

Aug. 29, 2023

Business Presentation: Environmental and Functional Materials Business

TOYOBO CO., LTD.

Representative Director & Co-COO

Head, Environmental and Functional Materials Division

Toyobo MC Corporation

President & Representative Director, CEO

Chikao Morishige

- I . Positioning of the Environmental and Functional Materials Business
- II . Toyobo MC Corporation
- III . Growth Strategy
- IV . Future Development
- V . Appendix

Corporate Philosophy System TOYOBO PVVs

● Principle	Principle	“Jun-Ri-Soku-Yu” Adhering to reason leads to prosperity
● Vision	Vision	We will continue to create the solutions needed by people and the earth with our materials and science.
● Values	Values	We welcome change, enjoy change, and create change. TOYOBO Spirit: Challenge, Reliability, Collaboration

I . Positioning of the Environmental and Functional Materials Business

Positioning of the Environmental and Functional Materials Business within the Toyobo Group

FY 3/23 Results

	Net sales	Ratio	Operating profit
Films	146.1	37%	1.6
Life Science	38.1	10%	9.2
Environmental and Functional Materials	110.8	28%	4.0
Functional Textiles and Trading	92.4	23%	- 2.5
Real Estate and Others	12.6	3%	2.2
Elimination & Corporate	-	-	- 4.5
Total	399.9	100%	10.1

* FY 3/23 result for the new segment is a preliminary estimate since it has not been audited. Subject to change in the future.

Resin and chemicals



Environment and fiber



Main Domestic and Overseas Bases for the Environmental and Functional Materials Business

Bases in Japan

● Production, R&D

● Sales



Tsuruga Research and Production Center (Environment and fiber)



Research Center



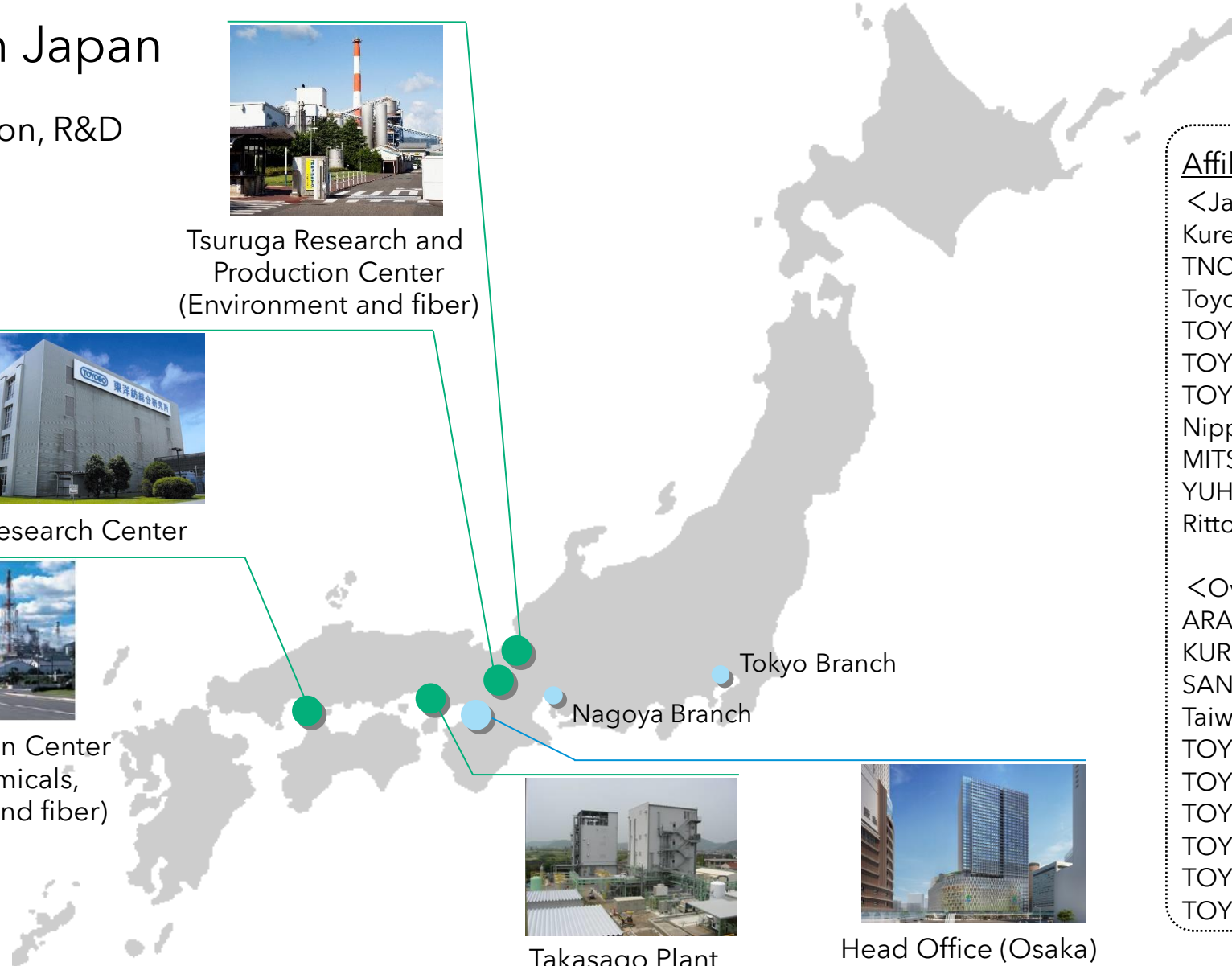
Iwakuni Production Center (Resin and chemicals, Environment and fiber)



Takasago Plant (Resin and chemicals)



Head Office (Osaka)



Affiliates

<Japan> *Japanese alphabetical order
Kureha Ltd.

TNC Corporation.

Toyobo MC Corporation

TOYOBO KANKYO TECHNO CO., LTD.

TOYOBO Techno Service Co., Ltd.

TOYOBO PHOTO CHEMICALS CO., LTD.

Nippon Dyneema Co., Ltd.

MITSUMOTO CHEMICALS CO., LTD.

YUHO CO., LTD.

Ritto Tech Co., Ltd.

<Overseas> *Alphabetical order

ARABIAN JAPANESE MEMBRANE COMPANY,LLC

KUREHA(THAILAND) CO., LTD.

SANTOYOKO (HONG KONG) CO., LTD.

Taiwan Kureha Co., Ltd.

TOYOBO CHEMICALS(Thailand) Co., Ltd.

TOYOBO KUREHA AMERICA CO., LTD.

TOYOBO MC U.S.A., INC.

TOYOBO MC MEXICO S.A. DE C.V.

TOYOBO (SHANGHAI) CO., LTD.

TOYOBO (THAILAND) CO., LTD.

Contributing to Solving Social Issues through the Environmental and Functional Materials Business (from Sustainable Vision 2030)



Vision : We will continue to create the solutions needed by people and the earth with our materials and science


Relations between five social issues and SDGs


People

 Employees' well-being and human rights in the supply chains

- People First: employees' safety, pride, rewarding work
- Respecting human rights in the entire supply chain

 Healthy lifestyle and health care



- Contributing to the field of infectious diseases
- Improving QOL with medical membranes, etc.

 Smart community and comfortable space



- Creating a humancentric, digital society with highly functional films and advanced materials
- **Dealing with new technologies such as CASE and MaaS and creating safe and comfortable mobility space**

Planet

 Decarbonized society and circulating society

- **Achieving carbon neutrality in Scope 1,2 by FY 3/51**
- **Establishing and joining an ecosystem for circulating resources used in products**

 Good condition of water area, atmosphere and soils, and biodiversity

- **Reducing the impact on and bettering the environment with functional membranes and equipment to recover solvents**
- Reducing food loss with highly functional packaging films
- Sustainable food

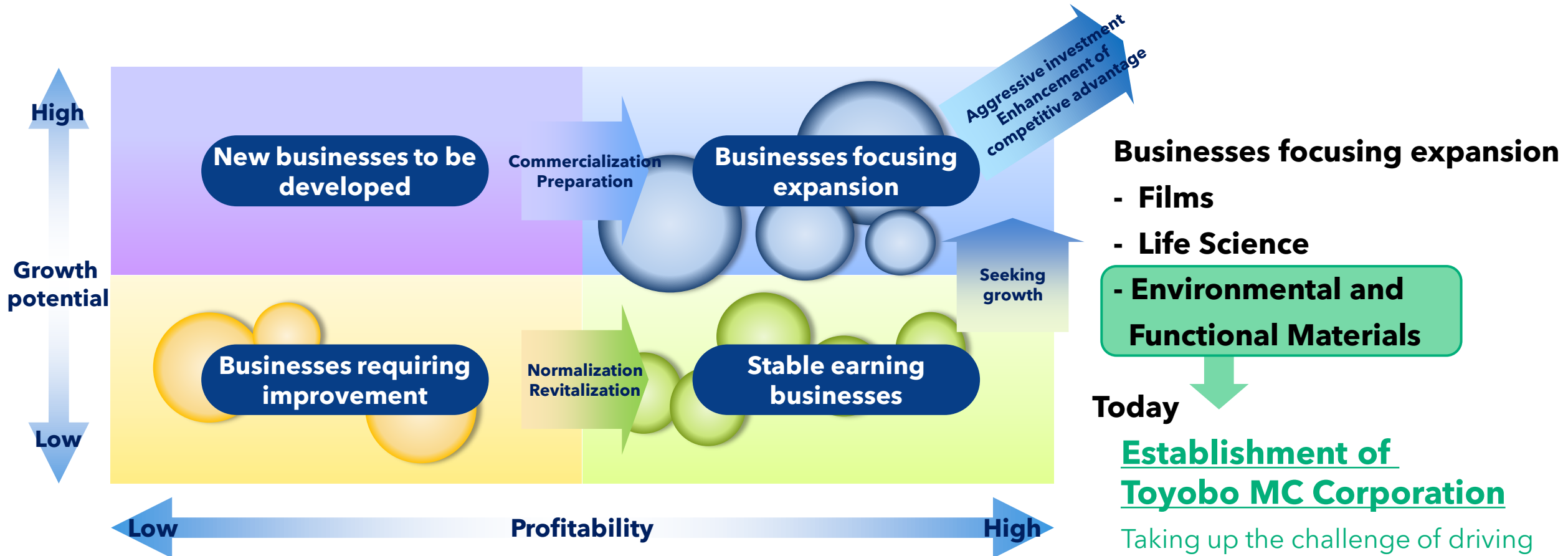
Environmental and Functional Materials Business

↑

Reorganization of the Business Portfolio

(from 2025 Medium-Term Management Plan)

Assess and stratify each business into 4 quadrants with 2 axes: "Profitability" and "Growth potential"



Establishment of Toyobo MC Corporation

Taking up the challenge of driving growth with a view to turning stable earning businesses into total volume of water produced the third pillar of growth

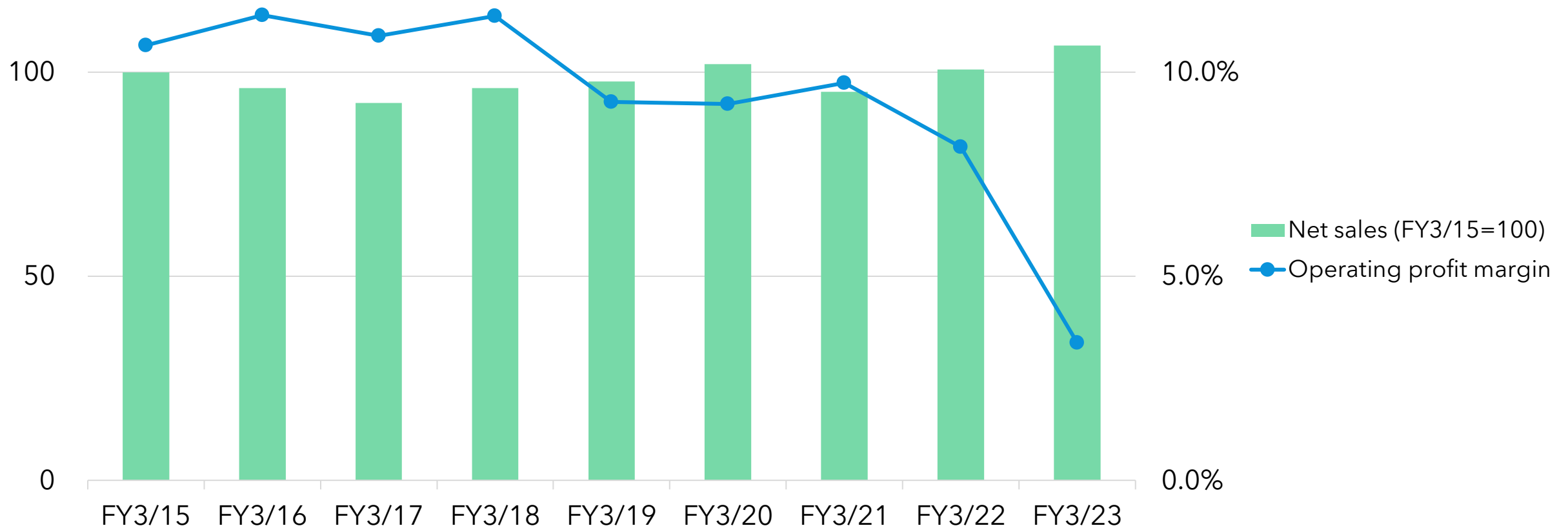
Ⅱ . Toyobo MC Corporation

- Environmental and Functional Materials Business -

Background to Toyobo MC Corporation's establishment : Earnings



Net sales and Operating profit margin in Toyobo group's environmental and functional materials business *without consolidated eliminations



Stable profits to date but insufficient growth

Background to Toyobo MC Corporation's establishment : Business Strengths and Issues

Strengths

- **Lineup of cutting-edge products**
- Considerable development capabilities
- Customer base centered on Japan

Issues

- Limited overseas presence
- Lack of business expansion speed
- Silos and segregation in each business unit



Recovery of solvent
VOC recovery equipment
Top share for absorption type



Photo-Functional Materials
Water-developable printing plates



"Zylon"
World's strongest and most fire-resistant organic fibers



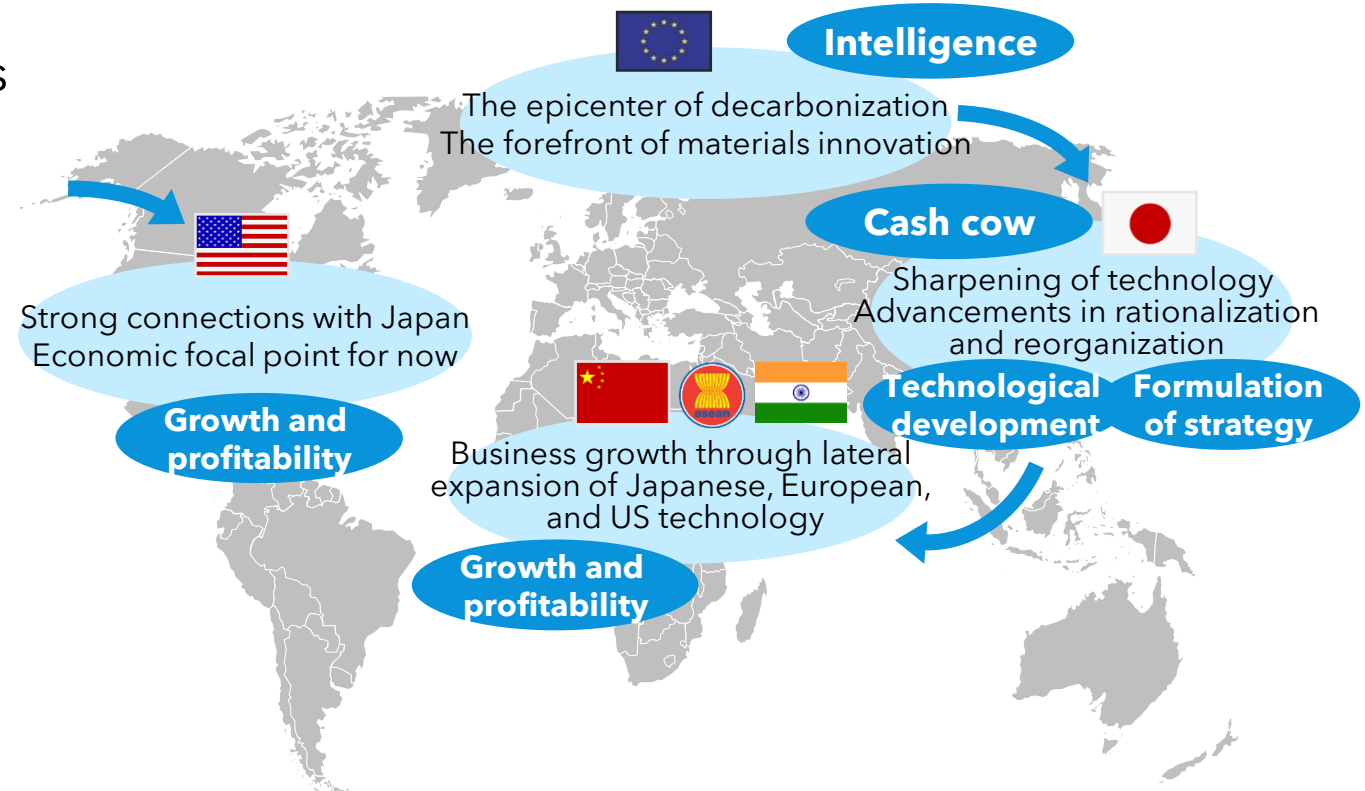
* TOYOBO estimation
Seawater desalination membranes
20% share* in Middle East/Arabian Gulf region



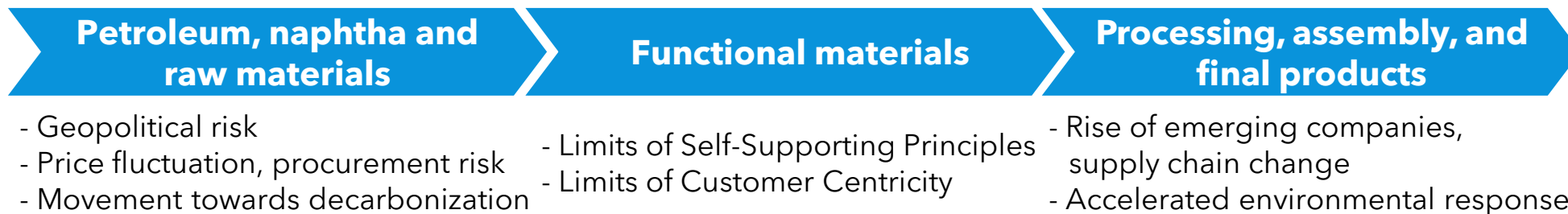
Three-dimensional cushion material
"BREATHAIR"
Materials that have rubber elasticity and formed with a unique steric structure

Background to Toyobo MC Corporation's establishment : Changes in External Environment

- Limitations of Japan-based businesses
⇒ Need to rebuild global sales, production, and development



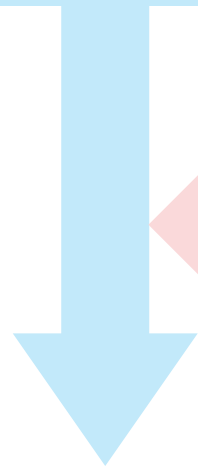
- Dramatic changes in upstream and downstream business environments
⇒ Need to transform ourselves for the swift response



Toyobo Co., Ltd.

Areas to be strengthened

- **Acceleration of global expansion**
- **Structure that can adapt to changes in upstream and downstream business environments**



Mitsubishi Corporation

Strengths

- International marketing/procurement functions/networks
- Consolidated management/overseas management know-how
- Inorganic strategy promotion

Toyobo MC Corporation

Becoming a new functional materials manufacturer with a presence in global markets

Vision "Solving global issues with high-performance materials"

Leveraging global management know-how and business transformation capabilities

Global expansion

- Overseas alliances / M&A know-how
- Global Network

Marketing

- Marketing strategy formulation/implementation
- Uncovering broad-ranging user needs

Sales / Procurement

- Supply chain development/strengthening

Digital / Environment

- Digital Transformation (DX)
- Energy Transformation (EX)

Reinforcement of
management
foundation

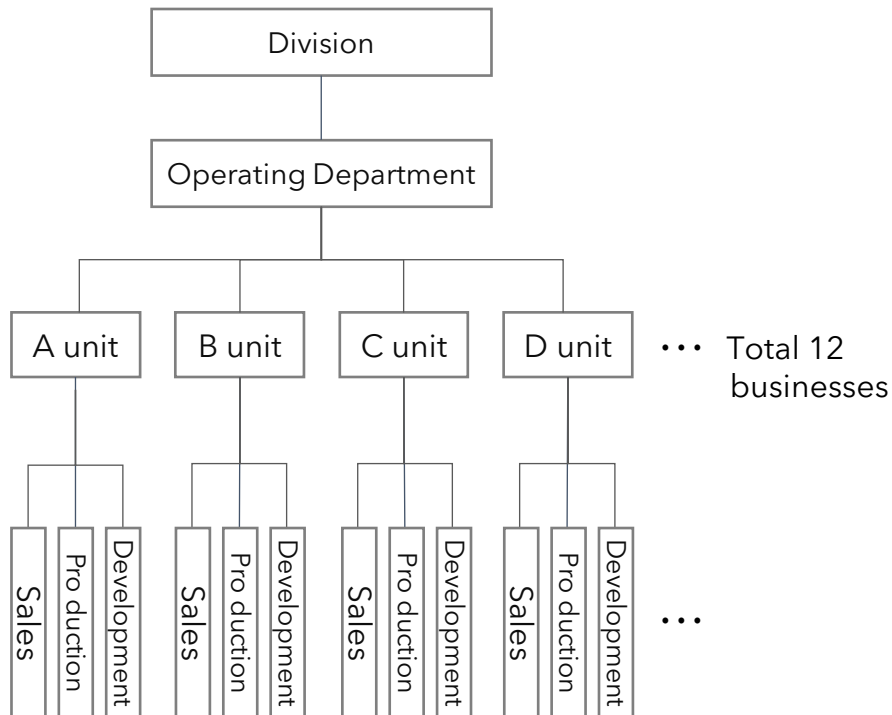
- Knowledge of consolidated management foundation development/strengthening through management of operating companies
- Human resources with wide-ranging industry and operating company management experience

Structure that can adapt to changes in the business environment

Establishment of an organization that can adapt to changes in the business environment and an organization and management foundation that can respond flexibly

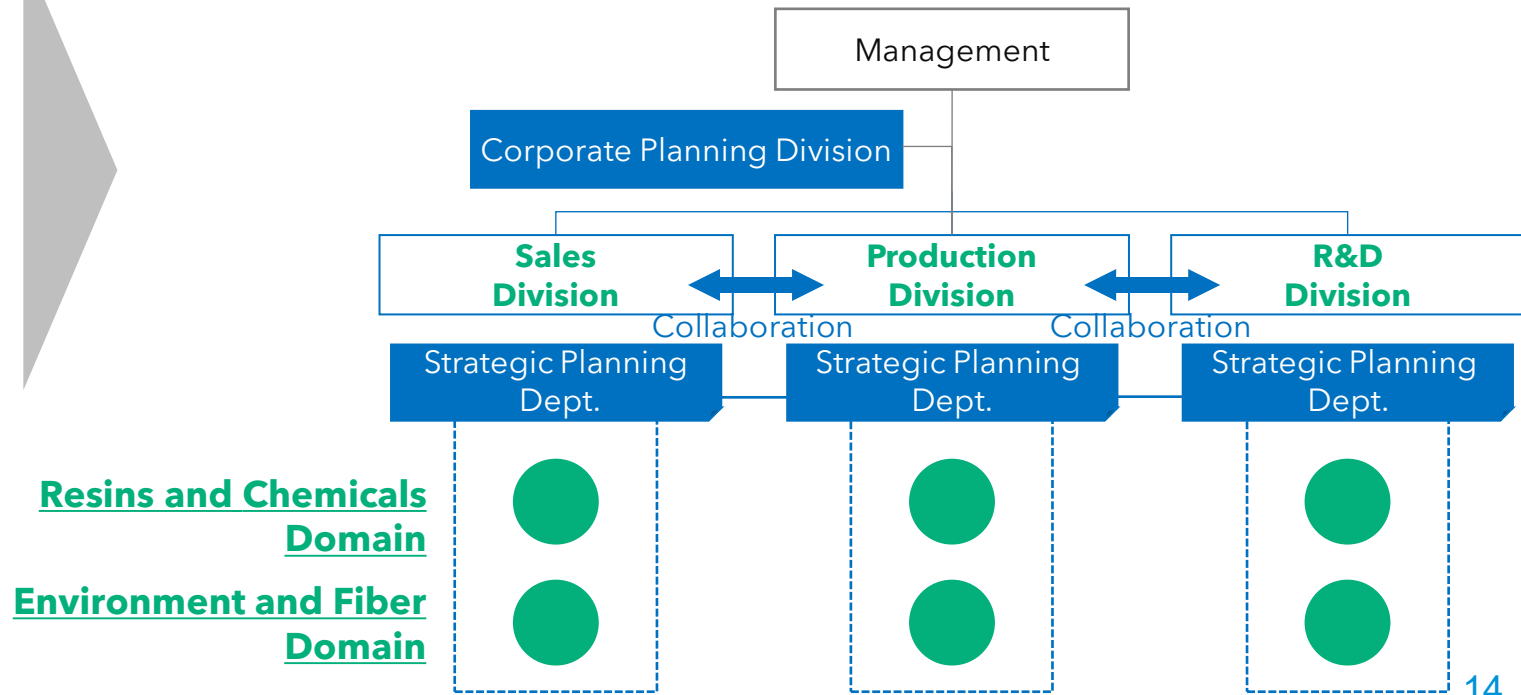
Before Business unit system

- ▲ Silos and segregation in each business unit
- ▲ Hindered fluidity of information and resources



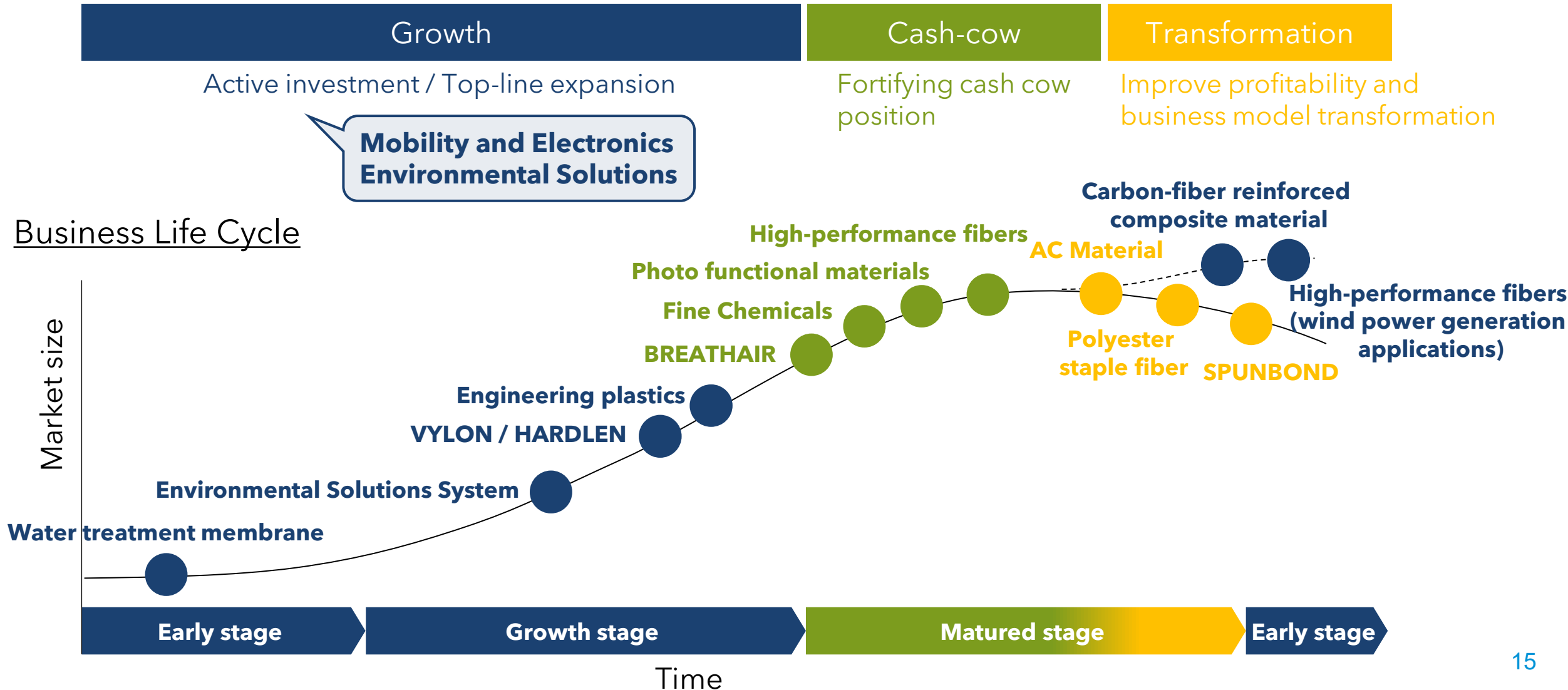
After Functional division system (3 Divisions × 2 Domains)

- ◎ Strengthen planning function: Shaping medium- and long-term strategy along with portfolio strategy
- ◎ Strengthen execution: Promoting dynamic resource shift and execution of strategy



Portfolio Management

Take strategic action in accordance with the portfolio strategy, which is based on business life cycle



Automotive electrification and electronics (**EV**)

Engineering plastics
VYLON / HARDLEN



High-speed transmission (**5G/6G**)

VYLON / HARDLEN
Carbon-fiber reinforced composite material



Reduction of environmental impacts mainly in the manufacturing of LIB separators, new **wastewater/exhaust gas regulations**

VOC recovery equipment



Growing **demand for various types of water treatment** in connection with population increase and economic growth

Water treatment membrane (RO, FO, BC)



Renewable energy, aerospace, etc.

High-performance fibers



Mobility

High-speed communication

Environment (air/water)

Renewable energy

III. Growth Strategy

- **Mobility**
- **High-speed communication**
- **Environment (air/water)**
- **Renewable energy**

Mobility: Outline of Engineering Plastics

- Applications:

Automotive roughly 70%, home appliances, IT, etc.

- Our strengths:

Heat-proof, highly durable, high rigidity, nice appearance, etc.

- Customers: Domestic automotive OEMs, Tier1 etc.

- Example of materials:

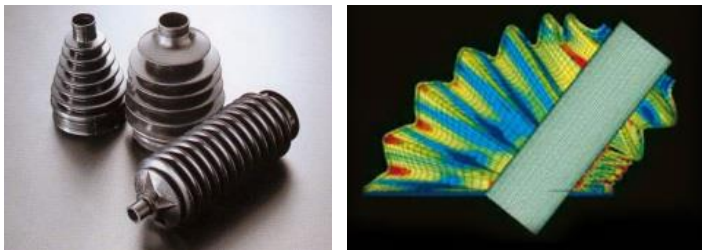
Polyester resin **"VYLOPET"**

Polyamide Resin **"GLAMIDE"**

Polyester elastomer **"PELPRENE"**

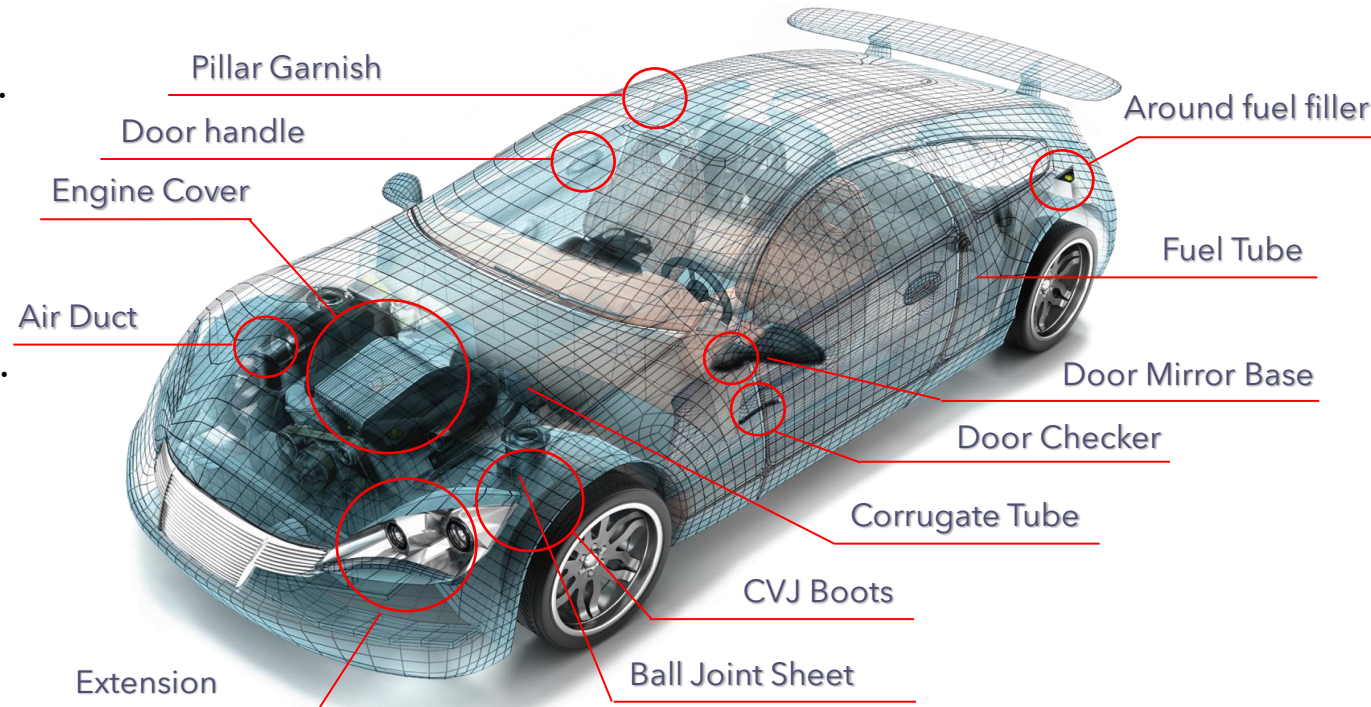
Biomass polyamide resin **"VYLOAMIDE"**

Example of CAE* Technology:
Large deformation analysis of polyester elastomers



*CAE : Computer Aided Engineering

Case examples of the adoption of our products

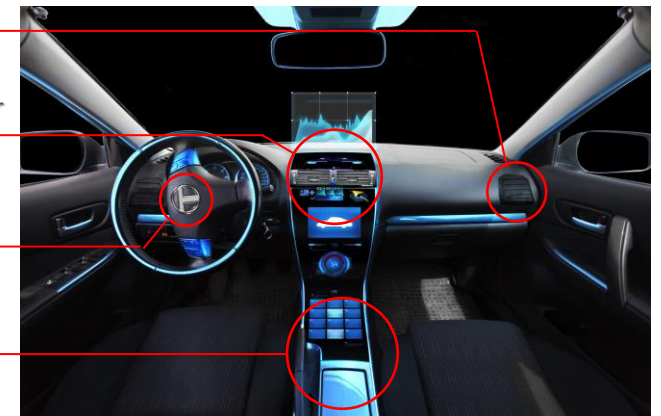


Side Register

Center Register

Emblem

Console Hinge



■ Responding to the transition to EVs

- Increased use in components around EV batteries
- Insulation, sound absorption, and lighter weight mainly with fine foam formation
- Expanded sales of high rigidity, high dissipation, and electromagnetic wave shielding materials

■ Expansion to **foreign auto manufacturers**

- Proposals that incorporate the use of our materials through to the design of the end product
- Utilization of Mitsubishi Corporation's extensive customer network

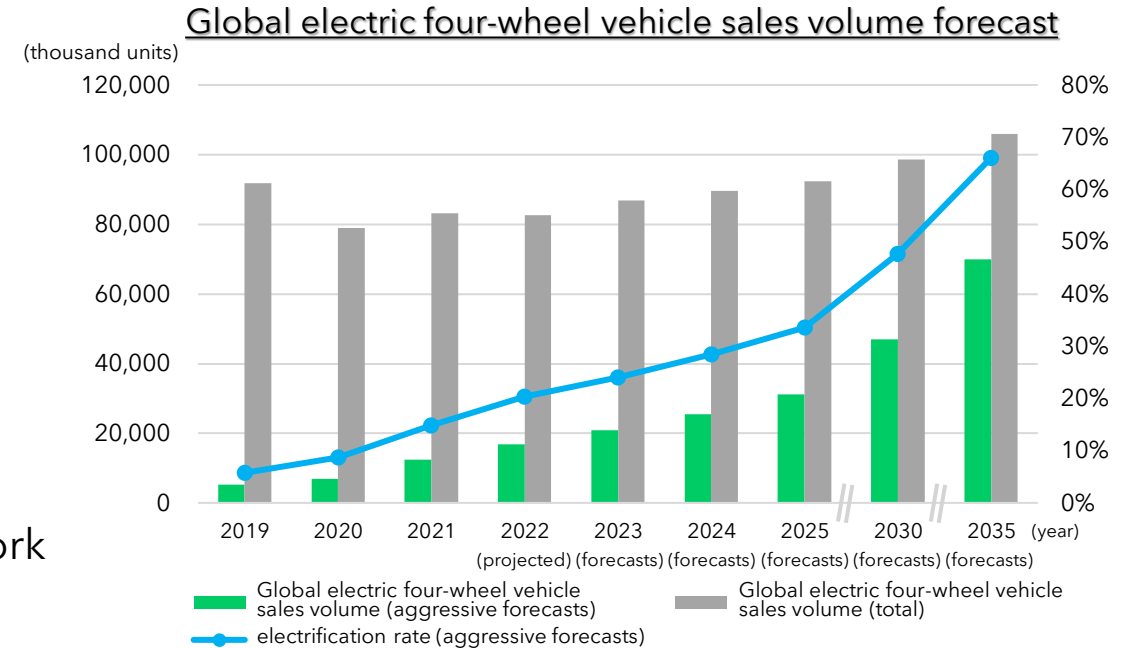
➤ Understanding the needs of Europe and US and delivering comprehensive proposals to foreign-affiliated manufacturers

Beyond Materials Corporation

Consulting and engineering services company for the materials industry

Joint venture between Mitsubishi Corporation and FEV Consulting GmbH (Germany) (Established on October 27, 2022)

Using digital technology to provide wide-ranging support/services mainly in the areas of market research, strategy formulation/execution, and product development and testing



Source: Created by the Company based on Yano Research Institute's global electric four-wheel vehicle market research 2023 (April 28, 2023; global electric four-wheel vehicle sales volume and electrification rate based on the aggressive forecasts of Yano Research Institute)

Note 1: Figures for 2019-2021 (sales volume basis) are Yano Research Institute estimates based on the data of industry associations in each country

Note 2: EVs include hybrids (HEVs), plugin hybrids (PHEVs), battery EVs (BEVs), and fuel cell EVs (FCEVs)

Note 3: Figure for 2022 is projected; figures for 2023 and beyond are forecasts

Note 4: Passenger vehicles are segments A to E, commercial vehicles are small commercial cars with a gross weight of no more than 3.5t; vehicles with a gross weight of 3.5t or more refer to trucks and buses

Note 5: Aggressive forecasts are calculated on the uptake of BEVs, irrespective of vehicle class, owing to the rollout of fast-charging infrastructure and the like



“VYLON” Copolymerized polyester

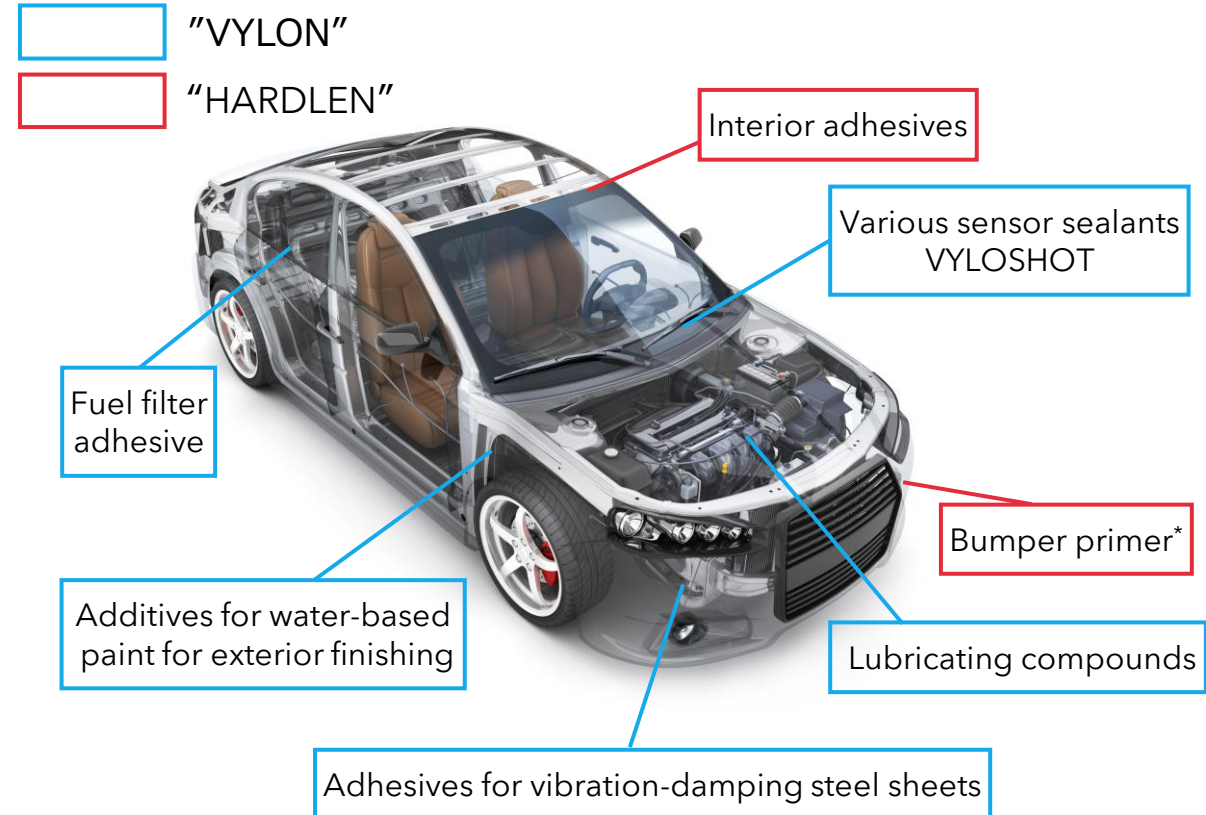
- Applications
 - Adhesives (packaging/sealants/FPCs)
 - Paints/coatings (home appliances/vehicles/cans)
- Our strengths
 - Superior adhesive on base materials, like metals and polyester film
 - Soluble in general purpose organic solvents
 - Can be provided in water-dispersible form
- Overseas ratio of net sales: Approx. 40%

“HARDLEN”

Polyolefin chlorinated or acid modified resin

- Applications
 - Adhesion promoter (ink/automotive interiors)
 - Paint primers (bumper primers)
- Our strengths
 - Good adhesiveness to PP (polypropylene)
 - Low conductivity
- Overseas ratio of net sales: Approx. 80%

Examples of our products used in automobiles



*Bumper primer:
Special primer (undercoating material) for applying paint to plastic parts such as automobile bumpers

■ Responding to the transition to EVs

Expanding sales of "VYLOSHOT"

- Low-pressure sealing and molding polyester resin (one type of "VYLON")
 - ※Low-pressure sealing and molding: Low-melting point thermoplastic resin is injected into a mold at low pressure to form inserts for electronic components, which then be cooled and solidified
- Applications: Electronic components (sensors, camera modules, etc.)
- Our strengths: Waterproof and protect electronic components



"HARDLEN" Lithium-ion battery pouch adhesive etc.

- Laminate adhesive with superior chemical resistance
- Compatible with dry lamination (composition: PP film / HARDLEN / aluminum)

*Dry lamination: Process for joining multiple base materials (aluminum/resin, etc.)



[Lithium-ion battery pouch adhesive](#)
PET adhesion ("VYLON")
PP adhesion ("HARDLEN")

➤ Future development

Understanding the needs of Europe and US and delivering comprehensive proposals to foreign-affiliated manufacturers

“VYLON” “HARDLEN”

- Applications: Interlayer adhesive used on FPCs (flexible printed circuit boards) for high-speed transmission (5G/6G)
- Our strengths: **Low dielectric properties** for high-speed, high-capacity 5G/6G data transmission, as well as **adhesiveness to various materials**
- Future Initiatives: **Strengthening positioning in Japan and overseas**
 - Identifying needs from downstream users, such as the electronics sector, and enhancing the development and proposal capabilities of next-generation products
 - Gathering information with the use of Mitsubishi Corporation’s global network

➤ Future development

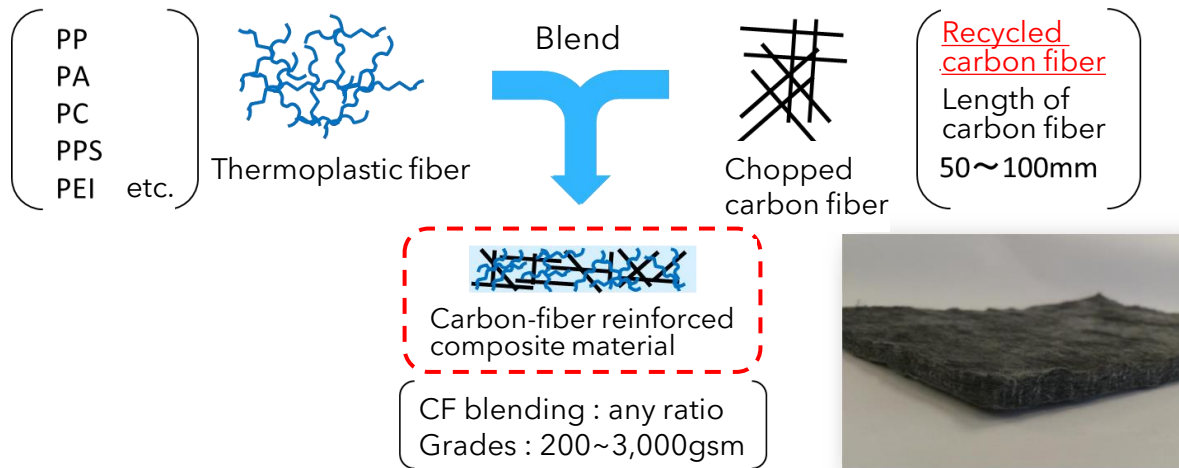
Expanding sales in Japan and overseas



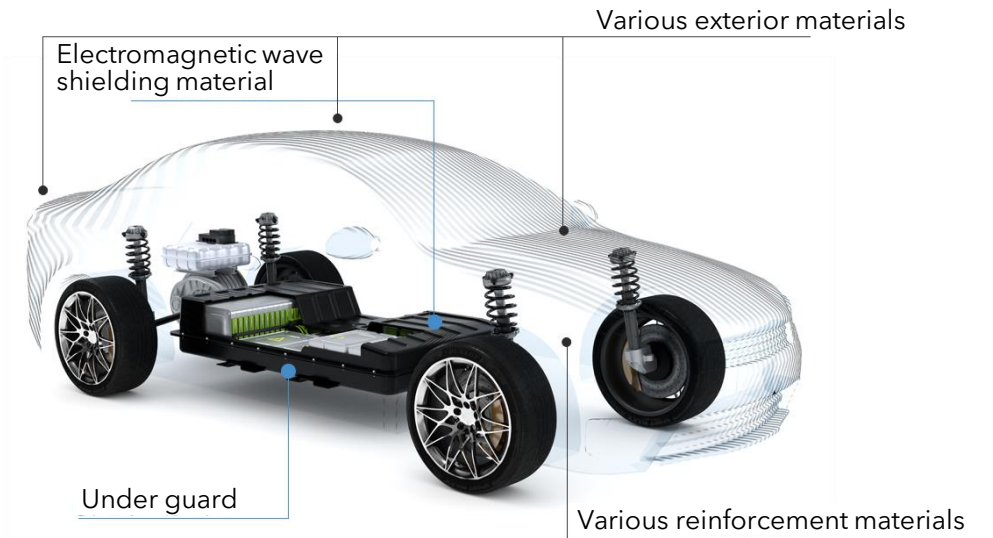
High-speed communication: Carbon-fiber Reinforced Composite Material

"HAYATE"

- Recycled carbon fiber / nonwoven fabric made from thermoplastic fiber; for reinforced plastic
- Applications: Material for lightweight automotive components (electromagnetic wave shielding materials, under guards, etc.)
- Our strengths: Nonwoven fabric technology that can also be used in stamping (cold pressing)



Examples of products used in automobiles



➤ Future development

Electromagnetic wave shielding for external vehicle communication control (high-speed/high-precision) and other applications

VOC recovery equipment

Equipment for VOC* emissions treatment ,equipped with "K-FILTER"

* VOC: volatile organic compounds



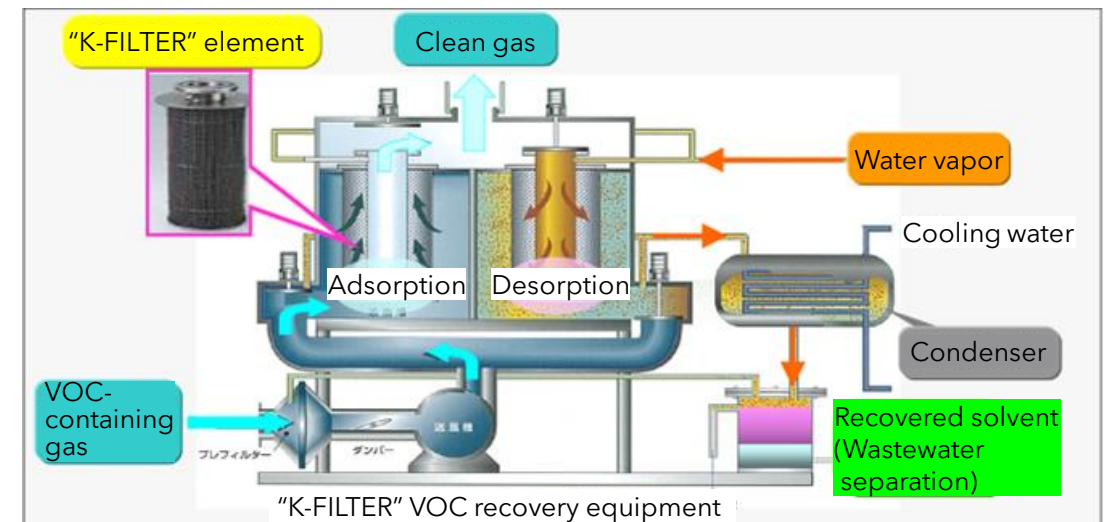
"K-FILTER"

TOYOBO's proprietary activated carbon fiber adsorbent, for which TOYOBO was the first in the world to put it into production in 1974



Absorb dichloromethane generated in the manufacturing process of lithium-ion battery separator (LIBS) used in EVs

- Customers: Separator manufacturers in Japan, China, and South Korea; track record of more than 1,500 units used in Japan
- Top share approx. 50% (solvent recovery equipment for LIBS plants)
- Our strengths (vs. combustion equipment and granular activated carbon units)
 - High rate of extraction (at least 95%)
 - High purity of recovered solvent (minimal separation)
 - Lightweight and compact
 - Emits hardly any CO₂



■ Responding to the transition to EVs

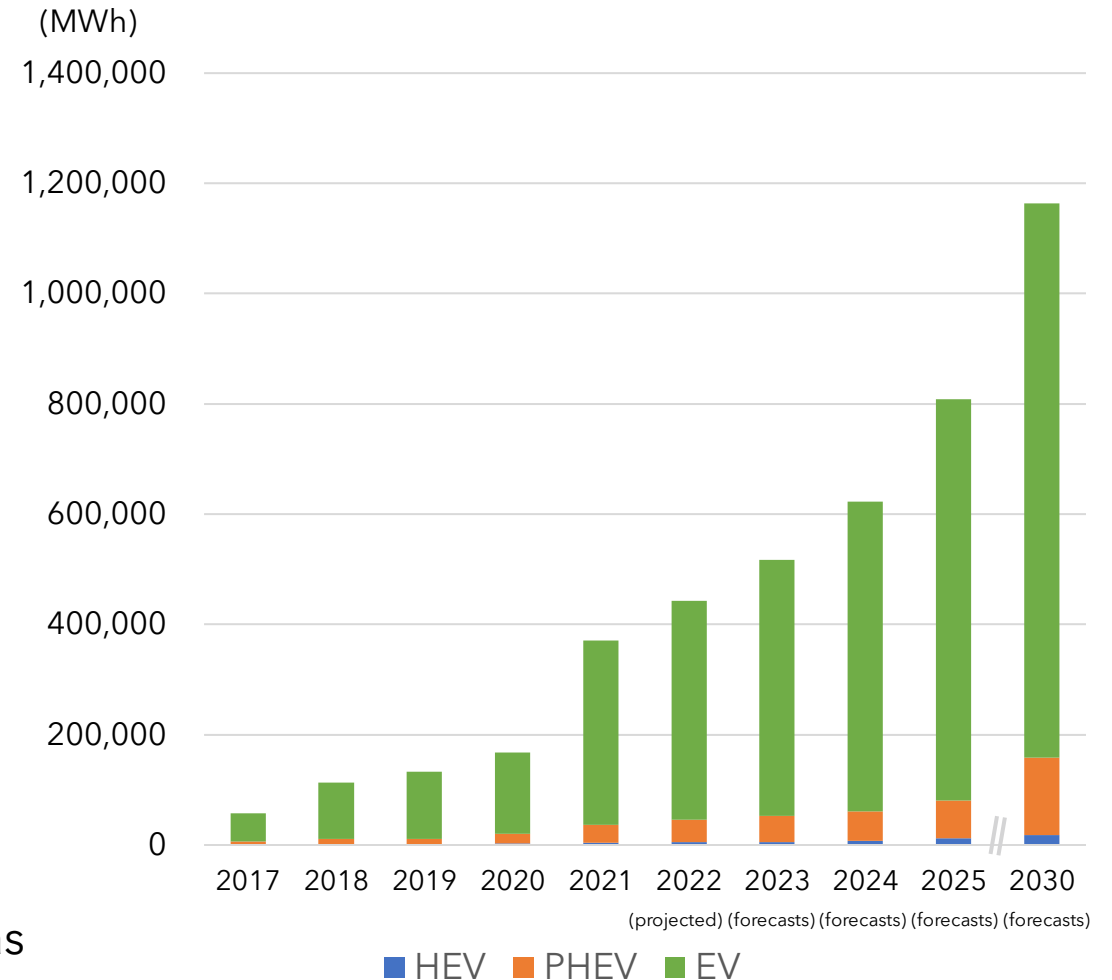
Expanding sales of **VOC recovery equipment**

- Steadily capturing LIBS demand
- Bolstering maintenance capabilities in overseas markets
- Increasingly higher performance of adsorbents (stronger lineup)

➤ Boosting sales in non-LIBS domains

- Quickly keeping up with the latest environmental regulations and changes in customer needs and launching products for new applications and in new areas

Size/forecasts of global automotive LIB market by xEV type



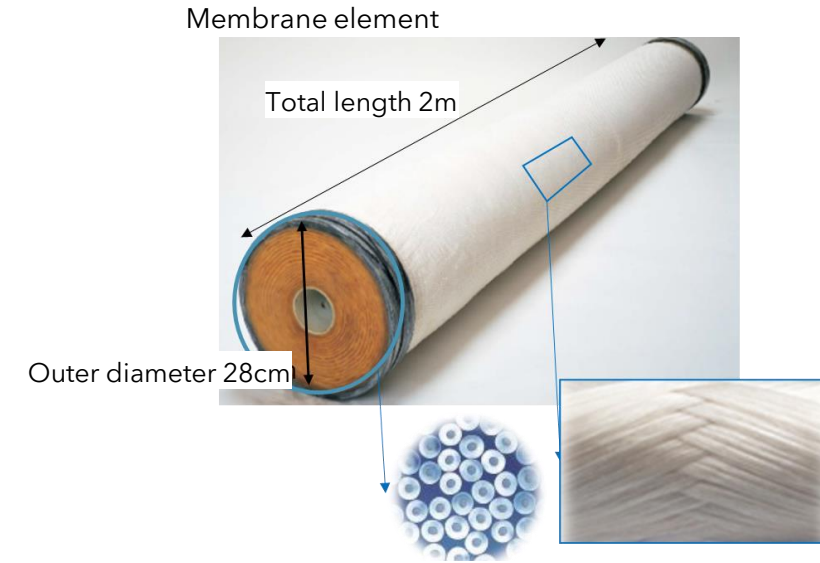
Source: Created by the Company based on Yano Research Institute's global automotive lithium-ion battery market research 2022 (July 28, 2022)

Note 1: Figure for 2022 is projected; figures for 2023 and beyond are forecasts; 2030 comparisons vs. 2025
 Note 2: LIBs used in passenger and commercial mild hybrids (SSV, 12V, 48V MHEVs), hybrids (HEVs), plugin hybrids (PHEVs), and electric vehicles (EVs); LIB capacity through 2021 calculated based on auto manufacturer shipments of xEVs with LIBs; LIB capacity from 2022 onwards calculated based on auto manufacturer xEV production

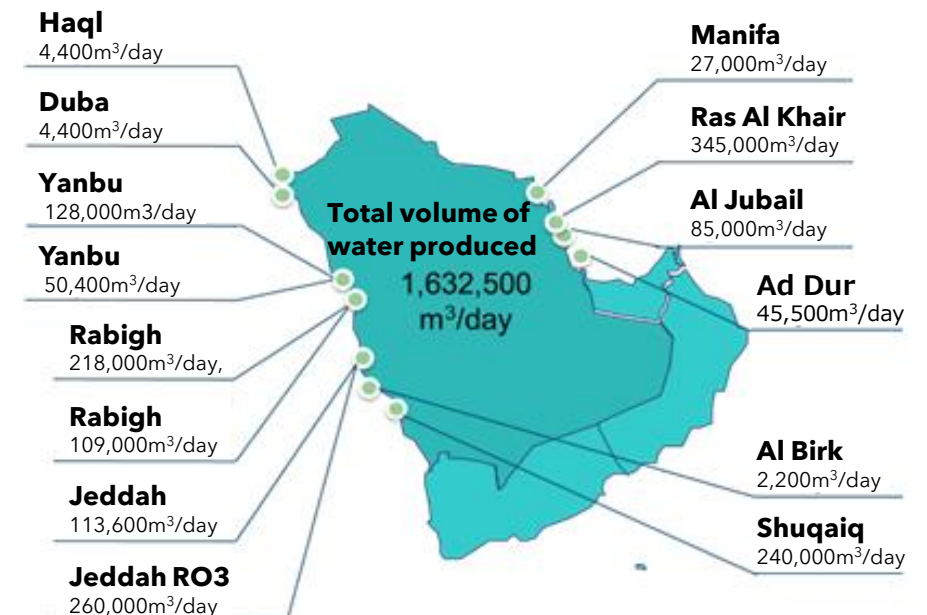
Environment: Outline of Water Treatment Membrane: (RO membranes)

RO membranes (RO: Reverse Osmosis)

- Cellulose triacetate (CTA) hollow fiber membranes
 - *Only our company for both CTA and hollow fiber type
 - Applications: seawater desalination
 - Our Strengths
 - CTA allows Chlorine Sterilization (prevent microbial growth)
 - Hollow fiber membranes: Large membrane surface area (disperses impact of contaminants)
- ⇒ Enabling stable operation of seawater desalination plants (long lifespan of membranes)
- Share: 20% in Middle East and Gulf countries
- ⇒ Produce 6.4 million people / day (1.6 million tones / day) water for domestic use



Track record of use in large seawater desalination plants in the Middle East and Gulf countries



Environment: Future Development of Water Treatment Membrane (FO membranes)

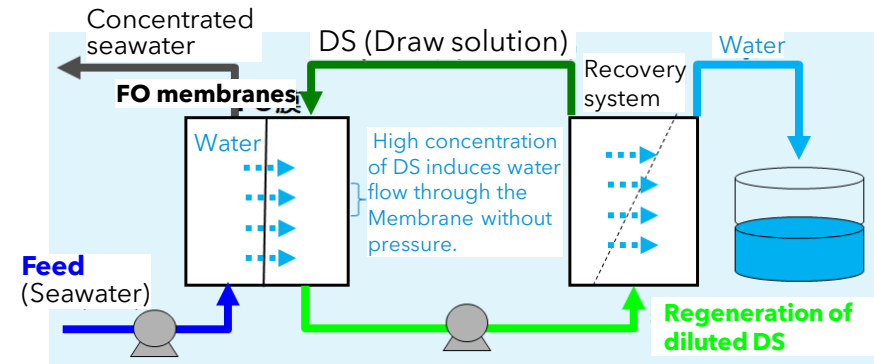
FO membranes (FO : Forward Osmosis)

*Only our company for hollow fiber type

■ Energy savings in seawater desalination process

Water from seawater (low concentration) is transferred to the draw solution (DS, high concentration) and heat is applied to separate the water and DS; roughly 75% less energy is used compared to RO membranes

*Draw solution: high osmotic solution to draw water out of seawater

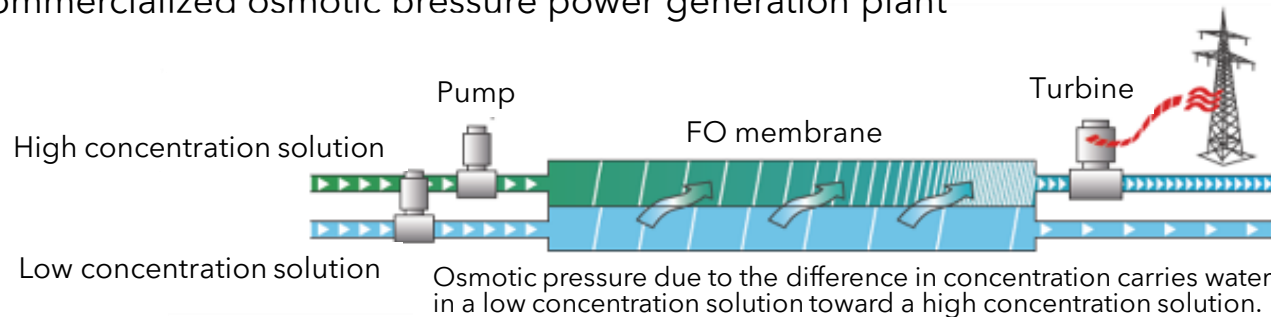


Energy savings in seawater desalination process

■ Osmotic pressure power generation (renewable energy)

Utilizing the concentration difference in liquids, power is generated from the osmotic pressure difference (transfer of water from low concentration to high concentration)

Our membranes are used by Denmark's Salt Power at the world's first successfully commercialized osmotic pressure power generation plant



Osmotic pressure power generation



Salt Power's osmotic power plant

➤ Creating partnerships in the water treatment industry

BC membranes (Brine Concentration) Treating high-concentration salt water

- Principle

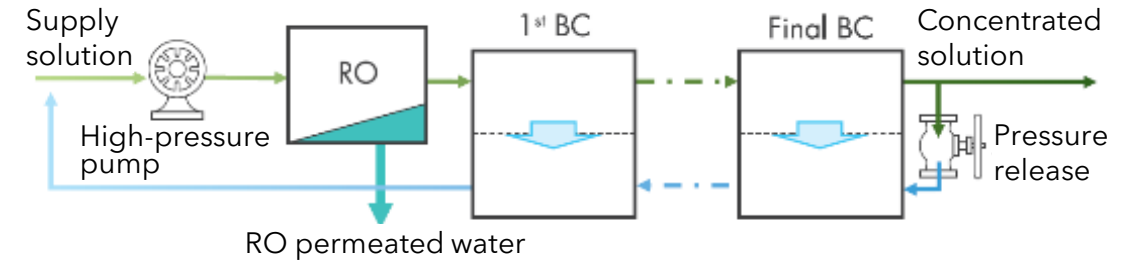
Supplying solutions of equal concentration to the inlet on the inside and outside of a hollow fiber membrane and applying pressure to one side to move water from high concentration to low concentration results in a heavy concentration; highly concentrated solutions are created by repeating this process

- Applications

- (1) Salt making: Seawater as the raw material; cheaper than ion-exchange membranes
- (2) Wastewater treatment: More cost-effective, energy-efficient, and emits less CO₂ than evaporation methods
- (3) Recovery of valuable substances (lithium, etc.)

- Advantages

Lower energy consumption compared to evaporation methods and other membrane concentration methods. Use of software to support design of BC processes for diverse concentration needs.



➤ Strengthening overseas network and distribution channels

Renewable energy : High-performance fibers

“IZANAS” Ultra-high-strength polyethylene fiber

- Properties: Strong, shock absorption, water resistance
- Applications: Ship mooring rope, fishing lines, etc.

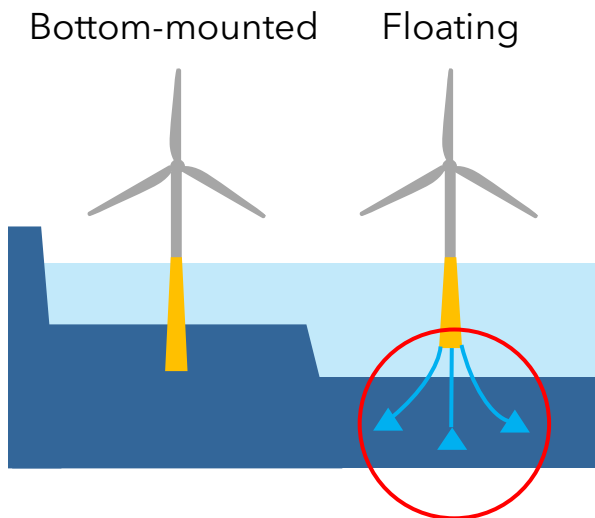
➤ Future development



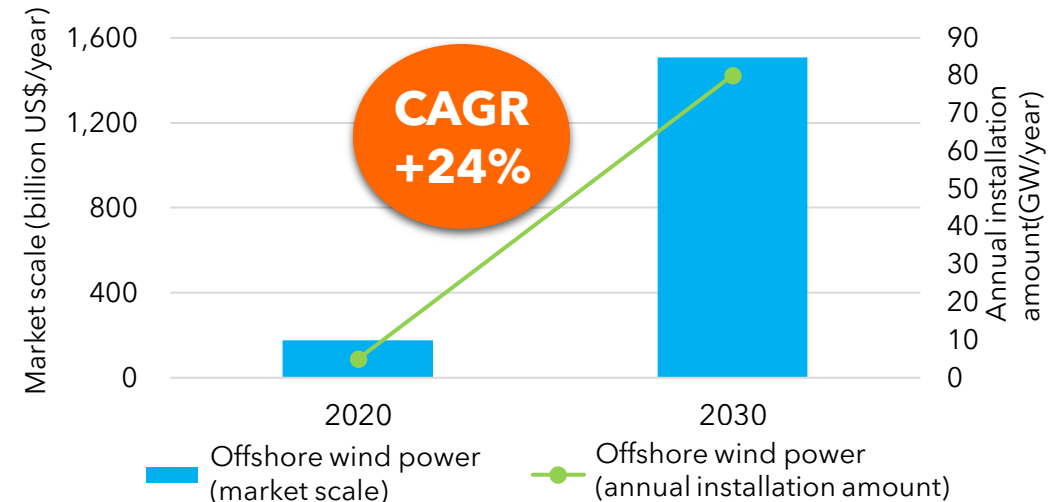
Strengthening overseas network and distribution channels

(exploring new applications in energy sector, etc.)

Example: Mooring cables for offshore floating wind power generation



Global outlook for offshore wind power market size



Source: Created by the Company based on wind power market trend from website of NEDO (New Energy and Industrial Technology Development Organization)

IV. Future Development

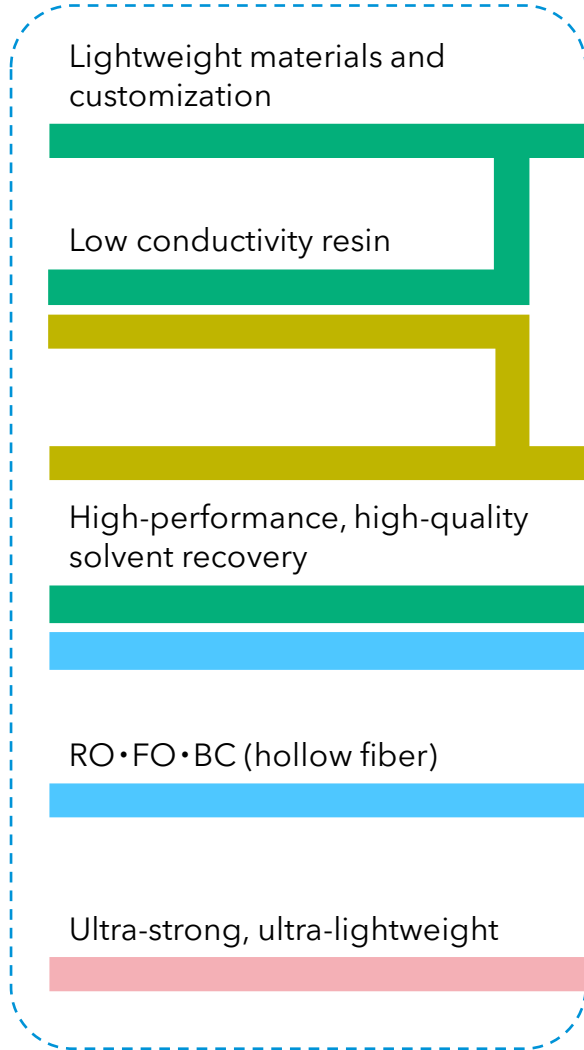
Summary of Future Development

Product

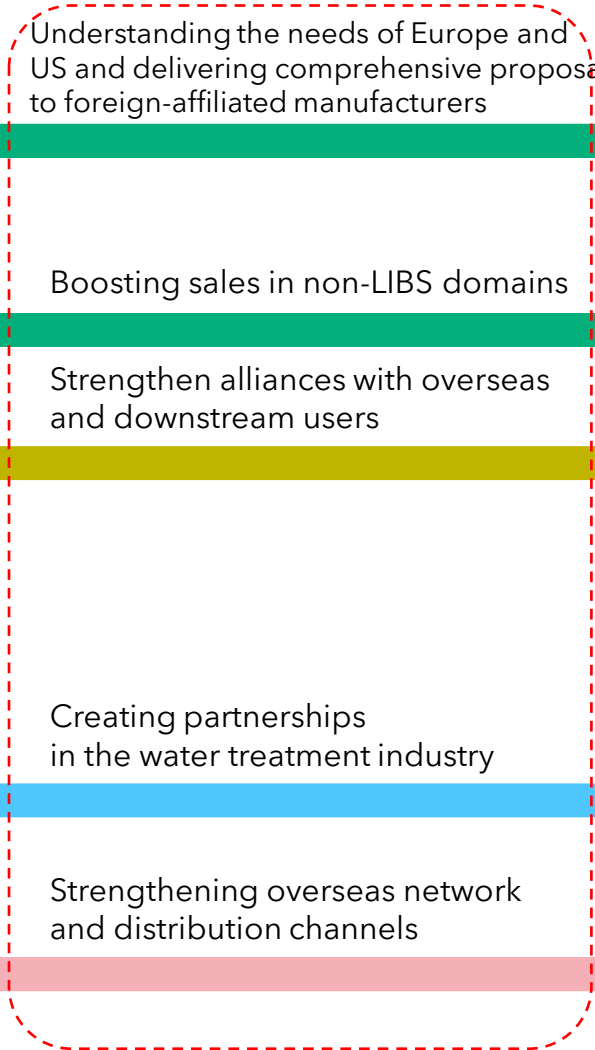
Future development

Growth areas

- Engineering plastics
- YVLON / HARDLEN
- Carbon-fiber reinforced composite material
- Environmental solutions system
- Water treatment membrane
- High-performance fibers




Toyobo Co., Ltd.
(strengths in materials)



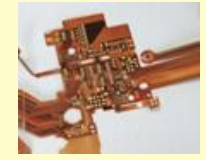
Mitsubishi Corporation
(strengths in networks and business concepts)

Mobility

EV 

LIBS 


High-speed communication

5G/6G 

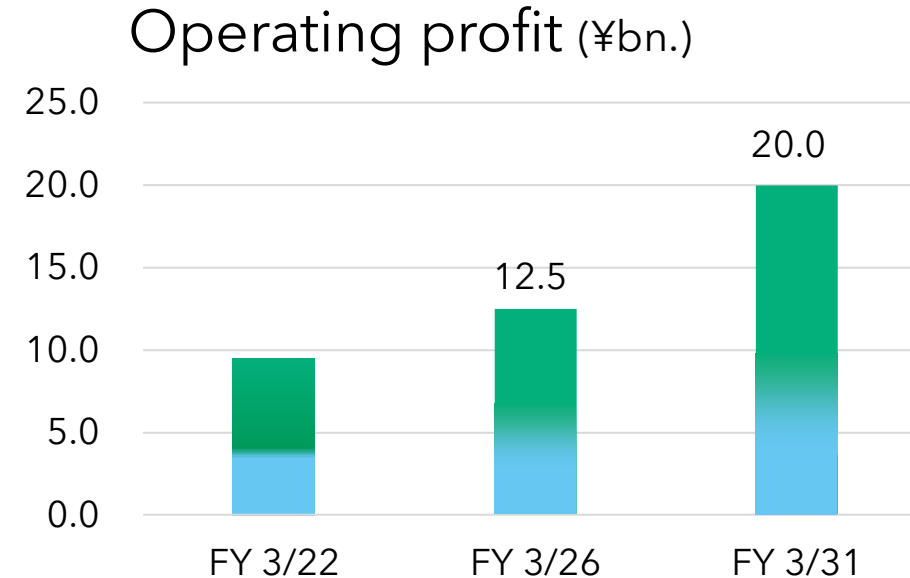
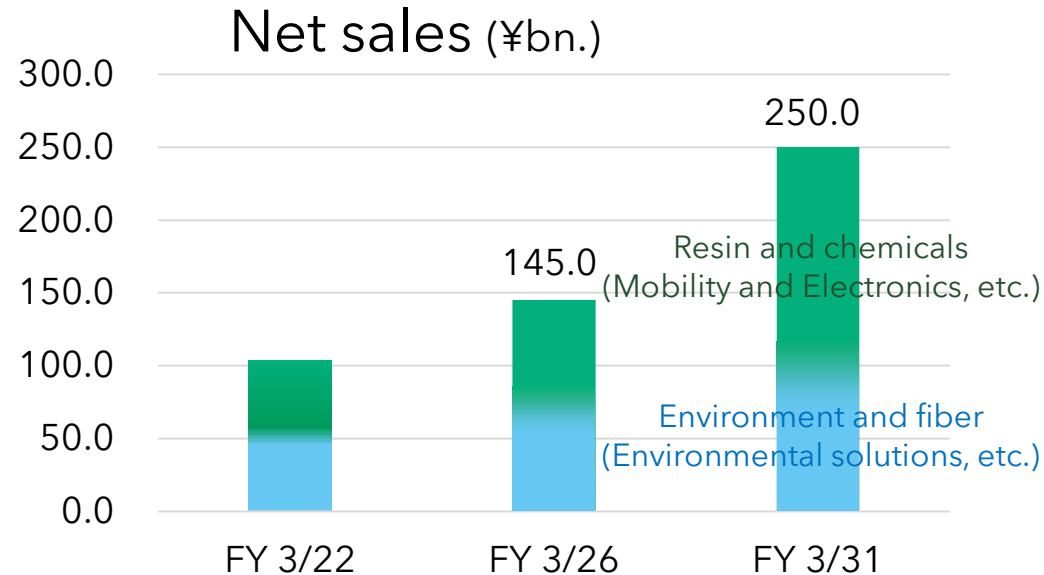
Environment (air/water)

High performance water treatment 

Renewable energy

Osmotic / Offshore wind power generation 

Pressing ahead with portfolio management and organic/inorganic growth strategies



*Breakdown of Resin and chemicals, Environment and fiber is an image.

Toyobo MC Corporation

Becoming a new functional materials manufacturer with a presence in global markets

Vision "Solving global issues with high-performance materials"

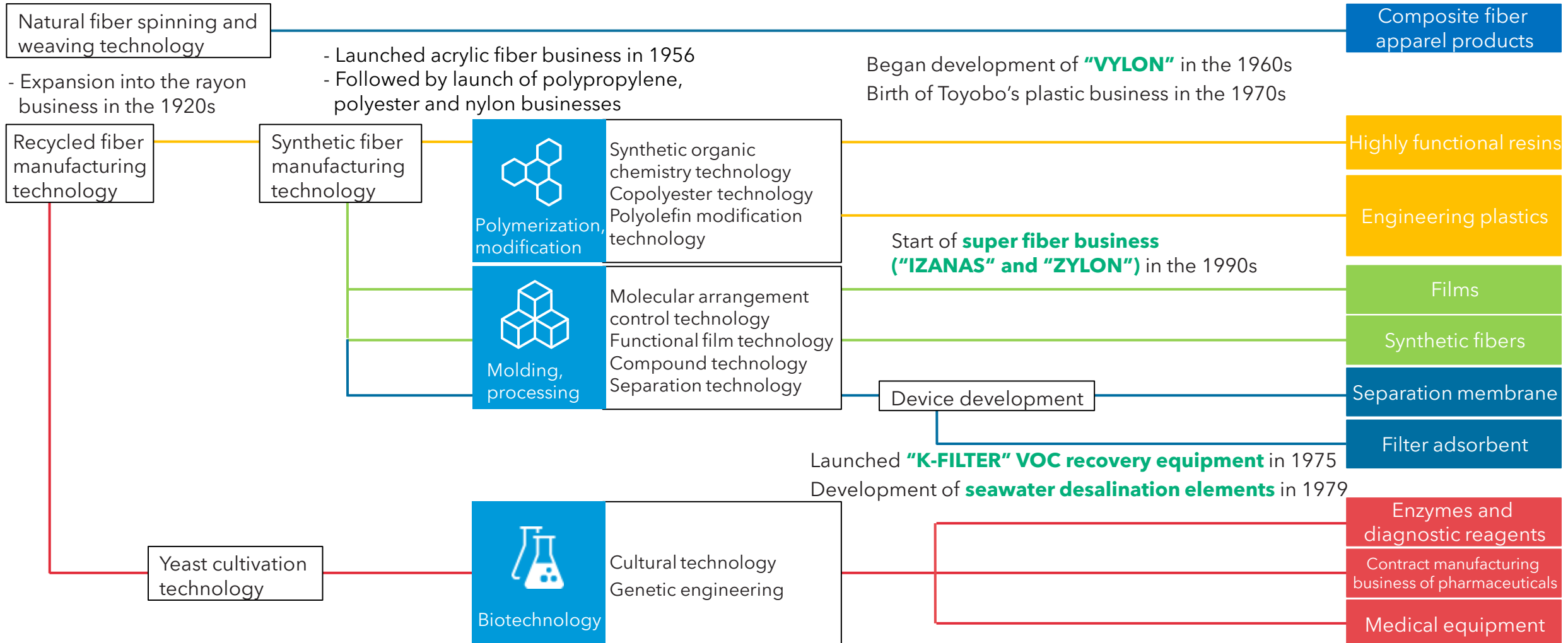
V . Appendix

Genealogy and History of Technology

Establishment of Osaka Boseki in 1882

Mie Boseki in 1886, adopting production equipment and technology from the U.K.

※Excerpts from our 2022 Integrated Report, p. 105-106



The business performance forecasts and targets included in the business plans contained in this presentation are based on information known to the Company's management as of the day of presentation. Please be aware that the content of the future forecasts may differ significantly from actual results, due to a number of unforeseeable factors.

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Beyond Horizons