

# **PLANTIC™ introduction as Biomass-derived Gas Barrier Material and Future Growth**

September 30, 2019

KURARAY CO., LTD.

# About Plantic Business

- Company name: Plantic Technologies Limited
- Location: Altona (near Melbourne), Victoria, Australia
- History:
  - 2002 Establish a corporate entity of industry-academia collaboration based on the technology developed by Australia's CRC\*  
(\* Co-operative Research Centre for International Food Packaging)
  - 2003 Commercialize biodegradable resin PLANTIC™ and adopted for confection sheets
  - 2009 Commercialize high-barrier packaging materials
  - 2011 Business start with the major Australian supermarket “Coles”
  - 2015 Join to Kuraray Group by acquisition
  - 2018 Decision made to invest in PLANTIC™ resin production in the U.S.  
(Scheduled to start operation in early 2020)  
Impairment loss in Plantic business
- Business overview:
  - Development/Production/Sales of biodegradable barrier materials using special starch as the raw material
    - PLANTIC™ mono-layer film and sheet
    - PLANTIC™ multi-layer film and sheet

# Efforts to Address the Sustainable Development Goals (SDGs)

The Kuraray Group creates economic and social value through the provision of its excellent products and services to the market and aims to contribute to the realization of a sustainable society.

## SUSTAINABLE DEVELOPMENT GOALS KNOWLEDGE PLATFORM



# What is PLANTIC™?

Ethylene vinyl-alcohol copolymers

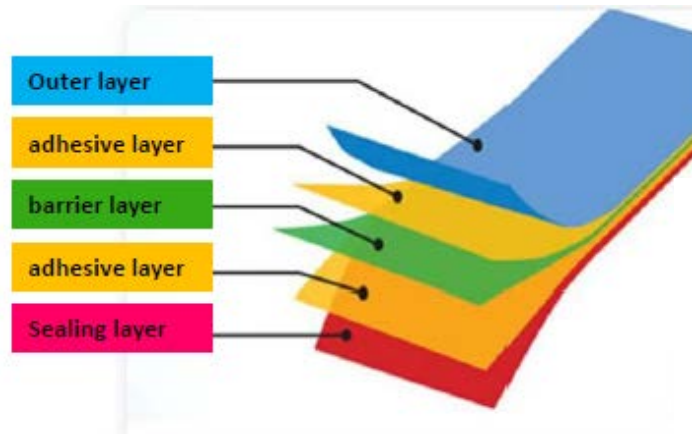


- Not biodegradable
- Petroleum-derived
- Use: Food packaging materials, fuel tanks, etc.
- Oxygen barrier performance:  
(20°C•65%RH) **0.7cc.20μ/m<sup>2</sup>•day•atm**



- Biodegradable
- Biomass-derived
- Use: Food packaging materials  
(mainly MAP packaging for meat and dry food)
- Oxygen barrier performance:  
(20°C•65%RH) **0.8cc.50μ/m<sup>2</sup>•day•atm**

- The basic manner of use as a barrier product is the same.



Reference:  
LDPE oxygen barrier performance:(20°C•65%RH)  
**6,700cc. 20μ /m<sup>2</sup>•day•atm**

# PLANTIC™ Environmental Certification of Products

Mono-layer  
film

TUV (Austria) certification mark



Biodegradable WATER & SOIL

Compost INDUSTRIAL & HOME

Biobased

Multi-layer  
film

Japan Organics Recycling Association certification mark



商品名: PLANTICシリーズ(Rタイプ)  
対象型式: R, RE  
登録番号: 150013

Multi-layer  
RE grade



商品名: PLANTICシリーズ(Eタイプ)  
対象型式: EF  
登録番号: 150012

Multi-layer  
EF grade

- The CO<sup>2</sup> generated by incinerating biomass plastic is excluded from the amount of CO<sup>2</sup> generated in Japan.
- Products granted the biomass mark are eligible to receive an official certificate from the Association indicating the amount of CO<sup>2</sup> reduced.

**Conforms to the basic principles of the Ministry of the Environment's plastic resource recycling strategy "3R + Renewable".**

# PLANTIC™ Cases of Adoption in Australia

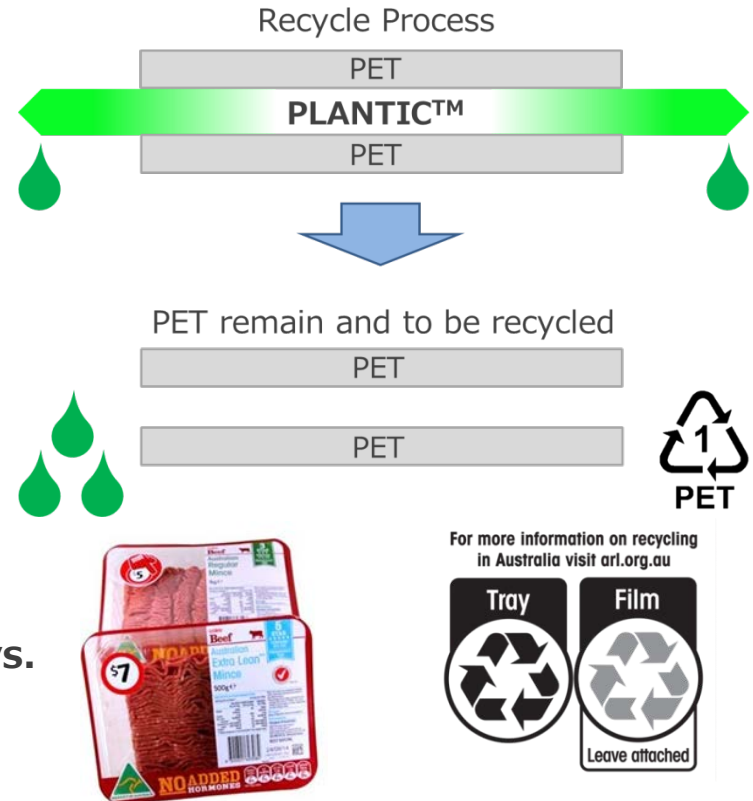
## coles (Major Australian supermarket)

FY19 Sales Revenue: AU\$35,001MM (Retail Business)

Number of stores : 2,445 (June, 2019) -from Coles HP-



- Shop display of processed meat using PLANTIC™ trays.
- PLANTIC™ is used in trays by combined with PET.
- Certified as recyclable containers in Australia.



coles

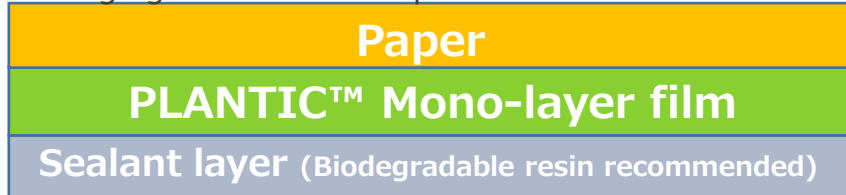
"While the majority of Coles Brand products are now in recyclable packaging, by 2020 all Coles Brand packaging will be recyclable at kerbside or in store."  
(from Coles HP "Sustainability at Coles")



# PLANTIC™ Development of Mono-layer Film Business

- Our proposal as biodegradable packaging materials with paper

Packaging structure example



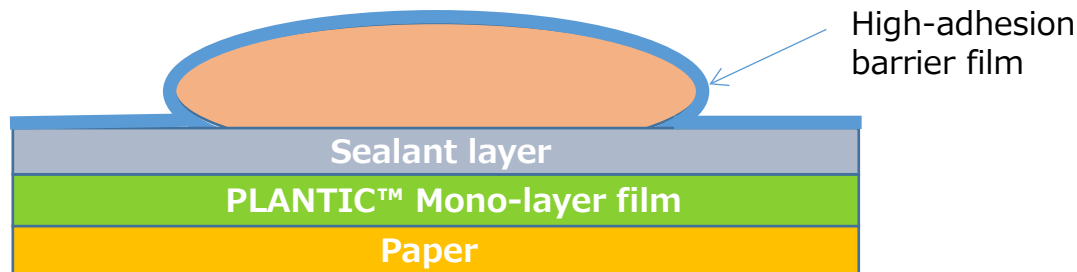
Mainly targeting pouches for dry food with keywords "Biomass", "Biodegradable" and "Compostable".

Example: Roasted coffee bean packaging materials (right)



"Implementation Framework for Actions on Marine Plastic Litter" booth display at the G20 Summit held June 14 to 16, 2019

- Our proposal of barrier materials that can be recycled as paper



Skin-pack is growing and popular form of packaging in Europe  
Three-dimension, Designability, Novelty and No leak of meat juices  
Can be laid or hung vertically and give flexibility in transportation



Skin-pack (meat)

# PLANTIC™ Expansion to Resin Business

## Alliance with Sealed Air Corporation (U.S.)

Sealed Air exclusively deploy the business in North America (U.S., Canada, Mexico).

Manufacturing and sale of PLANTIC™ resin

**Kuraray America Inc.**

Resin production facilities currently under construction

Resin Supply

Manufacturing and sale of multi-layer film packaging products

**Sealed Air Corporation**

Film production line currently under construction

## Sealed Air Corporation

-FY2018 Net Sales: US\$ 4,732.7MM (Food Care: US\$ 2,908.1MM)

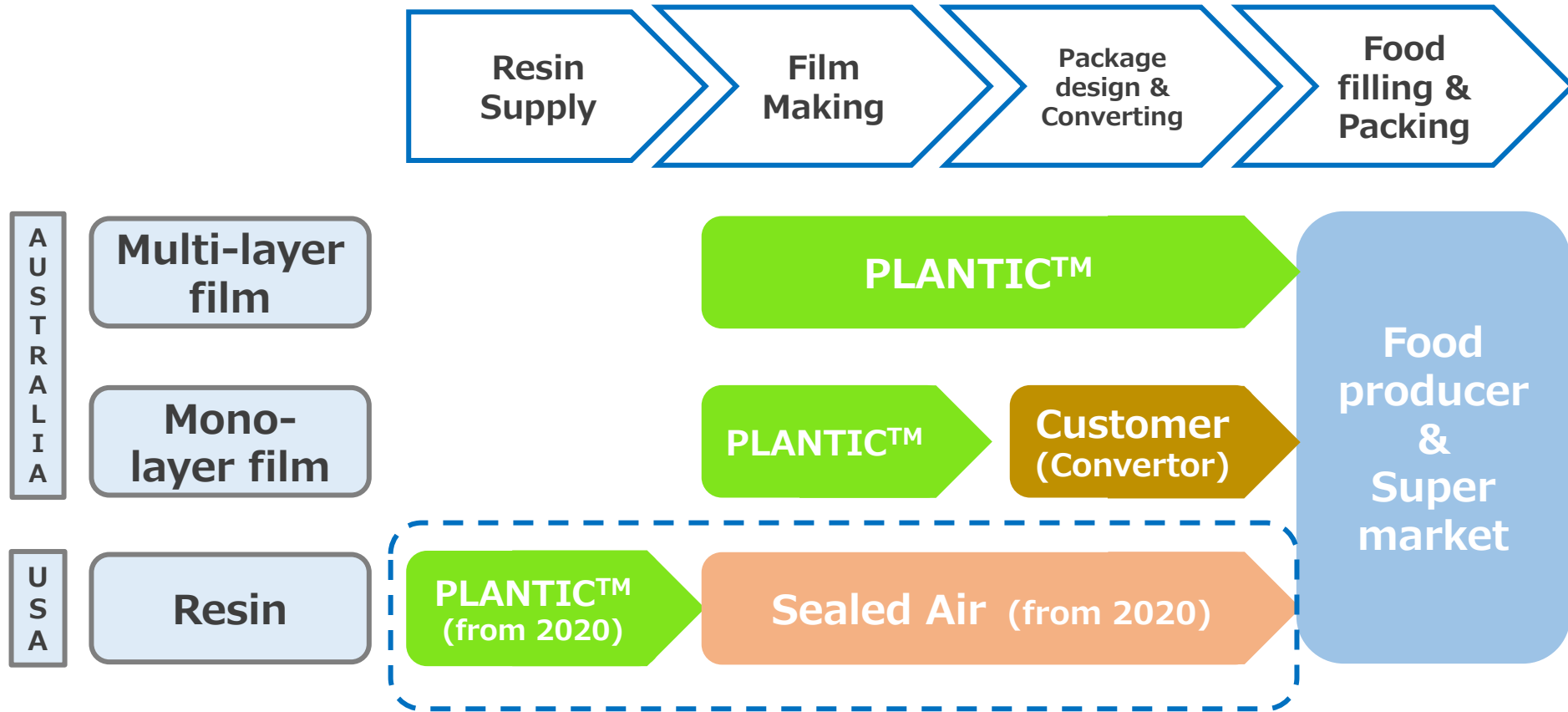
-from Sealed Air HP-

**Sealed Air®**

"At Sealed Air, we pledge to design and advance our innovative packaging solutions to be 100% recyclable or reusable by 2025."  
(from Sealed Air HP "2025 Sustainability & Plastics Pledge")



# PLANTIC™ Overview of business expansion



- Promote sales by cooperation with Sealed Air which has a strong presence in food packaging market in North America.
- By the start of resin business, we're able to make various proposals in the value-chain.

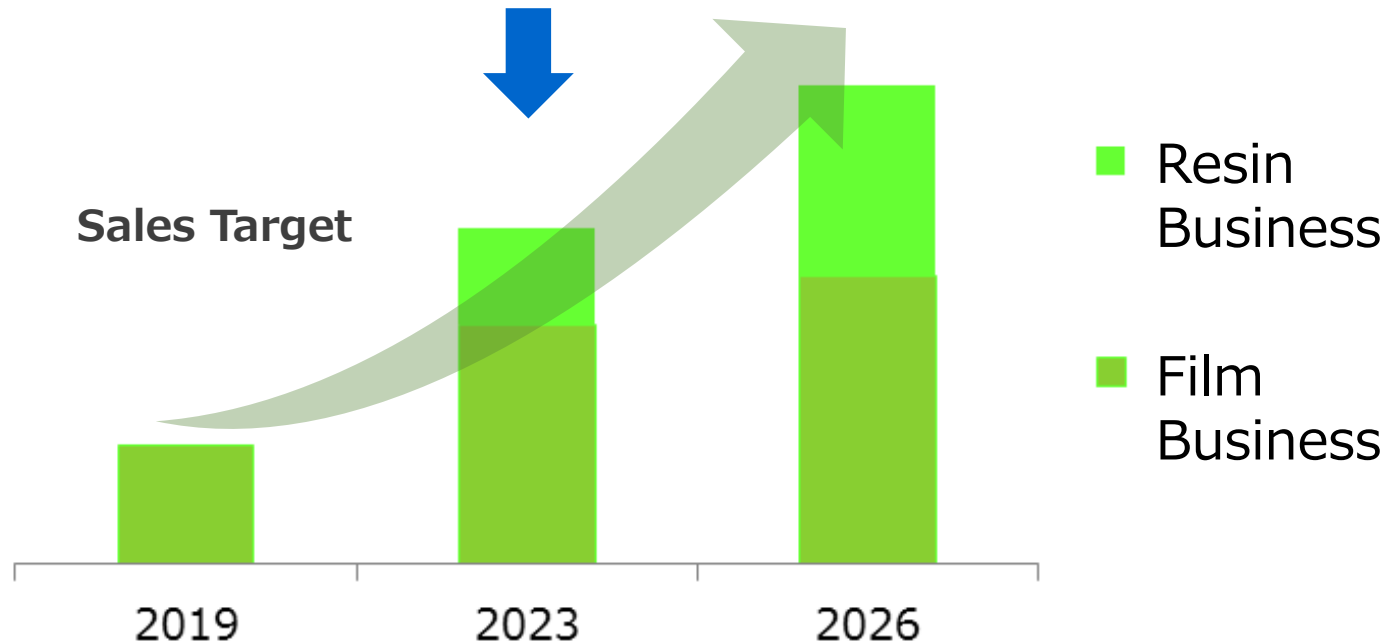
# PLANTIC™ Business Growth Scenarios

Film Business



Resin Business(From 2020)

In addition to business increase of film packaging outside Australia, we accelerate development of new products and application.



**FY2026 consolidated earning target**

**Net sales: Over US\$100 million**

**Operating margin: 20%**

# **Market Development in the automotive industry**

September 30, 2019

KURARAY CO., LTD.

# Kuraray Group Technologies in the Automotive industry

## Safety

PVB film <TROSIFOL™>  
Methacrylic resin molding material <PARAPET™>  
PVA fiber <KURALON™>



## Lighter weight

Heat-resistant polyamide resin <GENESTAR™>  
Styrenic thermoplastic elastomer <SEPTON™>  
Molded hook fasteners <MAGILOCK™>



## Comfortable

Methacrylic Resin Molding Material < PARAPET™>  
Styrenic thermoplastic elastomer <SEPTON™> <HYBRAR™>  
Liquid rubber <KURARAY LIQUID RUBBER™>  
Activated carbon <KURARAY COAL™>  
Melt-blown non-woven fabric



## Low-emission

EVOH resin <EVAL™>  
Heat-resistant polyamide resin < GENESTAR™>  
Activated carbon < KURARAY COAL™ >



# Megatrends & Target Domain in the Automotive industry

## Megatrends

Connected / Autonomous

Shared & Service (MaaS)

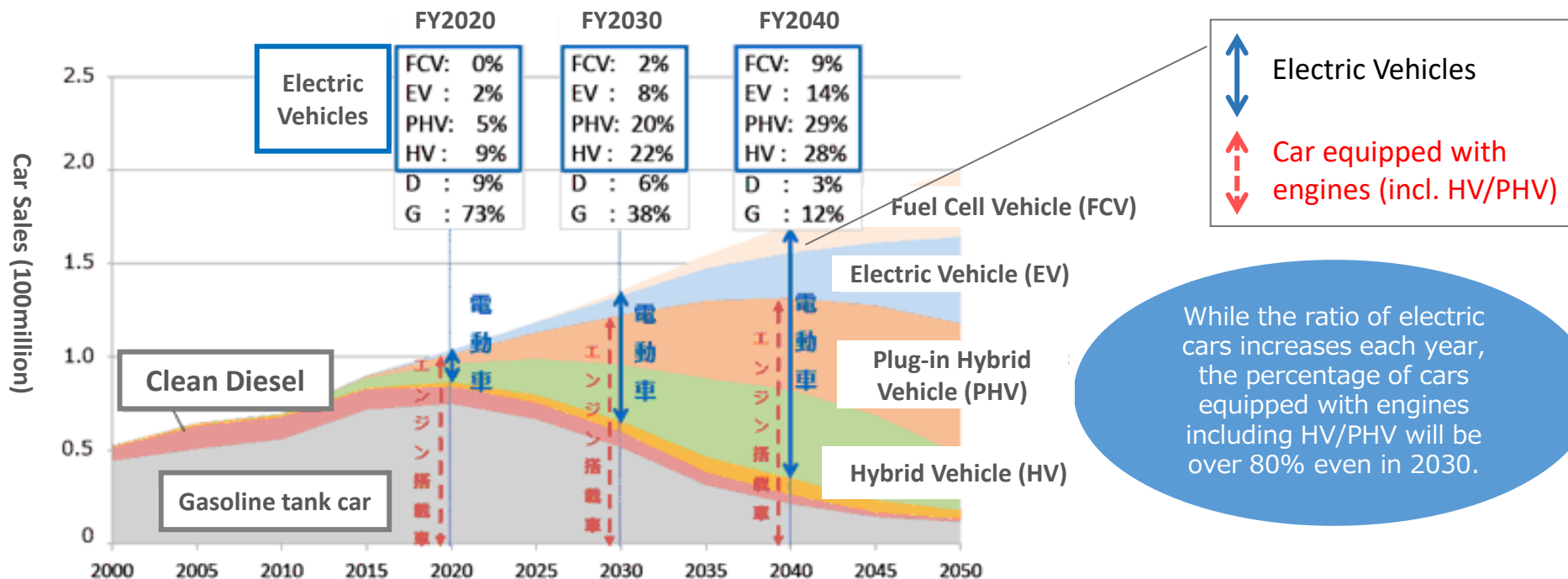
Fuel Diversity

## Kuraray's Target Domain

(1) Fuel management (HV/PHV/FCV)

(2) Electrification

(3) Autonomous Driving



Source: Ministry of Economy, Trade and Industry 2018 manufacturing whitepaper (Created by the Ministry of Economy, Trade and Industry based on IEA "ETP (Energy Technology Perspectives) 2017")

# Megatrends Fuel Management

Market trends	Target parts	Materials needs	Kuraray's solutions
Expansion of the demand for hybrid cars	Gasoline tank Canister	Conversion to a compact module	Heat-resistant polyamide resin <GENESTAR™> High-performance activated carbon <KURARAY COAL™>
Conversion to hydrogen energy	FCV fuel tank	Hydrogen barrier	Gas barrier resin <EVAL™>, etc.

The percentage of cars equipped with engines would be **over 80%** even in 2030.

Increasing requirements for advanced fuel management systems in hybrid vehicles (HV/PHV)

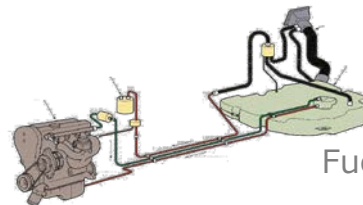


<EVAL™> <GENESTAR™>

Proposal of new fuel management systems based on Kuraray's technology related to high fuel barrier.

Feed line

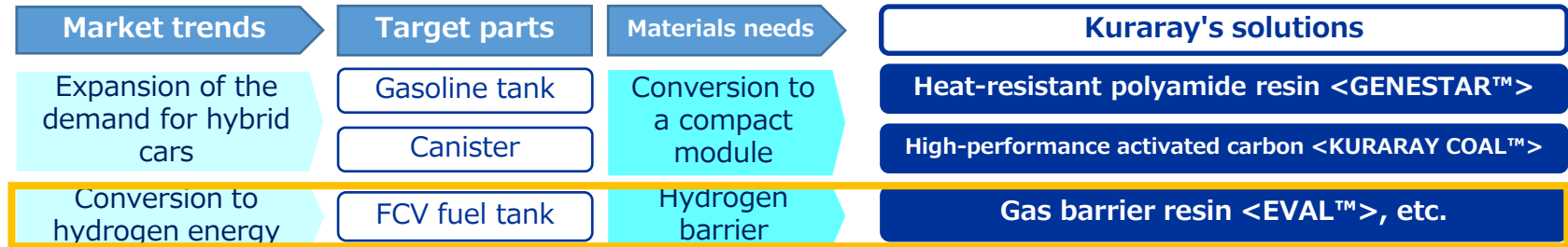
Engine



Fuel tank



# Megatrends Fuel Management



## Increasing requirements for advanced fuel management systems in hybrid vehicles (HV/PHV)



<EVAL™> <GENESTAR™> <VECSTAR™>

Proposal of new fuel cell vehicle (FCV) high-pressure tank based on Kuraray's hydrogen barrier technologies



Market trends	Target parts	Materials needs	Kuraray's solutions
Increased number of electronic control parts (Miniaturization needs)	ECU connector Actuator gear	Stable dimensions, strength, heat resistance	Heat-resistant polyamide resin <GENESTAR™>
Higher battery functionality	Anode Material for Lithium-ion Battery	High input/output characteristics	Hard carbon <KURANODE™>
Heat management	Cooling system	Cooling water resistance	Heat-resistant polyamide resin <GENESTAR™>
Transition to glass thin film	Side glass	High rigidity/sound insulation	High-rigidity acoustic interlayer film <TROSIFOL™>
Resin glazing	Sunroof	Weather resistance/heat shielding	PMMA/PC laminated sheet <PARAMIGHTY™>
Multi-material	Structural parts, etc.	Physical stability	Thermoplastic composite <GENESTAR™>

## Size reduction of electronic control parts Increasing needs for heat management



<GENESTAR™>

Increasing sales to the application such as ECU connectors, actuator gears and heat management system based on higher dimension stability and heat resistance

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## Strong demand for faster charge and longer life of battery



<KURANODE™>

Evaluation for the anode materials for lithium-ion battery, utilizing its high input / output characteristics

# Megatrends Electrification

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## Growing need for lighter structural parts for longer battery mileage



<TROSIFOL™>, <GENESTAR™>

Thinner laminated glasses with high-rigid acoustic interlayer film  
Thermoplastic composites stable even under high temperature and humidity

Market trends	Target parts	Materials needs	Kuraray's solutions
Ultra-high-speed/large capacity response to communications	Sensor antenna	Low transmission loss	LCP film <VECSTAR™>
	DDR5 connector	Dimensional stability	Heat-resistant polyamide resin <GENESTAR™>
Advanced display	HUD	Higher brightness	Intermediate screen micro-lens array
	Each type of display	Improved visibility	PMMA/PC laminated sheet <PARAMIGHTY™>

## Rapid growth of sensor demand caused by the popularization of autonomous driving

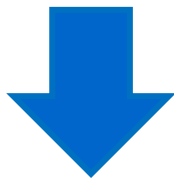


<VECSTAR™> <VECSTAR™ FCCL>

Substrate material which contributes lower transmission loss used in antennas for millimeter wave radar  
Investment for mass-production facilities for LCP film copper-clad laminate was determined to react to various specification requirements

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## High-speed memory DDR5 connector for next-generation servers



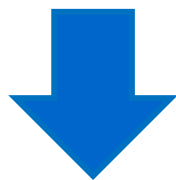
<GENESTAR™>

Co-development with customers, utilizing the features of heat resistance and stable dimensions



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## Growing demand for advanced HUD (Head-Up Display)



### Intermediate screen for head-up display (HUD)

Microfabrication technology to control light diffusion and to improve the display visibility

# Efforts Toward Growth

## Establish business model sustainable even in revolutionary time, as symbolized by "CASE"

### Promotion of cross-divisional work

- Joint events & actions
  - Automotive Engineering Exposition (Yokohama, Nagoya)
  - K2019 (Germany), Elexcon (China), Auto Expo (India), etc.
- Next-generation mobility workshop
- Automobile disassembly training



### From "competition" to "co-creation"

- Horizontal co-creation: Materials manufacturers, equipment manufacturers, design/prototype companies, etc.
- Vertical co-creation: To be a reliable co-creation partner with customers

### Global deployment

- US/Europe: New office in Detroit for customer service and marketing (Europe: planned)
- Asia: New production plant in Thailand (SEPTON™, GENESTAR™, etc)

**kuraray**