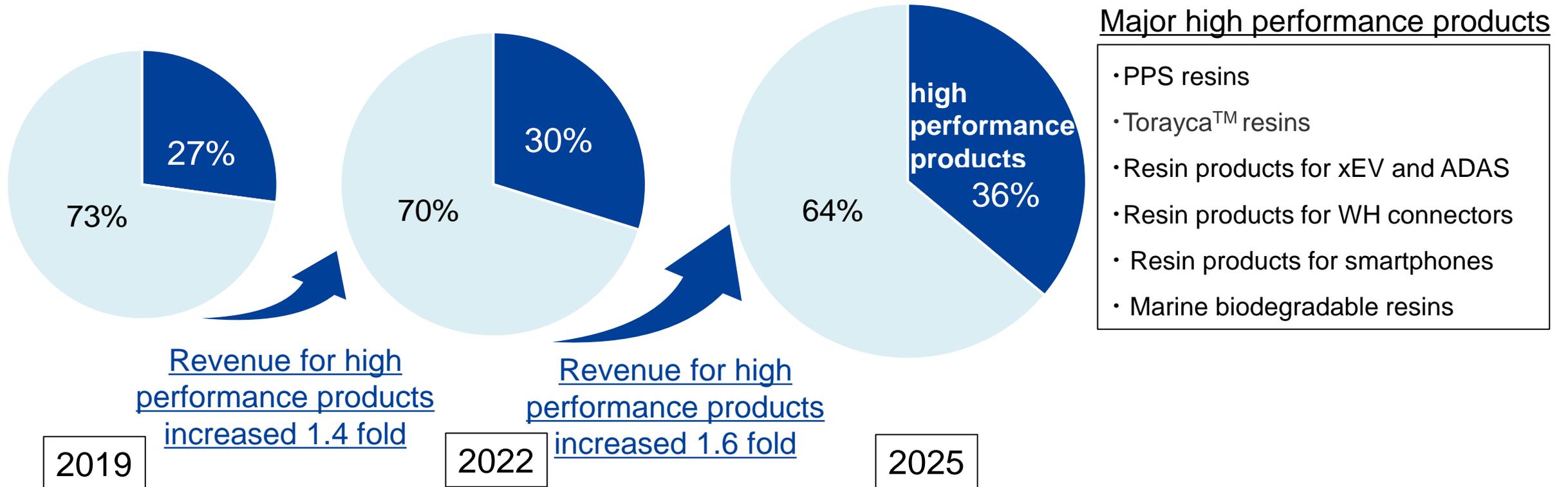
Group-wide Recurrence Measures	Measures by the Resins & Chemicals, Manufacturing, and Quality Assurance Divisions
1. Enhance compliance awareness	<ul style="list-style-type: none"> ✓ <u>Promotion of corporate culture reform through senior managers continually communicating messages to employees the importance of compliance and through communication to the frontlines</u> ✓ Enhancement communication by 5,900 employees on the floor, in order to 1. Enhance process control, 2. Create a culture of openness and 3. Foster a sense of pride (Ongoing)
2. Establish work procedures and an training system for UL-related operations	<ul style="list-style-type: none"> ✓ 1. Training for all members 2. Restructuring of the certification system/operation procedures 3. UL verification audit, C-CAP (Completed)
3. Transfer personnel between business divisions and other interaction	<ul style="list-style-type: none"> ✓ 1. <u>Change of director in charge of the division</u> 2. Personnel transfer of related individuals (Completed)
4. Establish a system to confirm UL compliance by the internal quality assurance organizations and/or external organizations	<ul style="list-style-type: none"> ✓ 1. Internal audit by the Quality Assurance Division 2. <u>External audit by UL and ISO recertification (Chiba, Nagoya)</u> (Completed)
5. Strengthen the structure of quality assurance organization	<ul style="list-style-type: none"> ✓ <u>1.Strengthened organizational structure by increasing members in the division and by strengthening auditing system, etc.</u> (Completed)
6. Establish system to ensure reporting of misconduct to Toray administrative organizations	<ul style="list-style-type: none"> ✓ 1. Improved contents of the internal survey (implemented in November 2022), conducted a follow-up of results (Completed)

2. High-added-value Creation

Advancement of Resin Compound Business

⇒ Promoting global sales expansion of high performance products and increase the ratio within the revenue

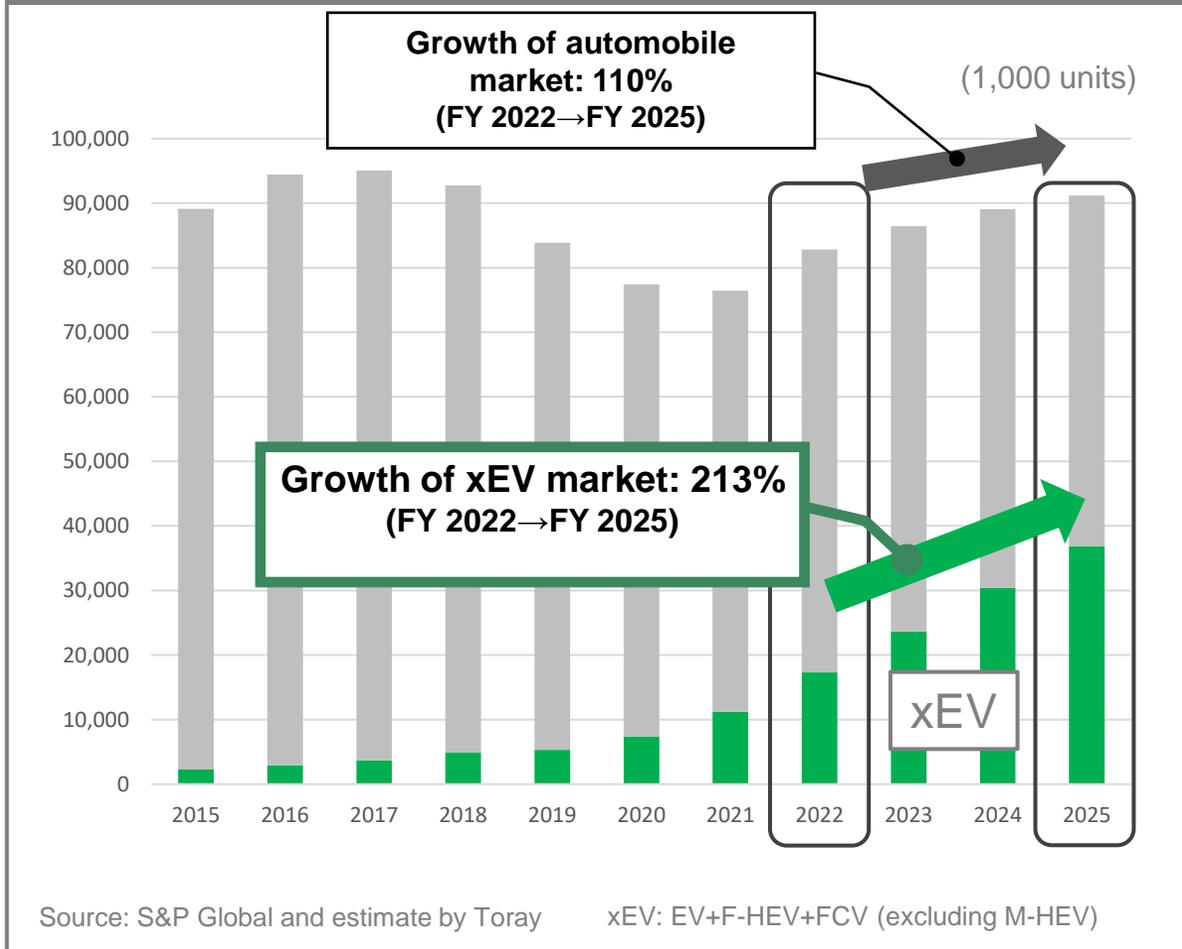
<In engineering plastic resins business, percentage of high performance products in revenue >



2(1).Business Strategies for Automobile Applications

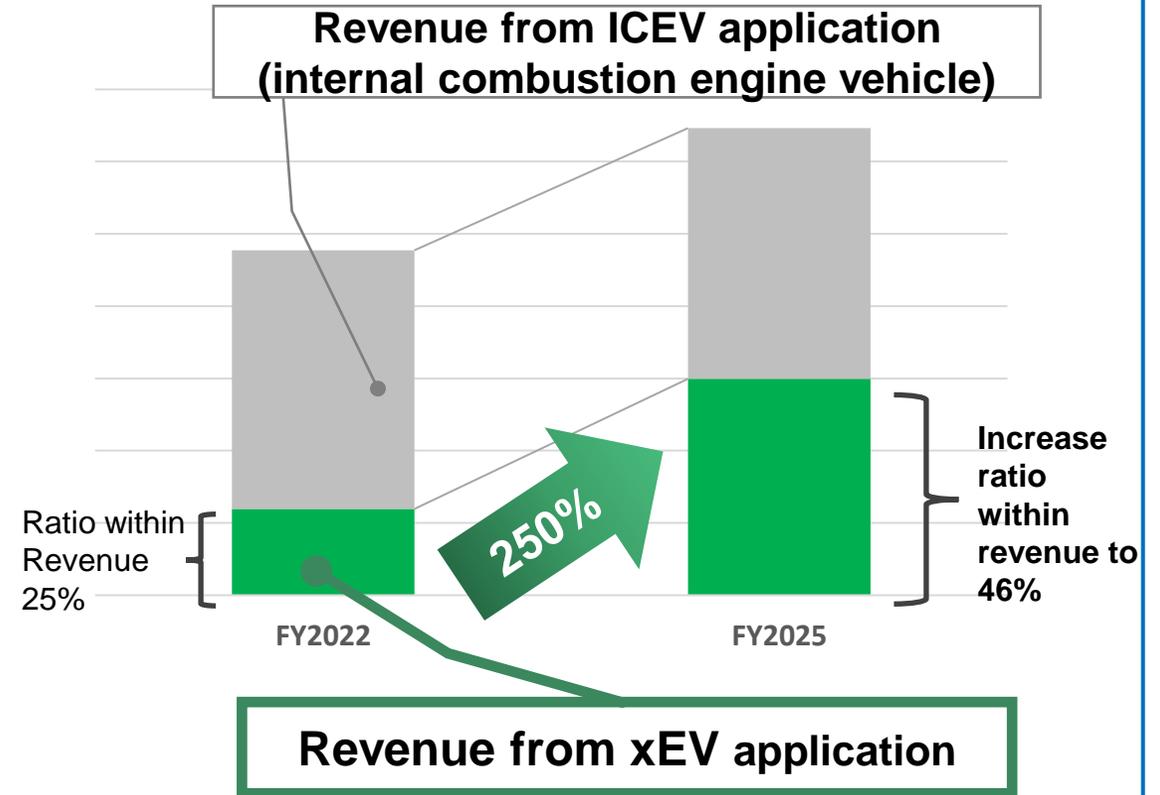
a. Capturing xEV demand and entering a new growth phase

Trend in global automobile production



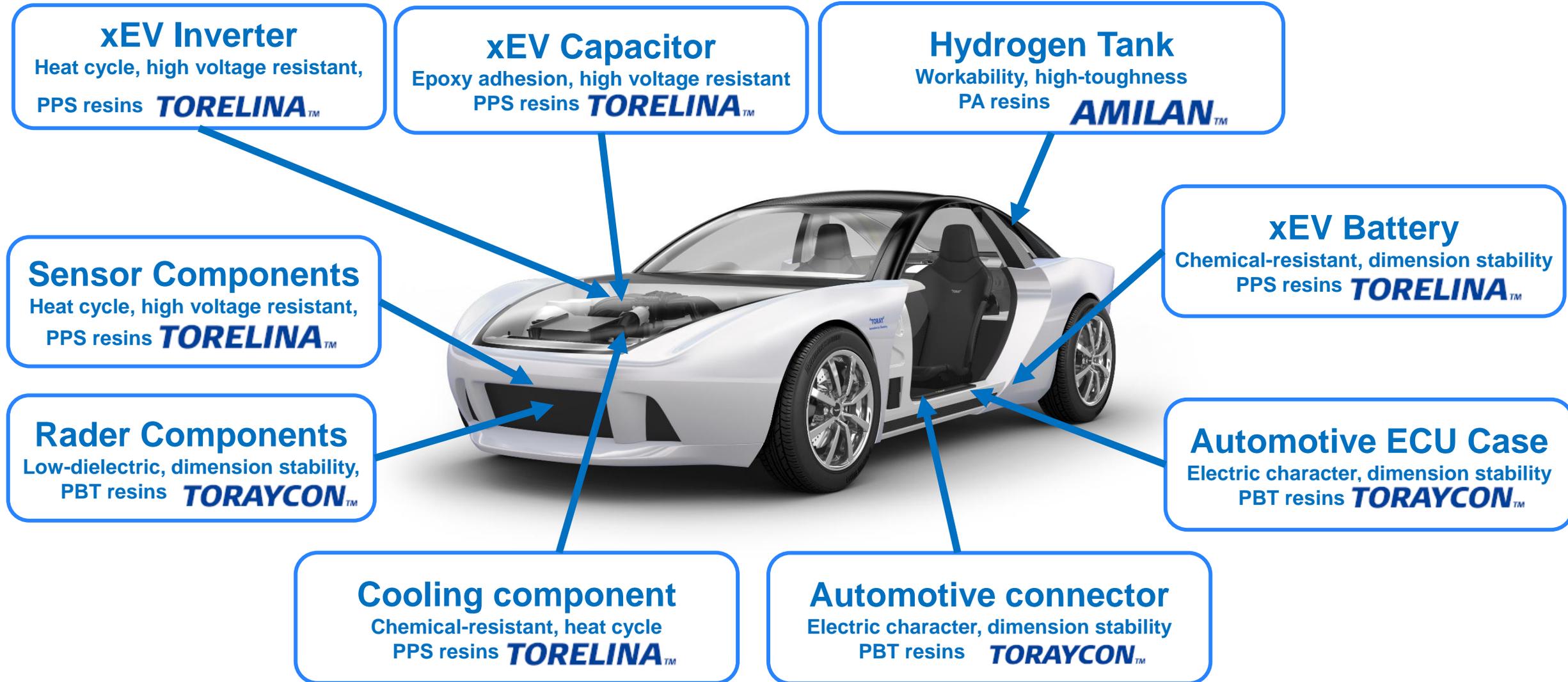
Engineering plastics business for automobile applications (Trend in revenue)

Expansion of engineering plastics business for automobile applications: **135%** (Revenue from FY 2022→FY 2025)



2(1) Business strategies for automobile applications

b. Toray's products for xEV



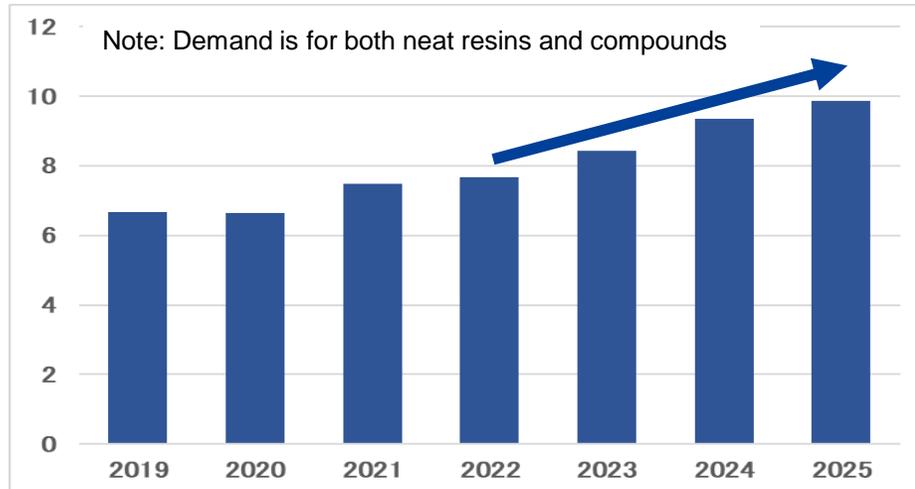
2 (2) Global Business of PPS Resins TORELINA™

a. Increasing market share of PPS compounds

(1) Global Market of PPS resins

a. Global demand for PPS (estimated by Toray)

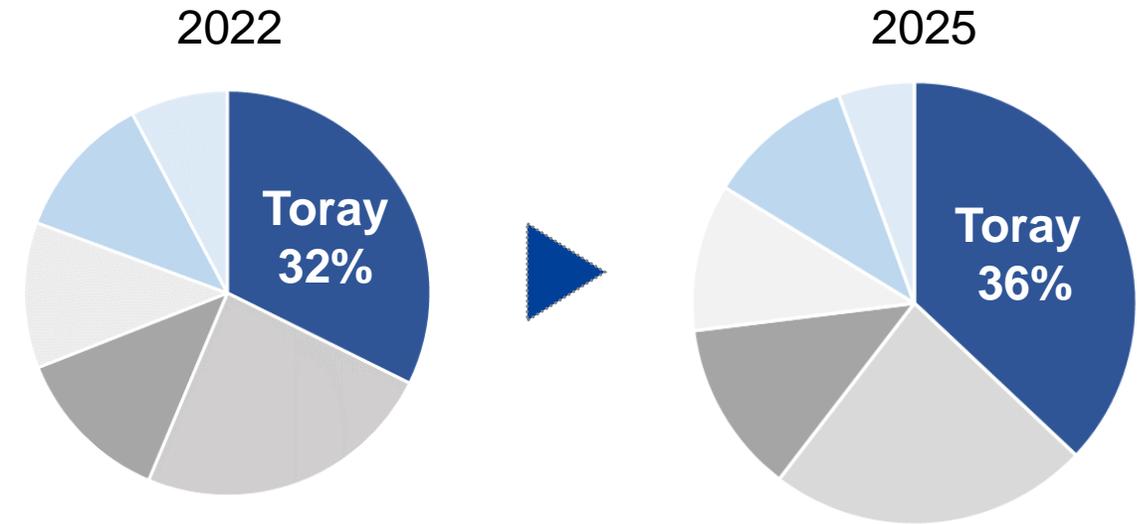
(Unit: 10K)



- Global demand is expanding 7% annually on the backdrop of growing needs in xEVs, automotive electronic components, and light-weighting properties (2022→2025).
- Super engineering plastics with long-term heat resistance, outstanding chemical resistance, and flame-retardant properties.
- Adopted in versatile applications including power semiconductors with increasing demand for energy-saving and labor-saving

TORELINA™

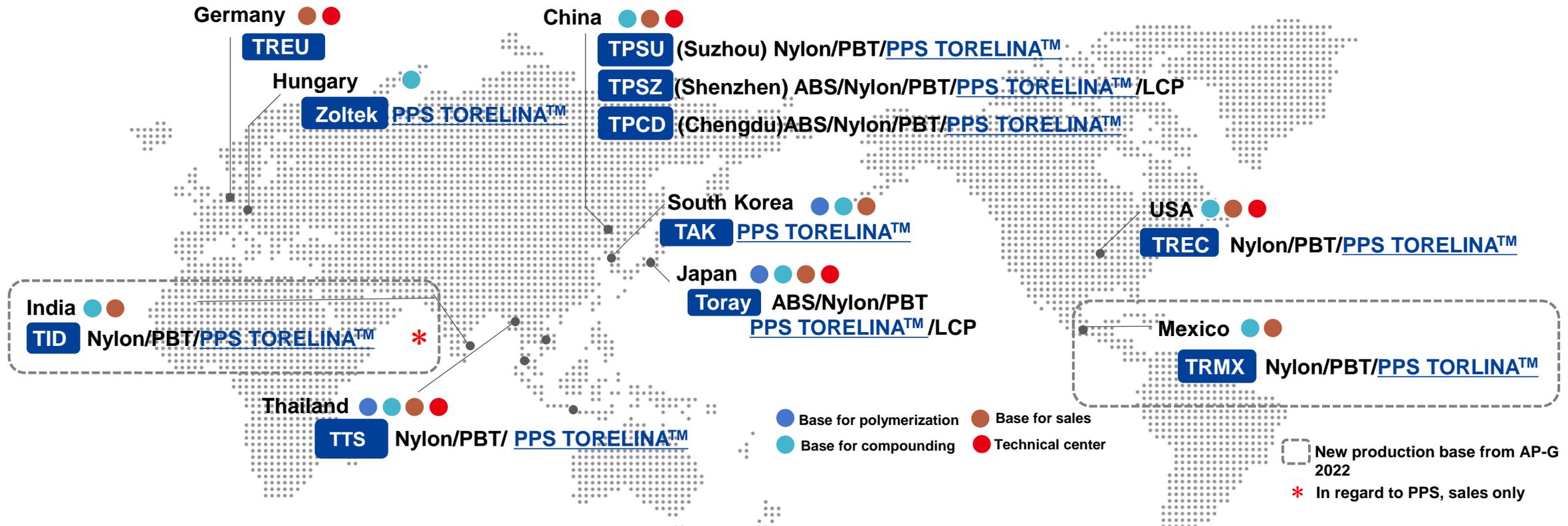
b. Global market share of PPS compounds (estimate by Toray)



- The world's only integrated manufacturer from monomer, polymer, to compounding, in addition to Fibers & Textiles and Films business.
- World's largest PPS polymer/compounding company (Market Share of compounds: 27% in 2019→32% in 2022→36% in 2025)

2 (2) Global Business of PPS Resins TORELINA™

b. Expansion of production sites and enhancement of solution proposal



- Placing production and technical centers globally, possessing cross-linked/ linear polymers and utilizing technologies including nanoalloy and CAE* analysis enable total solution proposal in globally
- World's only manufacturer with polymer production bases in two countries (Japan and South Korea) and the ability to respond to BCP.
- Increasing sales globally, mainly in Europe and China
(ratio of sales outside Japan: 60% in 2019 → 73% in 2025)

2 (2) Global Business of PPS Resins TORELINA™

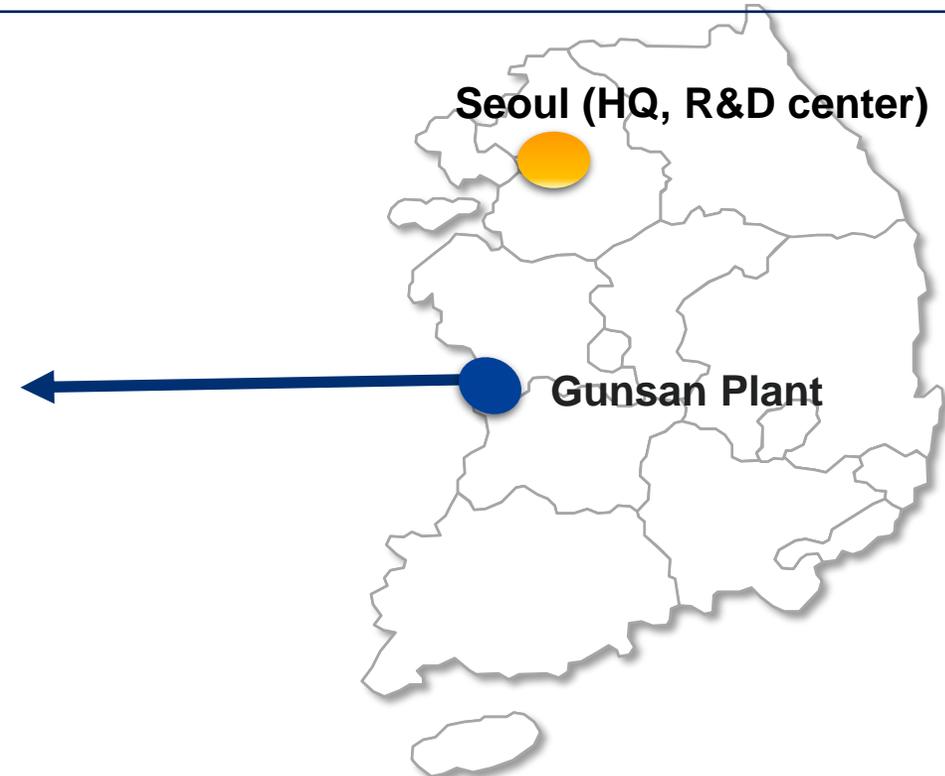
c. Expansion to world's largest polymerization capacity

PPS polymerization facilities in South Korea

In TAK, South Korea, production capacity for PPS resins will be increased 5,000 tons in the second phase (starting operation in December 2024).

- Established integrated production system from raw materials, polymerization to compounding.
- Proceeding expansion of world's largest PPS polymerization capacity.

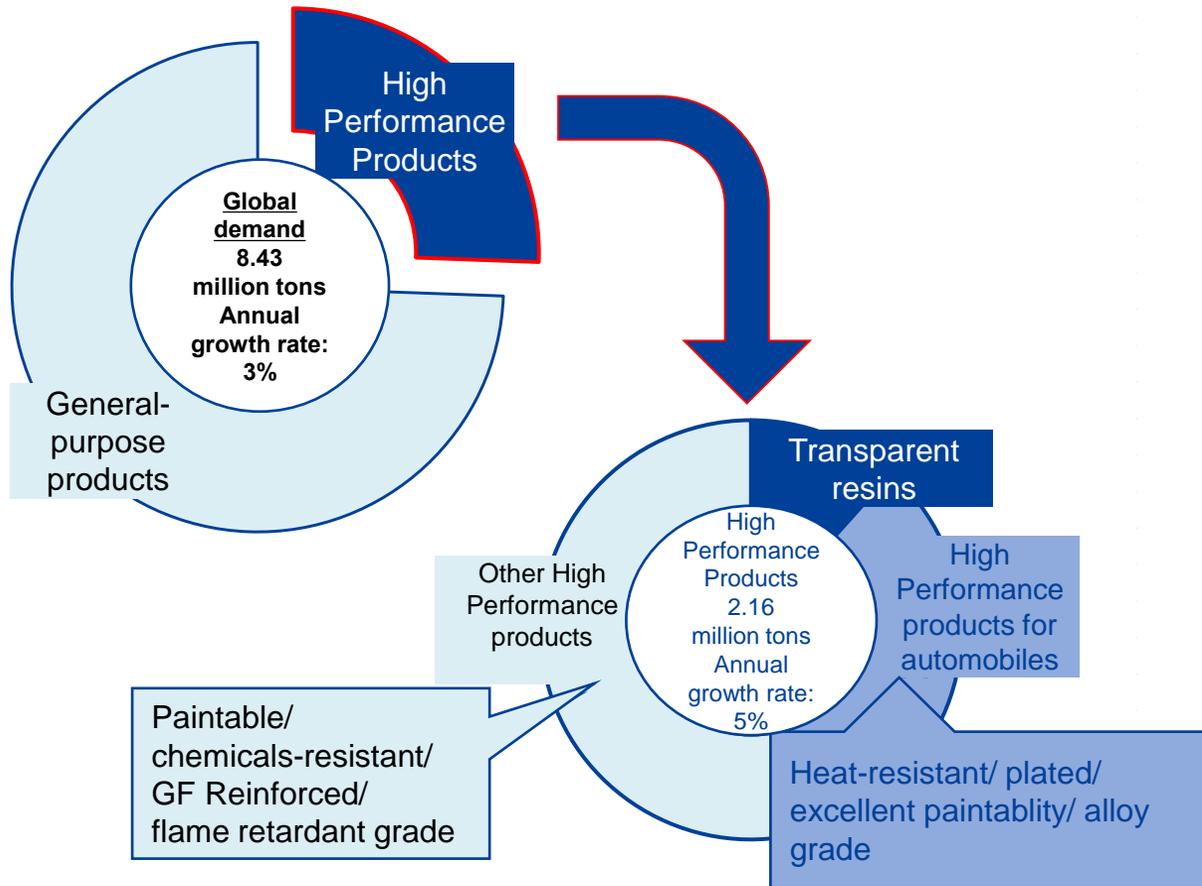
Toray-G total capacity: 27,600 tons in 2019 ▶ [32,600 tons by end of 2024](#)



2(3) Global Business of ABS Resins TOYOLAC™

a. ABS Resins Market

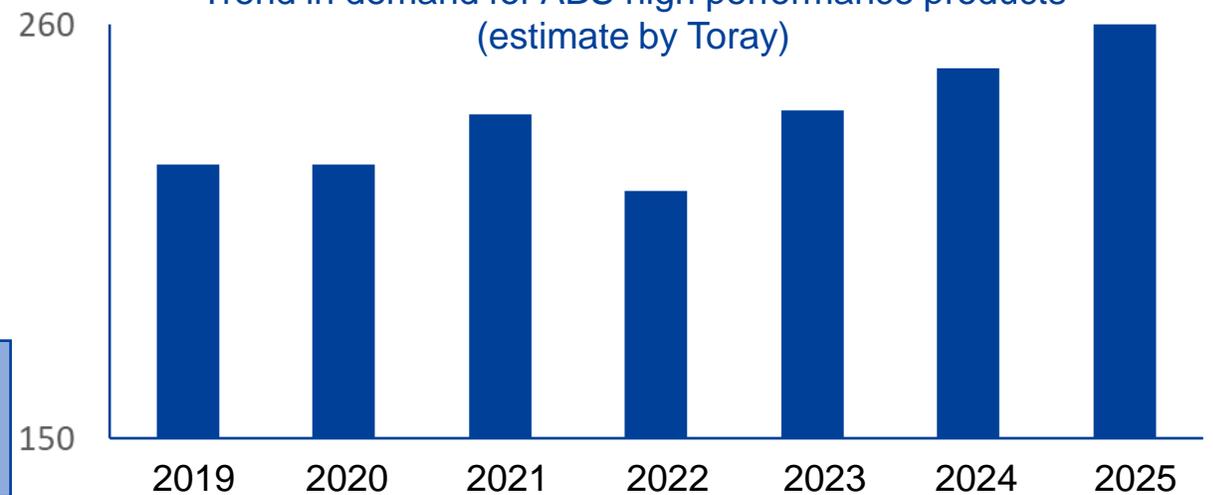
Global demand for ABS resins (estimate by Toray, 2022)



Trend of ABS resins market

- Demand was slow in 2022 but expected to gradually recover from 2023 onwards
- In general purpose ABS resins, competition will be harsh due to the production capacity increase in China. High performance products will be back to recovery track, at the annual growth rate of 5%
- Demand for products and initiatives for low environmental impact is expected to accelerate

(10K tons) Trend in demand for ABS high performance products (estimate by Toray)



Focusing on the strategic expansion in high performance product markets such as transparent resins and automobile applications

2(3) Global Business of ABS Resins TOYOLAC™

b. Strategies for high performance

Producing high performance products in 2 bases

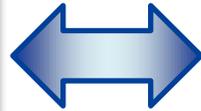
Chiba plant

(Ichihara, Japan)



72,000
tons/ year

Integrated
operation



Production
capacity

TPM

(Penang, Malaysia)



425,000
tons/ year

Excellence in materials and solutions

- Cost competitiveness and quality stability with proprietary co-polymerization process
- Specialty AS resins and alloy technology



Strategies for TOYOLAC™

A. World's No.1 share in transparent resins

- Target: Global share of around 45% in 2025
- Expansion of medical application as a growth field

B. Expansion of high performance products for automobiles

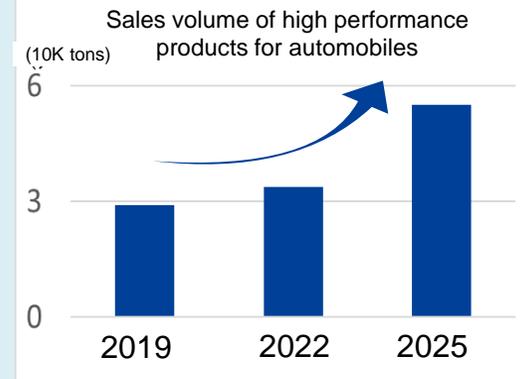
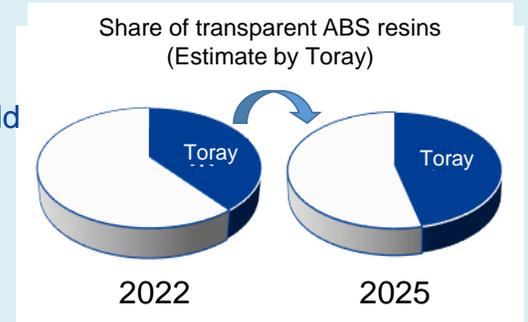
- Target sales volume in 2025: 1.6 times vs 2022
- Sales expansion of products which are thermally stable, excellent in painting properties, has anti-squeaking properties, low coefficient of linear thermal expansion, and ASA resin products

C. Expansion of other advanced products

- Target sales volume in 2025: 1.3 times vs 2022
- Sales expansion of products that have antistatic property, excellent painting property for motorcycle, and GF reinforced high-rigidity

D. Establish status as supplier of high performance and sustainable ABS resins

- Market development and sales expansion of recycled grade (PCR/PIR)
- Launching ABS resins using bio-based monomers



2(4) Ultimate value creation Value Creation through Digital Innovation

MI

Materials Big data



- Wide range of product lineup
- High quality physical data
- Proven track record for development of materials and additive formulation (glass/carbon fibers, fillers, etc.)
- Latest analysis data

AI



- Physical property prediction models with high precision (long-term durability, CO₂ emission)
- Optimizing compositions
- Formulation by inverse analysis

CAE

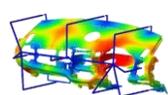
- Virtual examination of product shape
- Mold design by flow analysis
- Quality evaluation by thermal deformation analysis

Examining product shape



Displaying cause of warp deformation

Examination of mold spec



Examination of gate position and runner

Quality evaluation

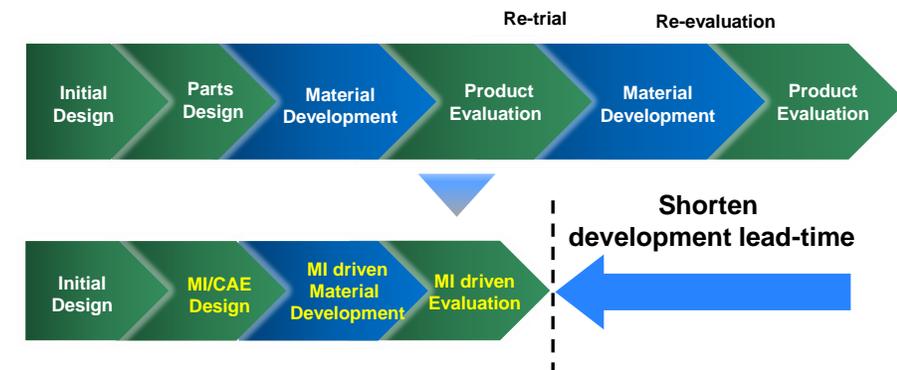


Residual stress/thermal deformation

*MI: Materials Informatics, AI: Artificial Intelligence, CAE: Computer Assisted Engineering

Value to customers

- Significantly shorten lead-time for product development
- Significantly reduce product development cost
- Achieving selection of best material candidate

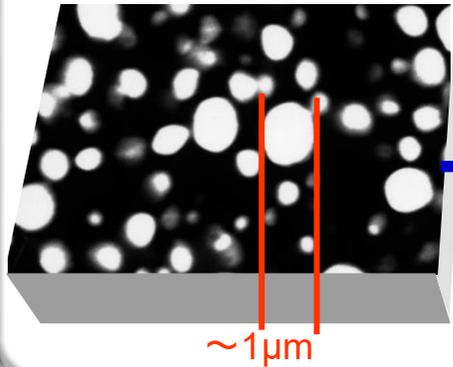


Integration of MI driven materials development and CAE enhance the efficiency of customer development

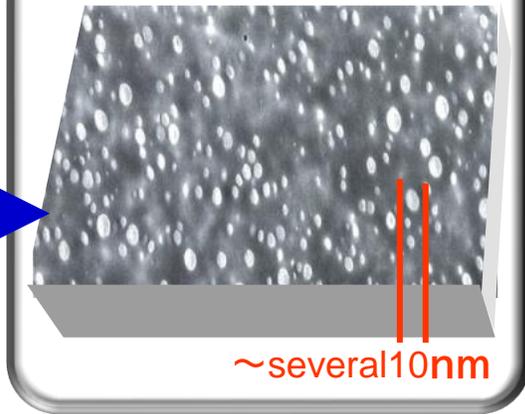
2(5) R&D

NANOALLOY™ Technology

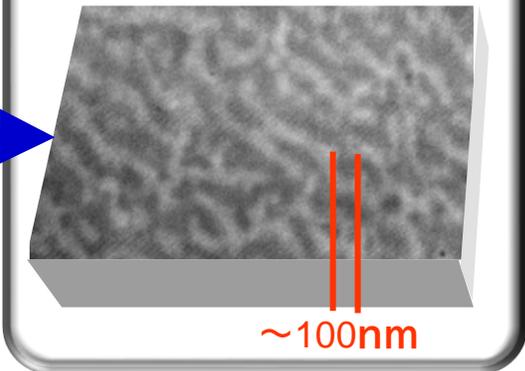
Conventional alloy



nano-dispersion



Nano-bicontinuous

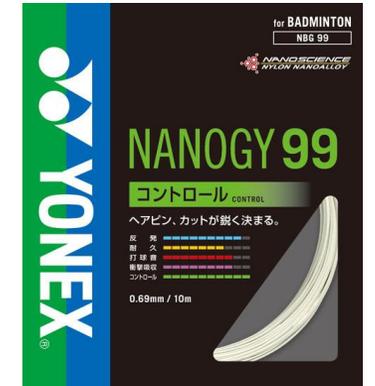


NANOALLOY™ TECHNOLOGY

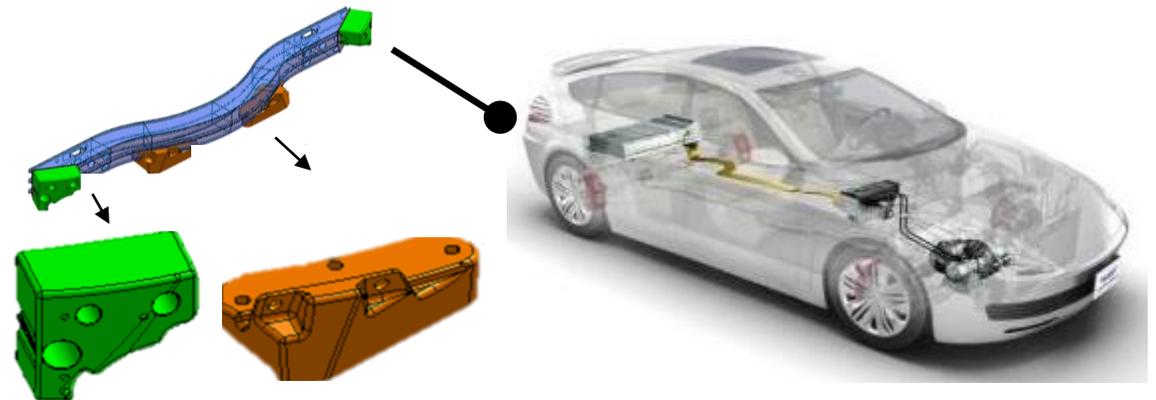
PC body
(Weight-saving and drop impact resistance)



Badminton strings
(Flexibly changing its shape for high speed impact)



Crash pad to reinforce bumper
(advanced shock absorber when crashing)



What is NANOALLOY™ Technology?

Toray's proprietary technology which helps dramatic improvement of property by blending in nanometer order

V

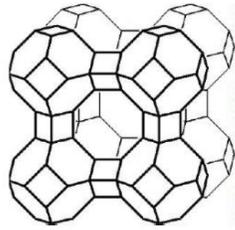
AP-G 2025 Strategies for the Chemicals Business

1. Expansion of the Fine Chemicals Business

(1) Businesses with world's top share

Through utilization of proprietary technologies and raw materials, operating businesses with world's top share

<NZ (New Zeolite) products>

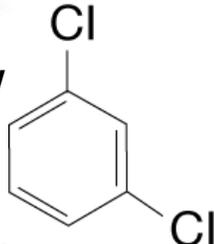


Zeolite catalyst

Toray's proprietary technology



Isomerization/
adsorption
separation

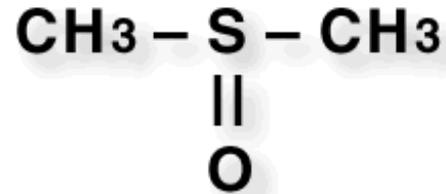


Meta-Dichlorobenzene

→Raw materials for
agricultural/ pharmaceutical
active ingredients

Contributing to advancement of
agriculture and food security

< DMSO >



Highly safe polar solvent

→Remove, cleaning agent,
organic synthesis solvent

- Production / business operation at 2 locations, Japan and China
- Lining up high-added-value products including excipient and low metal grade

Contributing to a substitution for other less safe polar solvents and to expanding demand for semiconductors

< Thiokol™ >



- Special polymer with sulfur in the polymer backbone
 - Easily change to high-molecular weight rubber at room temperature
 - Low permeability, high chemical and oil resistance
- Sealant (insulating glass), adhesive agent

Contributing to energy saving through highly insulating glass sealant applications

Target revenue in FY 2025: +21% vs FY 2023

1. Expansion of the Fine Chemicals Business

(2) Veterinary medicine business

With my precious family, forever.

“I want to live happily with my companion animal, my family member, as long as possible.”

To respond to the owners' wish, we will develop innovative veterinary medicines for dogs and cats with passion and contribute to advancement of veterinary treatment.

Operating business for longer healthy life expectancy of companion animals

INTERCAT™

Antiviral medicine



World's first
Feline interferon (genetically modified) drug

RAPROS™

Medicine for chronic kidney disease



World's first
Kidney disease medicine for cat

1. Expansion of the Fine Chemicals Business

(3) Aromatic fine chemicals business

<Fragrance>

Create fragrance for cosmetics

→Fragrance for hair care, body care and skin care products

- **Proposal for fragrance based on marketing research and analysis**



- **Unique technologies for synthetic/ natural raw materials production**
- **Original technologies for analysis and evaluation of aroma**

<Flavor>

Create flavor for food

→Flavoring/enhancing flavor for beverages, sweets, dairy products, masking unpleasant odor

- **Supply chains of flavor for China and ASEAN**



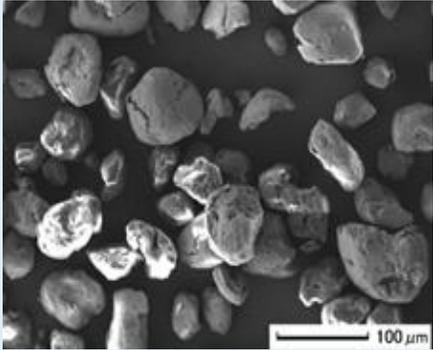
Paint the scenes of prosperous future with aroma, an invisible paint

2. New Business (High performance resin powders for 3D printing)

Aiming to expand new business by utilizing Toray's unique high performance polymer and technologies for functional prototype and end-use parts

< Toraymill™ PPS >

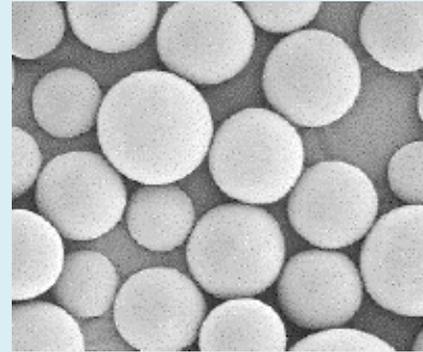
High-heat resistance, insulation properties, machine characteristic



Automotive filter piping

< Toraypearl™ PA6 >

Uniform particle size distribution, high fluidity



Intake manifold

No machining wastes and mold-free, reduction of inventory (parts) through on-demand production
→ Realization of sustainable manufacturing

3. Lactam and Lactam-related Business

Caprolactam: Utilizing Toray's unique photoreaction technology (Photo Nitrosation Cyclohexane: PNC process), realized high safety (at normal temperature and pressure) and easy process (single stage reaction)

Related business: Expanding business in various fields, leveraging unique by-products

Reducing environmental impact using lactam process

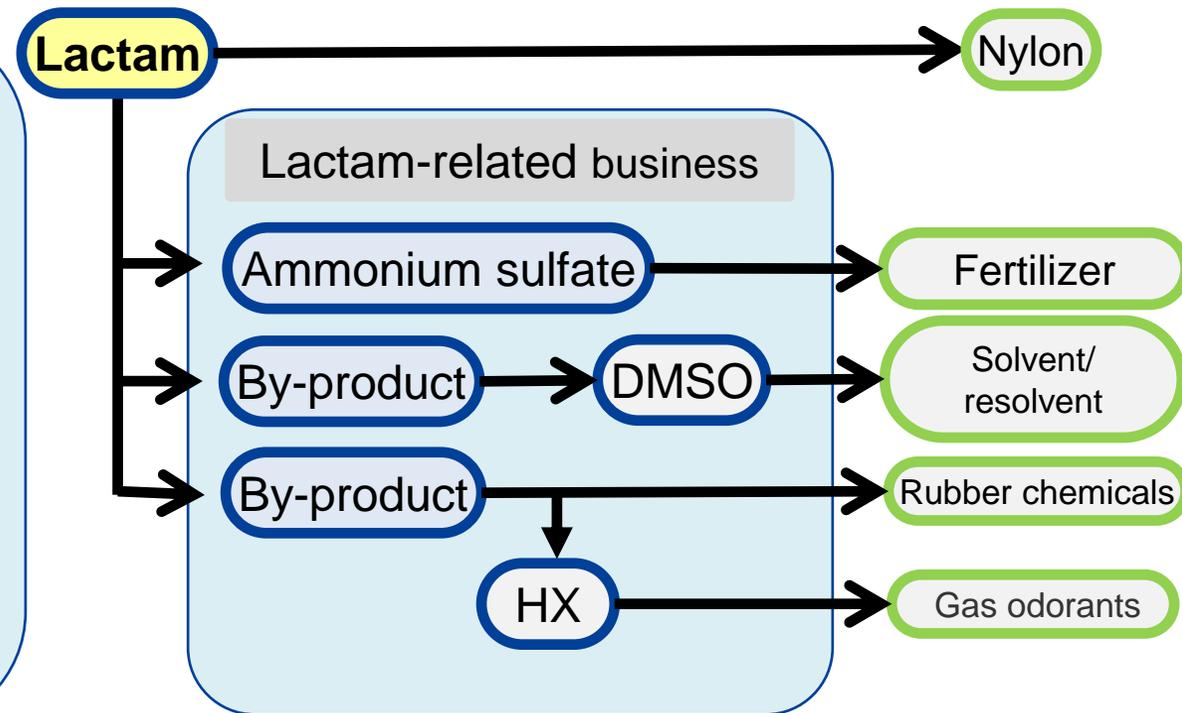
<Measures>

LED conversion of Photoreactive light source

Developing a new type of lamp utilizing LED



Photoreactive tank



4. Ultimate Value Creation

(1) Recycling-oriented Business

Towards a world where resources are sustainably managed

Establishing a recycling-oriented business model utilizing unused resources (currently under development)

- (1) Leveraging burned ash as fertilizer by Toray's granulation technology
- (2) Domestic production of fertilizer raw materials (phosphorus and kalium) that depend on imports

Examples of items under development

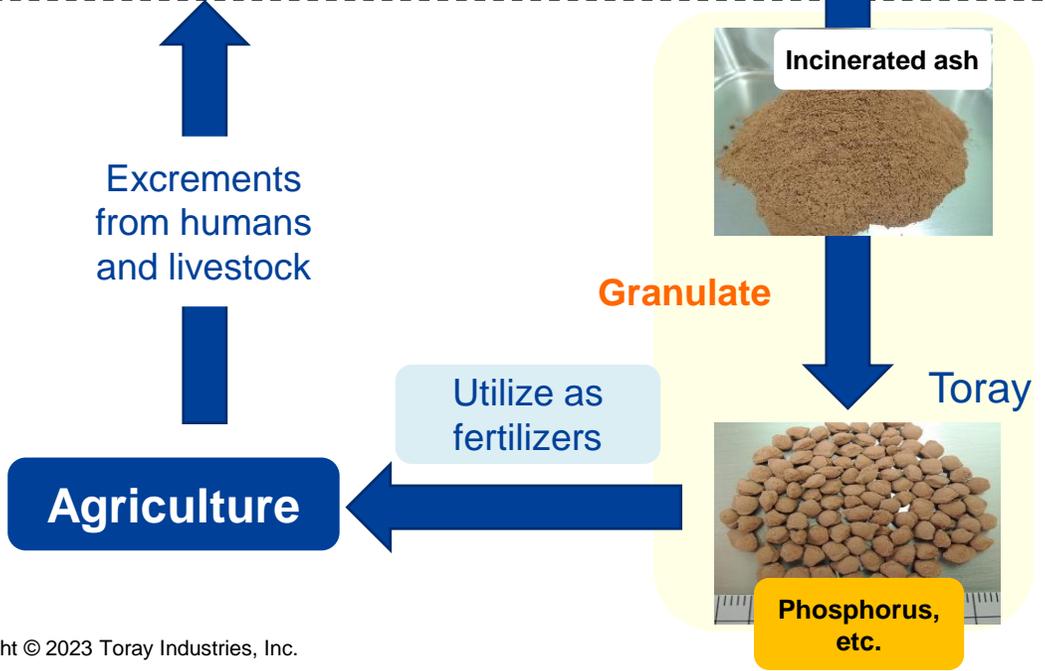


Incinerated sludge ash (P)



Incinerated livestock manure ash (P, K) + Ammonium sulfate (N)

N: nitrogen, P: phosphorus K: kalium

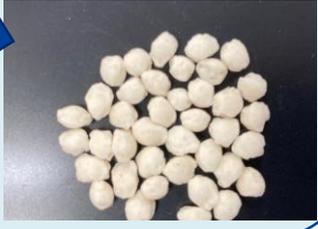


Toray's proprietary technologies



Fine-grained ammonium sulfate (less than 2mm)

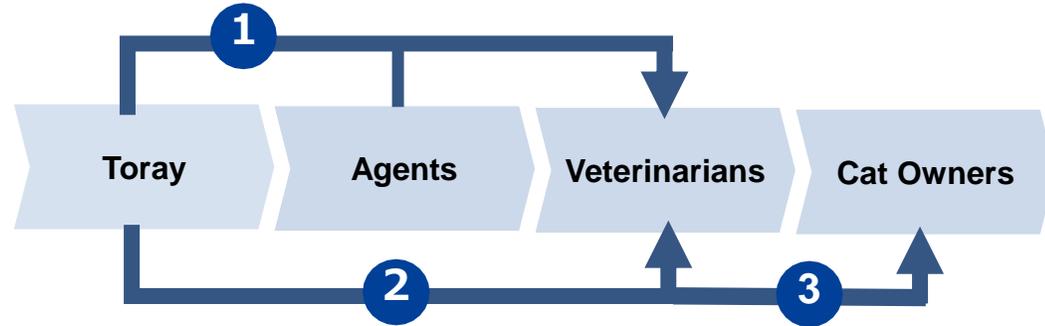
Granulate



Granulated ammonium sulfate (2-4 mm)

4. Ultimate Value Creation (2) Direct Marketing

Direct internet-based marketing of veterinary medicine RAPROS™ for veterinarians



Video of veterinarians talk on chronic kidney disease of cat



- 1 Creating a database on veterinary hospitals and targeting on hospitals that have not used RAPROS™
⇒ Planning and implementing sales activities including seminars for the target hospitals
- 2 Direct marketing for veterinarians through Toray's veterinary medicine site
⇒ -Sending direct mails to the veterinarians who have registered on the website
(marketing promotion)
-Marketing research and gathering information on new cases.
(There are comments on difficulties of giving drugs, especially by pill)
- 3 **(1) Posting a video on how to give pills to animals on YouTube (Supporting problems for owners)**
(2) Examining possibilities for adding flavor to RAPROS™

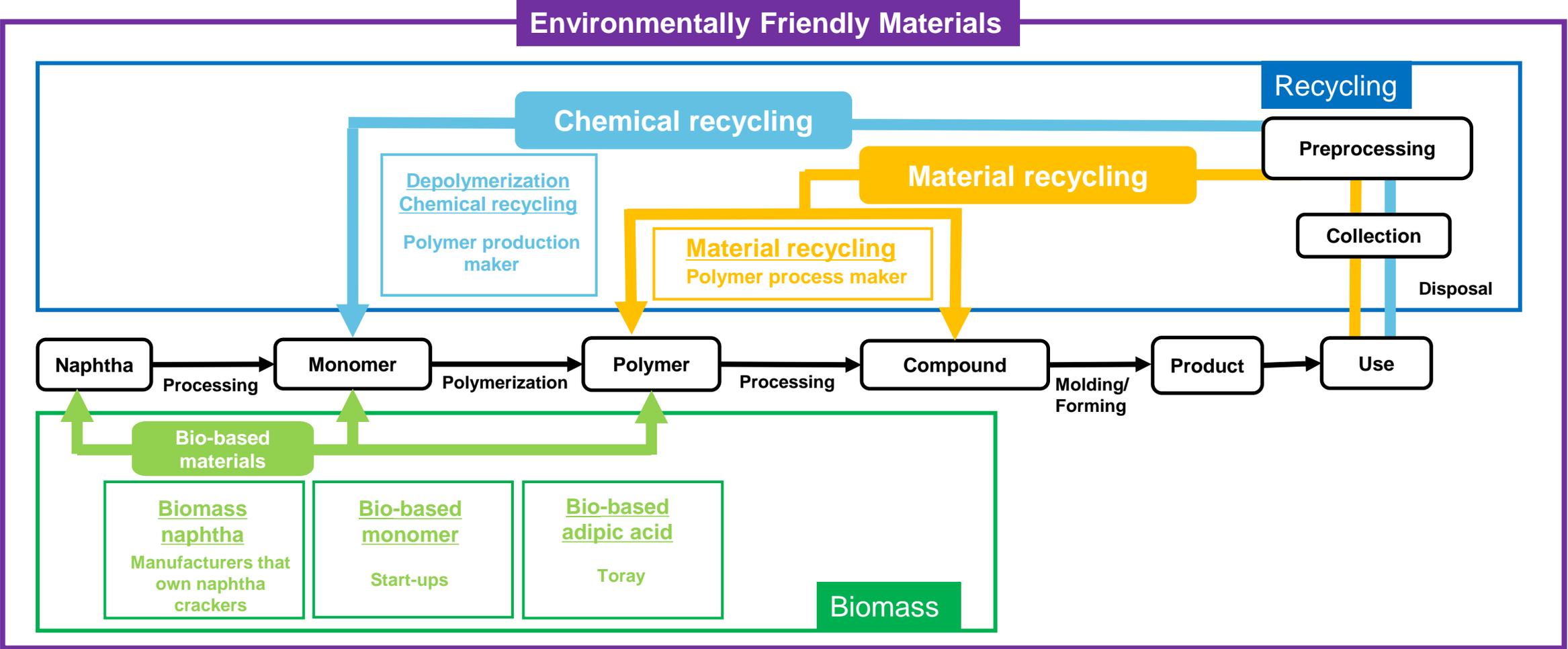


Launch in markets outside Japan, utilizing direct web marketing know-how

VI

Contribution to the Realization of a Sustainable Society

1. Flow Chart of Environmentally Friendly Materials Production



Realizing sustainable production using 3 methods

2. Source of Environmentally Friendly Materials by Manufacturing Process

	Material Recycling	Chemical Recycling	Biomass
ABS PC/ABS	<ul style="list-style-type: none"> ● Parts for air conditioner ● Water bottle, CD 		<ul style="list-style-type: none"> ■ Biomass styrene monomer ▲ Biomass acrylic nitrile
PA	<ul style="list-style-type: none"> ● Scrap wastes from PA processing ■ Airbags ■ Office chair 	<ul style="list-style-type: none"> ■ PA auto parts ■ Fishing nets 	<ul style="list-style-type: none"> ▲ Bio-based adipic acid ▲ Bio-based cyclohexane ■ Marine biodegradable resins
PBT PBT/PET	<ul style="list-style-type: none"> ● Scrap wastes from PET film processing ■ PBT auto parts 	<ul style="list-style-type: none"> ● Scrap wastes from PBT processing 	<ul style="list-style-type: none"> ▲ Bio-based BDO
PPS	<ul style="list-style-type: none"> ■ Plumbing parts ■ PPS auto parts ■ Scrap wastes from PET film processing 		<ul style="list-style-type: none"> ▲ Biomass benzene

(1) Currently, sales expansion mainly in material recycling products
 (2) Differentiation by chemical recycling, one of the Toray's strengths
 (3) Utilizing Toray's internal resources with high quality and supply stability

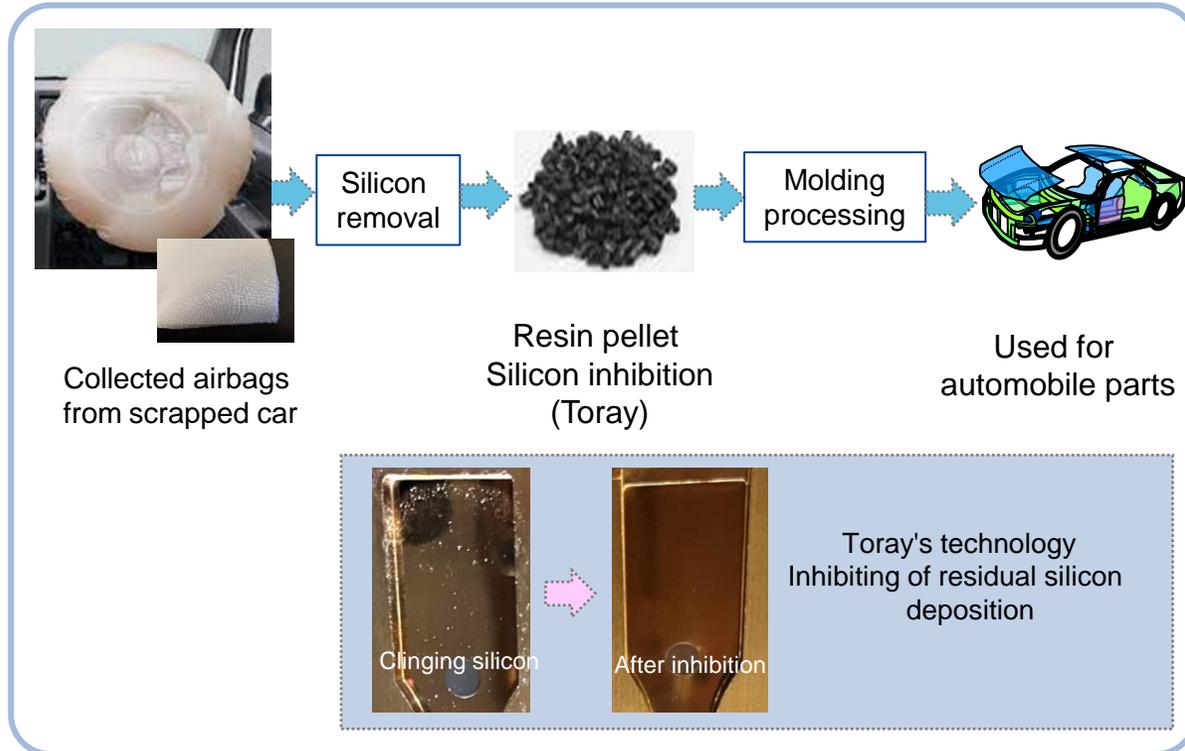
● Launched
 ■ Developing
 ▲ Researching

3. Expansion of Environmentally Friendly Materials

(1) Material Recycling

1) Recycling of airbags for automobiles (PA)

Under development



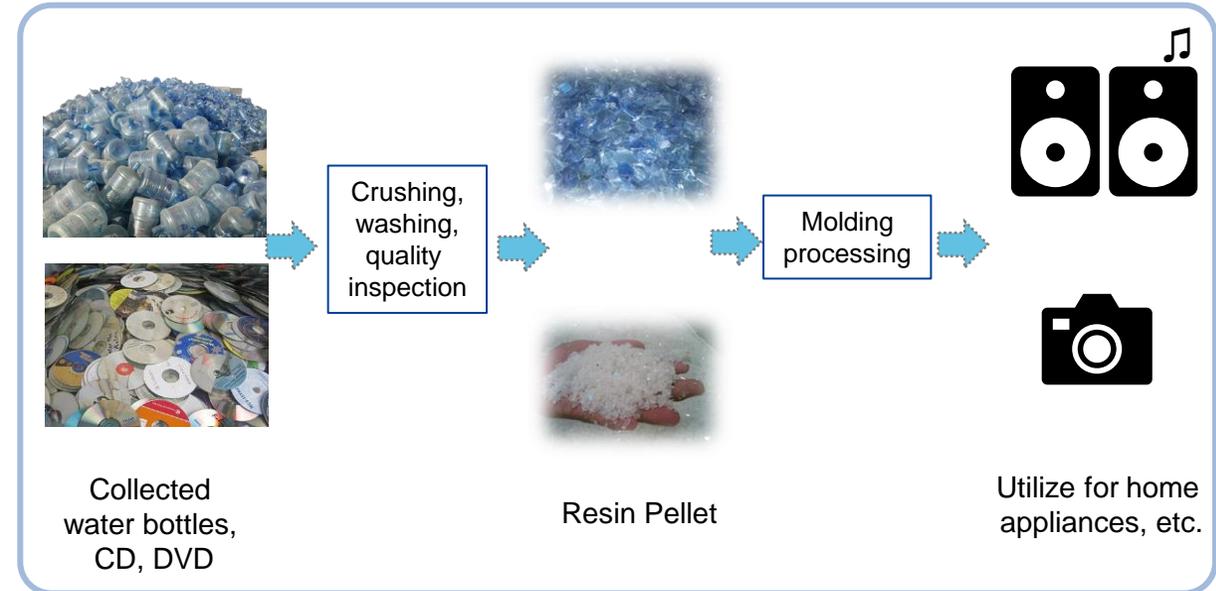
<Features>

- (1) Recycling airbags collected from the market to auto parts
- (2) Inhibiting residual silicon which negatively affects physical properties using Toray's technology
- (3) Reducing carbon footprint by 36%*

* Calculation under the special circumstances. Not guaranteed figures.

2) Recycling of water bottles and CDs(PC//ABS)

Launched



<Features>

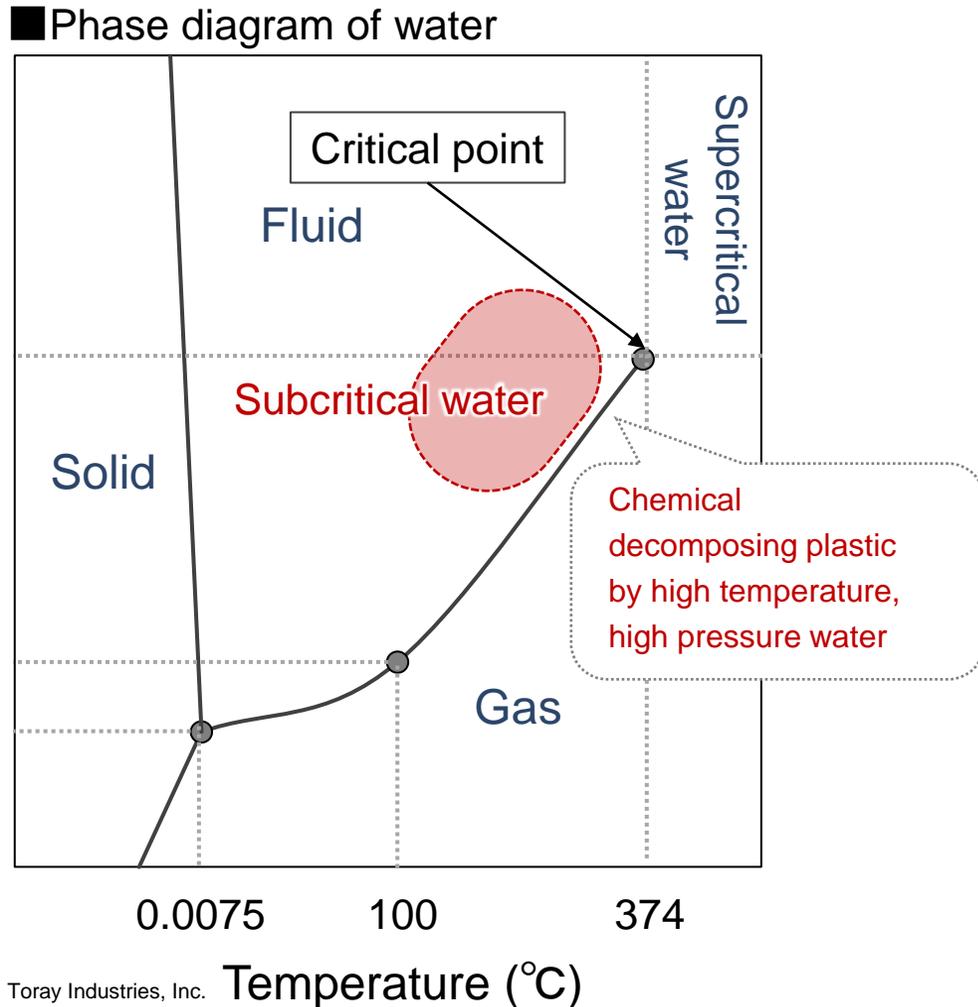
- (1) Recycling water bottles, CDs and DVDs to produce recycled PC resins, which are alloyed with ABS resins
- (2) RoHS certification available by severe inspection process
- (3) Excellent molding processability, good appearance (Expansion of applications including home appliances)

3. Expansion of Sustainable Materials (2) Chemical recycling

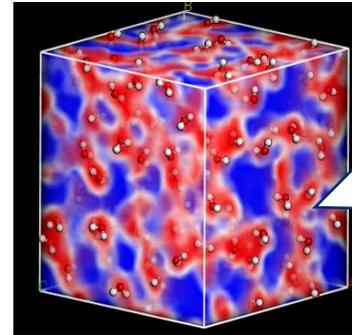
Under development

Chemical recycling
(subcritical water depolymerization technology)

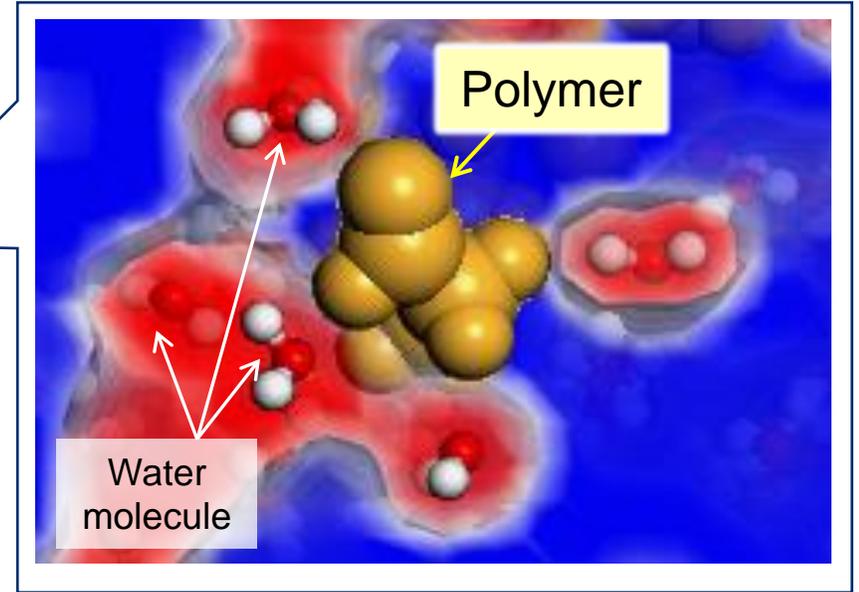
Chemical decomposing and recycling by composite plastic



Subcritical water



Hydrogen bonds with low or high density



Hydrogen bonding with low density: Polymer will be dissolved
Hydrogen bonding with high density: Polymer will be hydrolyzed

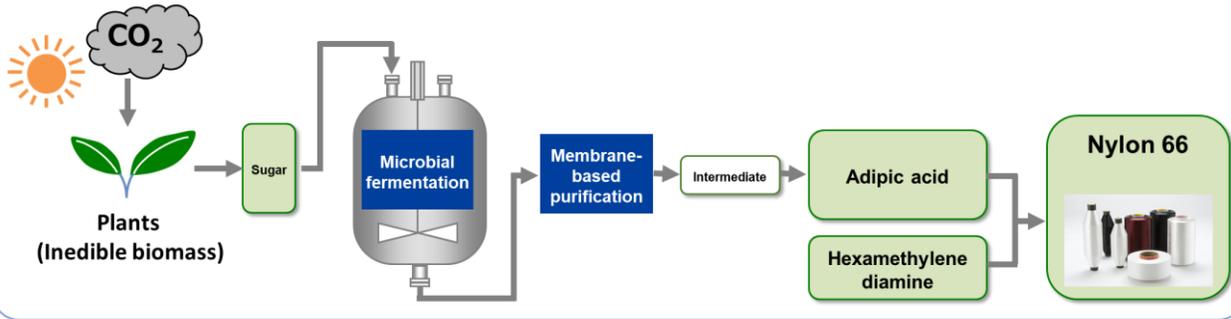
- Processes including purification and separation industrialized by Toray's proprietary technologies
- Establishment of a polymer recycling system

3. Expansion of Environmentally Friendly Materials

(3) Biomass

1) Internal production of bio-based adipic acid (PA66)

Under Research



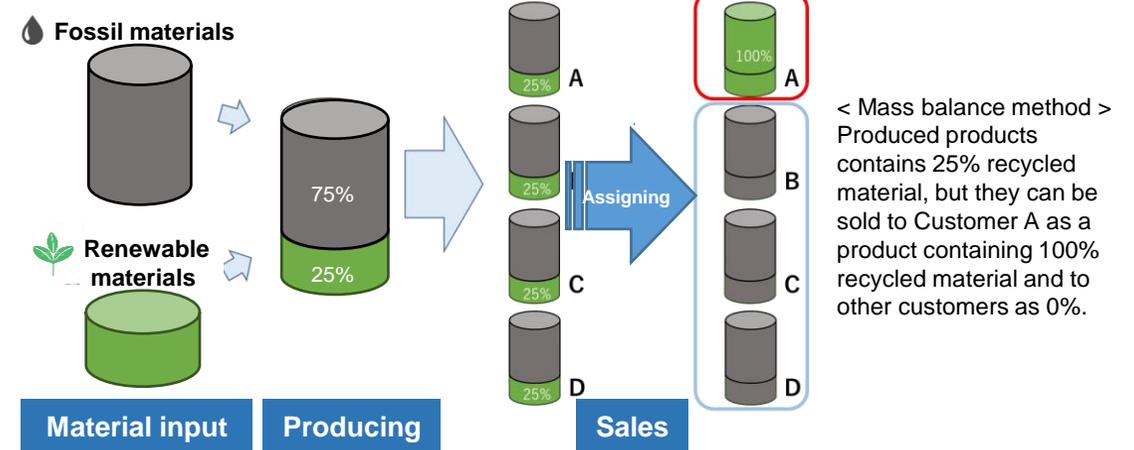
<Feature>

1. Developed a bio-based adipic acid made from sugars derived from inedible component of plants by combining Toray's microbial fermentation technology and chemical purification technology (world's first development of adipic acid made from sugar derived from inedible biomass)
2. Enabling low GHG emission (no N₂O emission), produced by microbial fermentation process which is different from conventional chemical synthetic procedure
3. Target to commercialize around 2030, after completing production technology development and marketing research

2) Biomass ABS by mass-balance method

Under Development

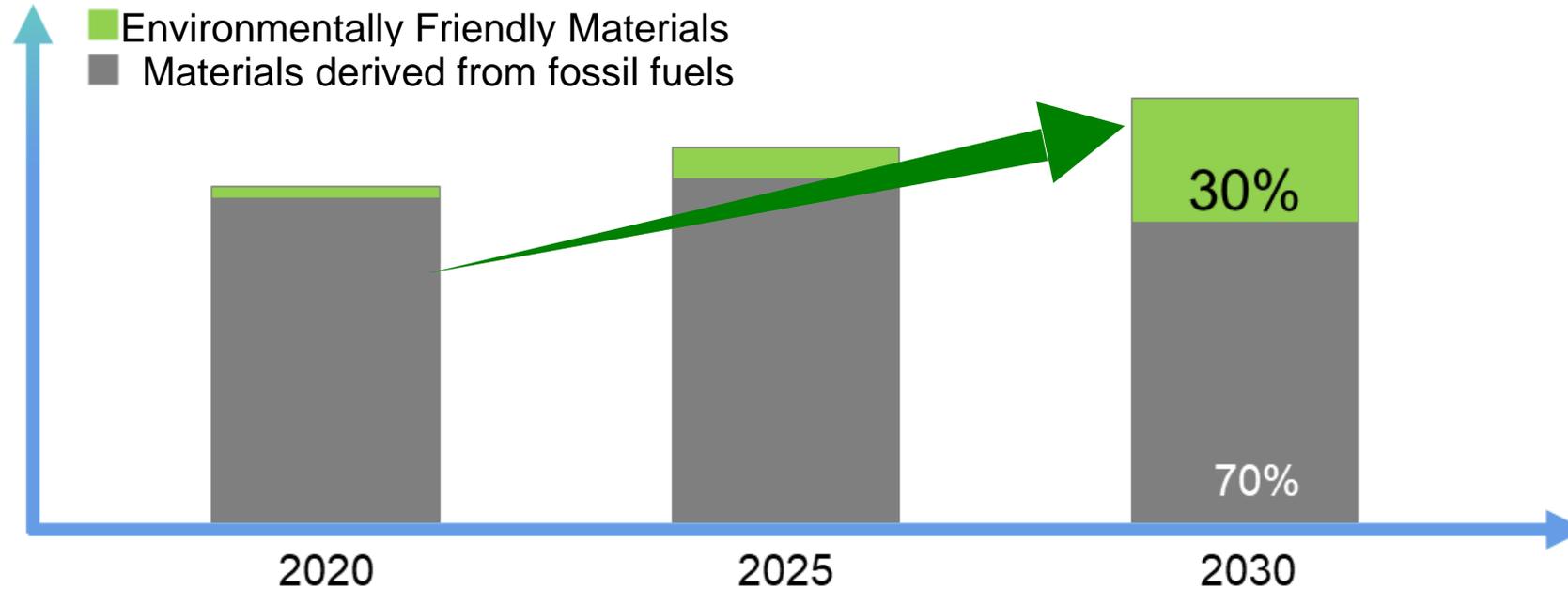
(Example of mass balance method)



<Feature>

1. Biomass ABS made from biomass styrene monomer is under development
2. Production start expected in October 2023. Toray will become the first in Japan to produce biomass ABS.
3. Biomass styrene monomer is manufactured by Idemitsu, leveraging the mass balance method. Toray will use this monomer to produce ABS resins by mass balance method

4. Sales Expansion Target of Environmentally Friendly Materials



<Summary of Initiatives to achieve the Toray Group Sustainability Vision>

- (1) Toray will enhance its measures toward sustainability through three approaches: material recycling, chemical recycling, and biomass
- (2) Currently, expansion of sales mainly through material recycling. Aim to differentiate from others by chemical recycling
- (3) Will maximize use of Toray's internal resources with high quality and supply stability.

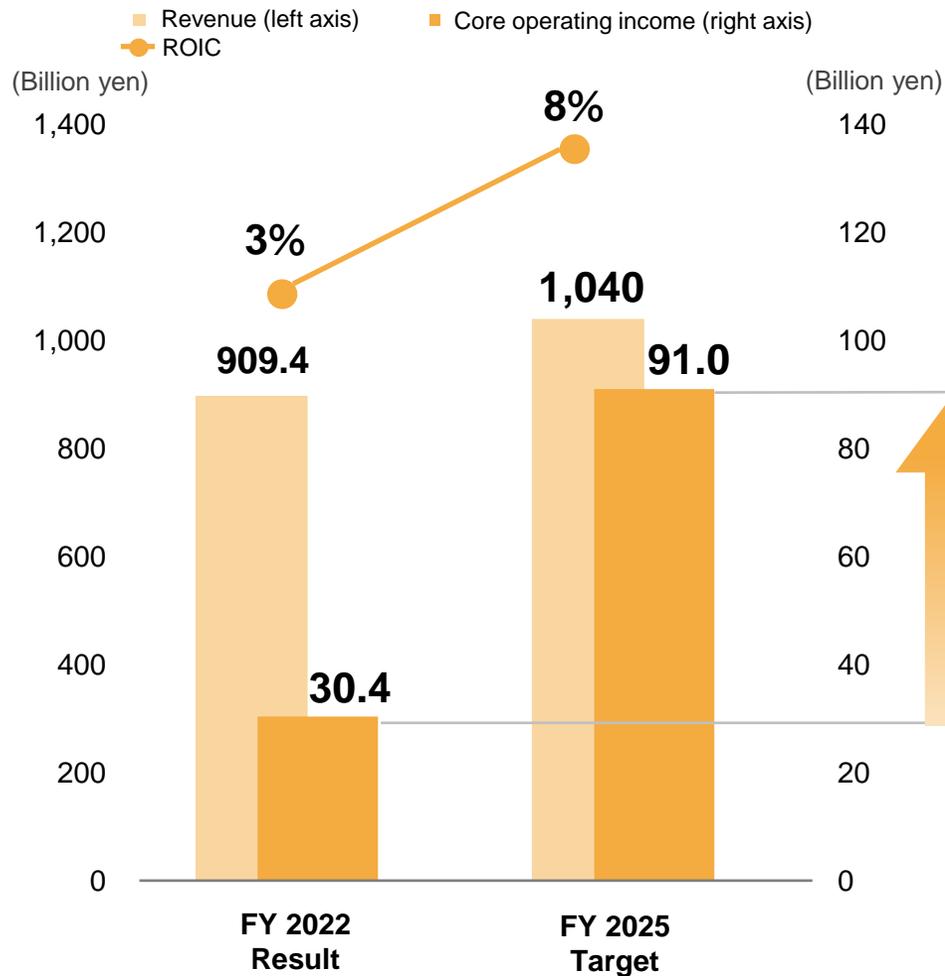
Aim to convert 30% of raw materials to sustainable materials by 2030

VII

FY 2025 Target

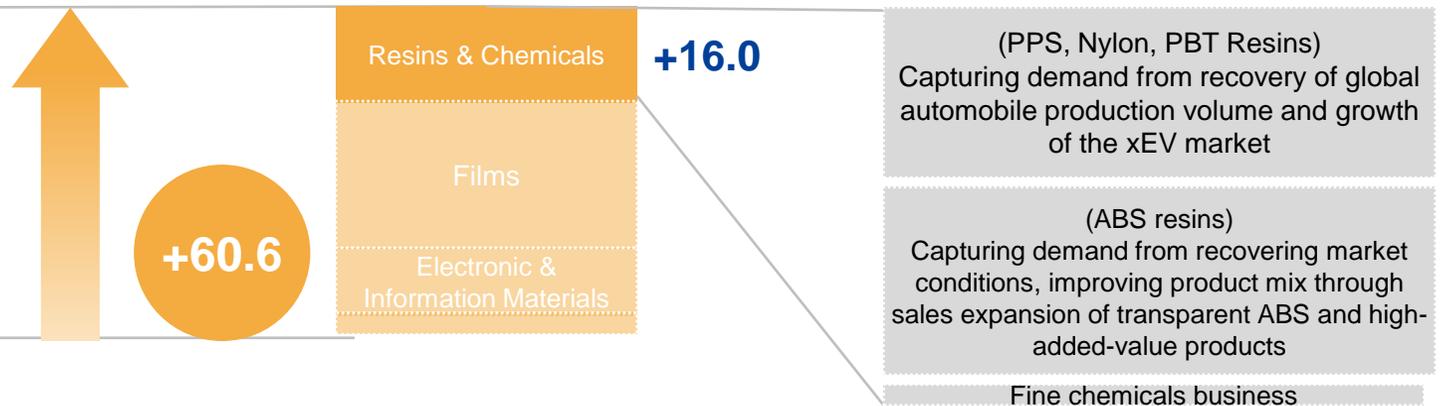
Revenue target (Resins & Chemicals)

Target of Performance Chemicals



In the resins business, in addition to market recovery, aim to capture demand in growth markets such as the xEV market, by enhancing solution proposing capabilities, expanding global bases, and developing high performance products. Moreover, will proceed with the expansion of the fine chemicals business.

Target: **+16.0** billion yen in core operating income compared to FY 2022



Reference

Revision of Revenue Target: Performance Chemicals Subsegment



Performance Chemicals (Revision of Revenue Target by Subsegment)

Revenue Target by Subsegment

Billion yen

	FY 2022 Forecast	AP-G 2025 FY 2025 Target	AP-G 2025 Revised Target*1 for FY 2025
Resins & Chemicals	427.0	550.0	<u>520.0</u>
Films	327.0	400.0	<u>380.0</u>
Electronic & Information Materials	56.0	100.0	100.0
Trading, other	553.0	590.0	590.0
Reconciliations	▲437.0	▲600.0	▲ <u>550.0</u>
Total	926.0	1,040.0	1,040.0

*1Internal transaction in Toray Industries was deducted.

Descriptions of predicted business results, projections and business plans contained in this material are based on assumptions and forecasts regarding the future business environment, made at the time of publication.

Information provided in this material does not constitute any guarantee concerning the Toray Group's future performance.

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