



Materials Business Briefing

13 June 2022

This document is an English translation of a statement written originally in Japanese for reference. The Japanese original should be considered as the primary version


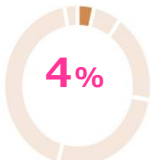



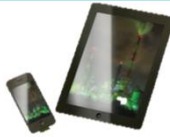







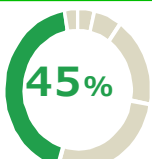

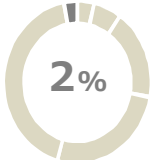

Daicel's Business Segment

FY2022 Net Sales Total


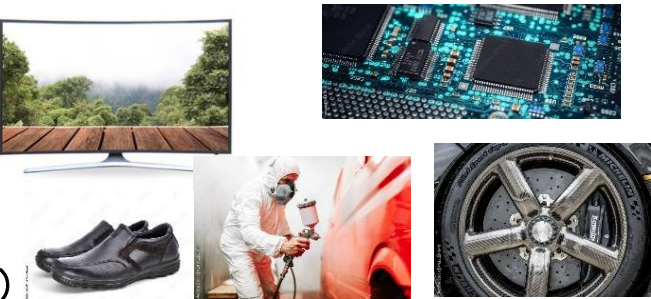
467.9 bn-yen Major Products

Japan's market
share No.1

World's market
share No.1

<p>Medical / Healthcare</p> 	 <p>4%</p>	<p>Cosmetics ingredients such as 1,3-butylene glycol and polyglycerin Naturally derived ingredients such as equol and Konjac ceramide Chiral columns, High-purity chiral reagents, Co-processed excipients such as orally disintegrating tablets</p>	
<p>Smart</p> 	 <p>7%</p>	<p>Cellulose acetate for optical films Resist materials, Solvents for printed electronics High-performance optical films, Optical devices, Semiconductor devices</p>	
<p>Safety</p> 	 <p>15%</p>	<p>Automobile safety parts such as airbag inflators, micro gas generators, initiators and pyro-fuses</p>	
<p>Materials</p> 	 <p>26%</p>	<p>Acetic acid, Acetic acid derivatives(acetic anhydride ,common solvents) Cellulose acetate for applications other than optical films Acetate tow, Organic chemicals such as Alicyclic-epoxy-resin, Caprolactone derivatives</p>	
<p>Engineering Plastics</p> 	 <p>45%</p>	<p>Engineering plastics such as POM, PBT, PPS, LCP, COC Resin compound products such as SAN, MS, ABS resin, Polymer alloys Plastics processing products such as Polystyrene sheet, Coating films Water-soluble polymer</p>	
<p>Others</p>	 <p>2%</p>	<p>Membrane separation systems Defense-related products</p>	

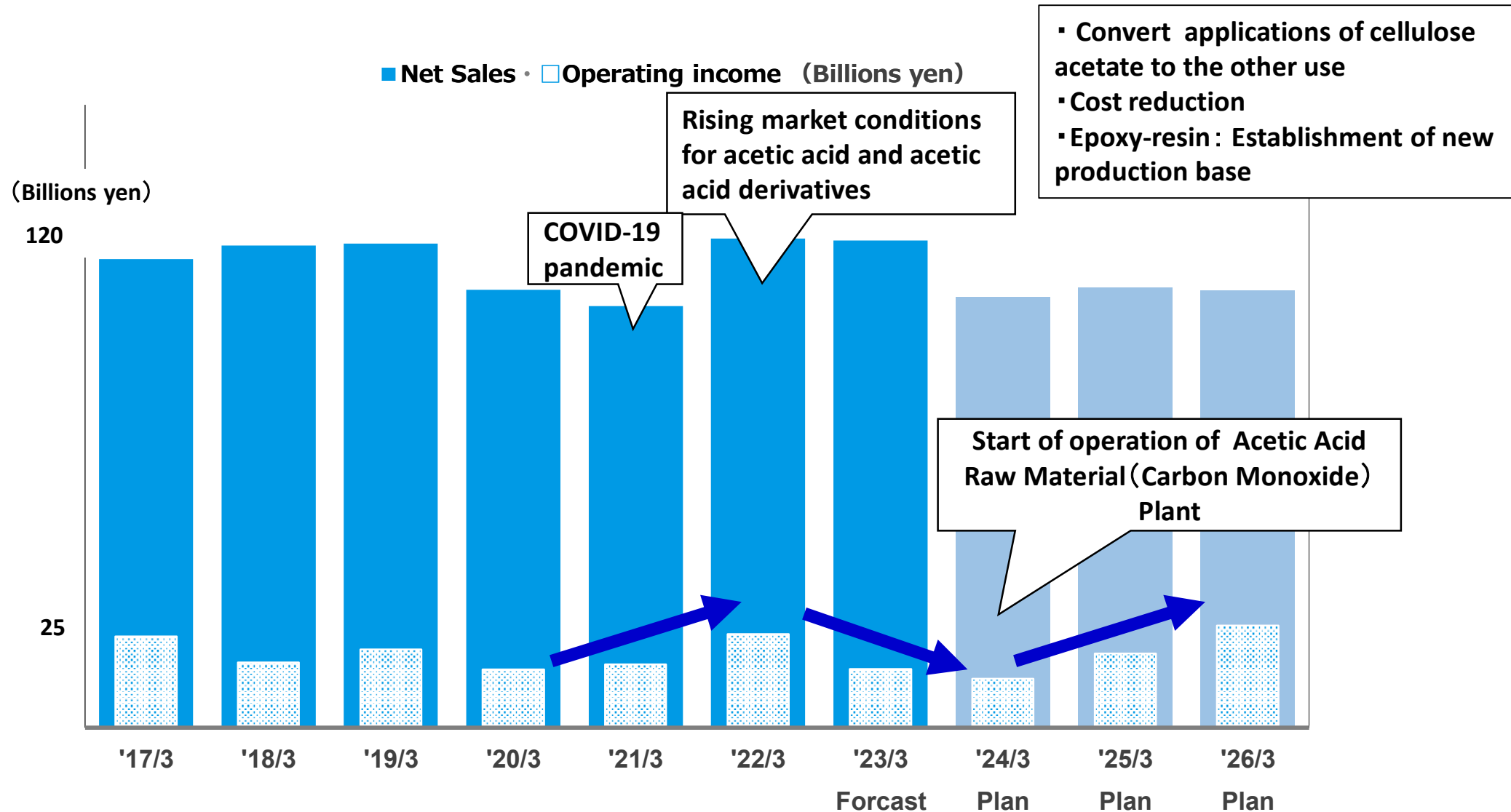
Outline of Materials business

BU	Main products	Main markets	Overseas sales ratio
Acetyl	Acetic acid, acetic anhydride, ethyl acetate	VAM (vinyl acetate monomer), PTA (high-purity terephthalic acid), LCP (liquid crystal polymer resin), Adhesive compound, Ink paint 	10%
	Cellulose acetate for applications other than optical films	Fiber, Membranes for water treatment process and artificial dialysis, Plastics 	50%
	Acetate tow	Cigarette filters 	90%
Chemical	Alicyclic epoxy, Caprolactone derivatives and alkylamines, etc.	Adhesive material for displays Polyurethane, paint, Insulating material, CFRP (carbon-fiber reinforced plastic) 	50%

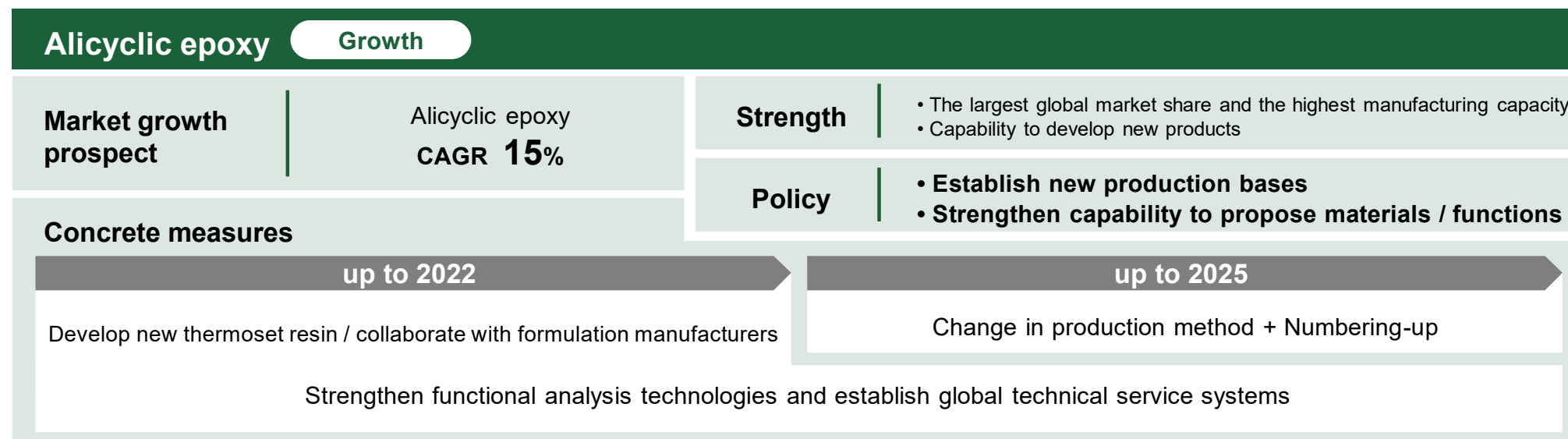
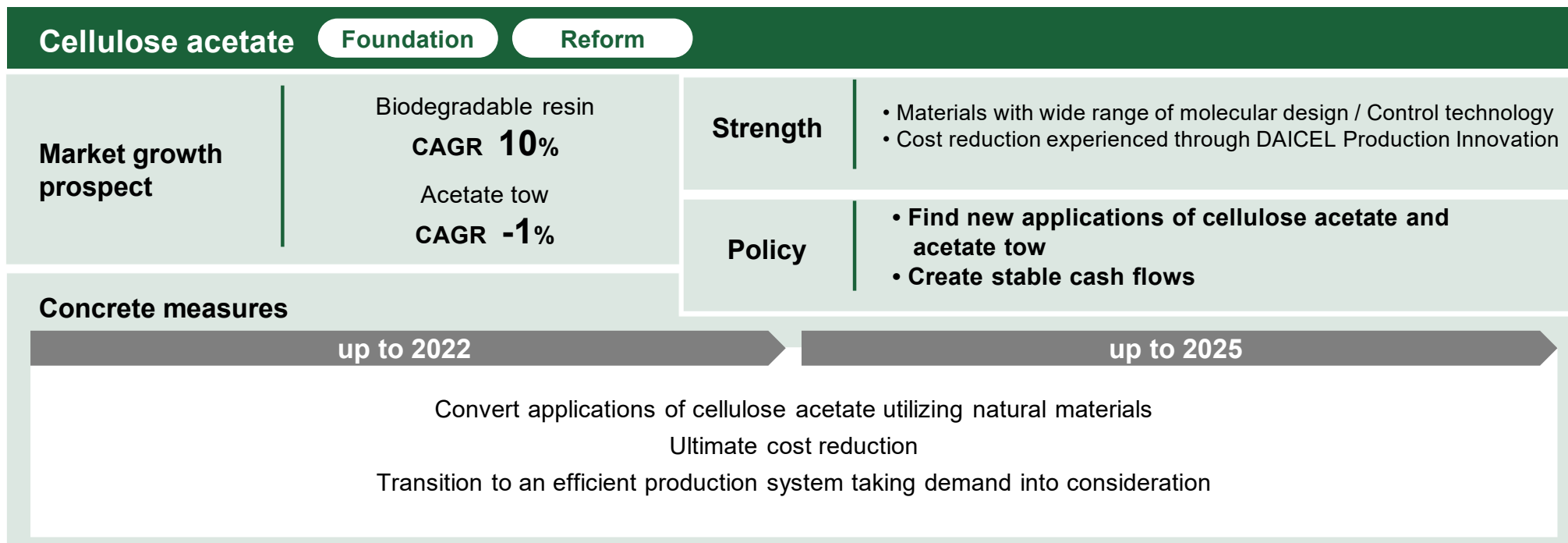




Net sales and Operating Income's Trends in Materials segment (From FY2017 To FY2026)

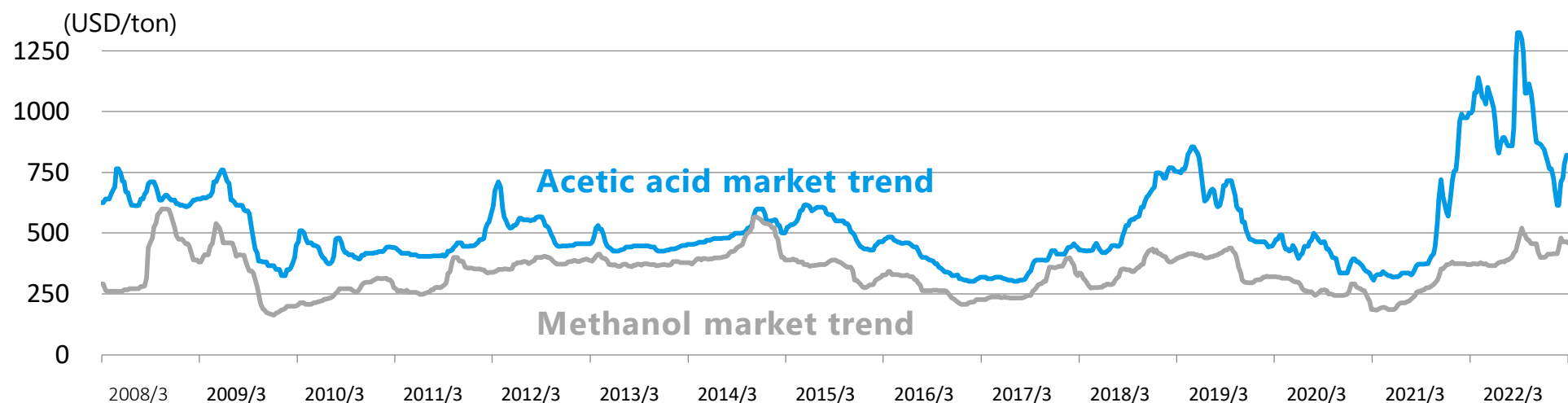


Mid-term strategy in Materials





Acetic acid market trends and fluctuation factors



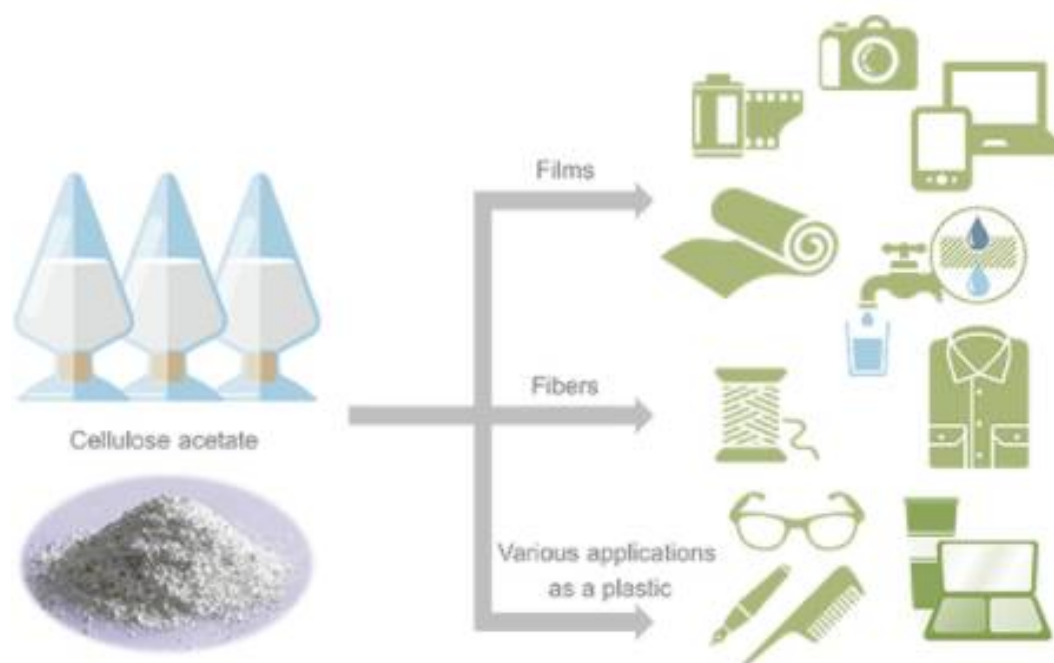
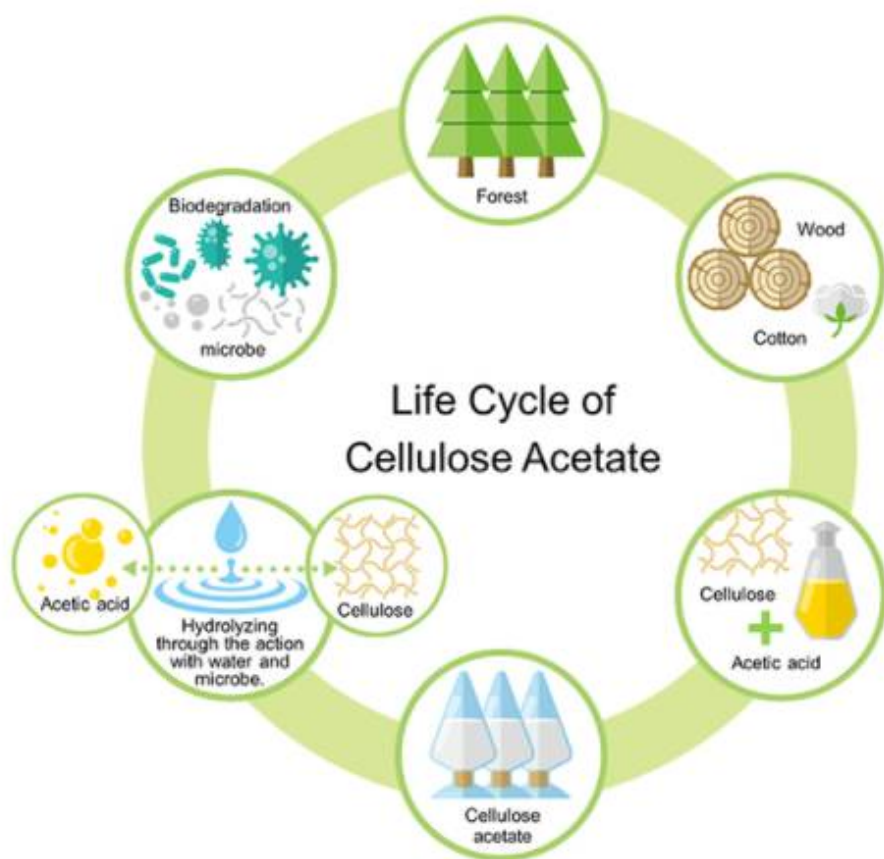
◇ Acetic acid market trends and fluctuation factors

Source : Daicel created based on ICIS

Time	Events that affected the acetic acid market
Feb,2021	The cold wave in Texas closed the US acetic acid maker Plants , and the declaration of force majeure tightened supply and demand.
From April to June in2021	Tightening supply and demand through regular repairs by multiple acetic acid manufacturers in Asia, including our company
July ,2021	At the end of June, the supply-demand balance was eased due to the start of operation of a new plant (500,000 tons) in China and the recovery of supply due to the completion of each company's regular repairs.
Oct. 2021	In mid-September, the production of acetic acid manufacturers in China was reduced due to the policy of environmental regulation and power restriction by the Chinese government, and the supply and demand became tighter.
Nov. 2021	The balance between supply and demand was eased due to the recovery of supply by Chinese acetic acid manufacturers due to the relaxation of environmental regulations and power restrictions in China.
Jan.2022	Relaxation of supply-demand balance by starting operation of new factory in China (700,000 tons)
From Feb. to March in 2022	Tightening supply and demand due to regular repairs of acetic acid plants in China, etc.

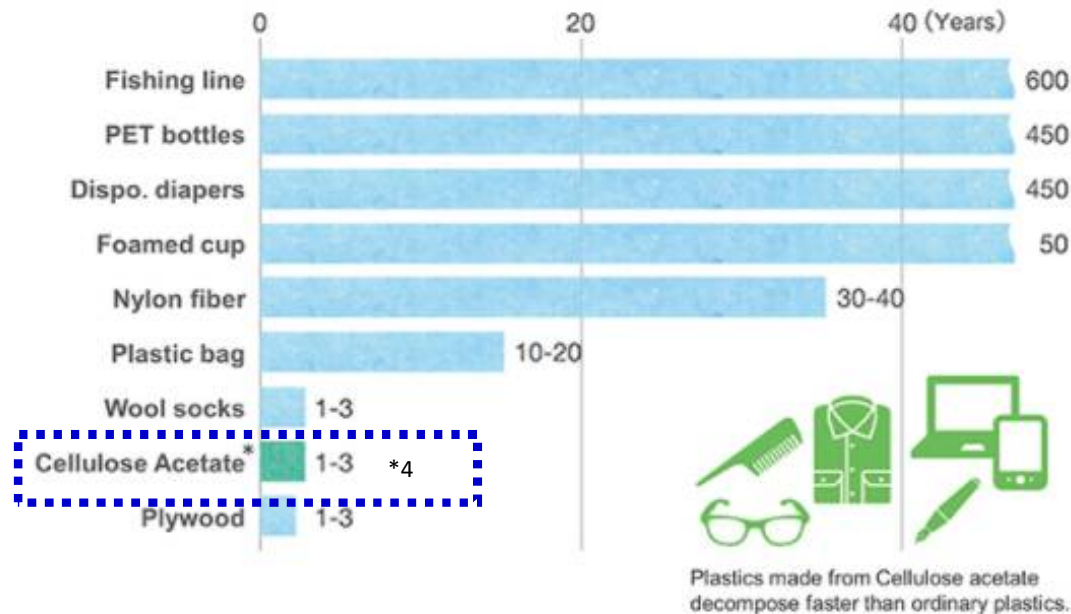
Cellulose acetate

Unlike most typical synthetic plastics, those made with cellulose acetate break down after use into cellulose and acetic acid by the action of water in the natural environment. These materials eventually return to the environment with no adverse impact. What's more, water and microorganisms eventually decompose the cellulose into carbon dioxide and water that can be used to nourish plants once again.



Biodegradability of cellulose acetate

Compared with common synthetic plastics, however, cellulose acetate decomposes quite rapidly in both seawater and soil (Figs. 1).



(Fig. 1) Decomposition Time in the Ocean Environment (from our own data and the following *1,*2 and *3 sources)

(*1)U.S. National Park Service; Mote Marine Lab, Sarasota, FL and
“Garbage In, Garbage Out,” Audubon magazine, Sept/Oct 1998

(*2)The Problem of Marine Plastics” (WWF Japan)
<https://www.wwf.or.jp/activities/basicinfo/3776.html> (Japanese site)

(*3)New Aspects of Cellulose Acetate Biodegradation,
Dirk HÖLTER,Philippe LAPERSONNE,2017_ST13

(*4) Cellulose diacetate used for plastics and cigarette filters

Cellulose acetate biodegrades in a variety of environments. Table 1 shows a comparison table with other biodegradable plastics.

Environmental conditions	Compost	Soil	Seawater
Cellulose acetate	○	○	○
PLA (Polylactic acid)*4	○	×	×
Bio-based PBS (Poly Butylene Succinate)	○	○	△

Table 1. Decomposition Time in Nature (from our own data and the following *1,*2 and *3 sources)

(*1)“Garbage In: The Problem of Marine Plastics,” WWF Japan
<https://www.wwf.or.jp/activities/basicinfo/3776.html> (Japanese site)

(*2)“Issues and future prospects of biodegradable plastics,” Mitsubishi Research Institute, Inc.

<https://www.mri.co.jp/knowledge/column/20190408.html> (Japanese site)

(*3)“Misconceptions regarding PLA as a biodegradable plastic”
http://nature3d.net/explanation/pla_notreally.html (Japanese site)

(*4) Plastic comprising mainly polylactic acid



Marine biodegradability of Cellulose Acetate

With the cellulose acetate manufacturing technology cultivated over the years, the degree of substitution and the degree of polymerization are controlled to achieve the same quality as conventional products. Improves **biodegradability rate in seawater** while maintaining. We gave shape to our thought, "**Cellulose Acetate for Blue Ocean**", and named it "**CAFBLO™**".

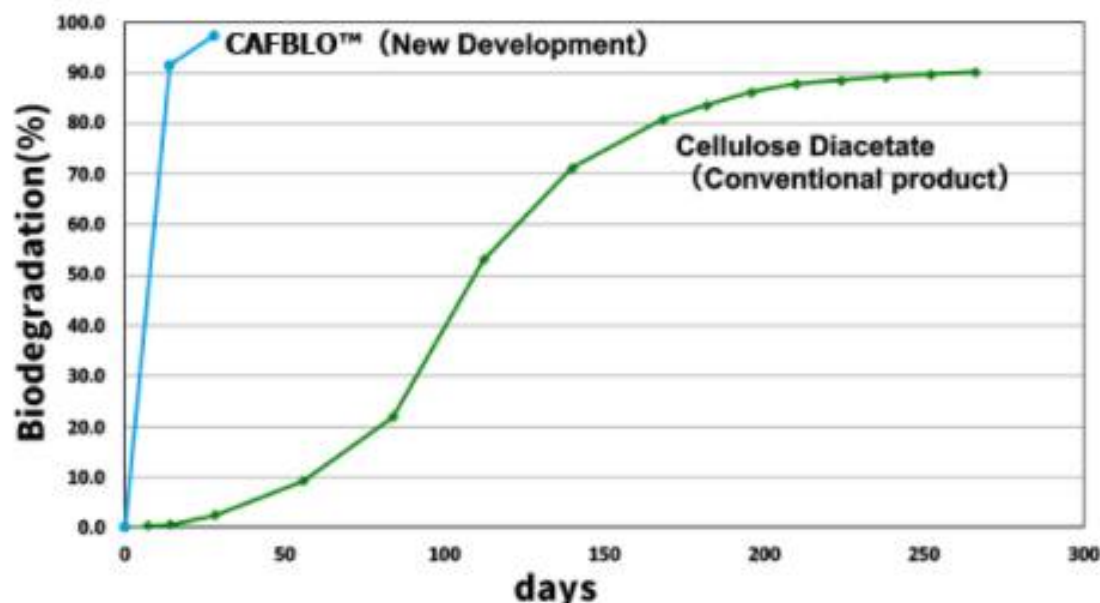


Figure. Marine biodegradability of conventional cellulose acetate vs our new development, CAFBLO™

(testing performed in accordance with the requirements of the OK biodegradable MARINE certification scheme of TÜV Austria)

Daicel would like to make **cellulose acetate the solution to the marine plastics problem** and proceed with product development together with everyone.

A new cellulose acetate product with improved marine biodegradability "CAFBLO(Cellulose Acetate for Blue Ocean)", and we expand it to various use



CAFBLO's Concept color

Development of environmentally friendly plastics

The low effective utilization rate of waste plastics and environmental pollution caused by marine plastics are global issues. Daicel provides a solution with cellulose acetate, a plant-derived biomass plastic.

New Market

In order to enter the packaging containers and trays that are the main uses of environmental plastics, it is necessary to provide materials and prescriptions that match various molding methods (processing suitability and productivity).

Existing Market

Glass frames,
Driver's handle etc.



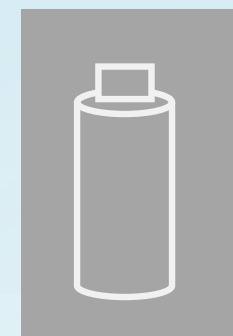
Injection molding



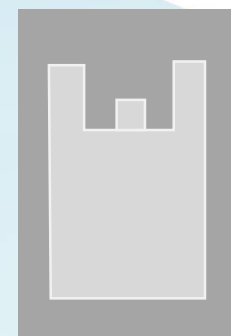
Extrusion molding



Sheet molding, vacuum forming



Blow molding



Inflation molding

Design development

Cellulose acetate
Molecular design

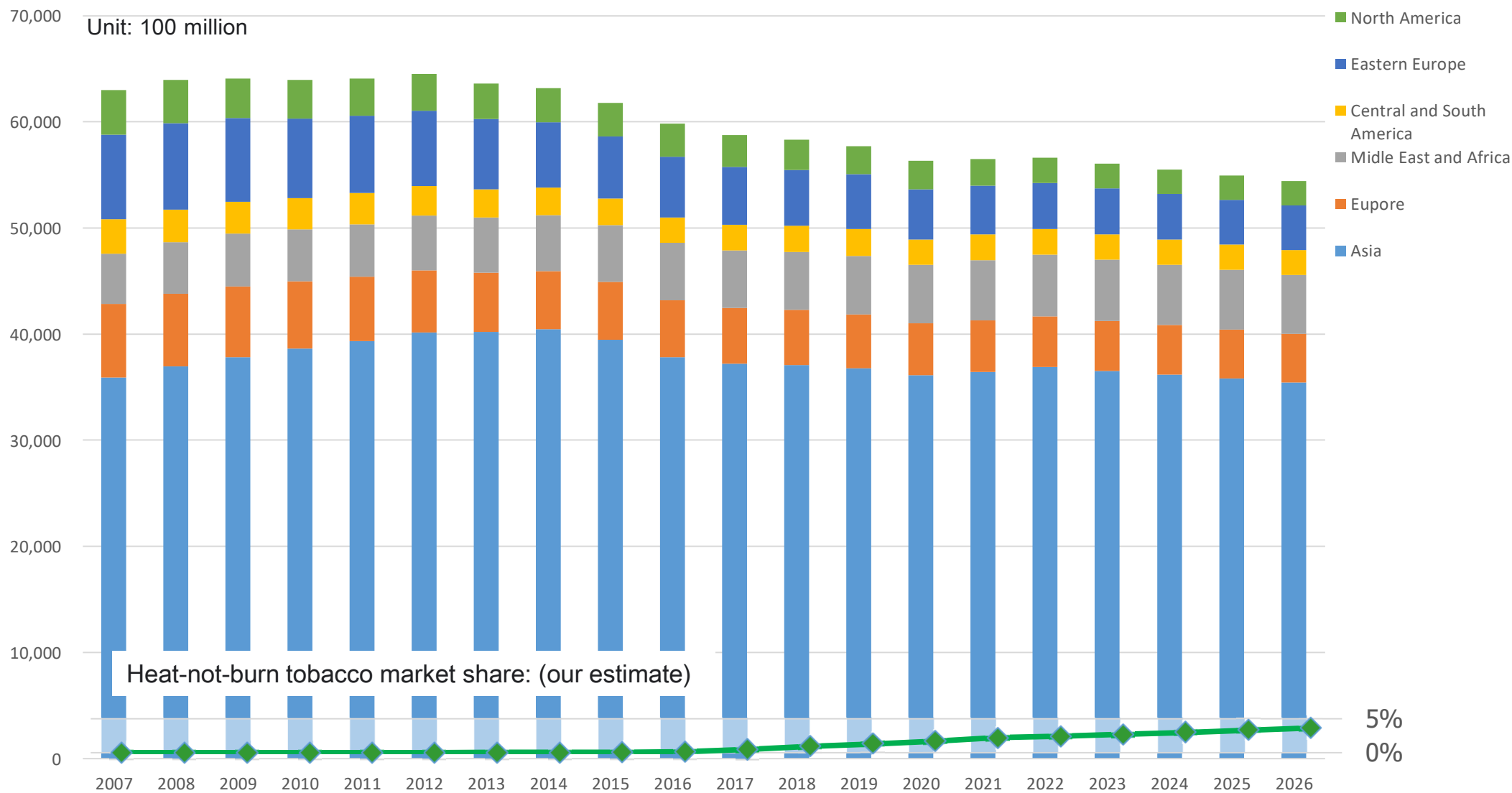
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New plasticizer
Combination of additives =
Alloy with other polymers

Expression of new physical properties
Control of Biodegradable

Tobacco demand forecast

Tobacco demand is expected to decline by approximately 1% after 2023. On the other hand, for acetate tow, due to the increase in the amount of filter used for heat-not-burn tobacco products and health consciousness. It is not expected to decrease as much as the demand for tobacco due to the lengthening and conversion to tobacco with filters.



Heat-not –burn tobacco products

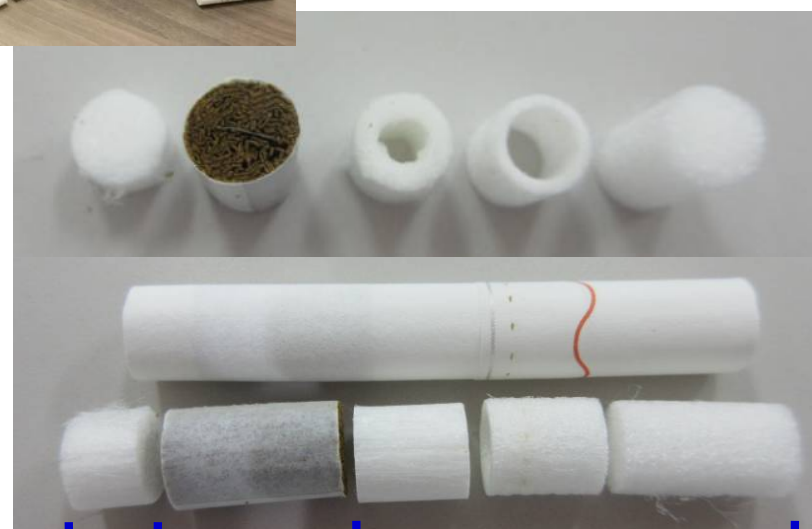
Acetate tow usage in heat-not-burn tobacco products is on the rise

(Acetate tow usage is increasing as PLA film used as an endothermic agent has been changed to acetate tow.)



PLA film

Acetate tow



Acetate tow

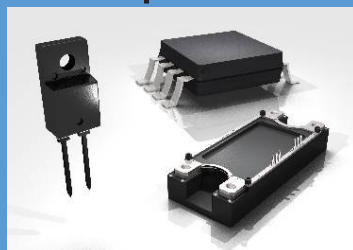
Daicel is the only company in the world to manufacture and sell alicyclic epoxies and ϵ -caprolactone by oxidation reaction using peracetic acid. These products are used in a wide range of fields such as automobiles, semiconductors and displays.

In the automobile field, electric vehicles are acceleratingly spreading to reduce CO2 emissions. Electric components (motors, power modules, batteries, etc.) of electric vehicles are required to be smaller and have higher output. For exterior parts, CFRP (carbon fiber impregnated resin) and paint protection film that protects the paint of new cars are attracting attention as metal substitute materials for weight reduction. In the field of power semiconductors, the trend toward Si \rightarrow SiC (silicon carbide) is increasing due to the increase in voltage, and in the field of displays, there is an increasing demand for hard and unbreakable materials such as high definition and flexibility.

【Alicyclic epoxy application example】



EV motor



SiC power module



Electronic components



Flexible display



Carbon fiber impregnated resin

【Caplactone application example】



EV battery



Paint protection film

Daicel Chemical BU aims to further expand its business by translating the functions required by OEMs and Tier 1 manufacturers in the fields of automobiles and displays to materials and by expansion of high-performance and high-value-added material

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