

September 21, 2005

# ***Outline and Strategies of Toray Group Plastics and Films Businesses***

## **Chiaki Tanaka**

**Senior Managing Director of the Board,  
General Manager, Plastics and Films Division**

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## **I. Outline of Toray Group**

### **Plastics & Films Businesses**

## **II. Outline and Strategies of Plastics Businesses**

## **III. Outline and Strategies of Films Businesses**

## **IV. Summary**

# **I. Outline of Toray Group**

## **Plastics & Films Businesses**

## ***Aspects of Toray Plastics & Films Businesses***

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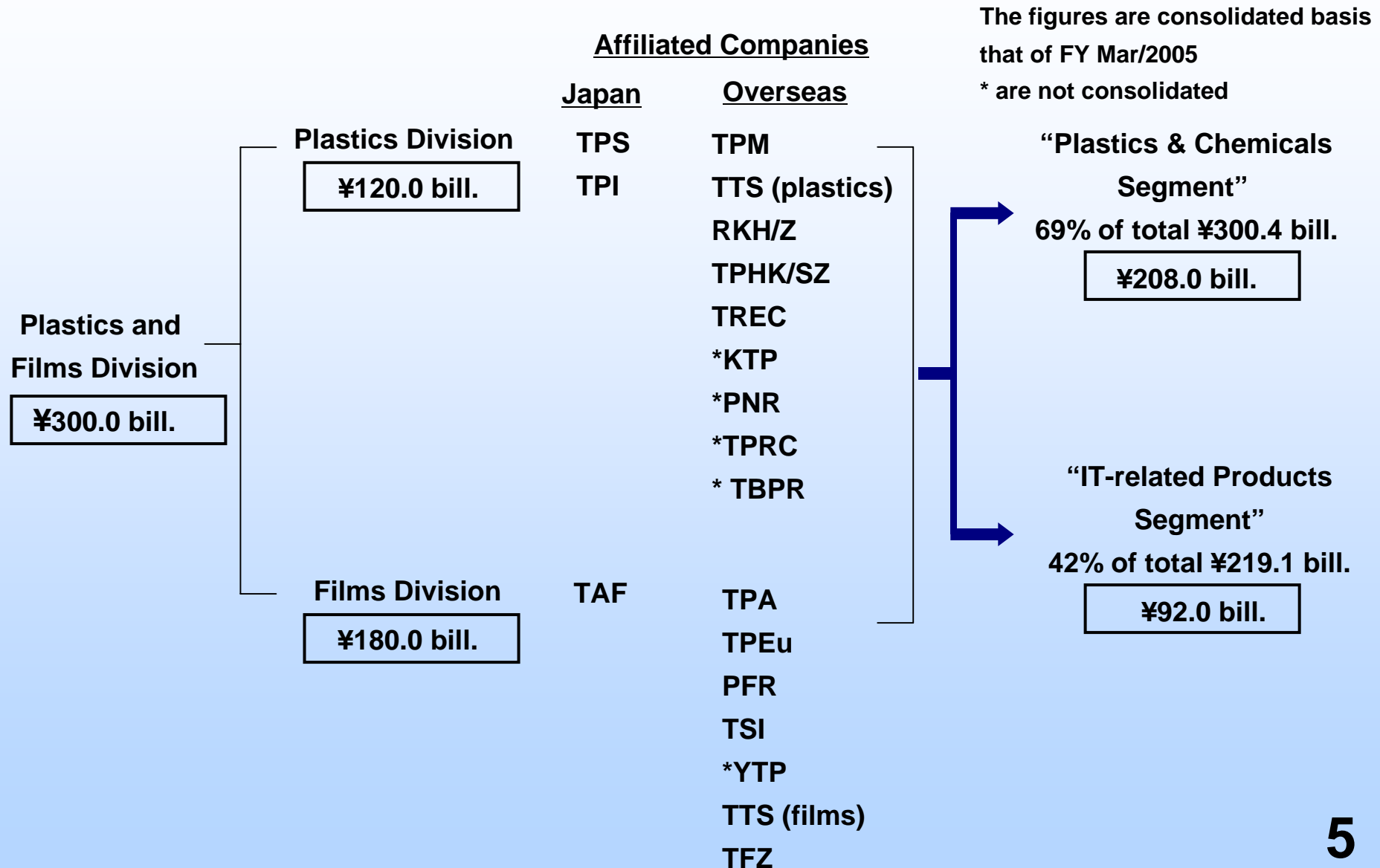
- 1. Pioneer of “High Performance” plastics and films businesses**
- 2. Expanding business globally**
- 3. Integrating vertically from raw material to processed products**

**Plastics : raw materials – base resins – compounding – precision processed products**

**Films : raw materials – polymer films – processed film products**

- 4. Numbers of global NO.1, Only 1, and First 1 products**
- 5. Supporting the expansion of high technology industries (IT, Flat Panel Display, automobile, etc.) through continuous development of advanced materials**
- 6. Penetrating in various part of industrial applications**
- 7. Key business that supports Toray’s foundation businesses and strategically expanding businesses (IT-related and environment businesses)**

## Current Situation of Toray Plastics and Films Businesses (1)

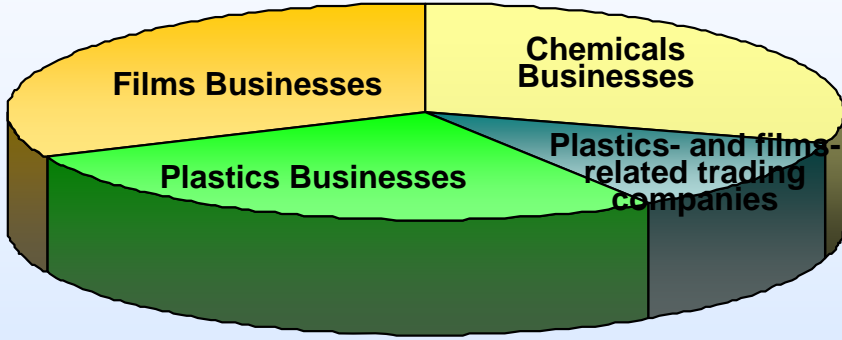


# Current Situation of Toray Plastics and Films Businesses (2) **TORAY**

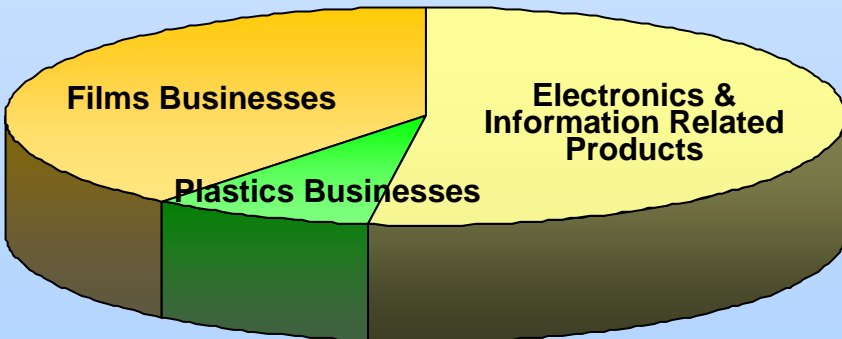
- consolidated net sales of FY Mar/2005

Unit : ¥ Billion

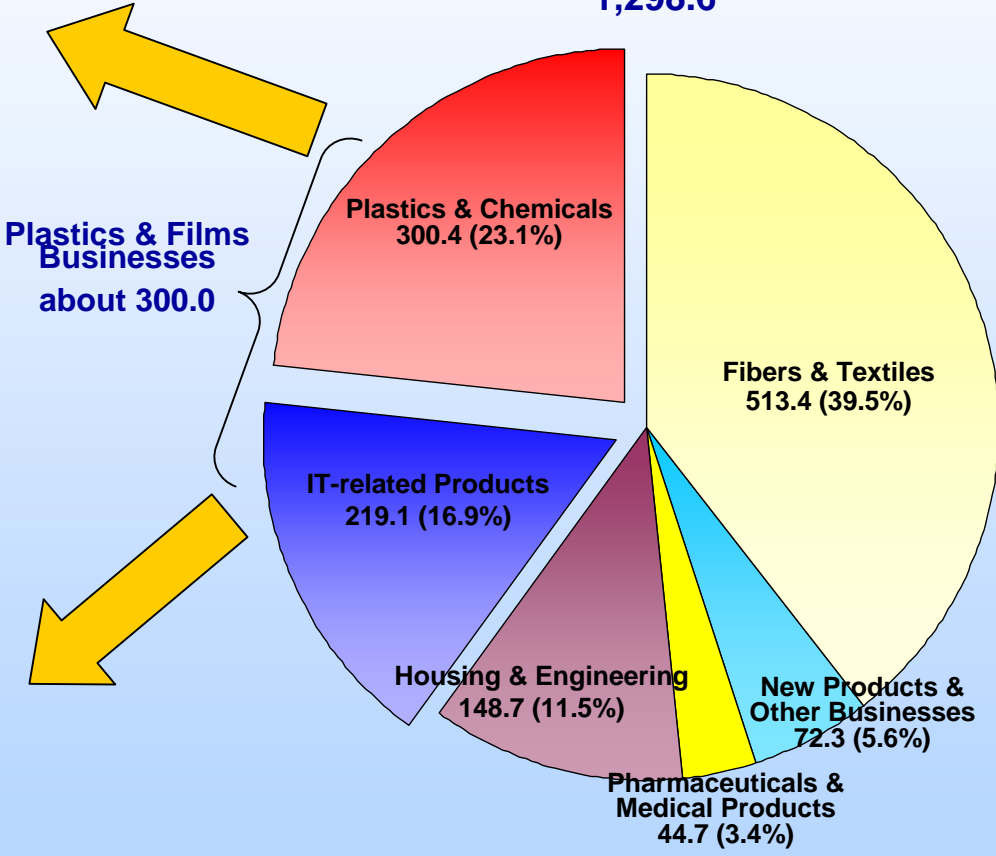
## Plastics & Chemicals



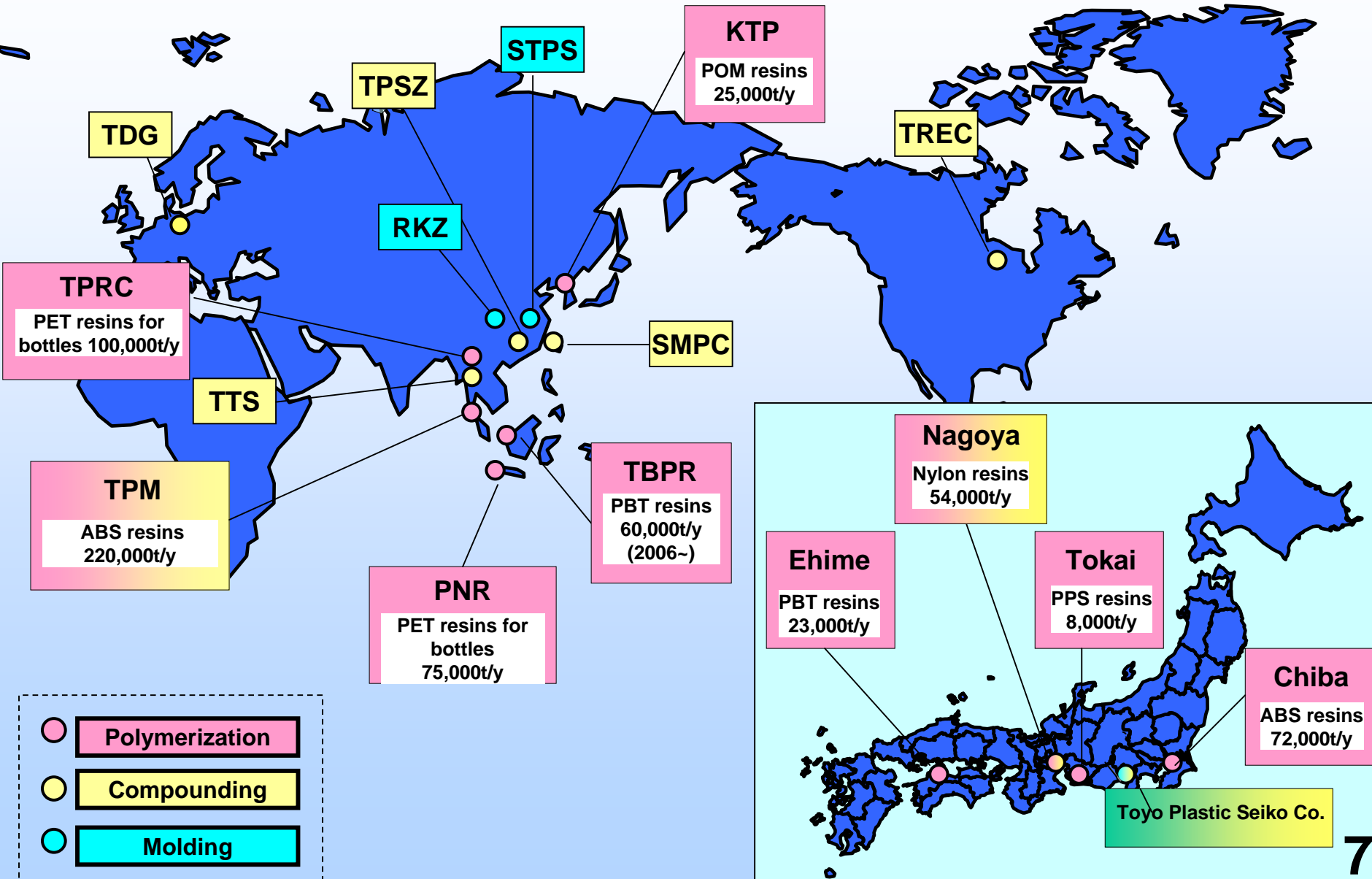
## IT-related Products



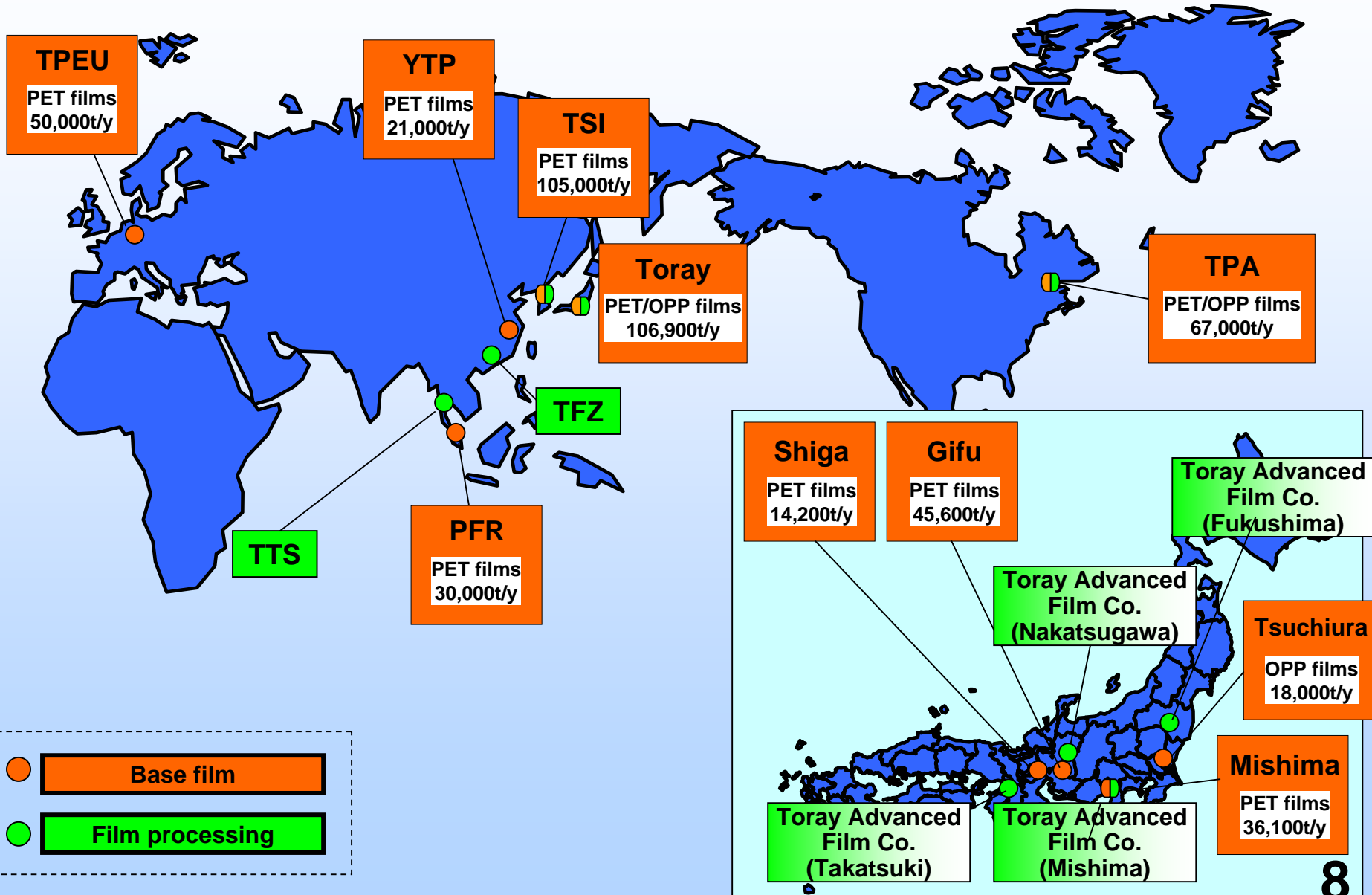
## Toray Group 1,298.6



## Plastics Production Bases



## Films Production Bases





## ***Strategies for Sustainable Growth of Plastics & Films Businesses***

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### **1. Create added values through Business Structure Reform**

- Supply advanced materials into growth areas based on polymer chemistry, organic synthetic chemistry, biochemistry, and nanotechnology
- Expand proactively to the downstream processing businesses
- Commit to the improvement of global environment

### **2. Lead the World's Performance Plastics & Films Industries through Global Expansion**

- Strengthen group-alignment , global operations, and global re-engineering

**3. Deepen “Customer Creed” Further**

- Work in close partnership and collaboration with customers
- Provide 4S to customers

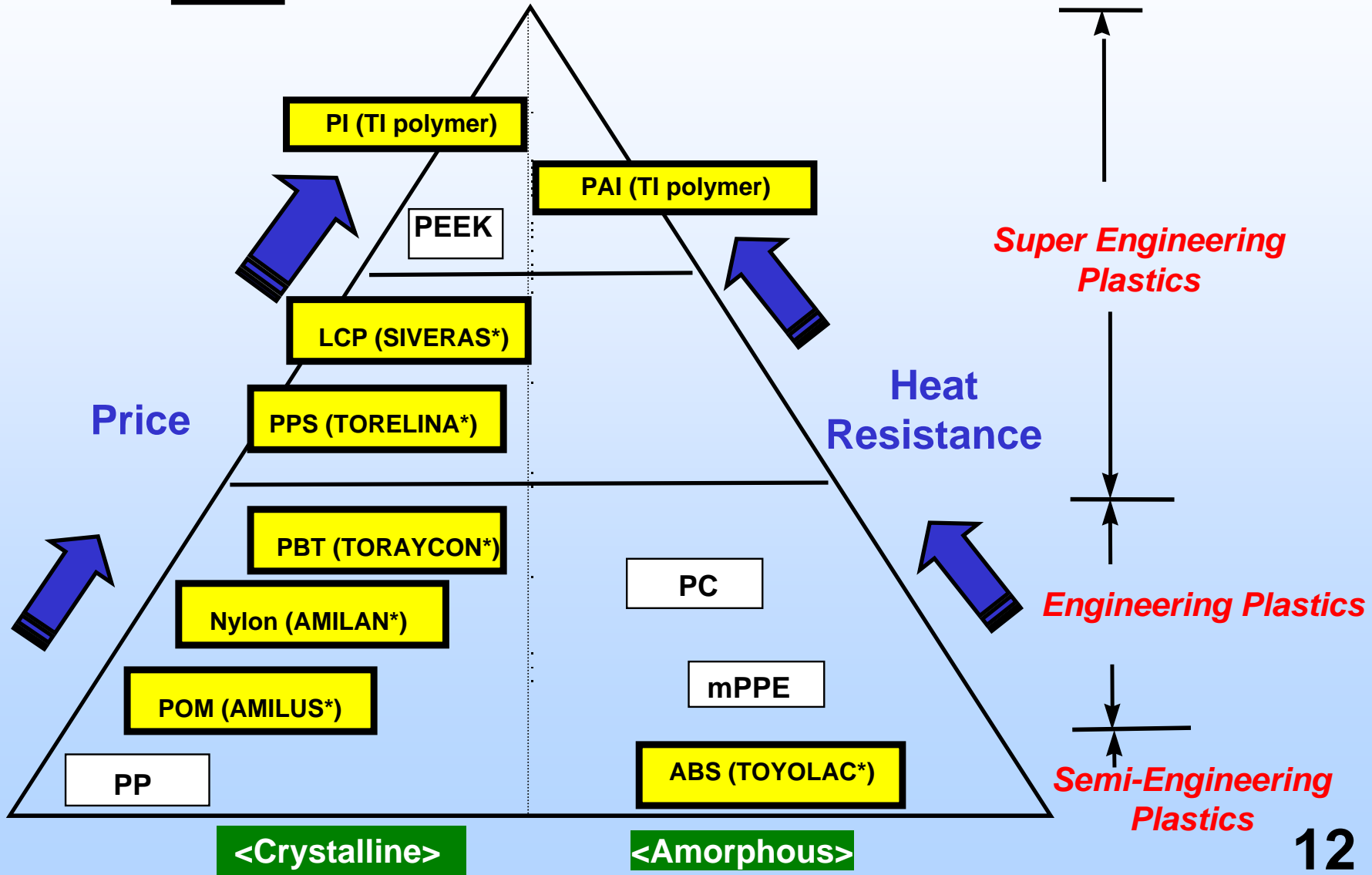
**(Solution, Surprise, Satisfaction, Success)**

**4. Promote Global Alliance**

## **II. Outline and Strategies of Plastics Businesses**

# Product Map of Toray Plastics

**Yellow box** : Toray products (\* brand names in brackets)



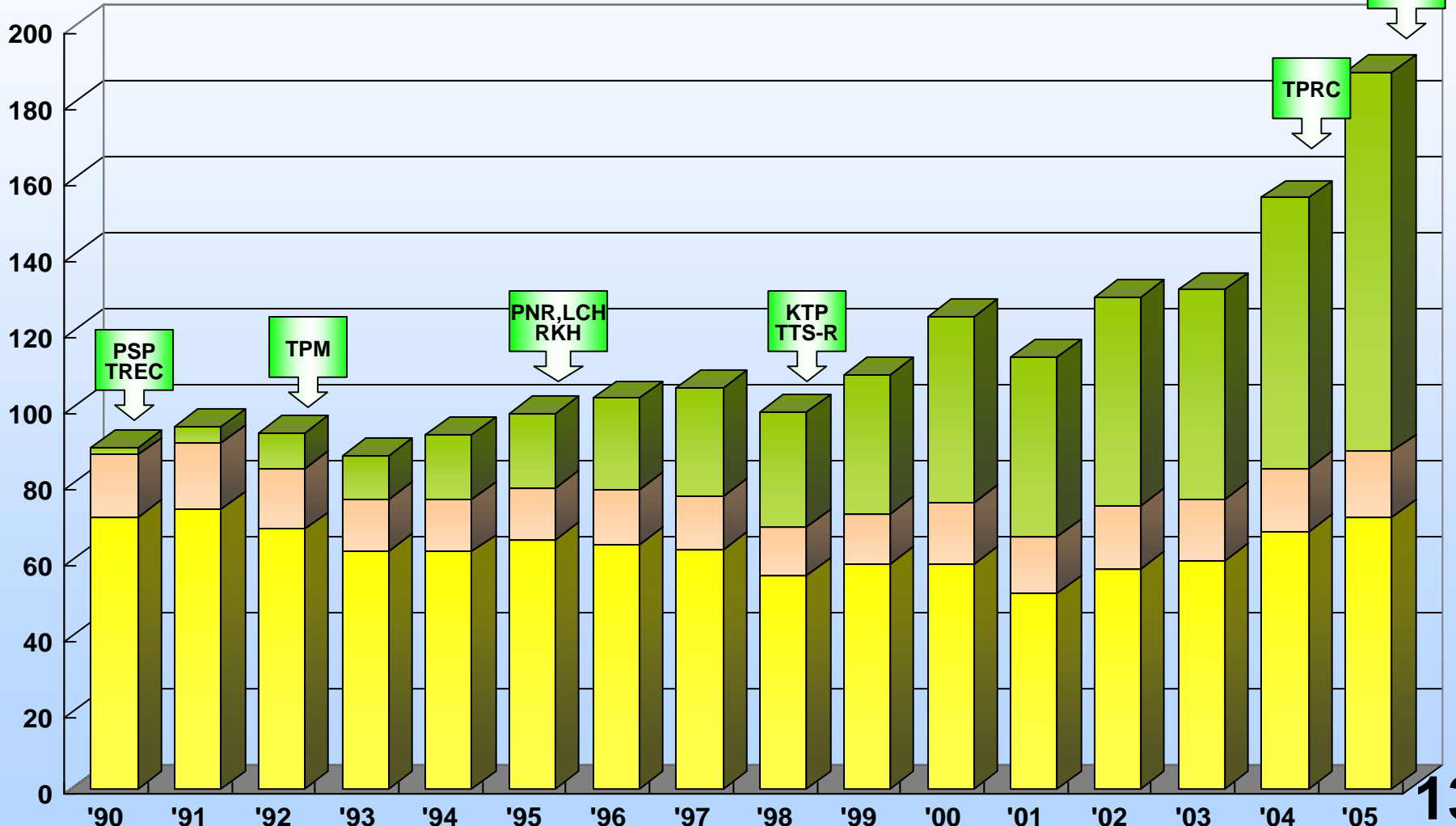
# Sales trends in s Businesses



Sum total including non-consolidated subsidiaries and affiliates

Unit: Billion Yen

Including Internal Sales



13  
(Forecast)

## Major Tasks and Expansion Strategy of Plastics Businesses

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### 1. Ensure top share in the fast-growing engineering plastics market in Asia

Toray's market share (engineering plastics) in Asia : Mar/05 15%  Mar/11 20%

Enhancement of a global supply bases

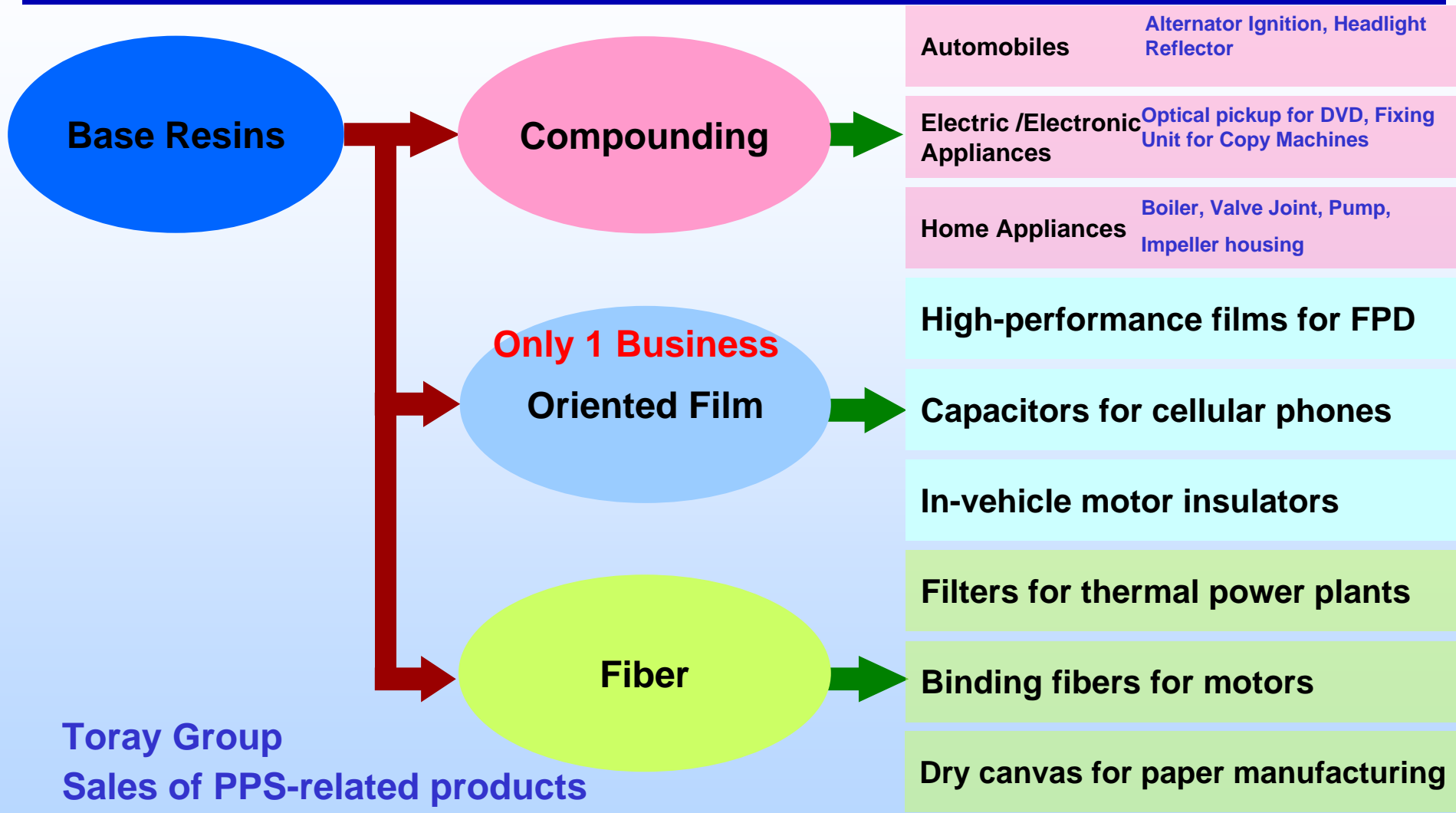
- Polymerization Capacity Expansion Plan -
  - ★ PBT resin : planned to start in Mar/06 (Malaysia)
  - ★ ABS, Nylon, PPS, LCP resins are under consideration
- Compounding Capacity Expansion Plan -
  - ★ South China, TTS (Thailand) : capacity expansion underway
  - ★ East/North China, Malaysia : under consideration

### 2. Transform to solution-proposal business models → high-value added, highly-profitable businesses

Polymer design technology + molding technology + product design technology  
→ promotion of positive proposal of new applications and advanced materials

### 3. Respond to environmental issues and develop environment-friendly materials

# PPS Resin, Torelina\* -Total Business Development of Resins - Films - Fibers



Toray Group  
Sales of PPS-related products

**World No. 1**  
 ¥ 12.5 billion (FY Mar/06) ¥ 25.0 billion (FY Mar/11)

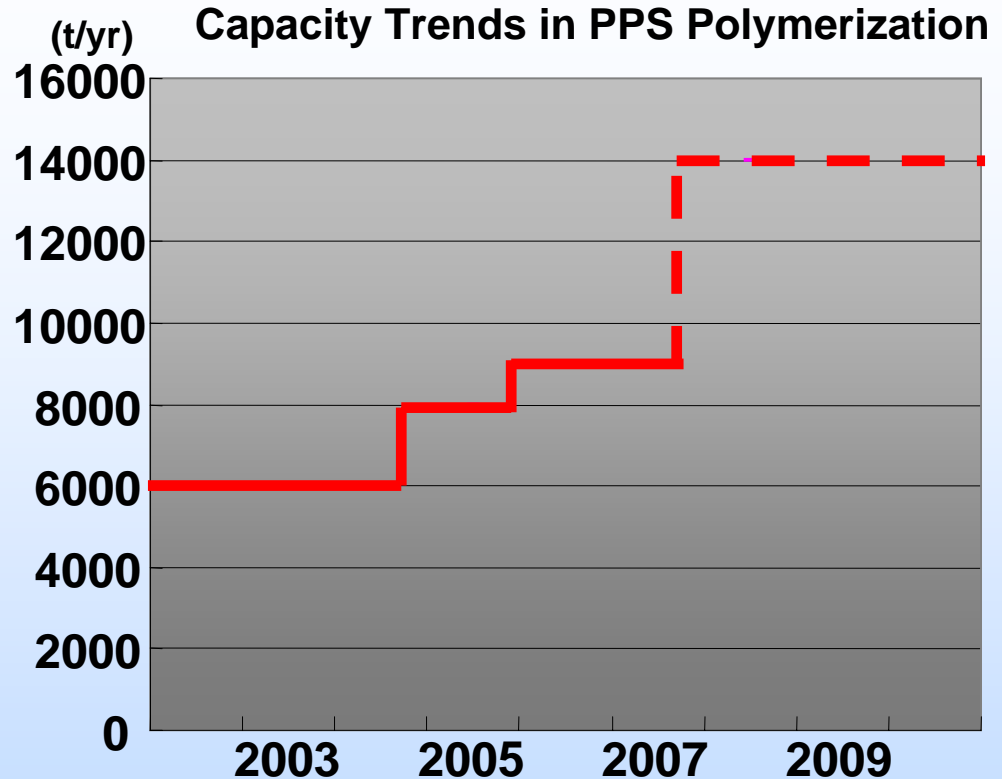
## Expansion Plan of PPS Resin, Torelina\*

### Polymerization capacity

- Autumn '04 Increased by 2,000t (for compounding)
- End of '05 Increase by 1,000t (for fibers, films)
- '07 Increase by 5,000t planned at Tokai Plant

### Compounding capacity

- Autumn '03 Started in-house PPS compounding in China (at TPSZ, Shenzhen) first as PPS resin manufacturer
- End of '04 Increased one line to the current production capacity of 3,000t/yr





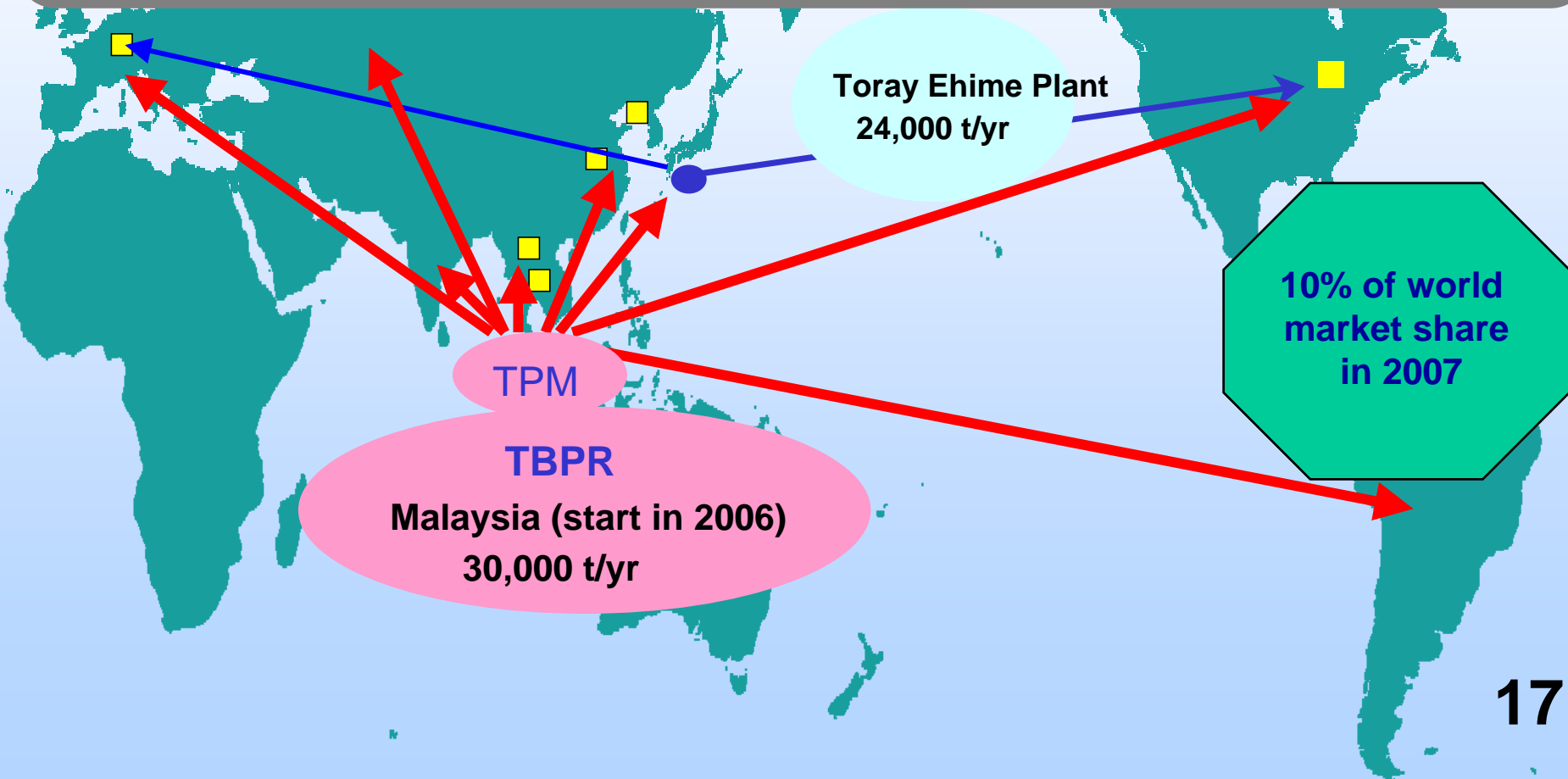
## Global Operation of PBT Resin, Toraycon\*

TBPR

- World No.1 in **quality and cost competitiveness**
- Toray's world's advanced **polyester consecutive polymerization technology**
- **Stable procurement at low price** of major raw material BDO from **state-of-the-art facility** of BASF subsidiary

Ehime Plant

- Development of **high-value added products** based on **co-polymerization technology** and **high-performance alloy technology**



# Strength of PBT Resin, Toraycon\*

## Strength of Toray PBT Resins

The only Japanese manufacturer that owns overseas production base  
 Outstanding development capability supported by co-polymerization technology and high-performance alloy technology

### Co-polymerization Technology (Polymer design)

Strain reduction of inside of molding by crystalline control

Valves  
 Metal-insert parts such as sensors



Enhanced flexibility by tenderization

Control cable liners, etc.



### High-performance Alloy Technology

Polyester nano-alloy (Impact resistance, Chemical resistance)

Automobile exterior parts such as door handles



PBT / ABS alloy (Impact resistance, Dimensional stability, Heat-cycle resistance)

Electric / electronic component chassis such as automobile door-lock housing and motor fans



PBT / PET alloy (Low warpage, Good appearance)

Gas range handle



## Global Operation of ABS Resin, Toyolac\*

### Strength of ABS resin, Toyolac\*

The only Japanese manufacturer that owns overseas production base

- manufacture same grade at TPM for overseas and at Chiba Plant for domestic

Transparent ABS- World No.1 share

Sustainable antistatic grade - world First one product

[Specialty Product]  
Transparency  
Antistatic  
Alloy

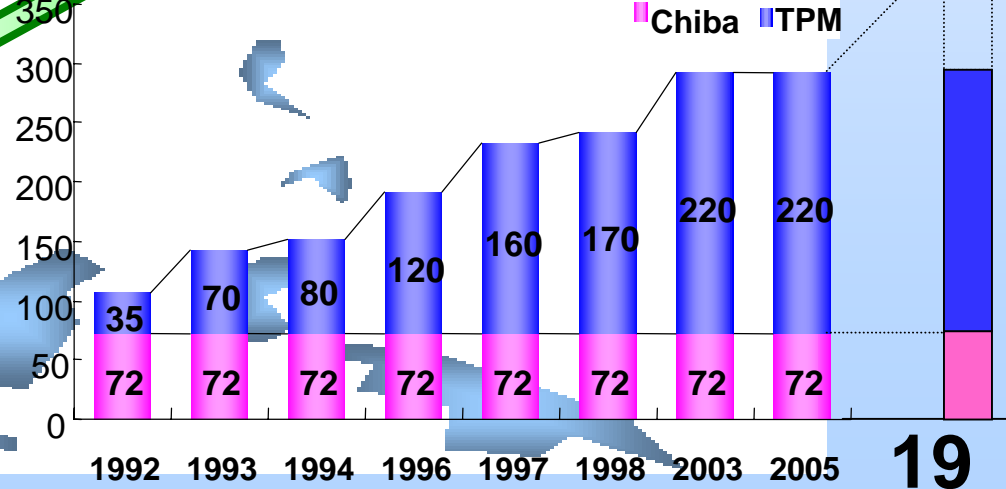
Chiba Plant

TPSZ  
compounding

TPM

Commodity  
Flame retardant  
Heat resistant

Capacity Trend at TPM and Chiba Plant (thousand t /yr)

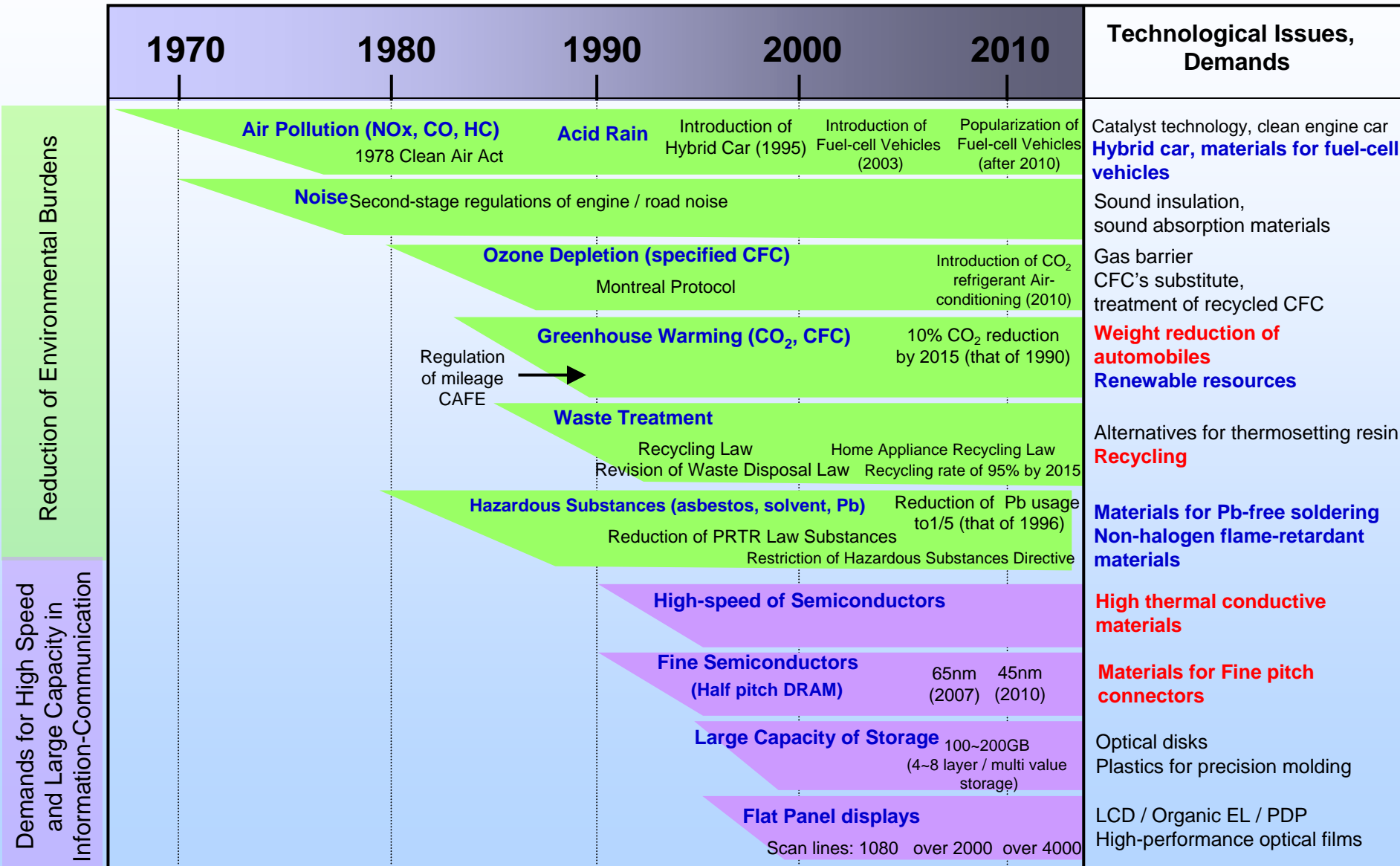


Toray Plastics Malaysia

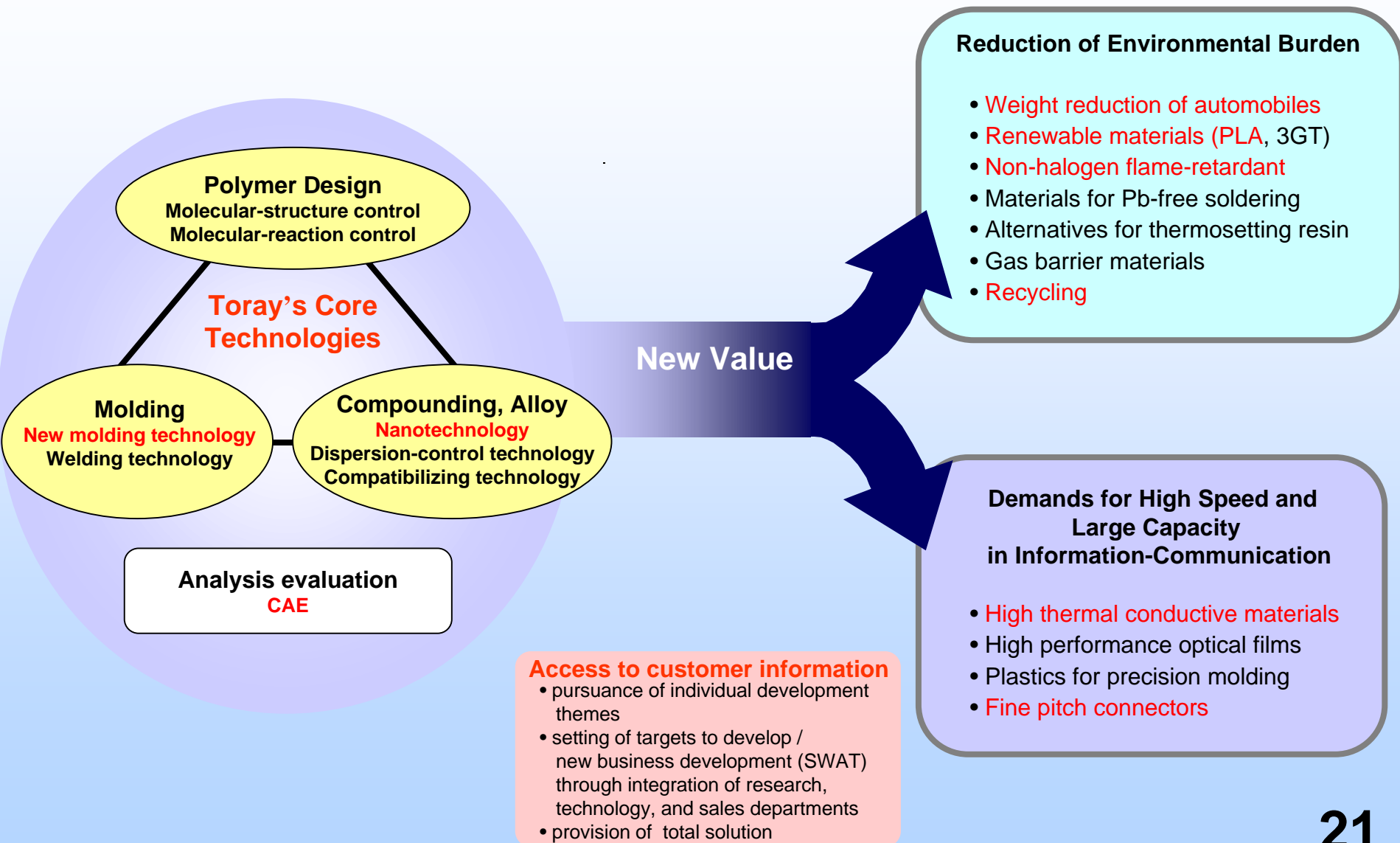


Technology Centre  
Opened in March '05

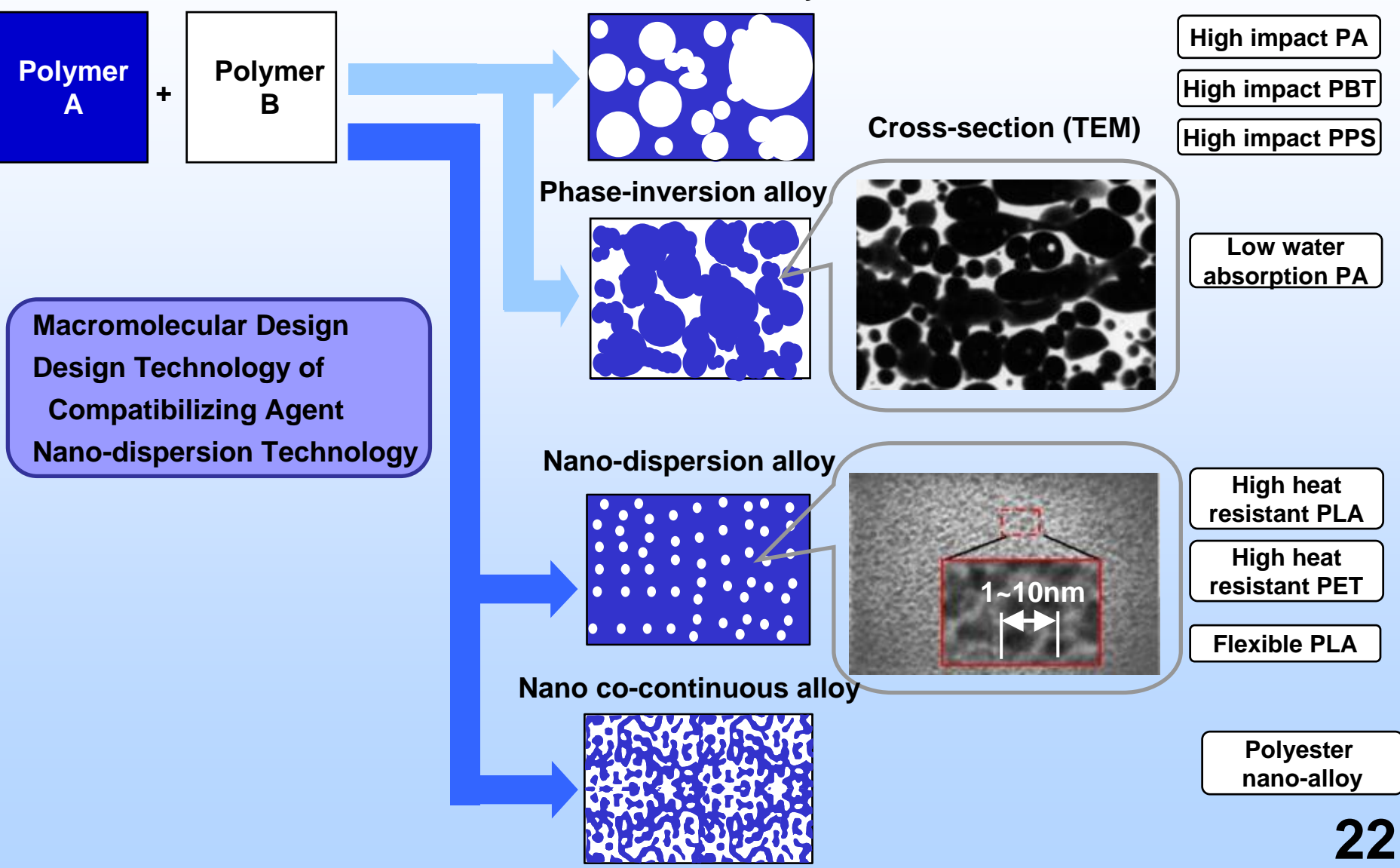
# World Trends related to Plastic Businesses



## Toray's Strategy in Technological Development



# Toray's Nano-alloy Technologies

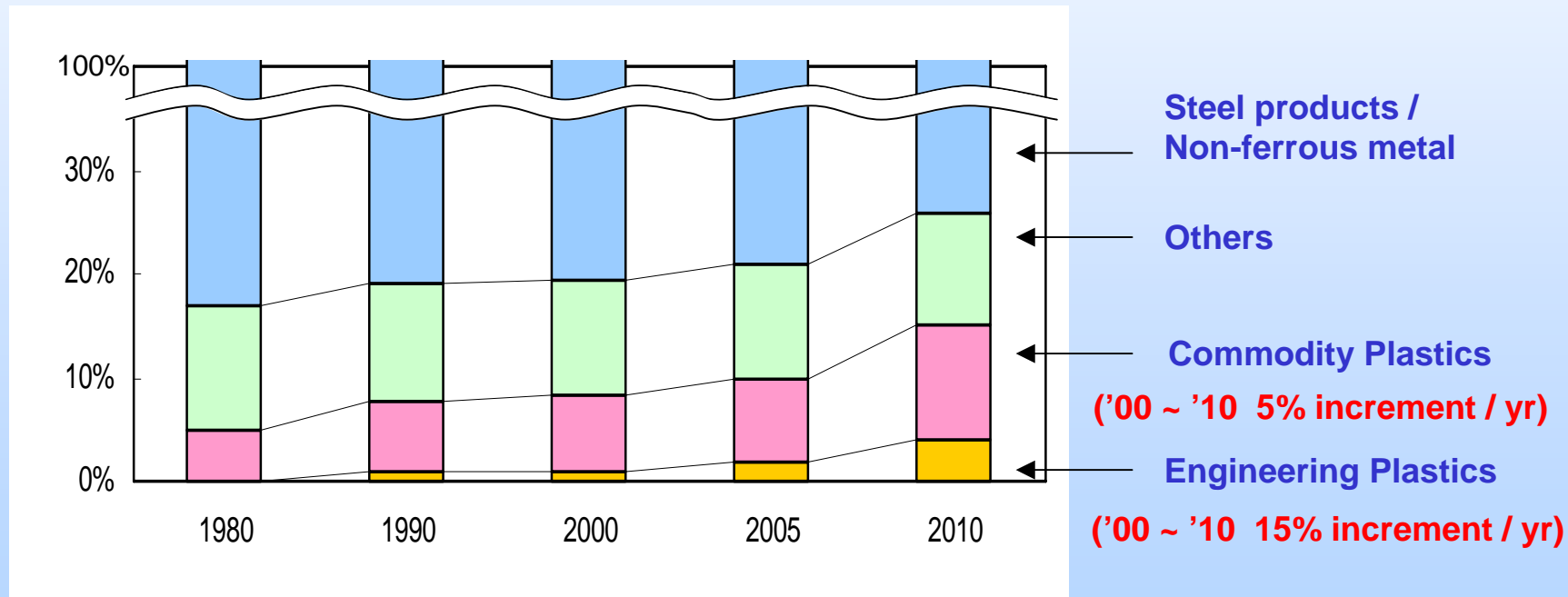


## Toray – A Market Leader of Engineering Plastics for Automobiles

### Toray's advantage for automobile applications

- Can offer wide array of product lineup as a comprehensive manufacturer of engineering plastics
- Strong product development capability due to tie-up with automobile manufacturers
- Preferential allocation of workforce to automobile applications
- Has workforce (production, sales, technology and research) in Nagoya, which is related especially with Toyota Motor Corp.

### Rate of usage of Plastic Materials in Automobile Parts



~ Trends of Usage of Plastic Materials ~

Weight reduction / Processability / Modularization / Designing

## Modularization of Automobile Parts

### Modularization

- Innovative cost reduction  
→ breakthrough in cost reduction limits of each components
- Weight reduction through reducing numbers of components  
→ improvement of fuel efficiency, CO<sub>2</sub> reduction

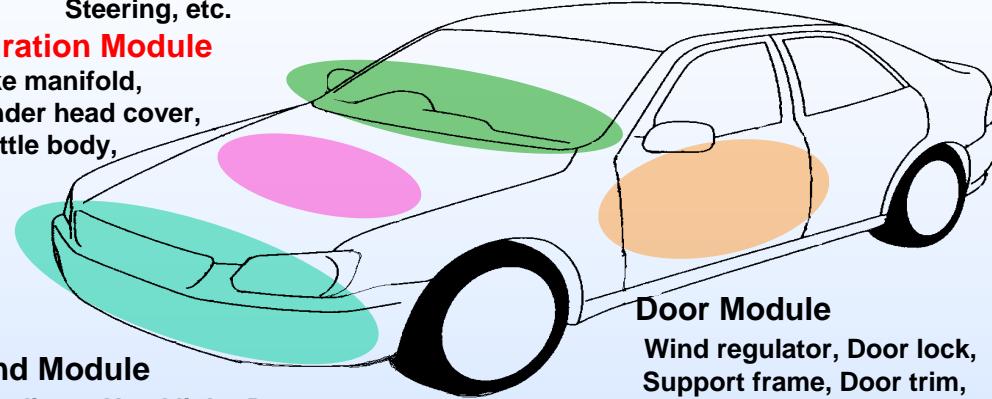
### Major Target Items for Modularization

#### Cockpit Module

Instrument panel, Meter, Steering, etc.

#### Aspiration Module

Intake manifold, Cylinder head cover, Throttle body, etc.



#### Door Module

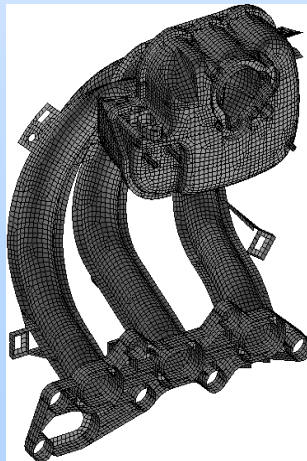
Wind regulator, Door lock, Support frame, Door trim, etc.

#### Front End Module

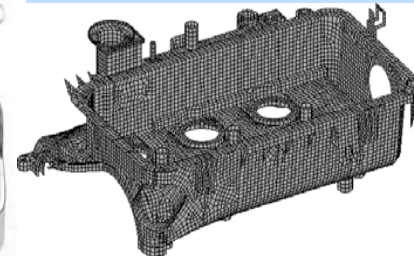
Frame, Radiator, Head light, Bumper, etc.

### Example of Aspiration Module

Intake Manifold  
(Nylon6 GF30)



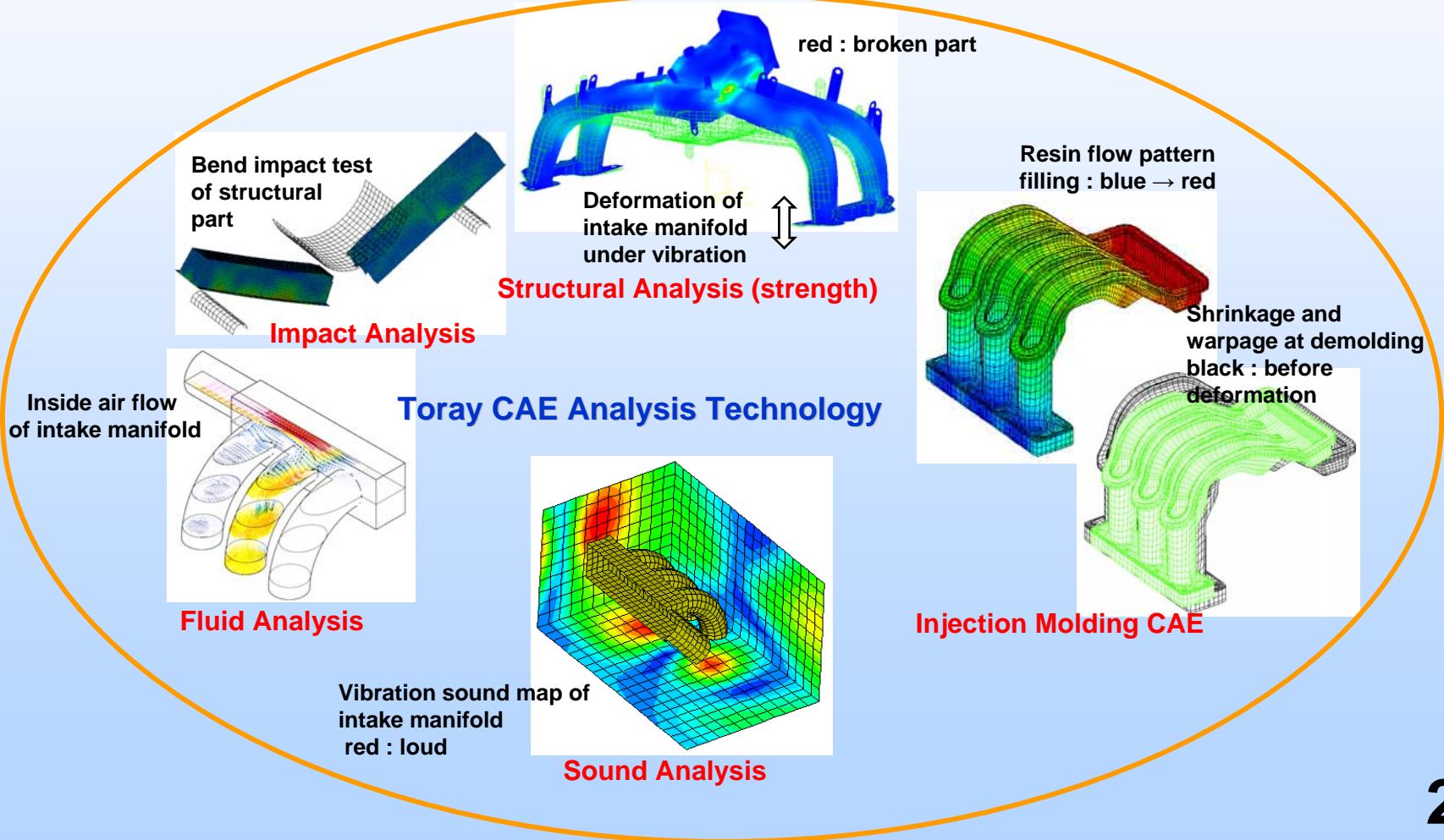
Cylinder Head Cover  
(Nylon6 GF45)





## Toray's CAE Analysis Technology (proposals for material development)

**CAE : Virtual production trial, virtual testing through computer simulation**  
- investigation of strength, reducing numbers of new-product prototypes by investigation in advance of molding conditions

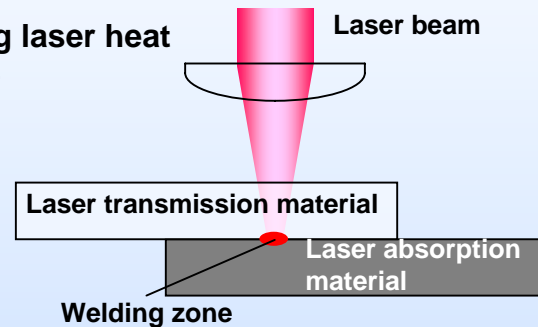


## Toray's Molding Technologies

Provide total solutions by developing plastic materials best-suited for customer's molding technologies

### Laser Welding

Welding technology utilizing laser heat  
(without vibration nor flash)



Aspiration Valve (laser welding)



### Vibration Welding

Welding technology utilizing frictional heat generated  
under pressure / vibration  
(applicable to wide range of molding shapes)

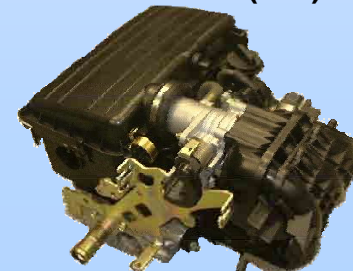
Intake Manifold (vibration welding)



### DSI (Die Slide Injection)

In-mold welding technology consisting of two-stage  
injection molding (applicable to three-dimensional welding  
surface)

Intake Manifold (DSI)




## Plastic Components Expected in Next Generation Power Train

 : Hybrid / Fuel-cell vehicles

 : Fuel-cell vehicles only

 : Partly used

 : Under development

**Power Module**  
Heat cycle, Electrical strength

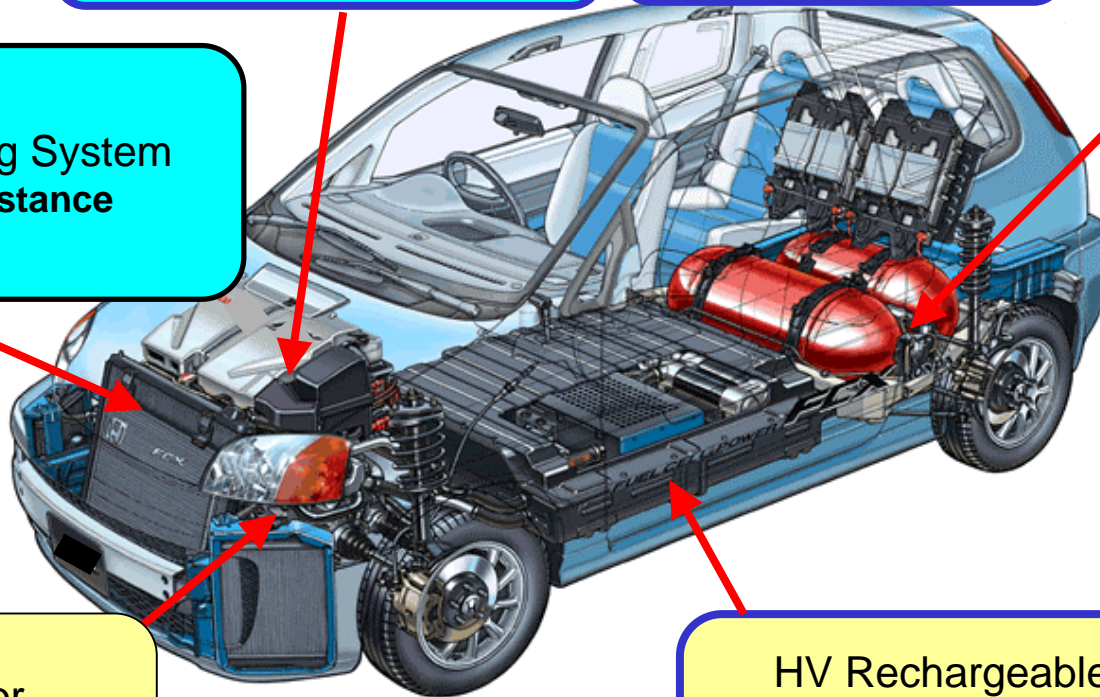
**Capacitor Case**  
Electrical strength

**Fuel Cell Cooling System**  
Chemical resistance

**Hydrogen Tank**  
H<sub>2</sub> barrier

**Motor Insulator**  
Flowability,  
Electrical strength

**HV Rechargeable Battery Cell**  
Battery Case  
Chemical resistance, Dimensional stability,  
Welding ability



## Expansion of Plastic Technologies into IT-related Areas

### Basic Technologies

### Pursuit of Ultimate Performance

### IT-related Areas

#### Polymer Technologies

New Polymers

Polymer Design

High Heat Resistance

High Chemical Resistance

#### Nylon Resin *Amilan\**

Cellular phone components



expanding into cellular phone housing

#### PPS Resin *Torelina\**

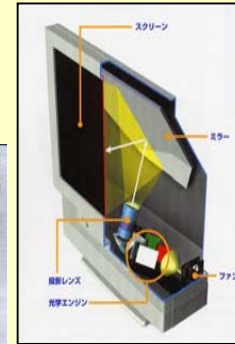
Optical pickup slide-base

30% market share



Projector, Projection TV Lamp case

30% market share



#### Compounding Technologies

Nano-alloy

Reinforced by fibers / fillers

Flame Retardancy

Moldability

#### LCP Resin *Siveras\**

Fine-pitch FPC connector

30% market share below 0.4mm pitch



Hard disk drive

40% market share below 2.5inch



#### Polyimide Resin *TI Polymer*

Fixing component of copying machines



#### Molding Technologies

Flow Analysis

Welding Technology

High Thermal Conductivity

Plant-derived, Biodegradable

#### PLA Resin *Ecodear\**

Note PCs Housing

First 1

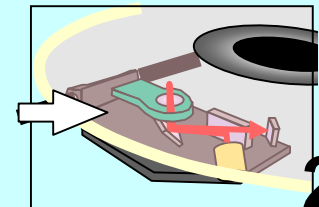
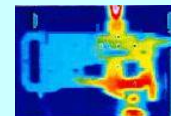


#### High thermal conductive PPS Resin

(planning to commercialize in 2006)

Evaluated in use for optical component

evaluated component



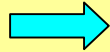
(\*) are Toray's trademarks  
Market shares are estimated by Toray

# Advantage of LCP Resin, Siveras\*

LCP resin is superior in flowability to other engineering plastics due to its liquid crystalline properties in molding.

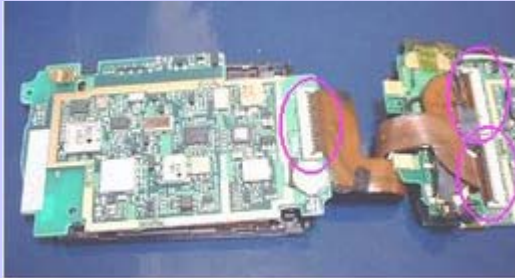
## Advantage of LCP resin, Siveras\*

Superior in thin-wall flowability (reduced warpage and torsion of molded parts)



Adoption in small-size molding / fine-pitch connectors

### Product examples



Fine pitch connectors



HDD actuator

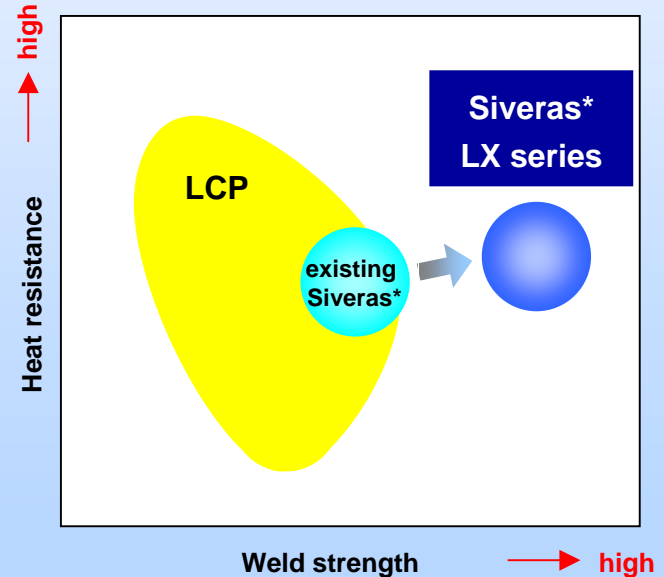


Optical pickup lens holder

New grade, Siveras\* LX series, based on unique polymer design

Maintain heat-resistance for Pb-free SMT application

Improved weld strength by controlled solidification



Weld : contacting part of melting polymer flows during molding of products

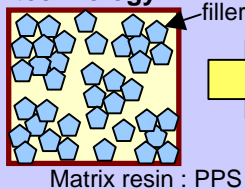
## Development of High Thermal Conductive Thermoplastics

Succeeded in developing a thermoplastic with the world's highest thermal conductivity, more than 100 times higher compared to conventional plastics, by improving intermolecular interaction between the plastic and the high thermal conductive filler.

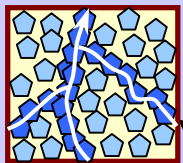
### <Advantages (compared with aluminum and ceramics)>

- Lightweight
- Quietness
- Low Cost
- High efficient production of complex parts

### Conventional molding technology

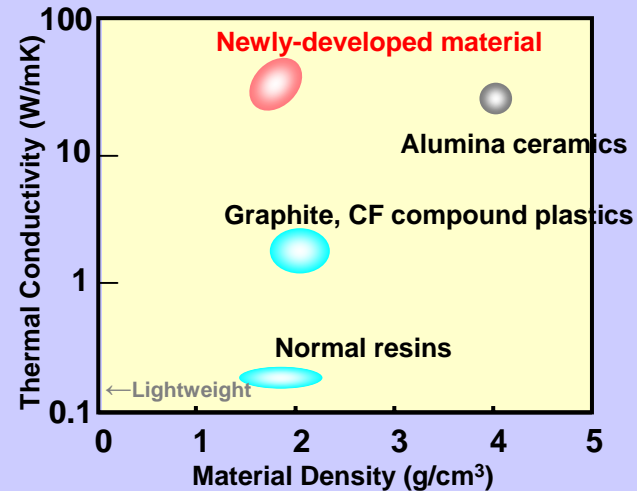


**Newly-developed material**  
(New technology of electrical conducting path formation)



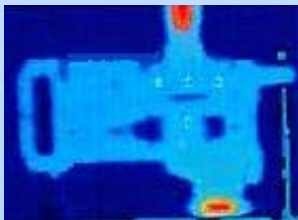
Electrical conducting path  
(formation of network structure)

### <Correlation of thermal conductivity and material density>

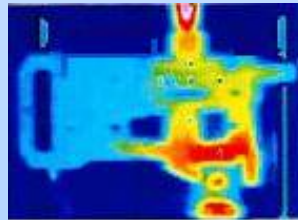


### <Thermal conductivity in an actual part>

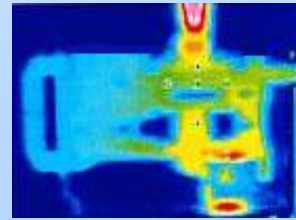
Newly-developed material has the equivalent heat release properties as those of aluminum die-cast.



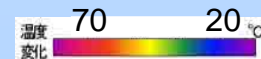
Conventional material



Newly-developed material



Aluminum die-cast

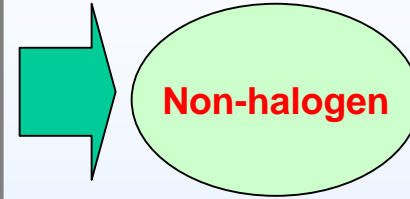


Expansion in areas where high heat-release / energy-saving properties are required such as home appliances / office automation equipment / automobiles, and others

## Development of Non-halogen Flame-retardant Materials

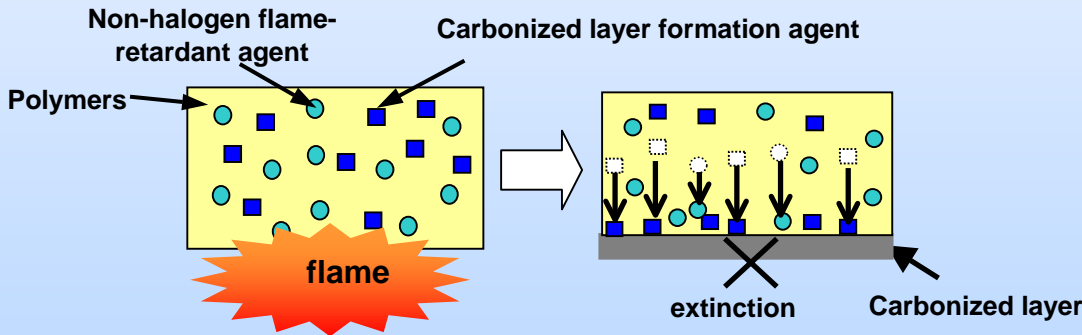
### World trends in flame-retardant materials

- 1. RoHS Directive** Usage of specific bromine flame-retardant agents is prohibited in principle for electrical/electronic applications.
- 2. WEEE Directive** De-installation of plastics containing specific bromine flame-retardant agents from the disposing electrical / electronic appliances is required.

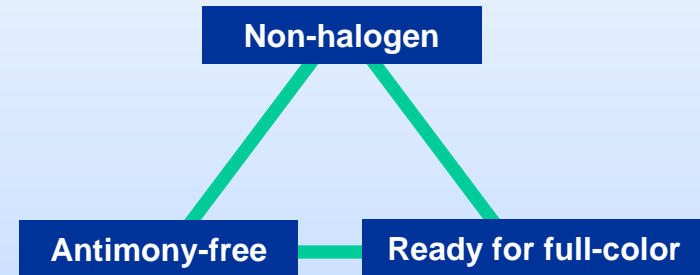


### Toray's Non-halogen Flame-retardant Technology

Selective formation of carbonized layer on the surface of molded part



### Toray's Advantage



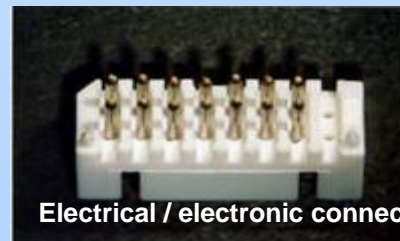
Toray's Non-halogen Flame-retardant Materials :  
PBT, PET, Nylon, ABS, PLA

### Product examples



Printer fixing unit cover

PBT Resin



Electrical / electronic connector

Nylon Resin

## Recycling Activities in Toray's Plastics Businesses

Toray established the "Plastics Ecology & Recycling Department" in August 2004 in order to promote plastics & films recycling. Focusing on material recycling which is considered to be advantageous in "Life Cycle Assessment (LCA)", Toray is promoting development and establishment of recycling business models. Toray started closed-material recycling of home appliance components with Mitsubishi Electric in February 2005.

1. Effective utilization of production process derivatives

Utilize film derivatives to resins and fiber products

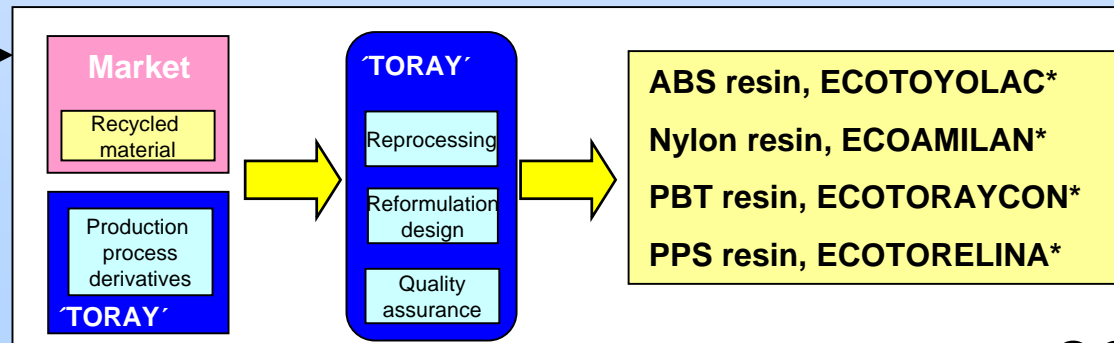
2. Establishment of recycling system with Mitsubishi Electric Corp.



3. Expansion of eco-plastics businesses



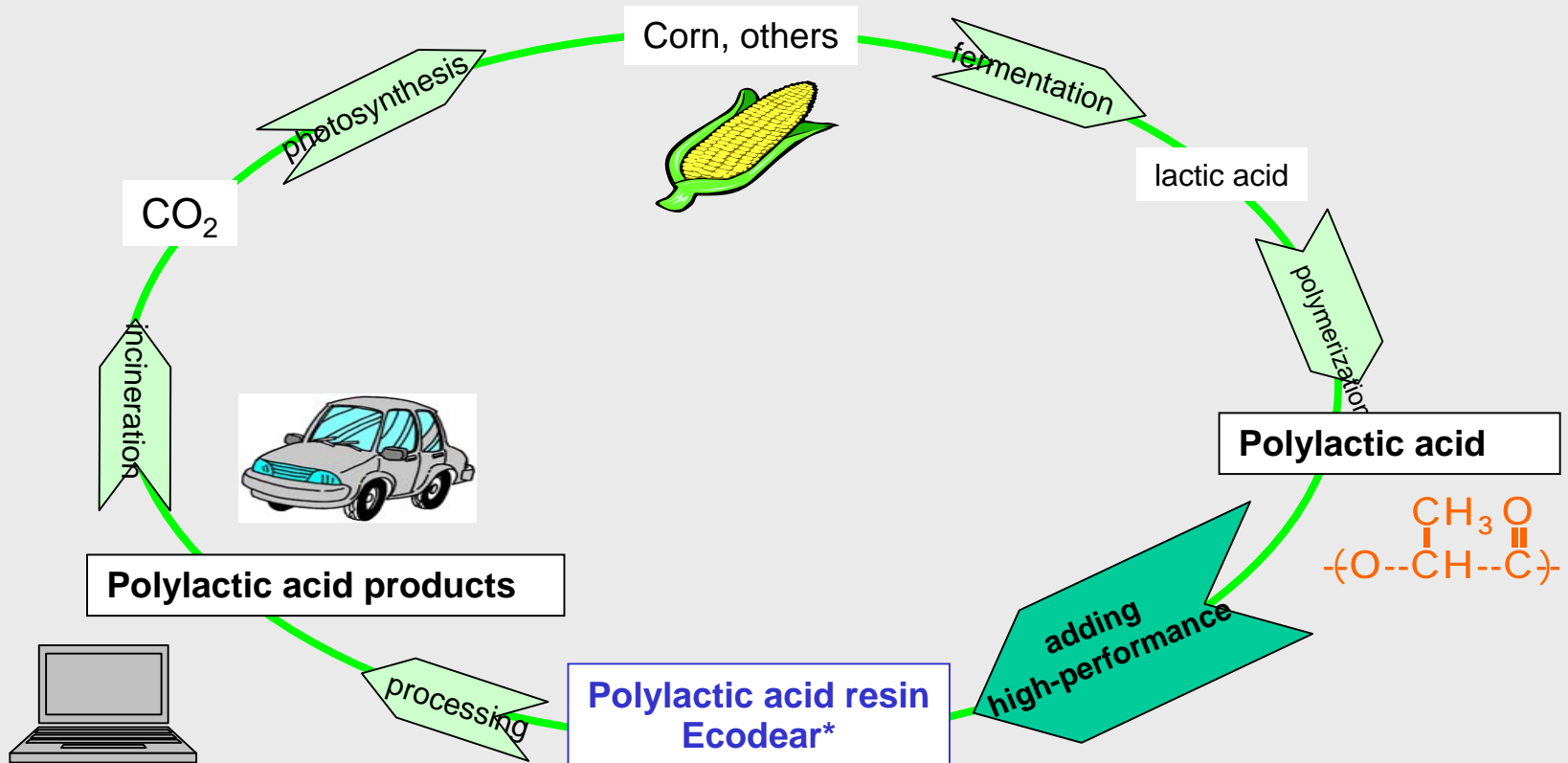
Expand activities as part of the "ecodream", Toray's total recycling, energy-saving, and environmental preservation system.





## Engagement in Environmentally-friendly Material

Developed high-performance material based on renewable polylactic acid, utilizing Toray's "nano-alloy technology" and "flame-retardant technology"



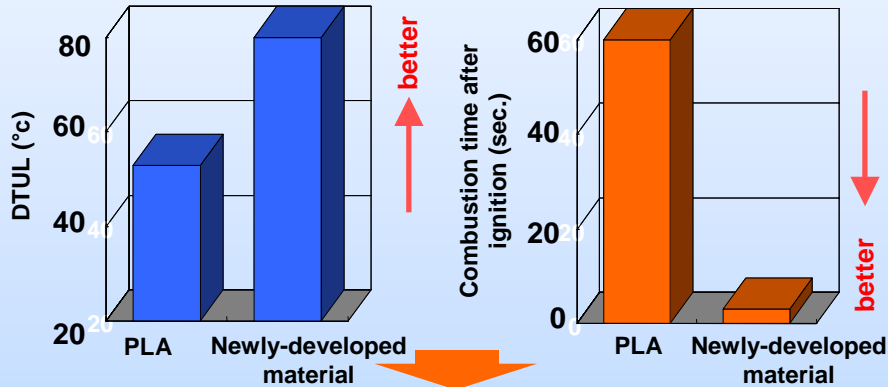
Plant-derived Polylactic Acid Resin, Ecodear\*

# Polylactic Acid Resin

Enhancing performances of polylactic acid (PLA) resins for electronic applications by utilizing polymer alloy technologies  
 Contributing to global environment, through reduction of CO<sub>2</sub> emissions and consumption of fossil resources

## Non-halogen, flame-retardant

Improved heat-resistance properties and realized high-level of flame-retardancy by utilizing alloy technology and non-halogen flame retardant technology



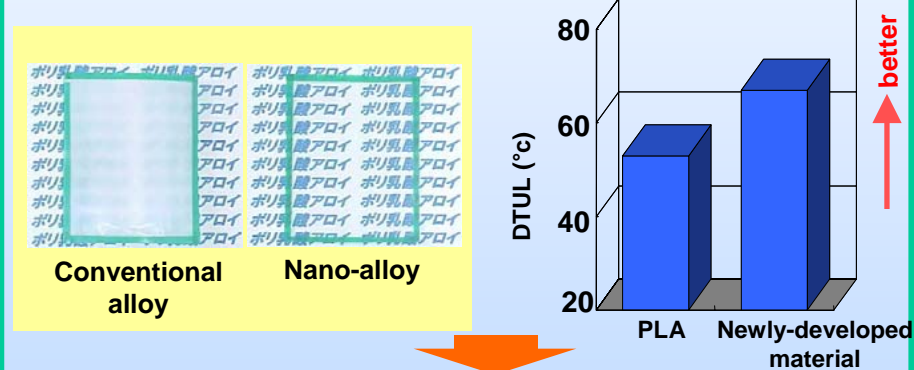
**World's first! Plant-based PC housing**



Co-developed with Fujitsu Ltd. → released in Jan., 2005

## Transparent, high heat-resistant

Improved heat-resistance and advanced optical characteristics by utilizing nano-alloy technology



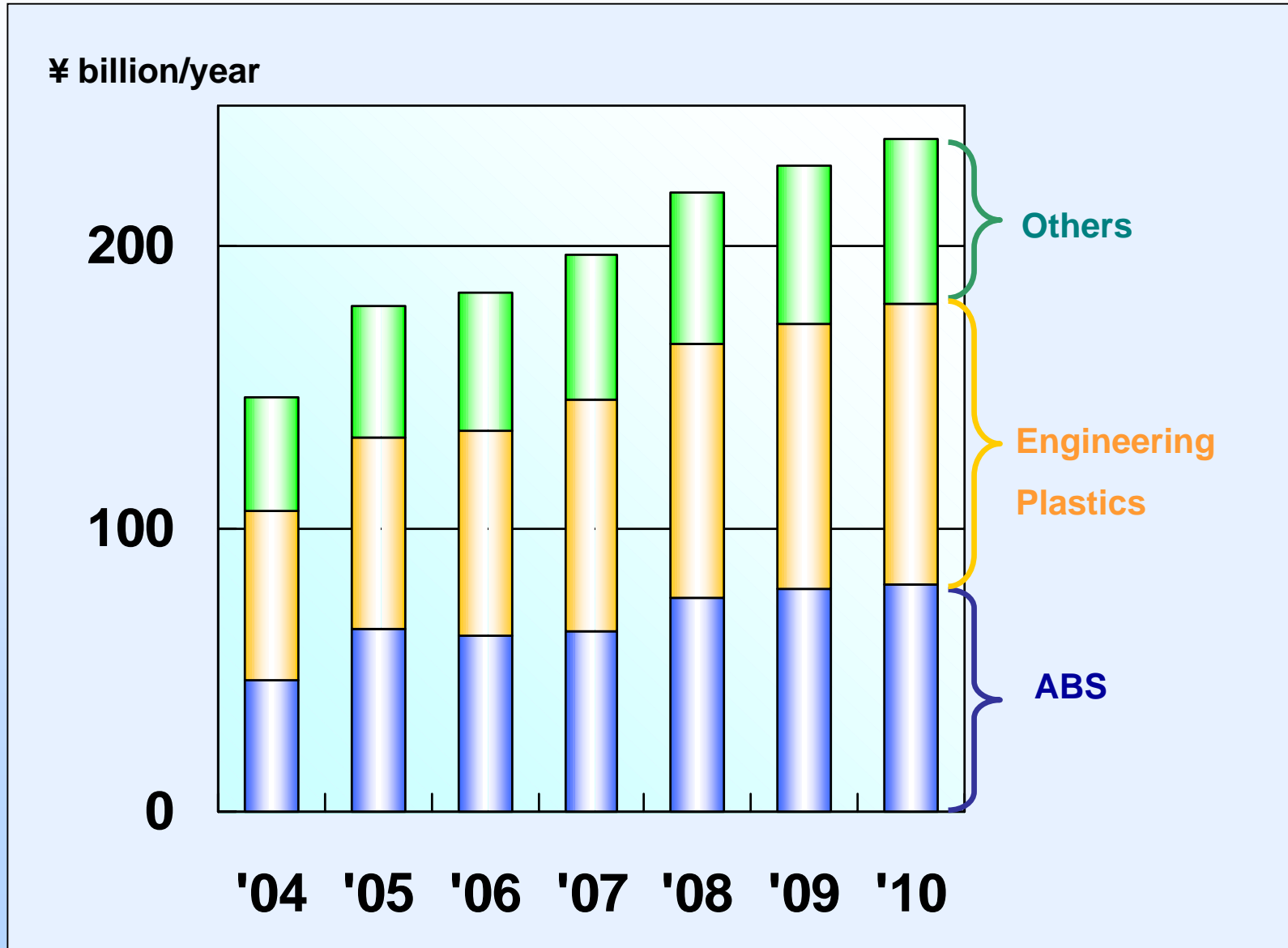
**DVD disks from corn**



Under co-development with Victor Co. of Japan

**Business Expansion Plan (Sales)**

Sum total including non-consolidated subsidiaries and affiliates



## **III. Outlines and Strategies for Films Businesses**

## Features and Applications of Film Products

Product	Features	Major Applications
<b>LUMIRROR*</b> (biaxially-oriented PET film)	<b>High-strength, Transparency, Chemical resistance</b> 	<b>Industrial, Packaging, Magnetic, Capacitors</b>
<b>TORAYFAN*</b> (biaxially-oriented PP film)	<b>Lightness, High tensile strength, Electrical properties, Mechanical properties, Chemical resistance, Moisture barrier</b>	<b>Industrial, Print lamination, Packaging, Capacitors</b> 
<b>TORELINA*</b> (PPS film)	<b>High / low temperature resistance, Low flammability, Chemical resistance, Dimension stability to humidity, Creep characteristics</b>	<b>Capacitors, Electric insulation, Electronic components, OA equipment</b>
<b>MICTRON*</b> (para-based aramid film)	<b>High rigidity, Heat resistance, Excellent moisture-proof property, Gas barrier property, Surface smoothness</b> 	<b>Computer data storage</b>
<b>TRETEC*</b> (polyolefin complex film)	<b>Excellent uncontamination property, Excellent workability, Heat resistance</b> 	<b>Surface protection of optical functional films</b>

# Toray's No.1 Business Lumirror\*'s Strength

## 1. No. 1 in world market share: 20% share on volume base

Production capacity of 6 global production sites:  
310 thousand tons / year

## 2. Global operation capability to respond quickly with change of business circumstances

Maximize profitability through best selection for both market and production

### Strength of local production

- Buy Korean policy
- Speedy technical service
- Provide solutions to customers
- Respond to unique food culture (Packaging)

### Strength of proper location production

- Commodity supply from PFR, YTP, TSI
- Supply of value-added products from Japan, US, Europe, Korea
- Efficiency of operation

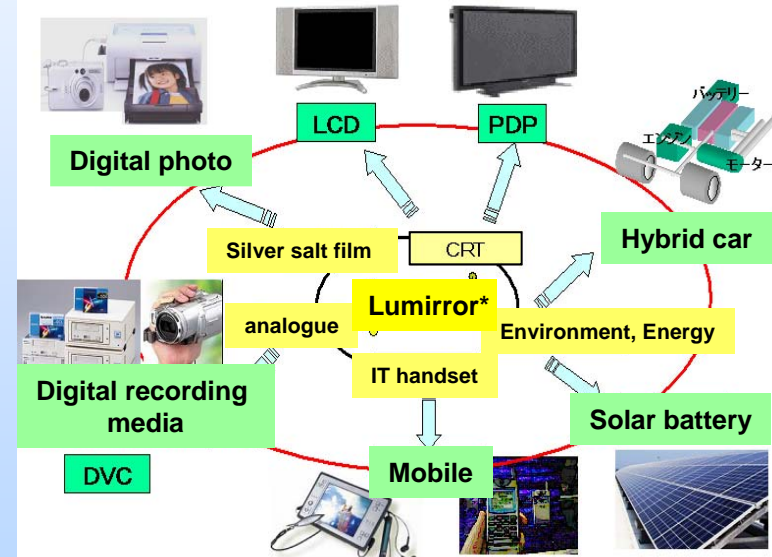
Japan is the technology development base with advanced technological capabilities

Production base in expanding Asian market (Japan, Korea, Malaysia, China)

## 3. Response capability in industrial structure changes and technology innovation

Spread in wide field of the industry

Newly created applications



## Strategies for Expansion of Films Businesses

### Business Environment

1. Overall steady growth (+4% points/yr) while significant structural change by region and application
  1. Expansion in China and Asia market
  2. Demand growth in IT-related applications
  3. Creation of new demand derived from concern in environmental and safety issues
2. The imbalance of supply and demand
  - Large capacity increase of thin-type in China
3. High price of raw material will continue

### Basic Policy

#### Business expansion and strengthening of profitability in growing markets

1. Expansion of No.1 business, Lumirror\* through aggressive investment
  1. “Offensive” global engineering
  2. Deepening and expansion of global operations with quick response capabilities with change of business circumstances
  3. Expansion of strategic applications
2. Expansion of Only 1 businesses (Torelina\*, Mictron\*)
3. Business structure reform through expansion of film processing businesses

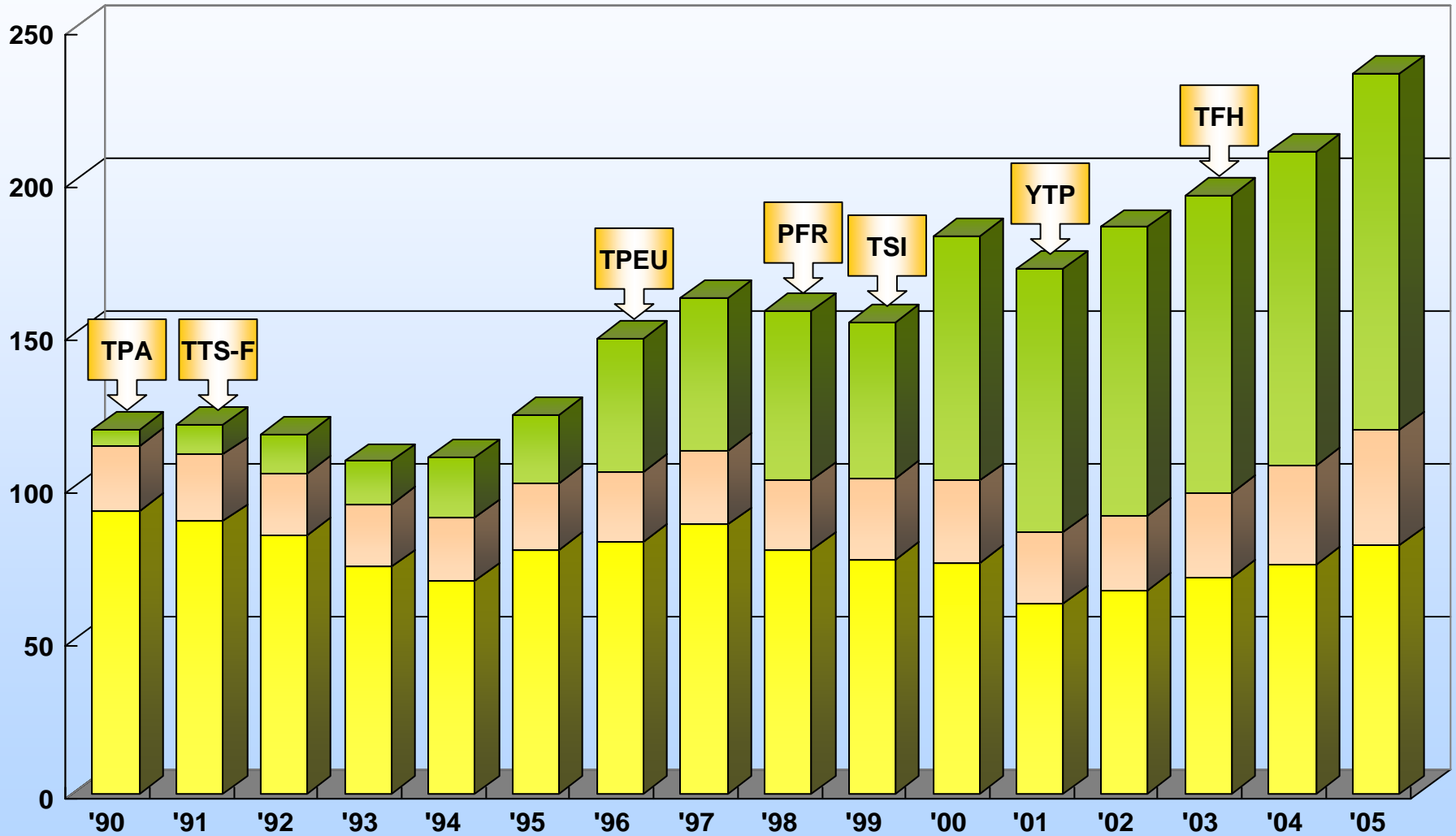
## Sales Trends of Films Businesses

Sum total including non-consolidated subsidiaries and affiliates

Unit: ¥ Billion

■ Toray 
 ■ Japanese 
 ■ Overseas

Including internal sales



Forecast



# 1. Expansion of No. 1 Business, Lumirror\* through aggressive Investment

## Maximize profitability by Role and Task Clarification of each Production Site

### (1) “Offensive” global engineering

1. Increase capacity of thick-type  
(optical and industrial applications)
2. Re-engineering of TSI  
(de-HV, response to Korean optical market)
3. Response to China market
4. Expansion of value-added products at  
TPA, TPEu

### (2) Deepening and expansion of global operation

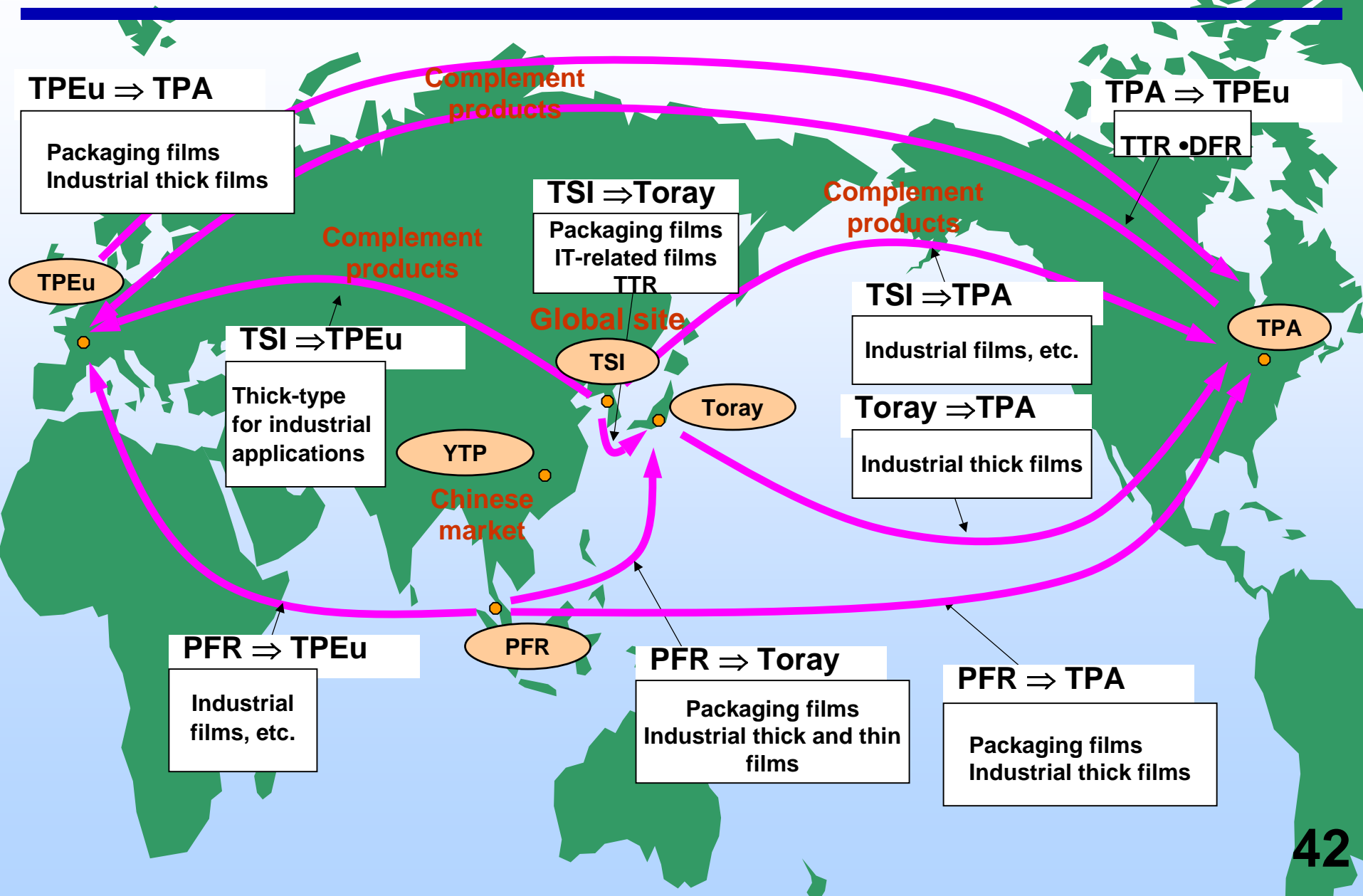
Maximize profitability through best selection for both market and production

1. Expansion of PFR, TSI
2. Leverage YTP

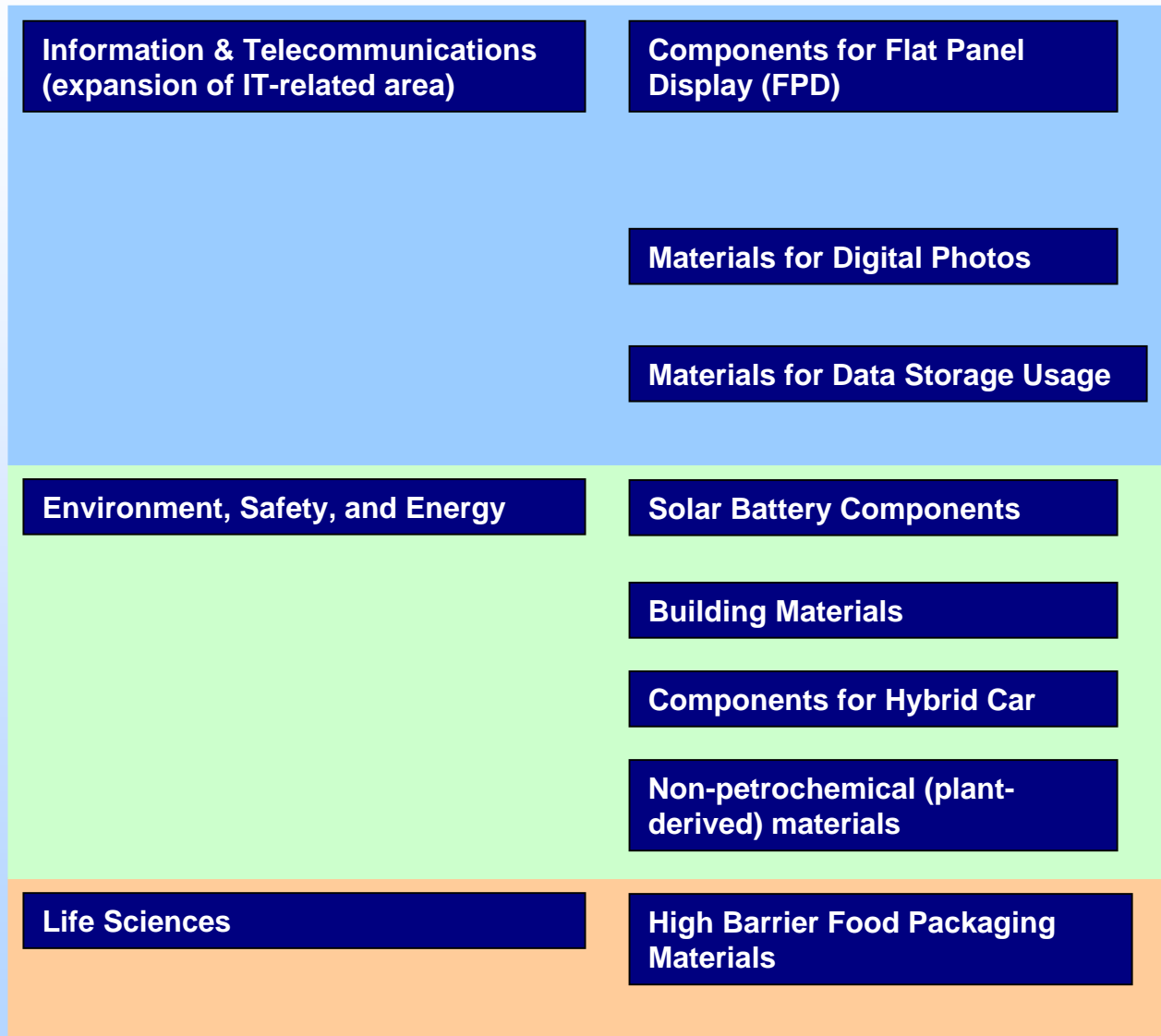
### (3) Creation of new demand and expansion of strategic applications following the industrial structure change and technology innovation

1. Information and telecommunication
2. Environment, safety, and Energy
3. Life sciences

## Toray Group Global Operation

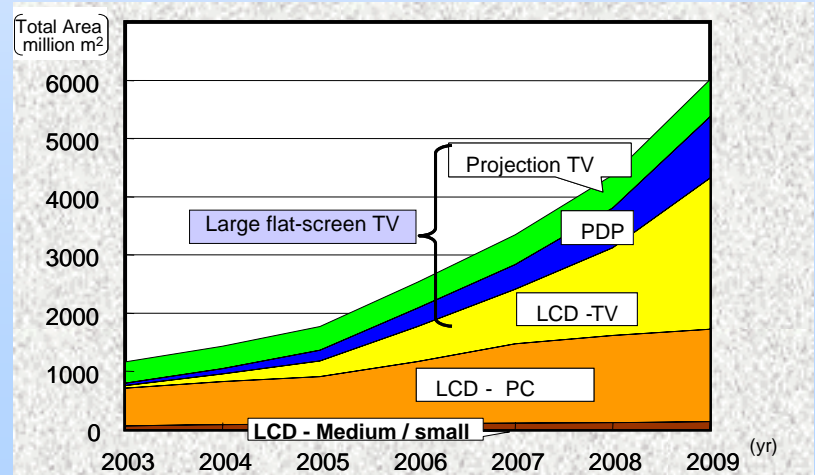
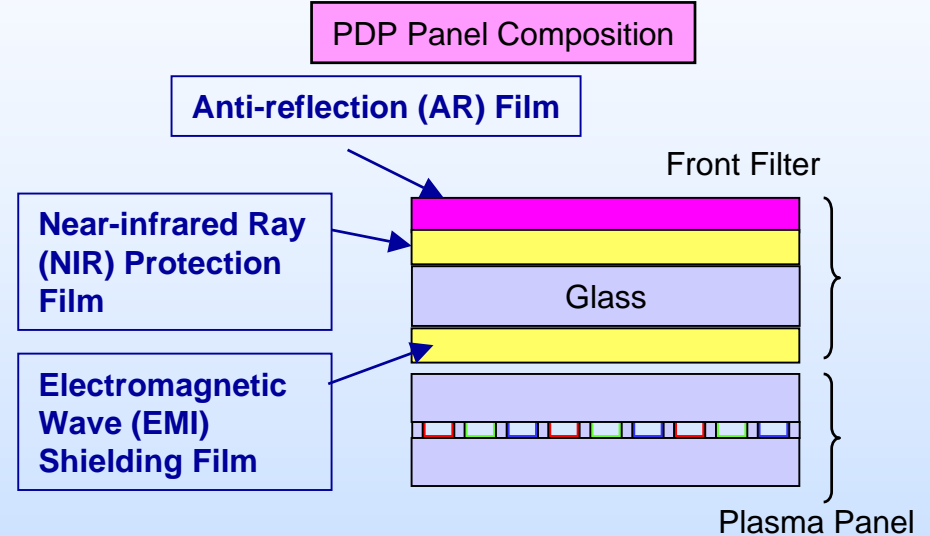
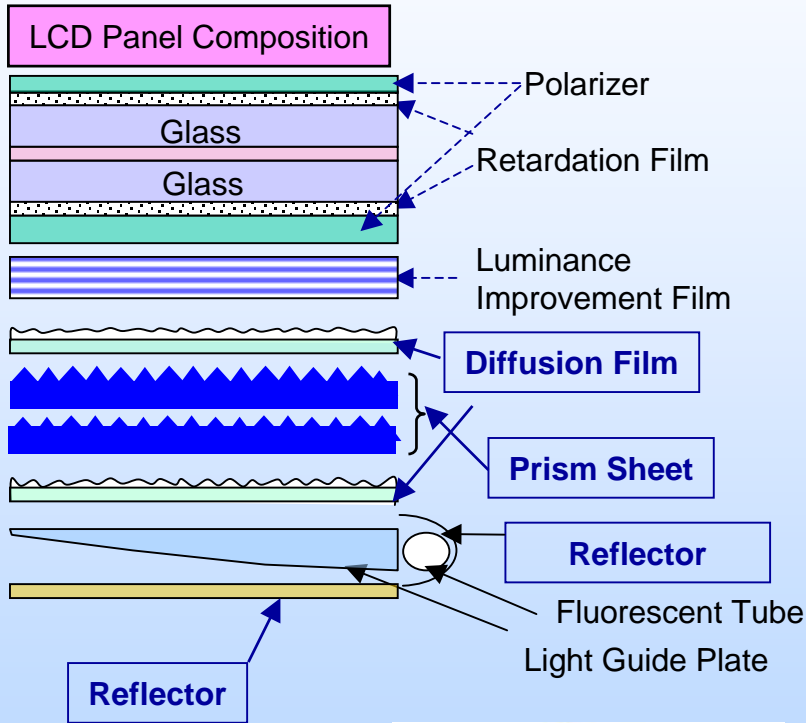


## *Expansion of High-value Added, Strategic Applications*



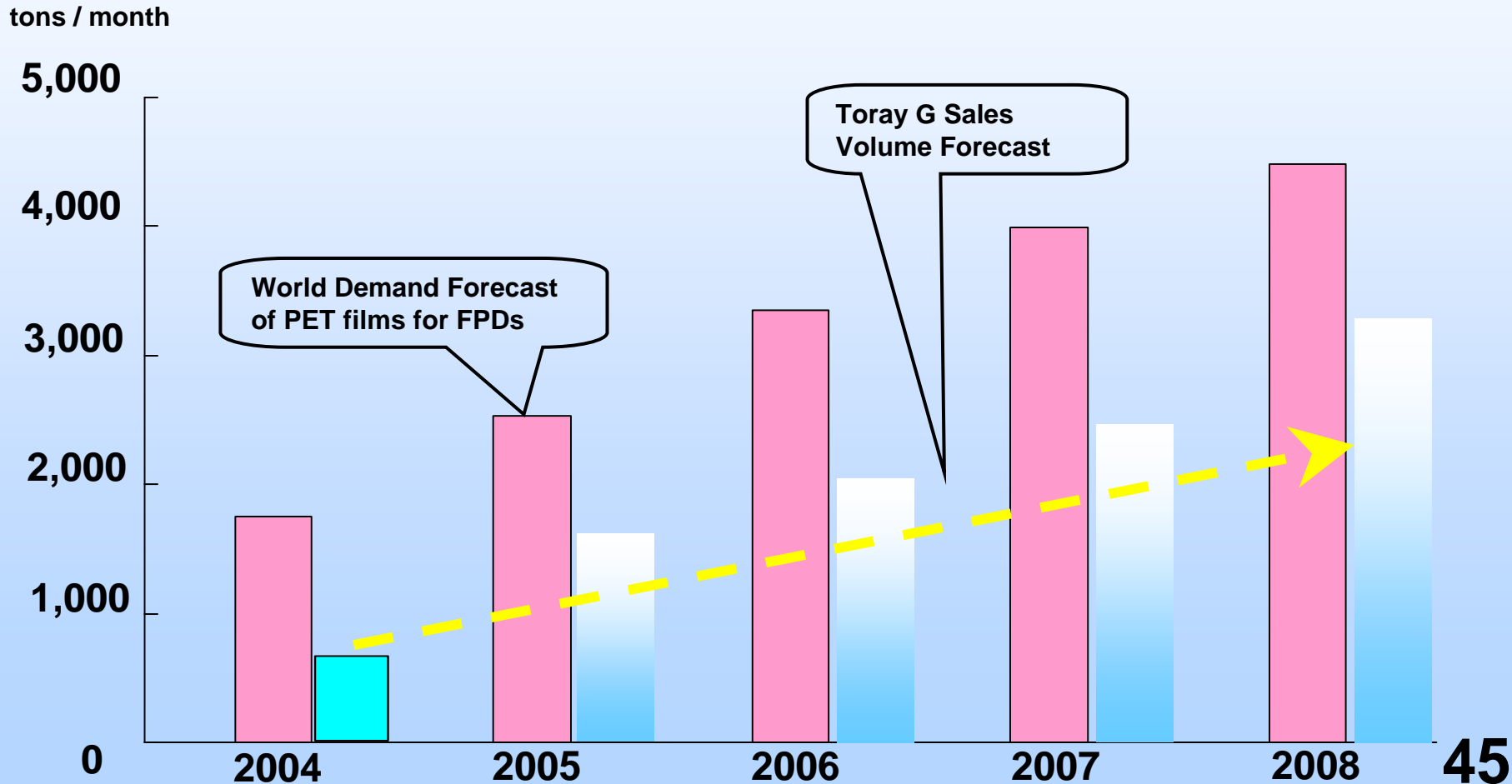
## Optical Films for FPDs

Toray PET film Lumirror\* is used in many components of expanding LCDs and PDPs. Toray boosts synergy with film processing business and further expands / strengthens film businesses for LCDs.



# World Demand and Toray Group Sales Volume of Optical PET Films for FPDs

Optical PET film demand for FPD use is expected to increase by annually 25% due to drastic growth of personal computers and LCDs / PDPs for large-size TV applications. Toray strives for business expansion by share-up in the market including film processing products.



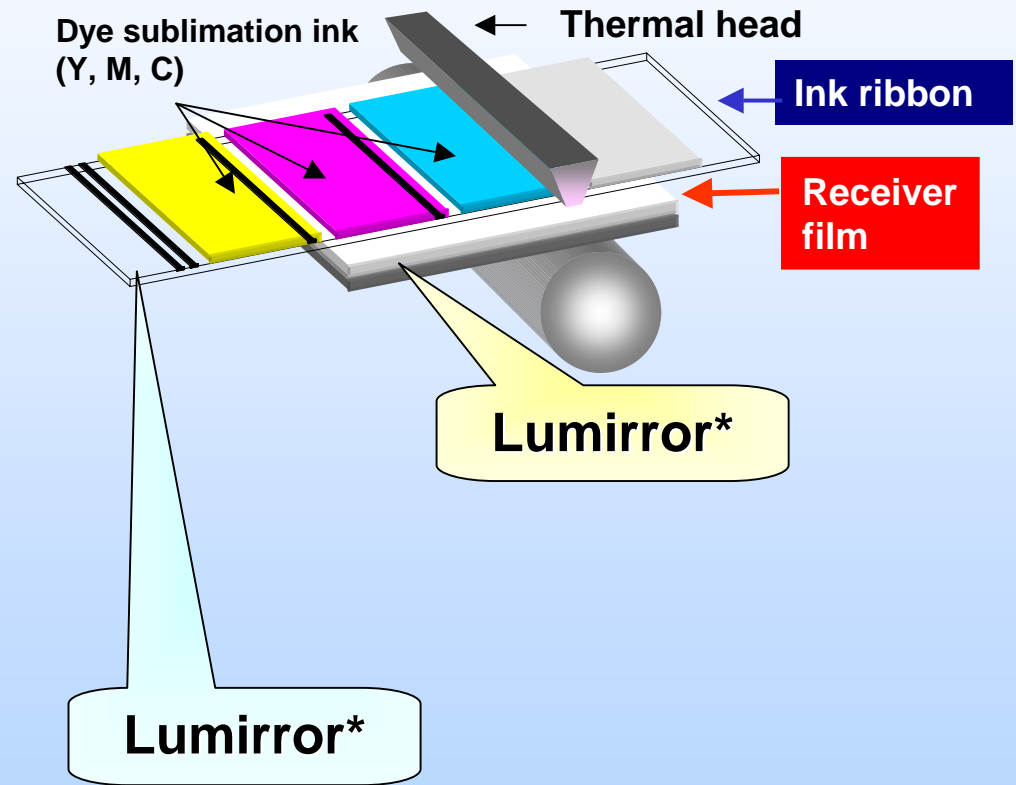
# Films for Digital Photos (1)

Developing both applications for TTR and receiver film

## ◆ Dye sublimation printer



## ◆ Dye sublimation printing method



屋外出力接点

デジタルプリント自販機

Confidential

KIOSK端末

Famiポート

Digital Contents Terminal

デジッP

レッツフォト

有人受付端末

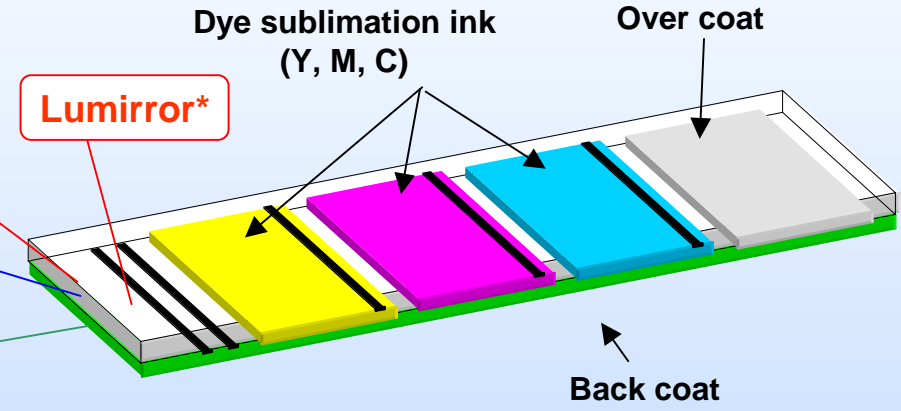
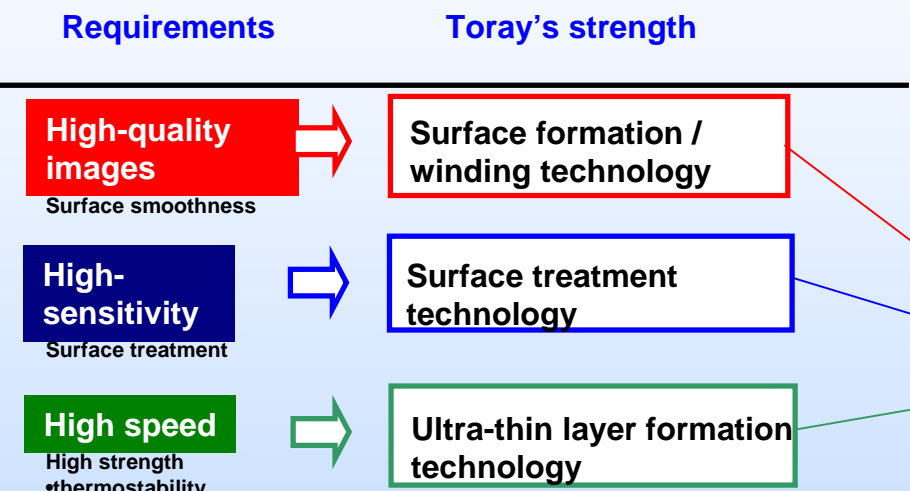
MEGAPIXEL II

9

# Films for Digital Photos (2)

Advanced Technology and Global Production System ⇒ Stable Supply to all the world

## Requirements of ribbon application for dye sublimation printer and Toray's strength



## Expansion of ribbons for dye sublimation printer

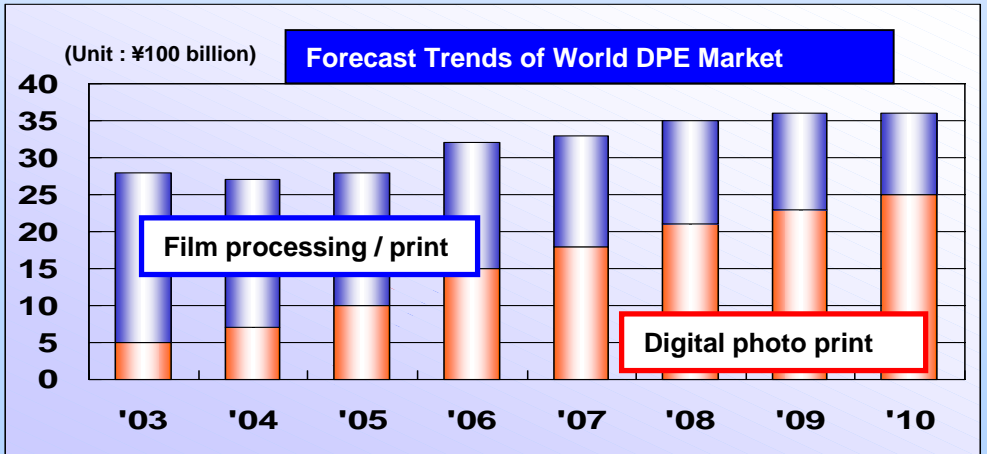
Global operation system of Japan, US, Europe, Korea

**2005 ⇒ 2009**

**Sales volume 5 x**

**World market share over 90%**

Market share is Toray's estimation



## Films for Solar Battery

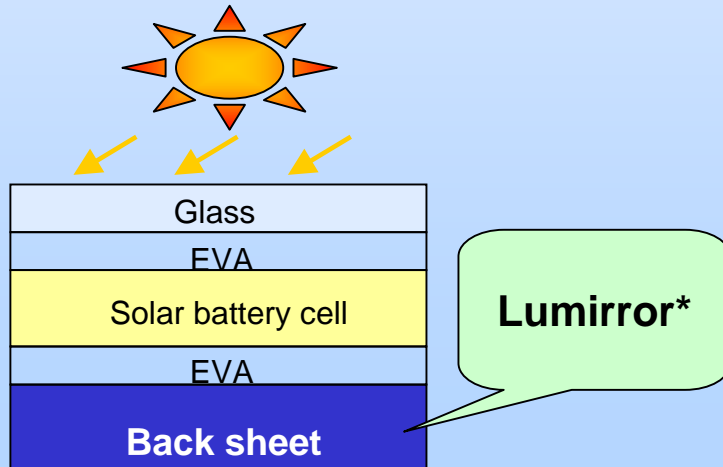
Toray has 100% domestic market share in films for solar battery application through capability in response to varying composition of back sheets. Able to provide a wide range of line-up including materials with low-hydrolyzable, UV resistant properties.

Market share is Toray's estimation

### ◆ Solar battery

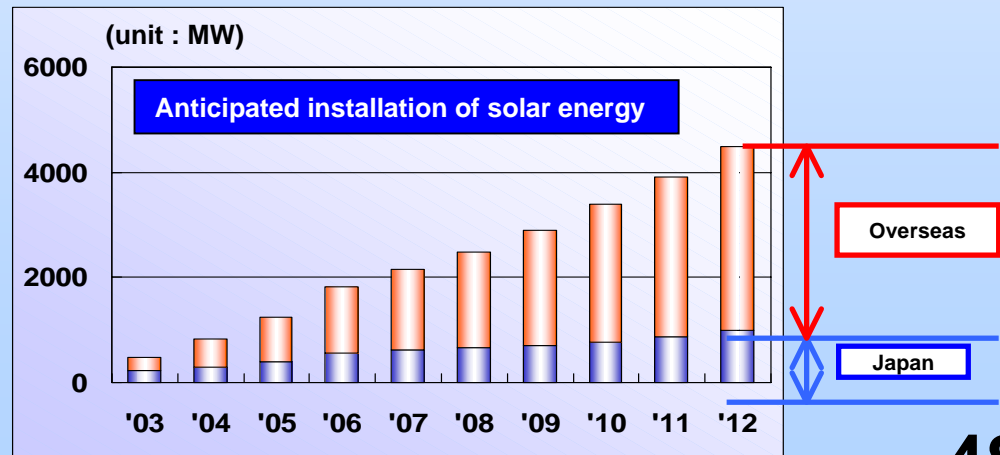
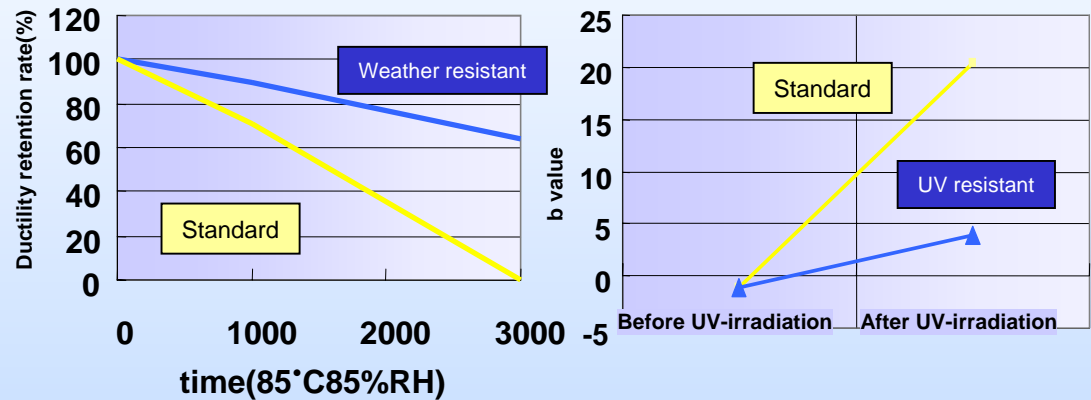


### ◆ Solar battery composition



### ◆ Expansion of European market

Developed upgraded low-hydrolyzable, UV resistant types



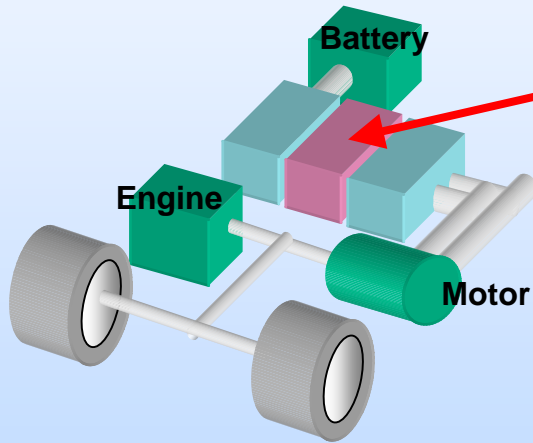


# Films of Capacitors for Hybrid Cars

Developed world's thinnest, high electric insulation polypropylene film, Torayfan\* V type

- ◆ Loaded onto hybrid cars
- ◆ Balance mileage and driving performance ⇒ high-voltage drive capable of high-performance motors

Realized high-capacity film capacitors (actual efficiency : + 78% to conventional type)



## Role of capacitors

Absorb the voltage variation at acceleration / deceleration



Improve driving performance

Well-designed for reliability (quality variation) in high-voltage usage



90% market share

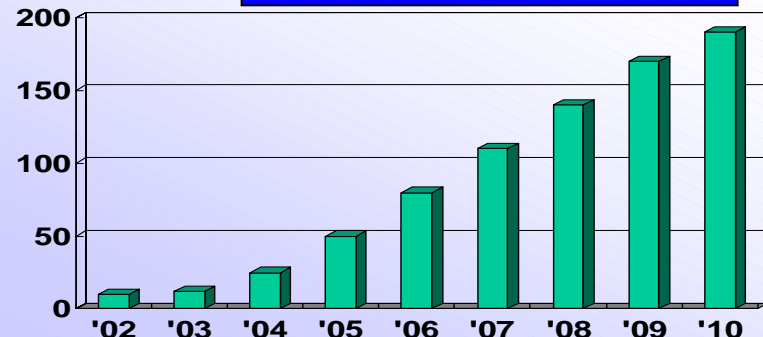
Market share is Toray's estimation

## ◆ Features of capacitors using Torayfan\* V-type

	V-type	Electrolytic Capacitor
Voltage proof	○	○
Stability	◎	△
Credibility	○	△
Capacitor life	◎	△

(unit : 10 thousand cars)

## Forecast numbers of hybrid cars



## Enhancement of Core Technologies

Develops new products through enhancement of No. 1 core technologies which are highly-evaluated in the market

High-performance polymers technology

- nano-alloy

Fine multi-layer control technology

- thin-layer laminate
- multi-layer laminate

Zero defect, longitudinal extension technology

Nano-thickness control technology

- high-function die
- advanced control (PPC)

High-functional coating technology

- high-functional coating materials

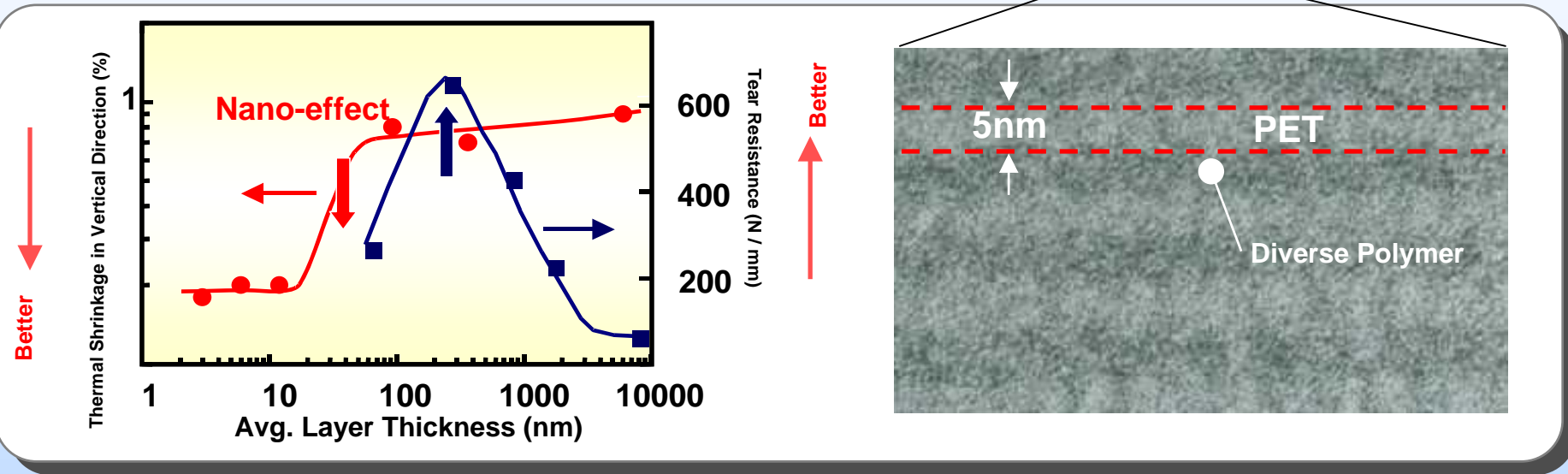
Dimensional stabilization technology

- simultaneous biaxial drawing

Advanced winding technology

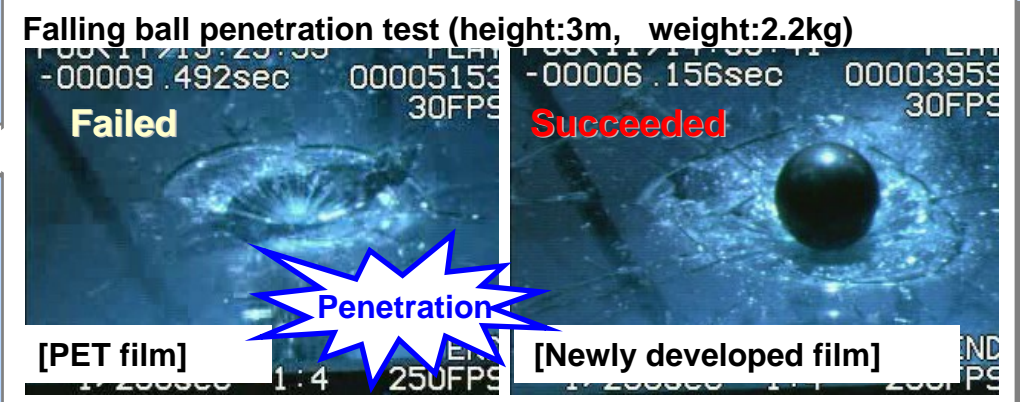
- electrostatic control

## Multi-nanolayer Films



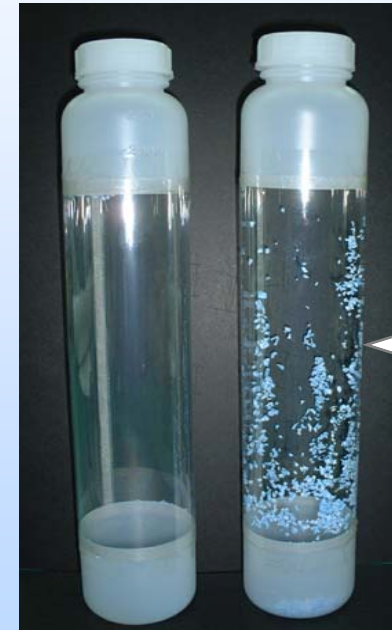
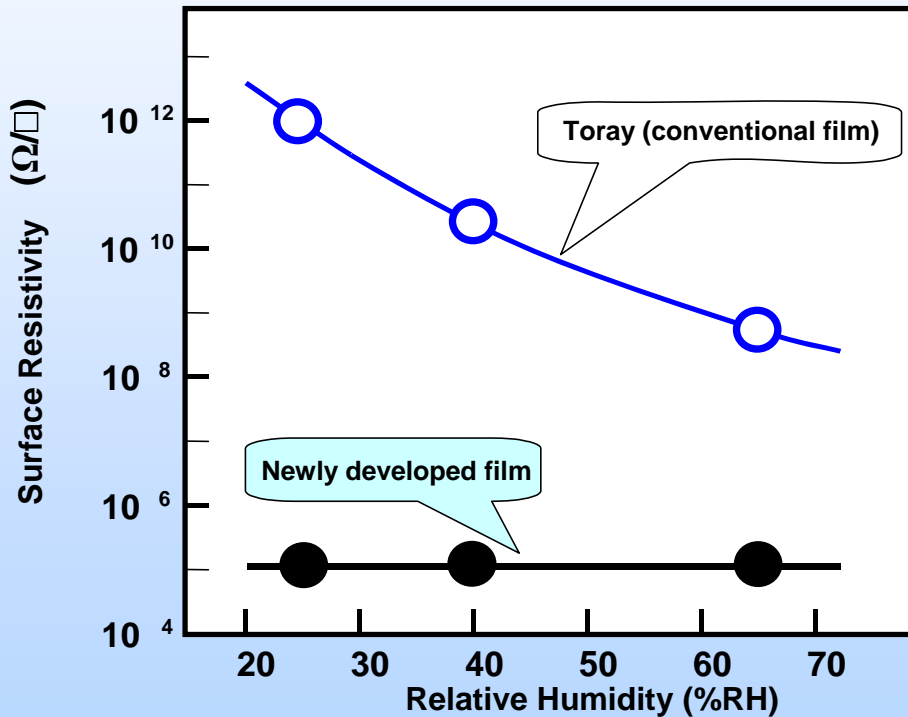
### Development of applications

- ◆ Glass protective films (for safety & security)
- ◆ Electronic Materials
- ◆ Optical Functional Tapes



## Newly Developed Antistatic Film

Succeeded first in the world in developing next generation process film with world-class level of surface resistivity and moisture-independent “extreme antistatic” properties based on Toray’s unique nano-coating technology.



Newly developed film      Conventional film

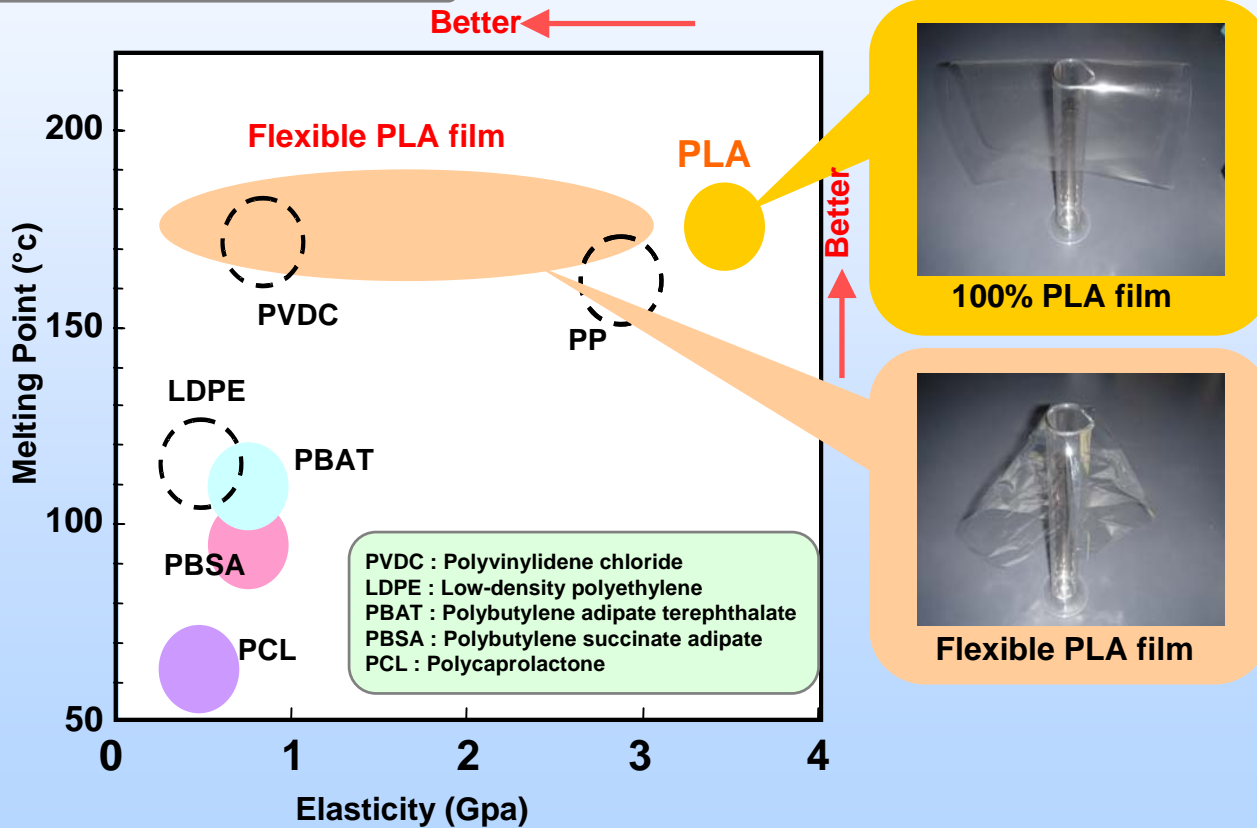
Electrification causes attachment of dust

★ Toray develops wide-range of applications including IT-, optical-related base materials for film processing using solution, various coating films, packages of electronic components, and dust-proof films.

# Polylactic Acid (PLA) Film

Succeeded first in the world in developing “fully biodegradable flexible films” made of environment-friendly plant-based Poly Lactic Acid (PLA).

Comparison of film properties



### **Only 1, First 1 Businesses**

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#### **(1) Expansion of PPS films**

- 1. Expansion of existing applications**
- 2. Development of new applications**
- 3. Further expansion of production capacity**

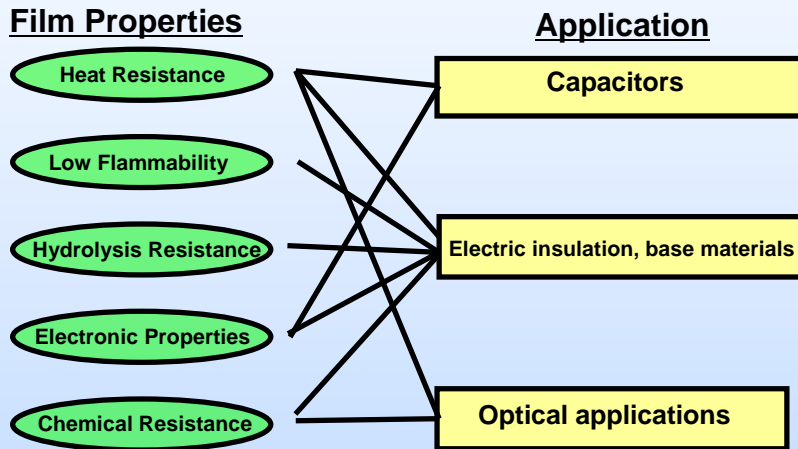
#### **(2) Expansion of Micron\***

- 1. Expansion of computer data storage applications**
- 2. Development of advanced electronic circuit materials**

# Application development of Torelina\* Films

Torelina\* films are adopted in small-size IT-related components such as cellular phones and chip capacitors while application for electric insulation is expanding by utilizing the heat resistances and nonhydrolyzable properties.

## ◆ Application development of Torelina\* films

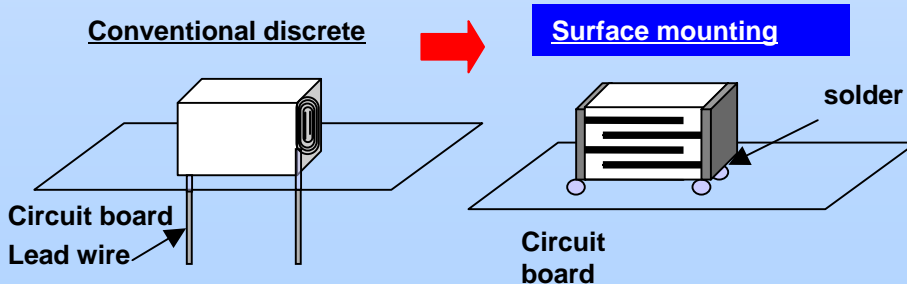


## ◆ Properties of Torelina\*

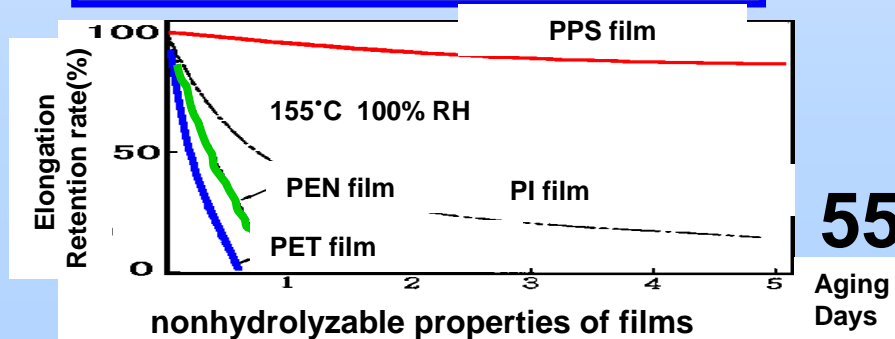
Excel in chemical resistance, electronic properties, and heat resistance

Properties	Torelina*	PEN	PET	PI
Heat resistance	○	△	△	◎
Chemical resistance	◎	△	△	△
Release characteristics	◎	×	○	△
Electronic properties (low dielectric loss)	◎	×	○	△

## World first, surface-mounted small size film capacitor

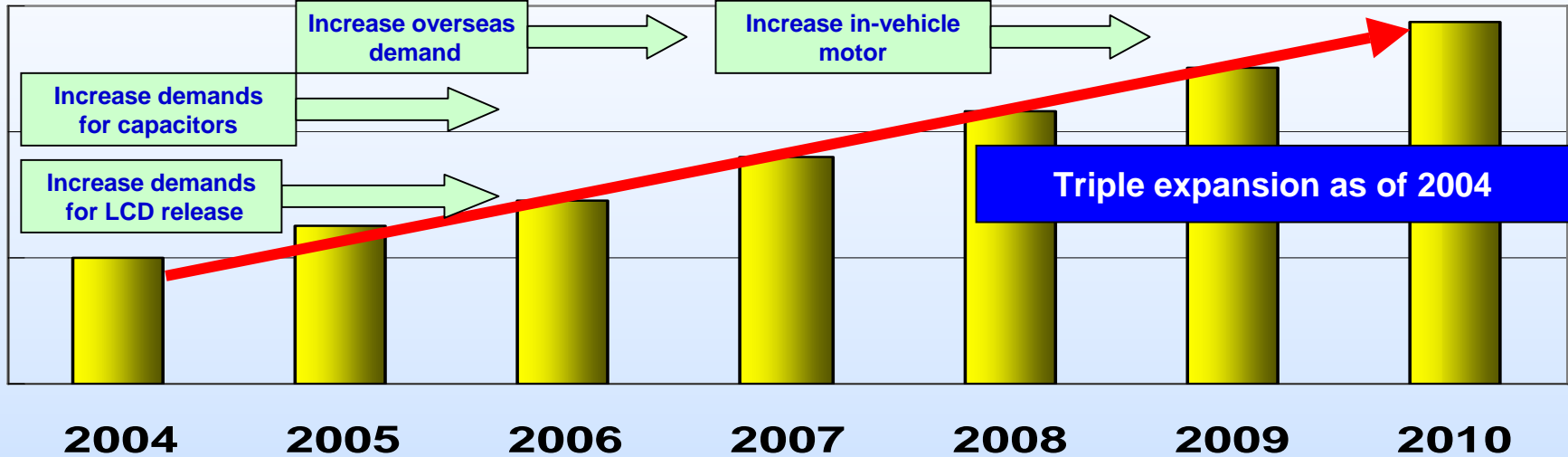


Reduction of environmental burden ⇒ demand expansion of heat resistant electric insulation film



## Expansion of Torelina\* Films

Scale up of Torelina\* films by 2010.



### Technological innovation / Development of new products

Introduction of multi-layer technology

Improvement of electric insulation of capacitors

Nano-alloy

Mass production of submicron films

Establishment of manufacturing technology of extra thick films



## Development of Applications of Mictron\* Films

Mictron\* is the only film capable for further high capacitance of data storage tapes.

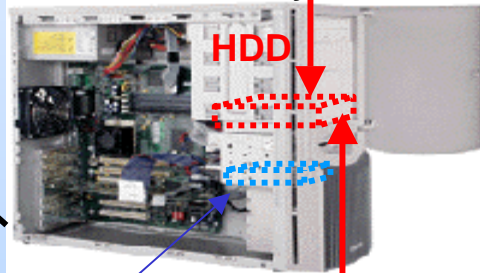
### ◆ Usages of tape drives



DLT (Lumirror\*)

DDS (Mictron\*)

Structure of entry server class



HDD



AIT (Mictron\*)

DDS, AIT can be embedded



HDD

### ◆ Demand characteristics of high capacitance and Toray's strength

Demand characteristics

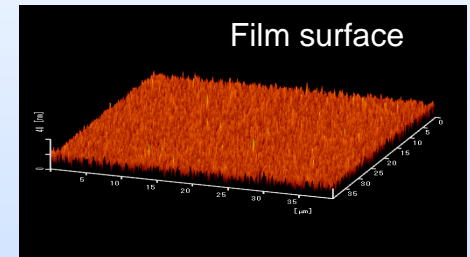
Toray's strength

High capacitance

Surface smoothness, thin-layer

Surface /Thin-layer formation technology

Optimization of nano-scale asperity

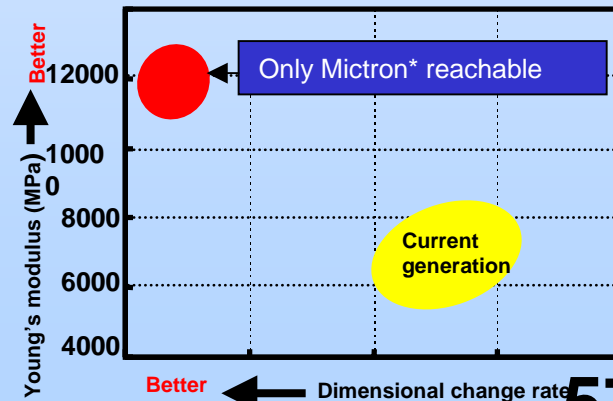


Credibility

Dimensional stability / Tensile strength

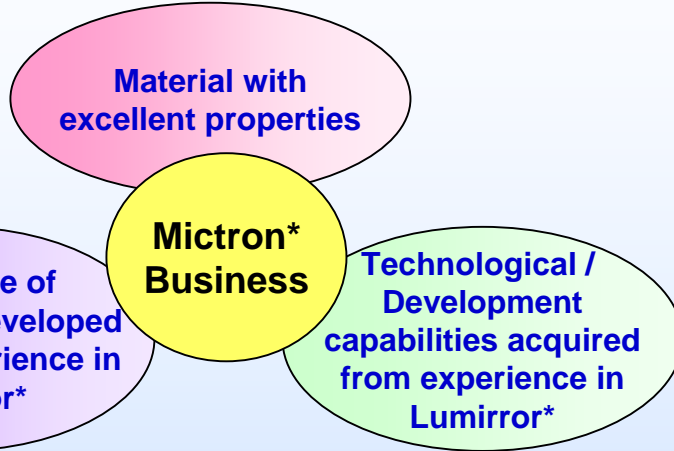
High-performance technology

Simultaneous pursuit of dimensional stability and tensile strength



## Applications expansion of Mictron\* Films (Industrial application)

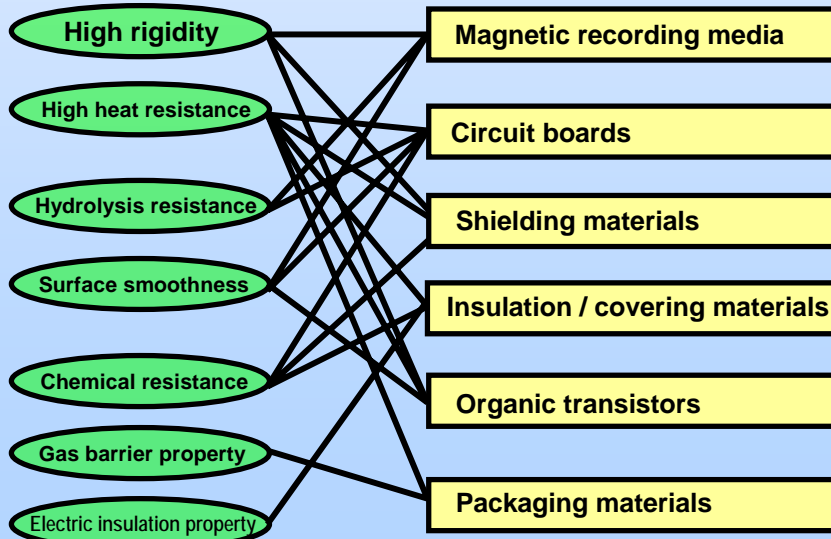
### ◆ Strength of Mictron\* business



### ◆ Application development of Mictron\*

#### Film properties

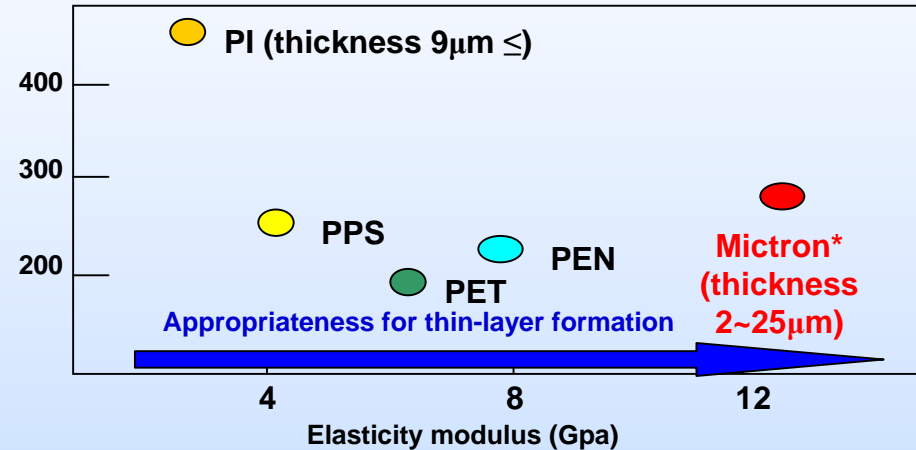
#### Applications



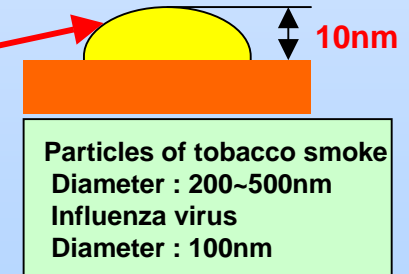
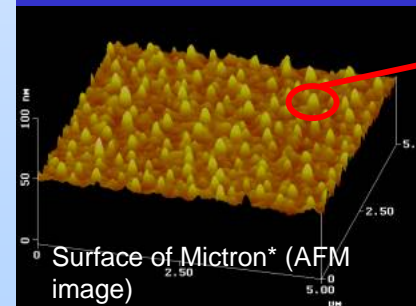
### ◆ Advantages in new industrial applications

Properties most suitable for high density circuit materials, films for high-sensitive sensors

Temperature limit (°C)



Utilizing surface formation technology acquired from experience in films for data storage



Forms nano-scale protrusions smaller than particles of tobacco smoke or influenza virus

## Films Businesses

### (1) Expansion of film processing businesses

1. Expansion of new base / process integrated film products (TAF, TSI, TTS, Toray)
  - a. PDP
  - b. LCD
  - c. Solar battery sheet
  - d. High-barrier packaging material
  - e. Circuit materials, etc.
2. Reorganization and expansion of metallizing facilities for capacitors
3. Early commercialization and expansion of new businesses through M&A and alliances

### (2) Expansion of new material, new process film products

1. New advanced optical films
2. PLA
3. Non-oriented films
4. Multi-layer films
5. Nano-alloy films

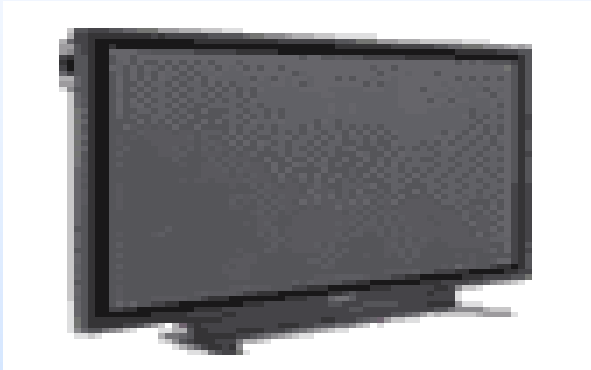
### (3) Strengthening development workforce

1. Reinforcing development system of film processing products
2. Enhancing and utilizing global development structure

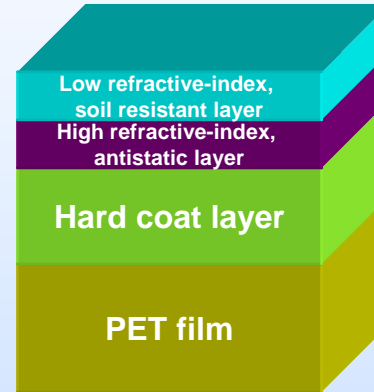
## Optical Films for FPDs (anti-reflection (AR) films for PDPs)

Developed advanced Anti-Reflection films and expanding film processing businesses in Japan and Korea

### ◆ Plasma Display Panel (PDP)



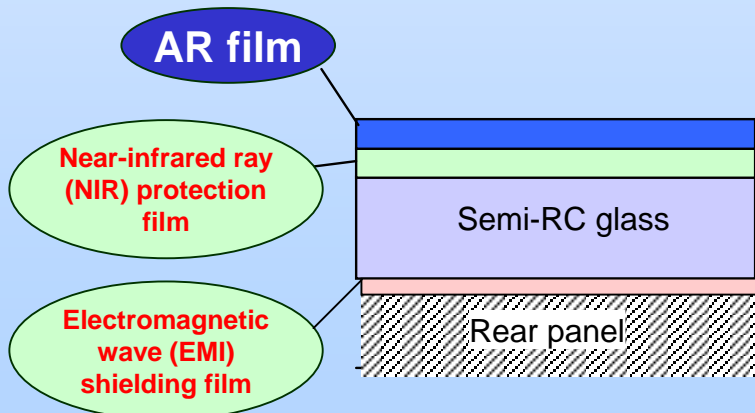
### ◆ Advanced AR film, Lumiclear\*



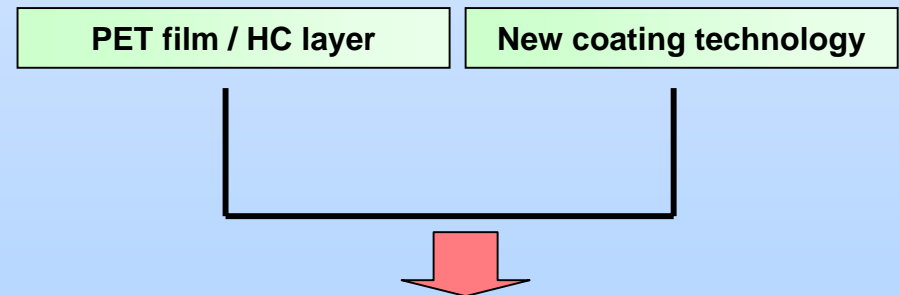
Adoption of new coating material

Application of fine coating technology  
Zero defect film processing technology

### ◆ PDP panel composition



### ◆ Development of next generation AR film

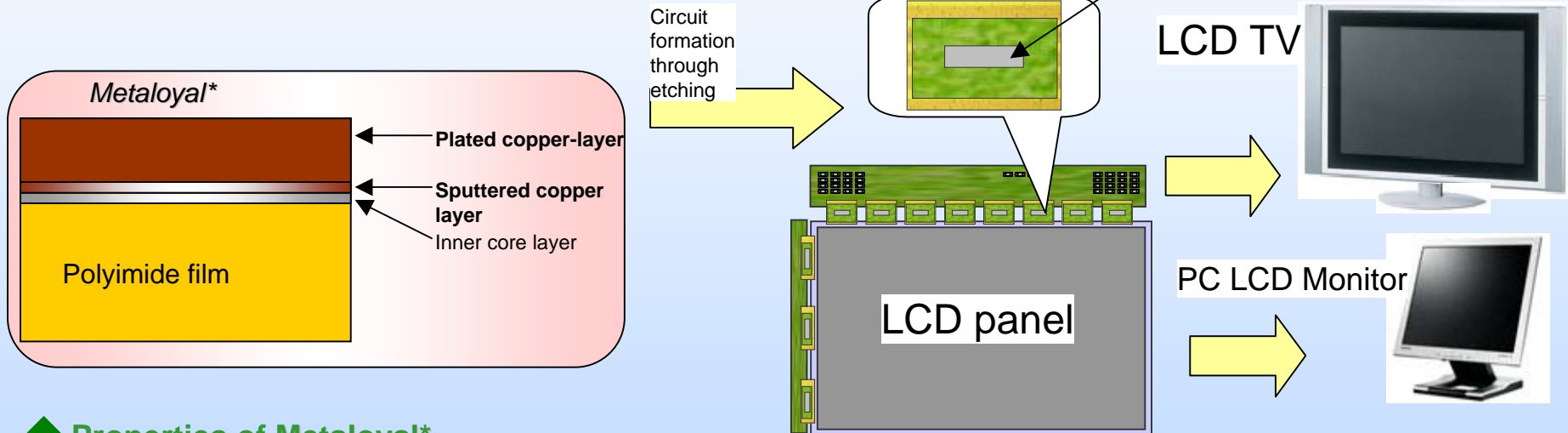


First with PET film to achieve excellent appearance without light interference stripes

# Two-layer Metallizing Circuit Material, Metaloyal\*

Pioneer to develop adhesiveless copper plated polyimide multi-layer film which is indispensable in COF bonding of FPD drive circuits.

## ◆ “Composition and application of Metaloyal\*”



## ◆ Properties of Metaloyal\*

### <General Properties>

- Flexible copper properties
- availability for thin films under 8 $\mu$
- Transparency under copper etching
- ease of both side processing (2 metals)

### <Advantages in customers>

- Excellent flex properties
- availability for Fine Pitch patterning
- availability for TAB bonder
- availability for 2 metal type COF

# Surface protection film

Surface protection film TRETEC\* is complex film produced by co-extrusion method. TRETEC\* can avoid contaminations and paste remaining and is used mainly for surface protection of optical functional films.



TRETEC\*

Optical functional film

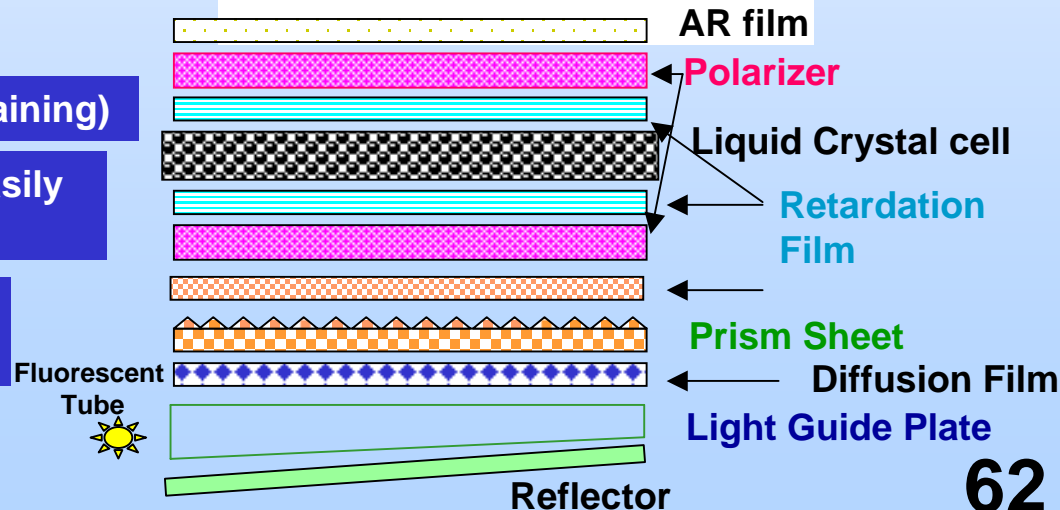
## Characteristics of TRETEC\*

- Excellent Anti-contamination (no paste remaining)
- Heat resistance type film can be released easily after high temperature treatment
- There are also excellent type films for fisheye, anti-contamination
- available in wide film (3,000mm)

## LCD panel composition and example of use



## Used for LCD related functional films



## Super high barrier transparent films for packaging

Transparency metallized film BARRIALOX\* , which came out of Toray group's technology integration, reaches the highest level as a film for packaging.

### ◆ Application of BARRIALOX\*

[Dried Food]



[Liquid]



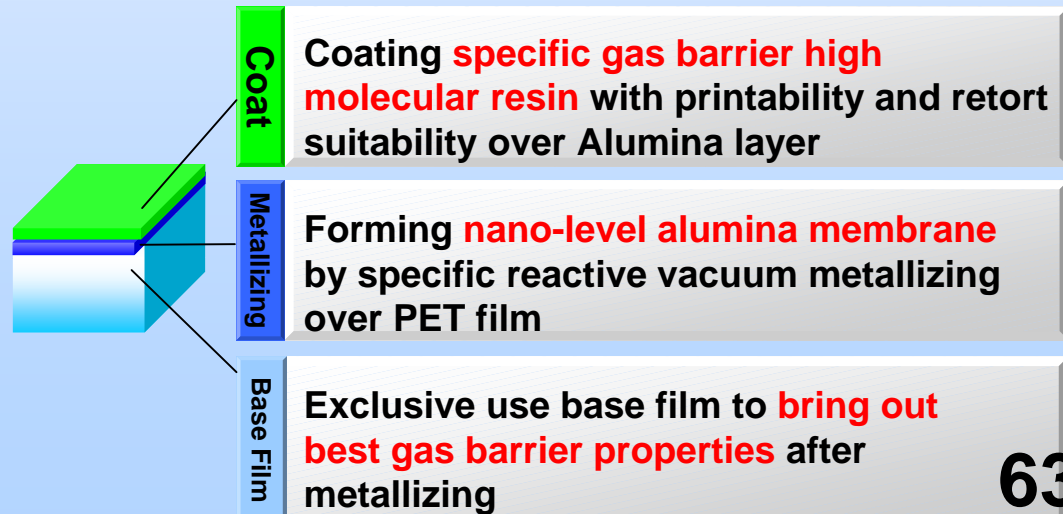
[Ham]



### ◆ Characteristics of BARRIALOX\*

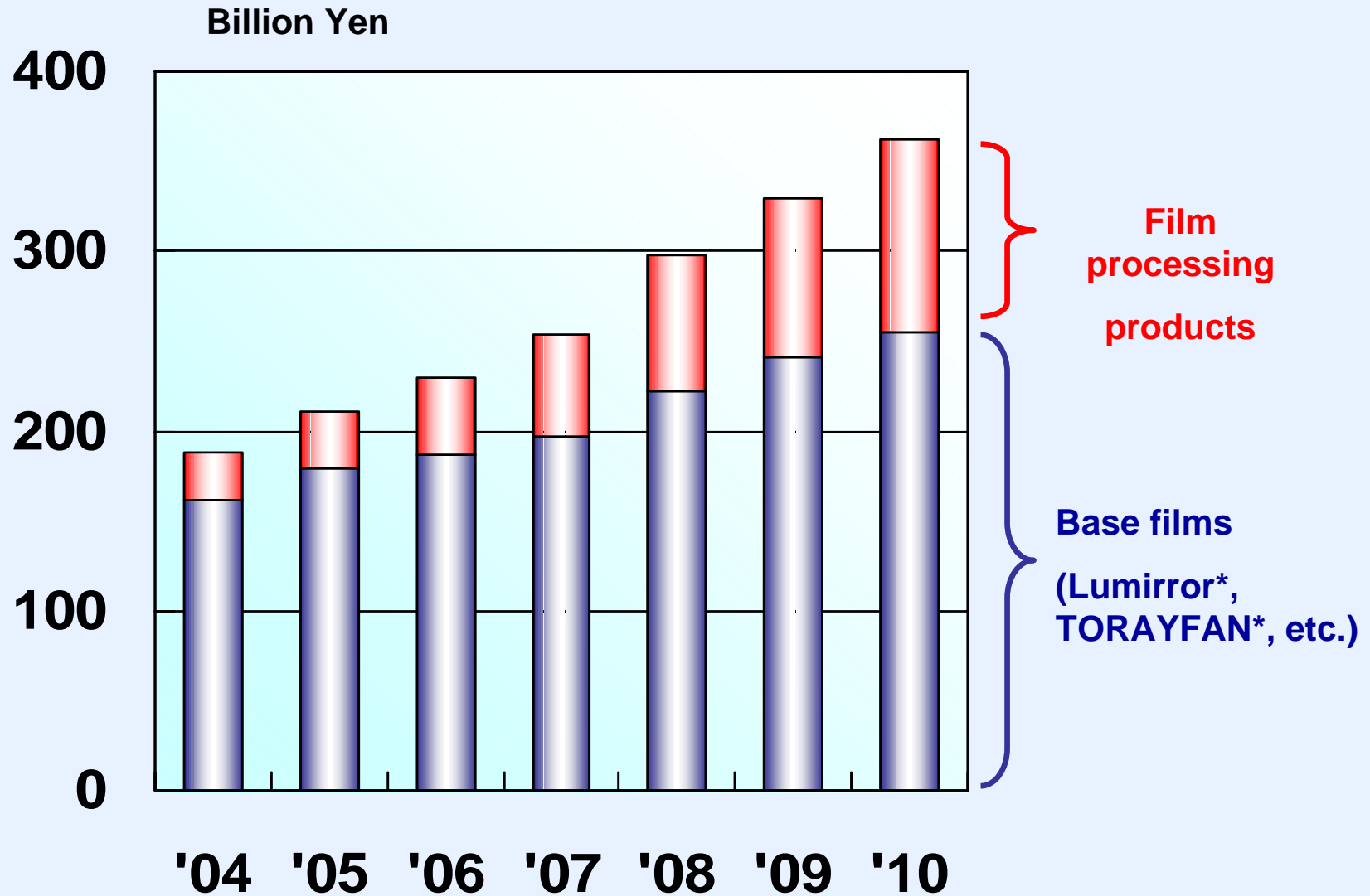
- Excellent oxygen and moisture barrier
- dioxin free
- available for metal detectors
- easy eye confirmation of Ingredients

### ◆ Components of BARRIALOX\*



# Business expansion plan (Sales)

Sum total including non-consolidated subsidiaries and affiliates

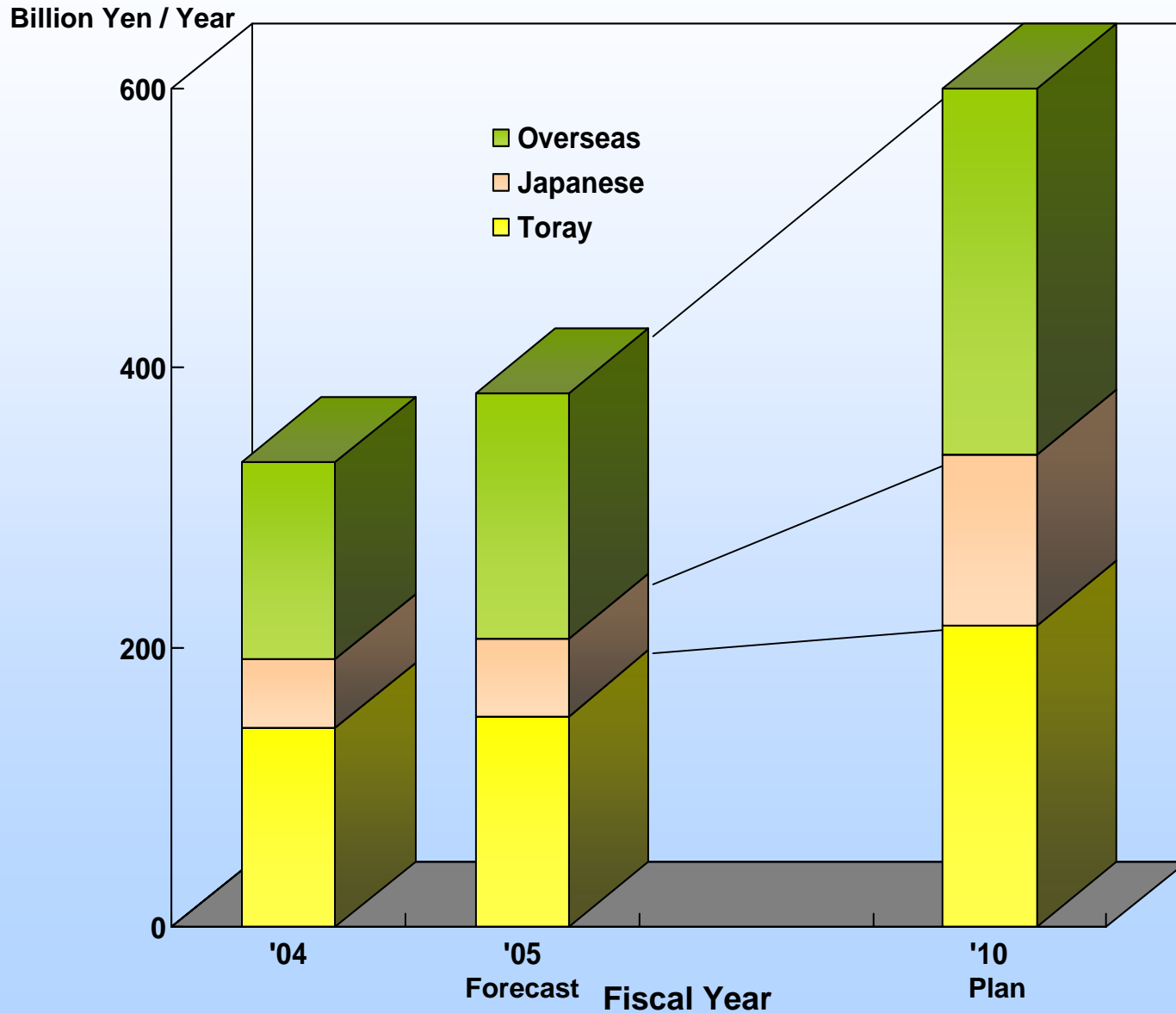




# **IV. Summary**

## Plastics and Films businesses expansion plan (Sales)

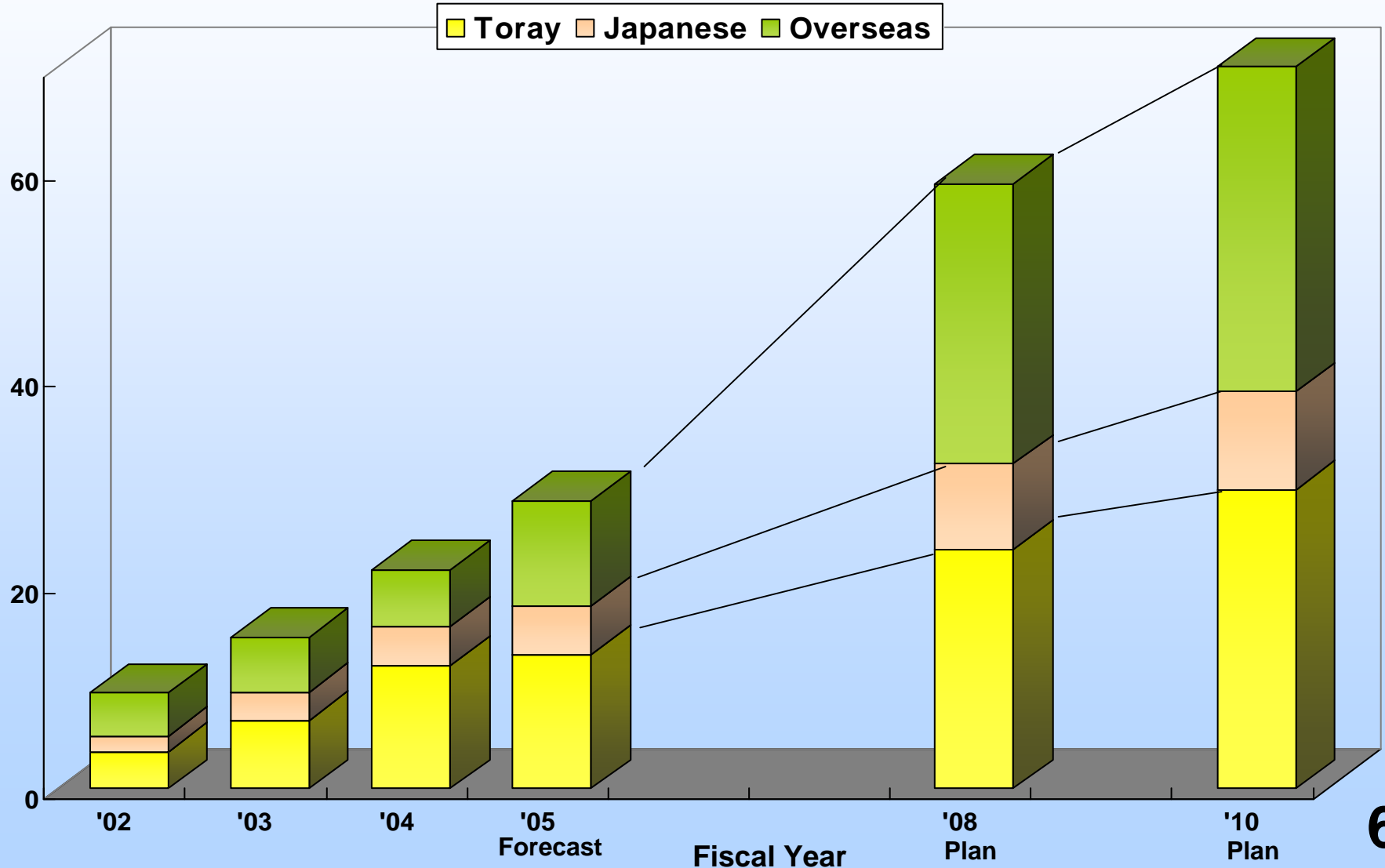
Sum total including non-consolidated subsidiaries and affiliates



## Plastics and Films businesses mid-term plan image (Operating Income)

Sum total including non-consolidated subsidiaries and affiliates

Billion Yen / Year



## Main subsidiaries and affiliates of Plastics businesses

Companies	Products	Location	Established Year
<b>Toyo Plastic Seiko Co., Ltd.</b>	<b>Plastics moldings</b>	<b>Japan</b>	<b>1961</b>
<b>Toray PEF Products Inc.</b>	<b>Polyolefin foam products</b>	<b>Japan</b>	<b>1980</b>
<b>TREC</b> (Toray Resin Co.)	Engineering plastics compoundings	<b>U.S.A</b>	<b>1989</b>
<b>TPM</b> (Toray Plastics ( Malaysia ) Sdn. Berhad)	<b>ABS resins</b>	<b>Malaysia</b>	<b>1990</b>
<b>PNR</b> (P.T. Petnesia Resindo)	<b>PET resins for bottles</b>	<b>Indonesia</b>	<b>1994</b>
<b>TPHK/SZ</b> (Toray Plastics ( Hong Kong ) Ltd.)	<b>Plastics compoundings</b>	Hong Kong-China	<b>1995</b>
<b>RKH/Z</b> (Toray Sanko Precision ( H. K. ) Ltd.)	<b>Plastics moldings</b>	Hong Kong-China	<b>1995</b>
<b>KTP</b> (KTP Industries Inc.)	<b>POM resins</b>	<b>Korea</b>	<b>1996</b>
<b>TTS</b> (Thai Toray Synthetics Co., Ltd.)	Engineering plastics compoundings	<b>Thailand</b>	<b>1998</b>
<b>TPRC</b> (Thai PET Resin Co., Ltd.)	<b>PET resins for bottles</b>	<b>Thailand</b>	<b>2002</b>
<b>TBPR</b> (Toray BASF PBT Resin Sdn. Berhad)	<b>PBT resins</b>	<b>Malaysia</b>	<b>2004</b>
<b>SMPC</b> (Shanghai Mitsui Plastic Compounds Ltd.)	<b>Plastics compoundings</b>	<b>China</b>	<b>1994</b>

## Main subsidiaries and affiliates of Films businesses

Companies	Products	Location	Established Year
Toray Advanced Film Co., Ltd.	Film processing products	Japan	2004
<b>TPA</b> (Toray Plastics America, Inc.)	OPP films,PET films	U.S.A	1985
<b>TTS</b> (Thai Toray Synthetics Co., Ltd.)	Metallized films for packaging	Thailand	1988
<b>TPEu</b> (Toray Plastics Europe S. A.)	PET films	France	1996
<b>PFR</b> (Penfibre Sdn. Berhad)	PET films	Malaysia	1997
<b>TSI</b> (Toray Saehan Inc.)	PET film, Film processing products	Korea	1999
<b>YTP</b> (Yihua Toray Polyester Film Co., Ltd.)	PET films	China	2001
<b>TFZ</b> (Toray Film Products Zhongshan Ltd.)	Metallized films for capacitors	China	2002

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**Description of predicted business results, Projections, and business plans contained, in this material are based on predictive forecasts of the future business environment made at the present time.**

**The material in this presentation is not a guarantee of the Company's future business Performance.**