TORAY IR Day
Medium-Term Management Program Project AP-G 2025

Electronic & Information Materials Business

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Senior Vice President
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Toray Industries, Inc.
Contents

I. Overview of Electronic & Information Materials Business

II. Reviewing the Medium-Term Management Program, Project AP-G 2022

III. Medium-Term Management Program, Project AP-G 2025
Overview of
Electronic & Information Materials Business
Diverse Product Lineup

Semiconductor & JISSO

Photoneece™ Semicofine™
Polyimide Coating Material

FALDA™
Photodefinable/Non-Photodefinable Adhesive Film

Flexible Printed Circuit Board
(Single-sided, Double-sided)

TORAYCERAM™
Fine Ceramics

RAYBRID™
Photodefinable Functional Paste

Printing

TORELIEF™
Photopolymer Letterpress Printing Plate

RESOLUCIA™
Photopolymer UV Flexo Printing Plate

IMPRIMA™
Environmentally Friendly Offset Printing Plate

PRI Xia™
High Resolution Dry Offset Printing Plate

Low Environmental Impact Printing System

Main Applications

Display

Photoneece™
Photodefinable Polyimide Coating Material

Light-Emitting Material for OLED

LUMIRICA™
Organic Spectrum Conversion Sheet

RAYBRID™
Photodefinable Functional Paste

Photoblack™
High-performance Light-shielding Ink

Photoclear™
High-performance Coating Material

Medical & Industrial

RAYTELA™
Plastic Optical Fiber

X-ray Scintillator Panel

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Reviewing the Medium-Term Management Program, Project AP-G 2022
Review of Project AP-G 2022

**AP-G 2022 Basic Strategy**

- Use advanced core technologies to create high value-added electronic materials that meet customer needs in a timely manner
- Earn customers’ trust and continuously expand business by providing prompt solutions through advanced materials and processes

**Electronic & Information Materials Trends in Revenue**

**The Performance Chemicals Segment Variance Analysis**

In FY 2021, sales were strong due to the special demand for stay-at-home. In FY 2022, core operating income was -14 billion yen below the target. The main factor was decline in sales volume caused by the declining demand and excess inventories.
**Laying Groundwork for AP-G 2025**

**Semiconductor & JISSO Market**
- In response to spread of xEV and renewable energy infrastructures, we concentrated our efforts on developing materials for power-semiconductor applications. Increase of market share in China from track record for qualification in Japan.
- Newly developed NMP-free polyimide has been qualified by one of the top power semiconductor manufacturer in the world. This material may become the next standardized material in the semiconductor industry.
- Active collaborative work with numerous industrial, academic, and governmental societies (e.g. LSTC and IME) to develop materials for the next generation of semiconductors.

**Display Market**
- Partnering-up with promising OLED display manufacturers with technological advantages of high brightness, efficient dimensional designs and low power dissipation, a business success is strongly sealed.
- For the next generation of displays, development for the micro LED materials has accelerated.
- Shift of Sales and R&D resources toward OLED and micro LED to enable quick response to customers.

**Printing Market**
- Succeeding in mass production of printing plates for environmentally friendly VOC-free printing systems to dramatically improve working conditions at printing process.
- Focusing on developing and marketing of label and package printing applications to appeal high added value.

**New Growth Market**
- Developed multi-core technology for plastic fiber using Toray’s unique NANODESIGN™ technology. Evaluation is progressing in optical communication.
- Developed a high photodefimable material that can form high-aspect bulkhead and a higher definition scintillator panel for non-destructive testing.

**Reinforcement of Global Network**
- Strengthened the global network to accommodate customer needs with speed and localized sales & technical support around the globe.
Medium-Term Management Program,
Project AP-G 2025
1. Basic Strategies
Basic Strategies of Project AP-G 2025

Achieving maximum profit by expanding sales in growing markets and regions, strengthening the management foundation, and creating new big business

**"The One" Strategy**

- **De facto standardization**
  
  By global expansion

- **Early acquisition of future needs**
  
  Tracking of customer trend and market trend

- **Number One**
  
  High barrier-to-entry

  IP network, Production performance (high quality, stable supply, competitive cost), customer support

- **First One**
  
  Early adoption of our products through rapid development

  using advanced and extensive fundamental technologies, process technologies, and evaluation capabilities

- **Only One**

**Expansion of Core Businesses**

Expanding the strategic products sales in growing markets and regions

<table>
<thead>
<tr>
<th>Polyimide Material</th>
<th>High-performance Coating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional Paste</td>
<td>Letterpress/Offset Plate</td>
</tr>
</tbody>
</table>

**New Business Creation**

Creating and promoting new business that fits "The One" strategy.

Expanding adoption of environmentally friendly materials

<table>
<thead>
<tr>
<th>Power Semiconductors</th>
<th>Optical Cable Optoelectronic Fusion Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Saving</td>
<td>Communication</td>
</tr>
<tr>
<td>xEV</td>
<td>Environmentally Friendly Technology</td>
</tr>
<tr>
<td>Thin Displays</td>
<td>Wearable Devices</td>
</tr>
<tr>
<td></td>
<td>Labels &amp; Packaging</td>
</tr>
</tbody>
</table>
Our Position in the Toray Group Growth Business Fields

Growth Business Fields under AP-G 2025

1. Products that accelerate measures to counter climate change
2. Products that facilitate sustainable, recycling-based use of resources and production
3. Products that help provide clean water and air and reduce environmental impact
4. Products that help deliver better medical care and hygiene for people worldwide

**SI Business**
Sustainability Innovation Business (*1)

*1: Group of businesses or products that can help realize the Toray Group Sustainability Vision

**New**
DI Business
Digital Innovation Business

Materials, equipment, technologies, and services that help improve convenience and productivity by supporting the widespread adoption of digital technology

**TORAY Group**
Revenue from DI Business

- Expand at an annual growth rate of 15%
- 2025 Target: 250.0 Billion Yen
- 2022: 166.4 Billion Yen

**Revenue of Electronic & Information Materials Business**

- Expand at an annual growth rate of 22%
- 2025 Target: 100.0 Billion Yen
- 2022: 55.2 Billion Yen

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Medium-Term Management Program, Project AP-G 2025
2. Semiconductor & JISSO Market
Semiconductor & JISSO Market

Achieving our business growth by focusing on the materials used for semiconductor memories and power semiconductors

- **Japan:** In order to accelerate our material development for the next-generation of semiconductors, actively collaborating with numerous industrial, academic and governmental organizations.
- **China:** Expanding sales by localizing customer support for faster and efficient services.
- **EU/USA:** Expanding sales by introducing environmentally friendly materials to the major power semiconductor manufacturers.
- In order to accommodate sales expansion for semiconductors related products, investments will be made to increase the mass production capacity.

**Products for Semiconductor & JISSO Market**

- **NMP-Free Polyimide**
  - That lowers potential environmental impacts

**NMP (N-methylpyrrolidone)**

- Used in polyimide polymerization solvents, but regulations are spreading due to concerns about reproductive toxicity.

**NMP-Free Polyimide**

- With non-NMP solvent

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**Market Size of Semiconductors**

Expand at an annual growth rate of **7%**

(Billion Dollars)

- (CY) 2023: 200
- 2024: 400
- 2025: 600

Estimated by Toray

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Super thick and high-aspect-ratio examples

- Φ15µm Via
- Line/Space=20/10µm

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*Differs from the actual structure*
The power semiconductor market is expanding with the spread of electric vehicles and renewable energy infrastructures. Proposing heat resistance and high reliability buffer coating materials and thermal conductive insulation films.

### Products for Power Semiconductors

**Expanding sales in power semiconductor applications with polyimide coating materials and adhesive films**

- Toray Group
- Polyimide Coating Materials
  - For Buffer Coating
    - High reliability
    - High sensitivity
  - Track record of over 40 years as buffer coating materials for power semiconductor ICs
- Thermal Conductive Insulation Films
  - Direct adhesion to heat sink without grease
  - Shortened the heat dissipation path by lowering the total thermal resistance of the module
  - EMS
  - Toray’s Adhesive Films
  - SIC Power Module
  - Joint research with IME

**Power Semiconductor**

- Toray Group
- Materials
  - Toray Singapore Research Center (TSRC) established (June 2022)
- Manufacturing and inspection equipment
  - New company (TRENGEU) established in Germany (April 2023)
- Customers
  - Power Module
  - Performance improvement
  - Increased productivity
Medium-Term Management Program, Project AP-G 2025
3. Display Market
Display Market

Maintaining de facto standard position and expanding business in the OLED display market

- The OLED display market will continue to expand with technological advantages of high brightness, efficient dimensional designs and low power dissipation
- Expect increase in market share for OLED display applications, such as mid-size TVs and smartphones. Also expect new adoption in applications such as tablets and automotive displays
- In order to accommodate sales expansion for OLED display related products, investments will be made to increase the mass production capacity

Market Size of OLED Displays

Forecast of OLED Display Percentage Change

<table>
<thead>
<tr>
<th>CY 2022</th>
<th>CY 2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile</td>
<td>40%</td>
</tr>
<tr>
<td>TV</td>
<td>3%</td>
</tr>
<tr>
<td>Car</td>
<td>1%</td>
</tr>
</tbody>
</table>

Expand at an annual growth rate of 10%

Products for OLED Displays

Polyimide Materials

Light-Emitting Materials for OLED

Estimated by Toray
Products for Micro LED Displays

Promoting a wide range of advanced materials for micro LED displays regarded as next-generation display technology

- Many materials are under evaluation for displays for wearable devices and VR goggles.

Micro LED Displays

<table>
<thead>
<tr>
<th>Toray Group</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Micro LED Displays</td>
</tr>
<tr>
<td></td>
<td>Manufacturing and Inspection Equipment</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Customers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro LED Displays</td>
</tr>
</tbody>
</table>

| Quality improvement |
| Increased productivity |

Cross-section View

- Bonding Material
- Bank Material
- Black Material
- Dielectric Material
- Side-Wire Material

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Medium-Term Management Program, Project AP-G 2025
4. Printing Market
Printing System for “Zero Environmental Impact”

Promoting the environmentally friendly printing system as a global standard to improve the working environment and protect the global environment

- Conventional printing process uses many organic solvent in inks, cleaning agents, etc., and improving the work environment and protecting the environment are serious issues
- “Completely ZERO VOC printing system” was achieved by the environmentally friendly offset printing plate IMPRIMA™ and water soluble EB curable ink

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### Environmentally Friendly Offset Plate IMPRIMA™

### Water Soluble Electron Beam (EB) Curable Ink

- **Ink Ingredients**
- Ink

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#### VOC Content

<table>
<thead>
<tr>
<th>Cleaning 100</th>
<th>Ink</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agent</td>
<td></td>
</tr>
<tr>
<td>Completely ZERO VOC</td>
<td>0</td>
</tr>
</tbody>
</table>

#### CO₂ Emission

<table>
<thead>
<tr>
<th>100</th>
<th>80% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Printing Process</td>
<td>&lt;20</td>
</tr>
</tbody>
</table>

* Estimated by Toray with solvent gravure printing emissions as 100
The Sustainable Solution for The Future of Flexible Packaging

Developing the ultimate environmentally friendly materials for flexible packaging to target various applications including food packaging

- Low environmental impact flexible packaging using recyclable materials and IMPRIMA™ EB offset printing system were developed with partners.

**Partners**

- **TORAY**
  - Printing Plates, Ink Ingredients, Film
  - Ink Manufacturer
  - Printing Press Manufacturer
  - Flexible Packaging Converter

**Recyclable Mono-material Packaging**

European CEFLEX compliant

- **OPP mono-material packaging**
  - Recyclable
  - For retort applications

- **PE mono-structure packaging**
  - Recyclable
  - For boil applications

Presented at Interpack 2023

**Various Applications**
Medium-Term Management Program, Project AP-G 2025
5. New Growth Markets
New Proposal for Optical Communication Field: Multi-Core Plastic Optical Fiber

- Developed multi-core optical fiber by Toray’s unique NANODESIGN™ technology and resin flow control technology.
- Evaluation is progressing in application to next-generation high-capacity optical communication systems.

**Optical Communication**

**Post-5G**
Ultra low latency, Multiple simultaneous connections

Increase of communication data volume
Increase in demand for high-speed, high-capacity communications

Reduction of energy consumption

**Silicon Photonics**

Copper Wiring (Electricity)
Optical waveguide (Optical)

**Plastic Optical Fiber**

- Core
- Clad

**Multi-Core Optical Fiber**

- Core
- Clad
- Sea

**Double-Layer Structure**

**Various polymer designs**
- Polymer A
- Polymer B

**Various cross-section designs**

**Ability to combine 3 types of polymers**

**Cross-Section Image of the 3-Components Multi-Core Fiber**

Core
Φ: 28μm

Sea
Clad
Contributing to High-Resolution Inspection: Scintillator Panel

- Ultra-thick film and high-aspect technology realized the world's highest resolution scintillator panel for digital X-ray inspection
- Promoting business expand in non-destructive digital testing applications

### Scintillator

<table>
<thead>
<tr>
<th>Digital</th>
<th>Film</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate image analysis, Cloud storage, Image modification possible</td>
<td>Developing work required, Storage space issue, Image modification not possible</td>
</tr>
</tbody>
</table>

### Plate Type

- **Analog (Conventional)**
- **TORAY Pixelated Type**

### Nuclear Power Plants

#### Sharp Image

- Nuclear Power Plants
- Aircraft Parts

#### Blurred Image

- Security Inspection
- Medical Tests

#### TORAY Pixelated Type

- X Ray
- **Rib**
  - 18㎛
  - 360㎛
Medium-Term Management Program, Project AP-G 2025
6. Target for FY 2025
**FY 2025 Target**

- Expanding market share in growth business fields
  - OLED Display
  - Power semiconductors
- Promoting business diversification by launching new businesses following the flexible printed circuit board business at an overseas subsidiary

**Performance Chemicals FY 2025 Target**

- **Revenue (left axis)**
  - FY 2022: 909.4 billion yen
  - FY 2025 Target: 1,040.0 billion yen

- **Core operating income (right axis)**
  - FY 2022: 30.4 billion yen
  - FY 2025 Target: 91.0 billion yen

- **ROIC**
  - FY 2022: 3%
  - FY 2025 Target: 8%

**Target: +14.0 billion yen in core operating income vs FY 2022**

- **Resins & Chemicals**
- **Films**
- **Electronic & Information Materials**

- Increase in TV and smartphone production
- Increase in the ratio of OLED display
- Semiconductor market recovery
- Increased demand for power semiconductors
- Printing materials & others
Electronic & Information Materials FY2025 Target

Sales Revenue (Billion yen)

- Mobile Phone Adoption
- Bubble Burst
- Financial Crisis
- IT Recession
- iPhone Introduction
- Lehman Shock
- Launch of OLED Smartphone
- Recession due to Stay-at-Home Demand

Sales Revenue:
- OLED Display
- LCD
- Printing
- Semiconductor & JISSO
- PDP Display

Descriptions of predicted business results, projections and business plans contained in this material are based on assumptions and forecasts regarding the future business environment, made at the time of publication. Information provided in this material does not constitute any guarantee concerning the Toray Group’s future performance.