

Presentation on Polymer Additives Business

Mar. 16, 2021

【TSE 4401】



1. Outline of the Business

- ADEKA's Innovation
- Position in Global Market
- Products with Leading Global Market Share
- Applications
- Approximate Sales Composition Ratio (By Applications)

2. Strengths of the Business

- (1) Extensive Product Line
 - Clarifying Agents
 - Flame Retardants
- (2) Provision of Solutions based on Technical Support
- (3) Strong Global Network

3. Contribution to a Sustainable Society

- Environment-Friendly Polymer Additives
 - Additives for recycled resins
 - Biomass-derived plasticizers for PVC
- Actions for Next Generation Automobiles
 - External Environment
 - Issue and Technologies requirements
 - Roles of Polymer Additives

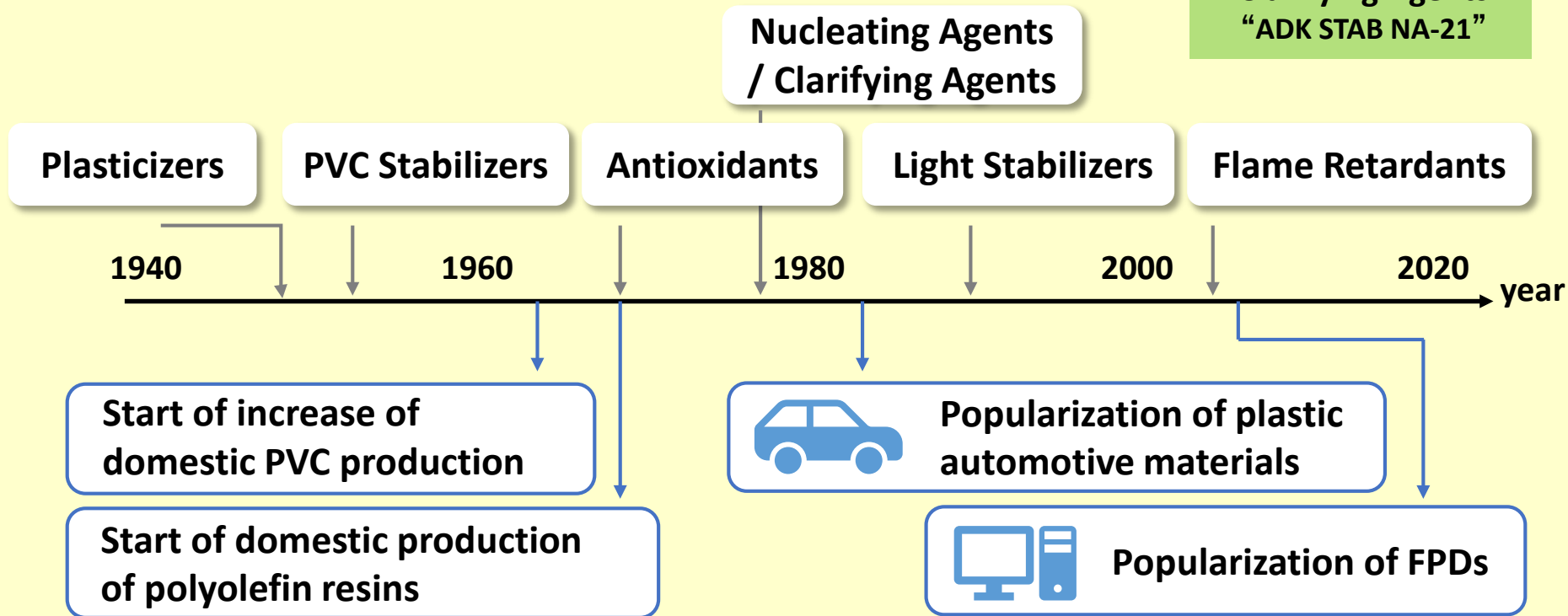
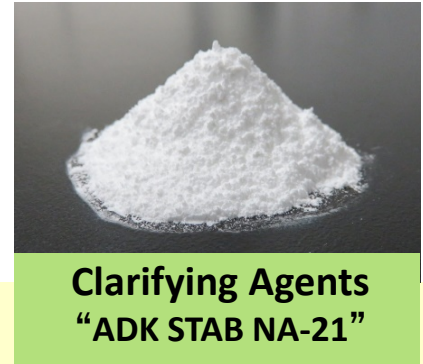
◆ References

- Forecast of Demand for Plastics and Additives
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ADEKA's Innovation

Polymer additives

Chemicals that add new functionality to plastic materials to increase their value



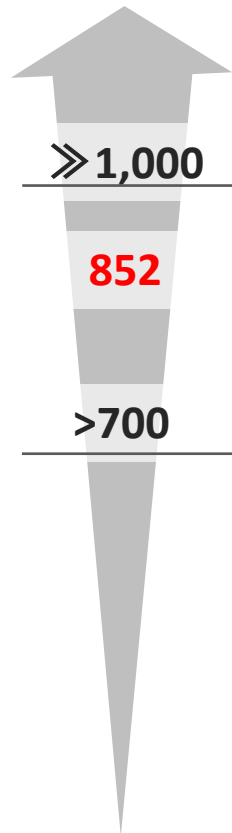
→ Polymer additives support the growth of industry







Position in Global Market

Second place among manufacturers of polymer additives*

Unit:
100 million yen

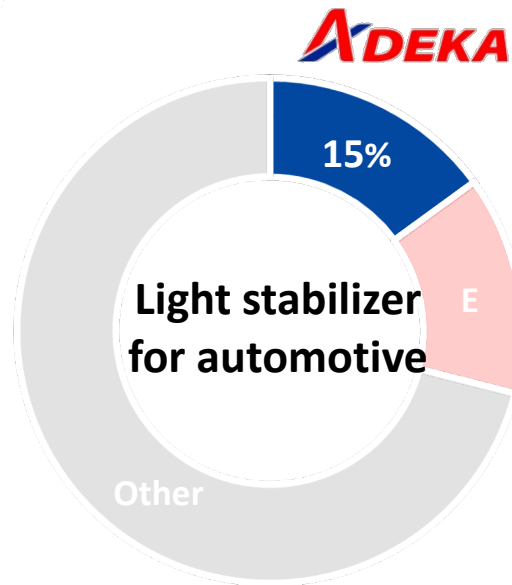
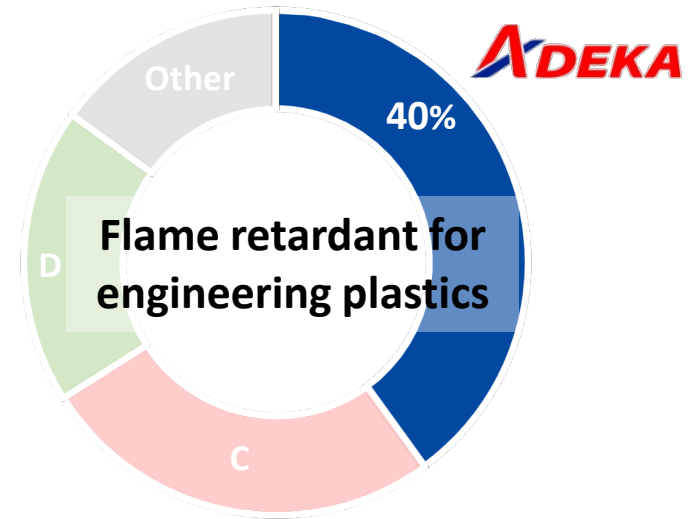
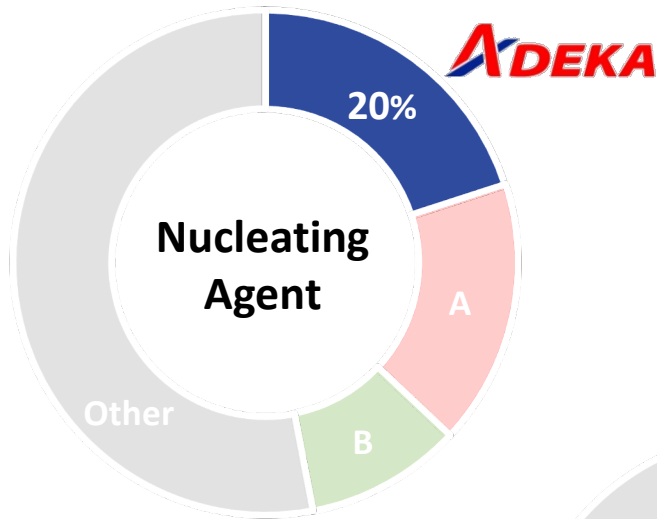
Sales



	Nucleating Agents / Clarifying Agents	Flame Retardants	Light Stabilizers	Antioxidants	PVC Stabilizers	Plasticizers
BASF 			✓	✓		✓
ADEKA 	✓	✓	✓	✓	✓	✓
Songwon 			✓	✓	✓	✓
Clariant 		✓	✓	✓		
Solvay 			✓	✓		
Milliken 	✓					

* ADEKA's estimate in the market of high-performance additives

Products with Leading Global Market Share



ADEKA's high performance polymer additives
contribute to the growth of industry

Applications | Automobile

Ideal for automobiles, featuring comfort, superior energy efficiency and environmental friendliness



Nucleating Agents, Light Stabilizers

Use of plastics to reduce the weight of car bodies

Exterior materials
(PP, PC)

Higher energy efficiency,
lower CO₂ emissions



Light Stabilizers

Superior weather
resistance of materials

Interior materials
(PP)

Longer automobile
service life

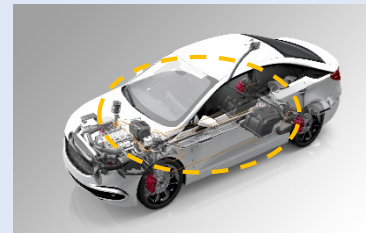


Plasticizers

High heat and
oil resistance achieved

Rubber components

Longer automobile
service life



PVC Stabilizers

Higher heat resistance
of materials

Wire harnesses
(PVC)

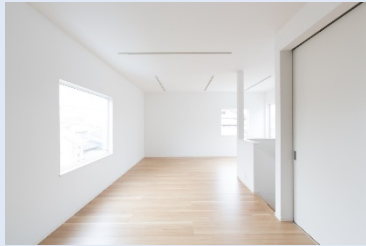
Realization of comfort and safety
by electrifying of vehicles

Antioxidants

Enabling high temperature
processing and long-term use

Applications | Building & Industrial Materials

Creating safe and durable materials to help provide fulfilling lifestyles



Wallpapers and flooring materials
(PVC)



Window frames

PVC Stabilizers

Adding heat resistance and aesthetic properties to materials and excellent in workability and color fastness to meet various needs



Creating comfortable indoor spaces



Stadium chair
(PP)

Flame Retardants

Preventing spread of fires



Providing safety
and reliability



Agricultural film
(PO)

Light Stabilizers

Extending service life even under acidic conditions due to Agrochemicals and other reasons



Higher farming productivity

Antioxidants Enabling high temperature processing and long-term use

Applications | Home Appliances & Electronics

Providing materials that support comfortable and diverse lifestyles



Casing/Housing
(PC/ABS)



Flame Retardants

Preventing losses of human lives and property due to fire hazard



Addition of safety and reliability to the functionalized and well designed products



Optical film
(Acrylic resins)



Light Stabilizers

Contribution in improving the performance of FPDs



Supporting a comfortable ICT society

Applications | Medical & Food Packaging

Contribution to people's health through advanced technologies



Disposable syringe

(PP, PVC)



Infusion bag

Clarifying Agents

Higher visibility of content

Plasticizers

PVC Stabilizers

Adding low-temperature storage stability and processing stability



Supporting safe and hygienic (antiseptic) medical care



Containers



Food packing film

(PP, PE)

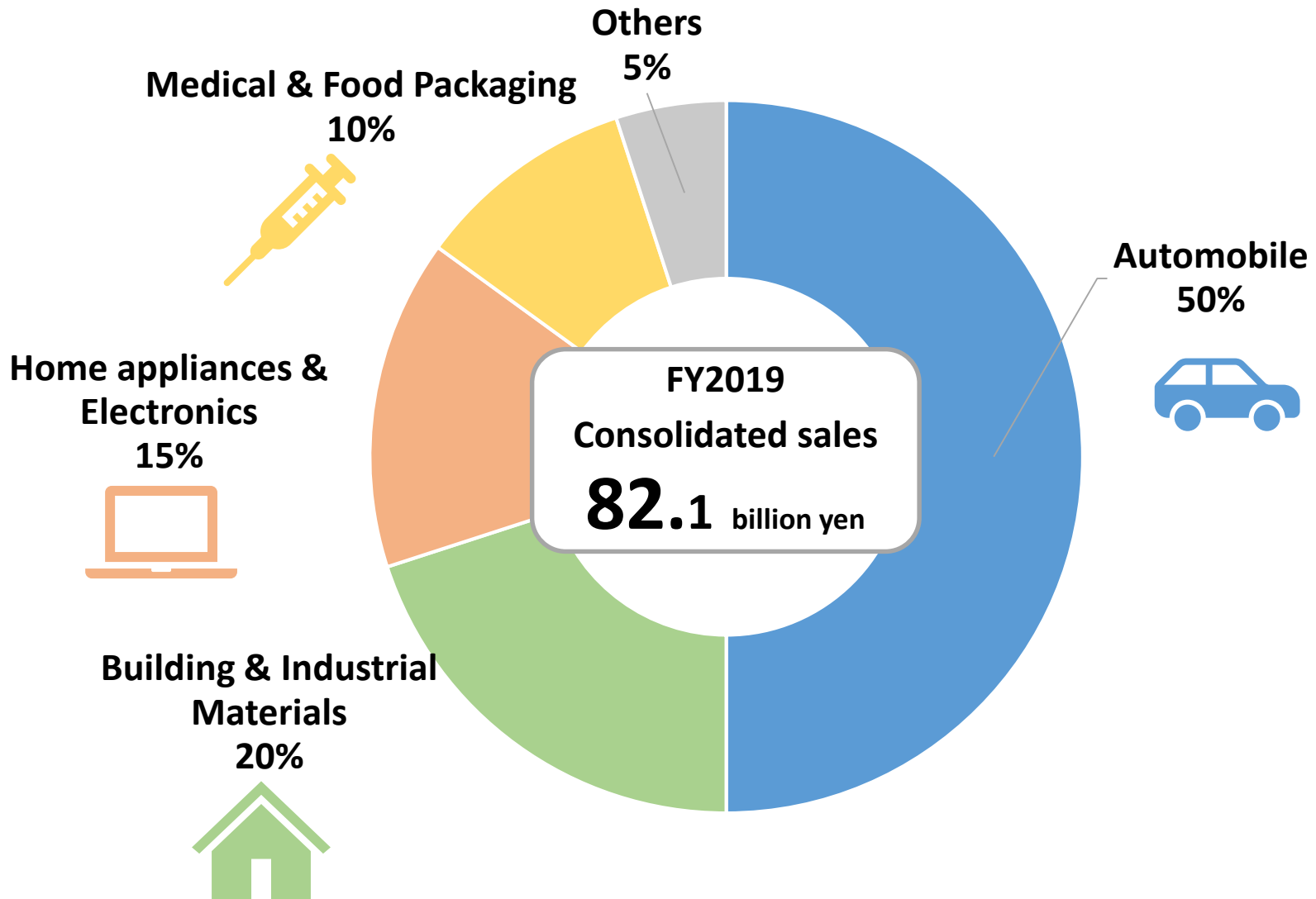
Clarifying Agents

Higher visibility of content and barrier properties



Contributing to ensure food safety and to maintain freshness

Approximate Sales Composition Ratio (By Application)



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2. Strengths of the Business

Providing best solutions suited to customers' needs

(1) Wide variety of products

Providing “one-step solutions” with the widest lineup of products in the world

(2) Provision of solutions through technical support

Proposing the best compounding methods depending on customers' resin molding methods and machines.

(3) Strong global network

Providing close technical support through a network of 16 bases in 12 countries and regions to help customers with development

Clarifying Agents

Features

Improving the transparency of formed products and increasing heat resistance

Examples

- ADK STAB NA-21
- ADK STAB NA-71



Without clarifying agents With clarifying agents

Applications (Resins)

Food packages & containers and disposable medical appliances (PP)

Future actions

Development and promotion of new products targeting to alternate PS, PET and other transparent resins.

Flame Retardants

Features

Prevent fire spreading to gain escaping time incase of fire hazard. Due to it's halogen-free characteristics, no toxic gas is generated and amount of CO is suppressed which can provide high level of safety.

Without Flame retardants



With Flame retardants
(ADK STAB FP-2000 series)



99% Less Smoke Density and
89% Less CO Emissions Under Flaming Conditions as compared to Br Treated PP



UL Verified Mark obtained in May 2017

UL Inc. , a U.S.-based third-party scientific safety organization, certified performance of intumescent flame retardants "ADK STAB FP-2000 series".

* They are the first products in the world in the area of functional materials to obtain this.

Applications (Resins)

Home appliance housing (PC/ABS, PS)

... **ADK STAB FP-600**

Building materials, Battery cases (PP), Electric wire (PE)

... **ADK STAB FP-2000 series**

Future actions

Respond to demand for plastics arising from EV market, Develop new products for TPU

PC/ABS: Polycarbonate/Acrylonitrile, Butadiene, Styrene co-polymer synthetic resins

PS: Polystyrene, PP: Polypropylene, PE: Polyethylene, TPU: Thermoplastic polyurethane

(2) Provision of Solutions based on Technical Support

Providing close technical support to

- Offer solutions in view of final applications and cultivate market needs
- Help customers with global expansion and development



Extruders and pelletizers



Injection molding machines



Film and sheet extruder

Other testing machines owned

- Weather meters (Sunshine-type and xenon-type)
- Constant temperature and humidity test system
- Tensile test machine
- UL-94V tester and more

(3) Strong Global Network

16 overseas bases in 12 countries and regions



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Environment-Friendly Polymer Additives

New products for the realization of a sustainable society
Developed the “ADK CYCLOAID Series”.

“ADK CYCLOAID UPR series” Additives for recycled resins

Reducing the consumption of limited resources and the amount of waste disposed in landfills to reduce environmental impact

“ADK CYCLOAID PNB Series” Bio-based plasticizers for PVC

Environment-Friendly products with high biomass content developed

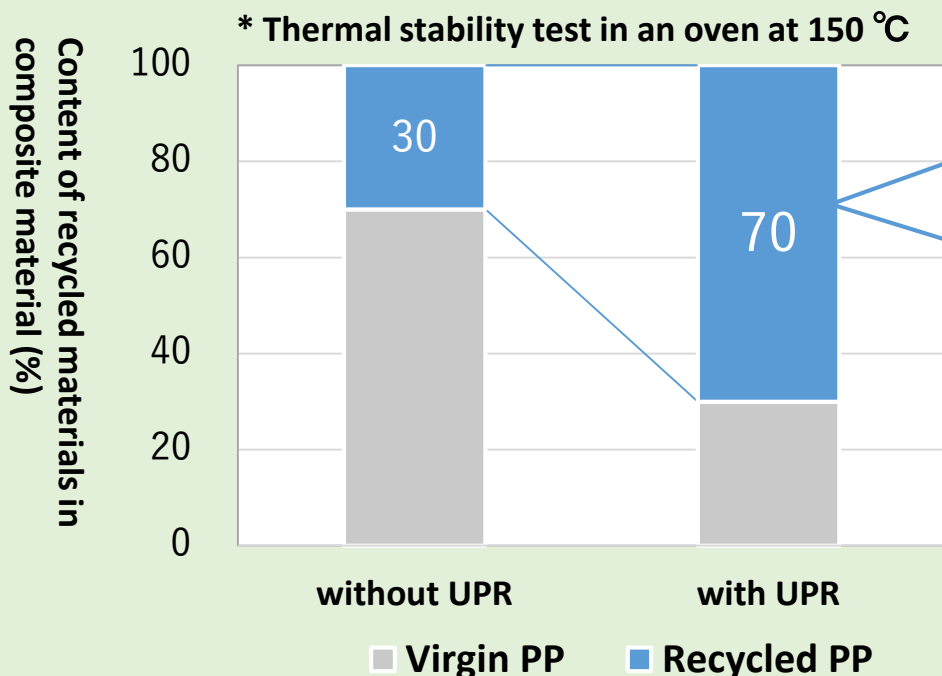


Environment-Friendly Polymer Additives

“ADK CYCLOAID UPR series” Additives for recycled resins

Helping reduce plastic waste

▶ Developed a package of additives that add thermal stability to composite materials made from recycled resins (polyolefins).



Added "ADK CYCLOAID UPR Series"

While maintaining thermal stability equivalent to a composite without UPR, the content of recycled materials in a composite with UPR may be increased by more than 2 times than the amount in the composite without UPR.

Environment-Friendly Polymer Additives

“ADK CYCLOAID PNB Series” Bio-based plasticizers for PVC

Helping create a low-carbon society

Naturally derived plant materials

▶ ADEKA has developed plasticizers made from 95% biomass materials.

They exhibit **oil resistance** and **thermal stability** equivalent to or superior than general-purpose plasticizers

* Phthalate plasticizers and dibasic acid ester plasticizers

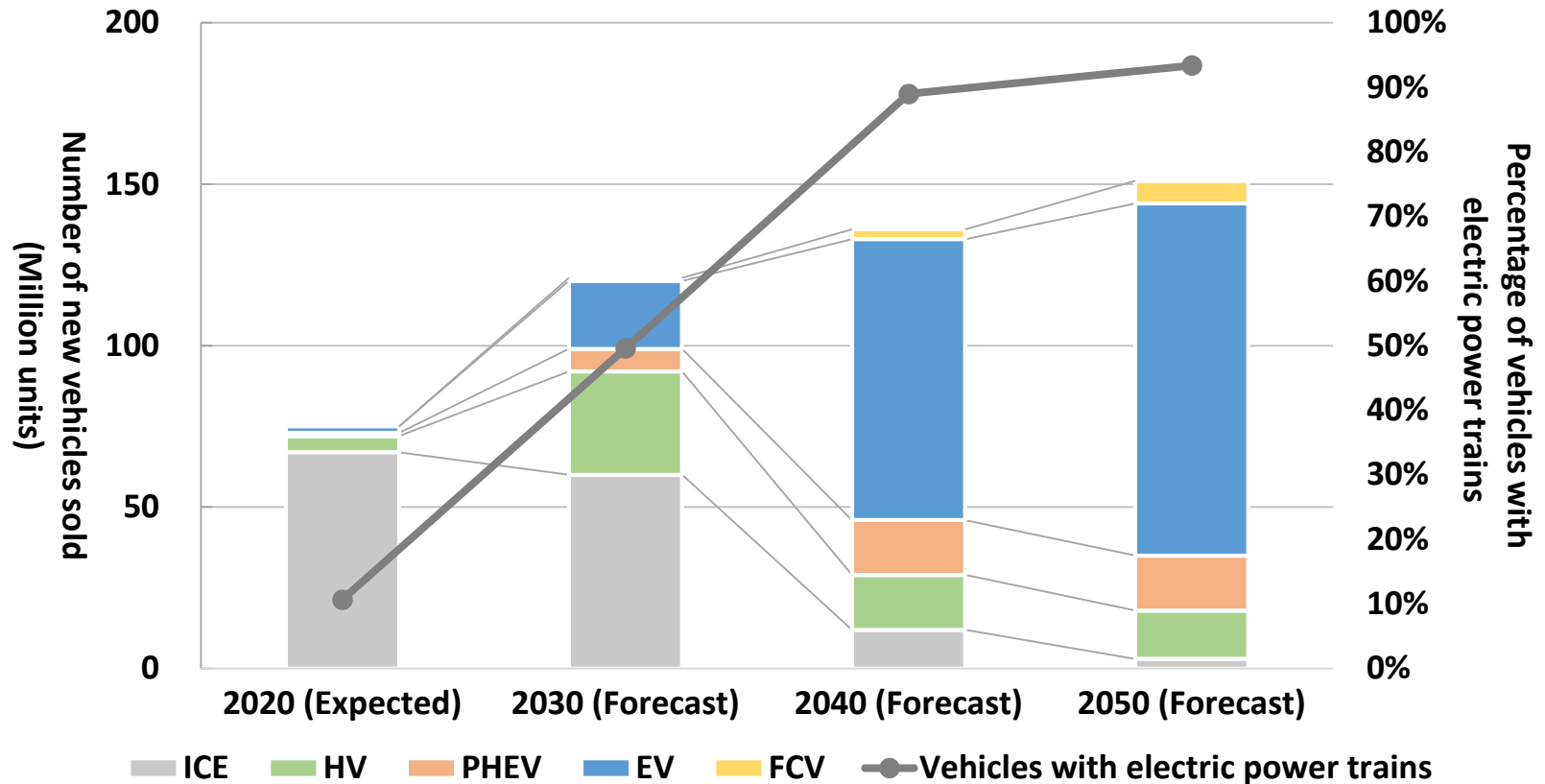
■ Application

Film, sheets and various industrial PVC products that are commonly used



Biomass
No.190395

External Environment



Target year for banning the sale of new gasoline-powered vehicles

- China : 2035
- USA(California) : 2035
- France : 2040
- Japan : 2030

Issue and Technologies requirements

	<p>Gasoline powered vehicles</p>	<p>Electric vehicles</p>
Power source	Engine	Motor
Main components	Engine, Fuel tank, Muffler, Radiator and others	Motor, Battery, Inverter and others
Vehicle-mounted electronic devices	Limited	Numerous
Materials	Iron and alloys	Resins and alloys FRP materials

Issue and Technologies requirements

- Increased weight & decreased fuel efficiency due to bringing in electric power trains
- Risk of ignition of the battery or other components

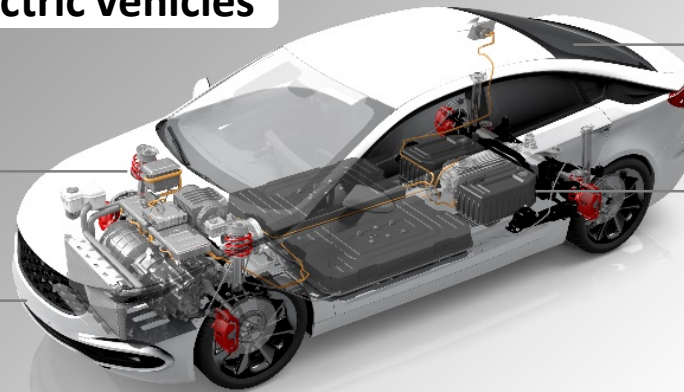
- **To reduce vehicle weight**
- **To ensure safety in the event of ignition**

Roles of Polymer Additives

↑ **Wire harnesses:** Growing demand due to the introduction of electric components
→ **PVC Stabilizers**

↑ **Windows:** Shift to resins to reduce vehicle weight
→ **Light Stabilizers**

Electric vehicles



↑ **Exterior materials:** Soaring demand for resins to reduce vehicle weight
→ **Nucleating Agents, Light Stabilizers, Antioxidants**

↑ **Battery cases:** Ensuring safety in case of ignition / combustion
→ **Flame Retardants**

↑ ↓ : Demand increase / decrease

↓ **Rubber components** around the engine: Demand shrinking due to decrease of gasoline powered vehicles → **Plasticizers**

Forecast of Demand for Plastics and Additives

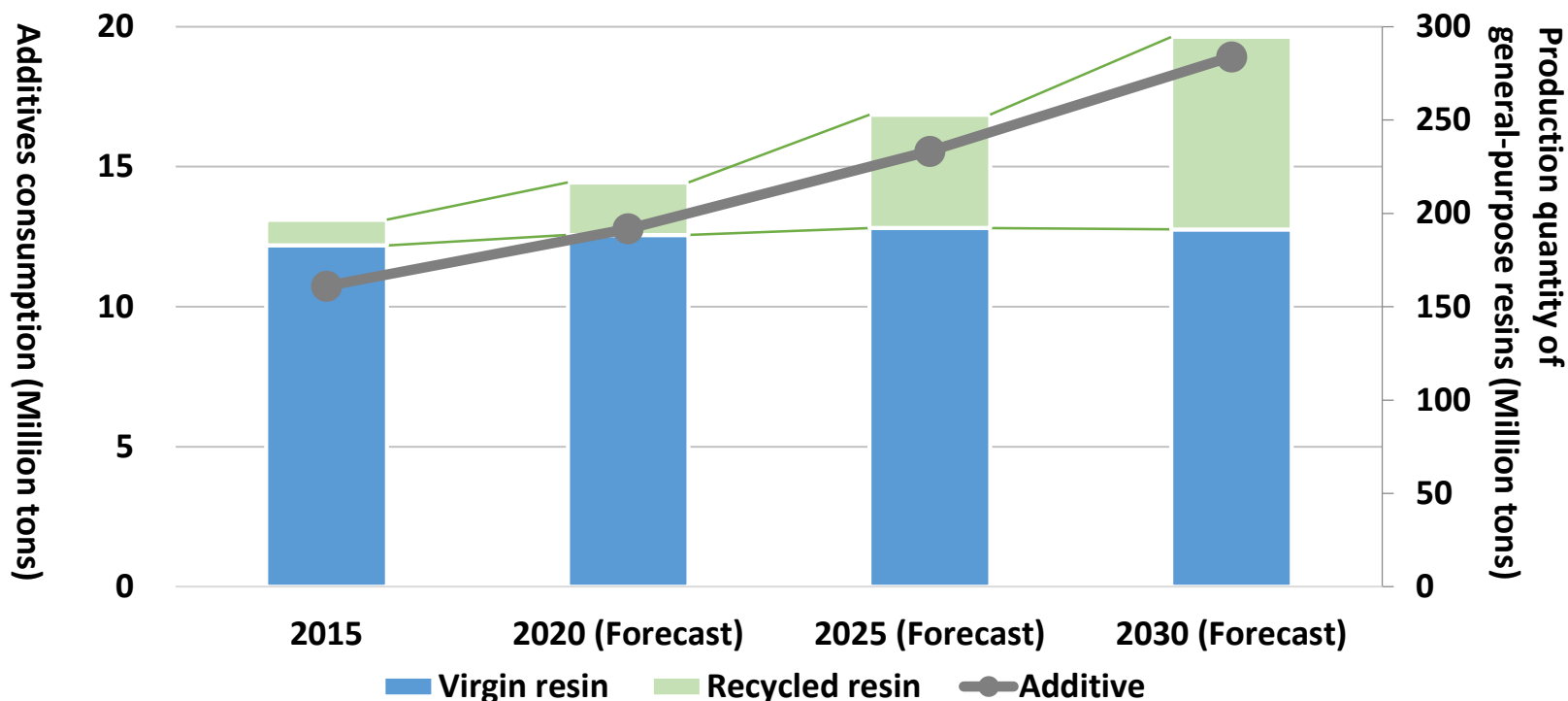
Plastics

Lighter than metals, easy to process, barely conduct electricity and heat, and hygienic

Used in various situations of daily life, including automobiles, building materials, home appliances, packaging materials, sanitary goods and medical care. Consumption increasing in emerging countries

- The production quantity of general-purpose resins is expected to increase.
- In particular, the quantity of recycled resins will increase every year.

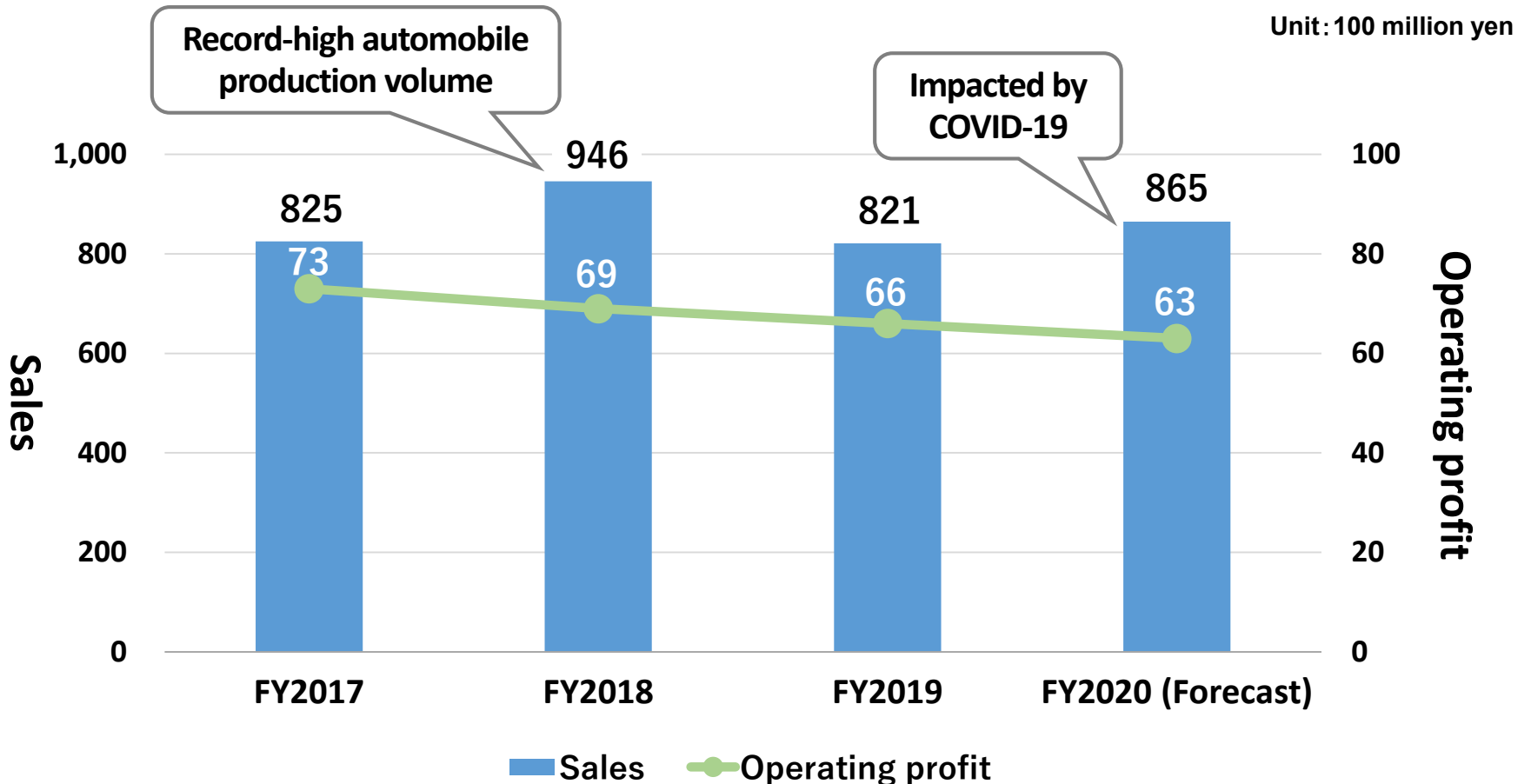
Further contribution of additives are expected.



Source: Townsend2015, Market insights reports@12/5/2020, Estimation based on materials from the Ministry of Economy, Trade and Industry, the Plastic Waste Management Institute, Mitsubishi Corporation and the KPMG website

Performance of the Polymer Additives Business

A core business accounting for nearly 30% of ADEKA's consolidated sales



Supply Chain for ADEKA's Polymer Additives

