

# ETERNAL MATERIALS



ETERNAL  
MATERIALS

# **Dry Film Photoresist Applications and Opportunities**

**Photoresist Materials Division**

Speaker : Director, Johnny Liao

2021/4/9

# Outline

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- **Profile**

Overview 、 Development Milestones 、 Core Technology  
、 Business Group 、 Global Production Sites 、 Global Service Network 、  
R&D Sites 、 Annual Sales Distribution 、 R&D Honor

- **Financial Information**

- **Introduction of the Photoresist Materials Business Division**

- **Dry Film Photoresist Applications and Opportunities**

# Profile - Overview

- **Core Business** : Manufacturing, processing and sales
- **Founding** : in 1964, Headquarters in Kaohsiung, Taiwan
- **Year of Listed on Taiwan Stock Exchange** : 1994
- **Chairman** : Allen K. L. Kao
- **Number of Employees** : 4,859 <sup>1</sup>
- **Number of Production Sites** : 23 (3 in Taiwan, 13 in Mainland China, 1 in United States, 1 in Thailand, 3 in Japan, 1 in Malaysia and 1 in Italy)
- **Overall Sales Revenue in 2019** : USD 1,299 million <sup>2</sup>
- **Headcounts of Researchers** : 591 (R&D expenditures accounted for 3% of sales revenue)

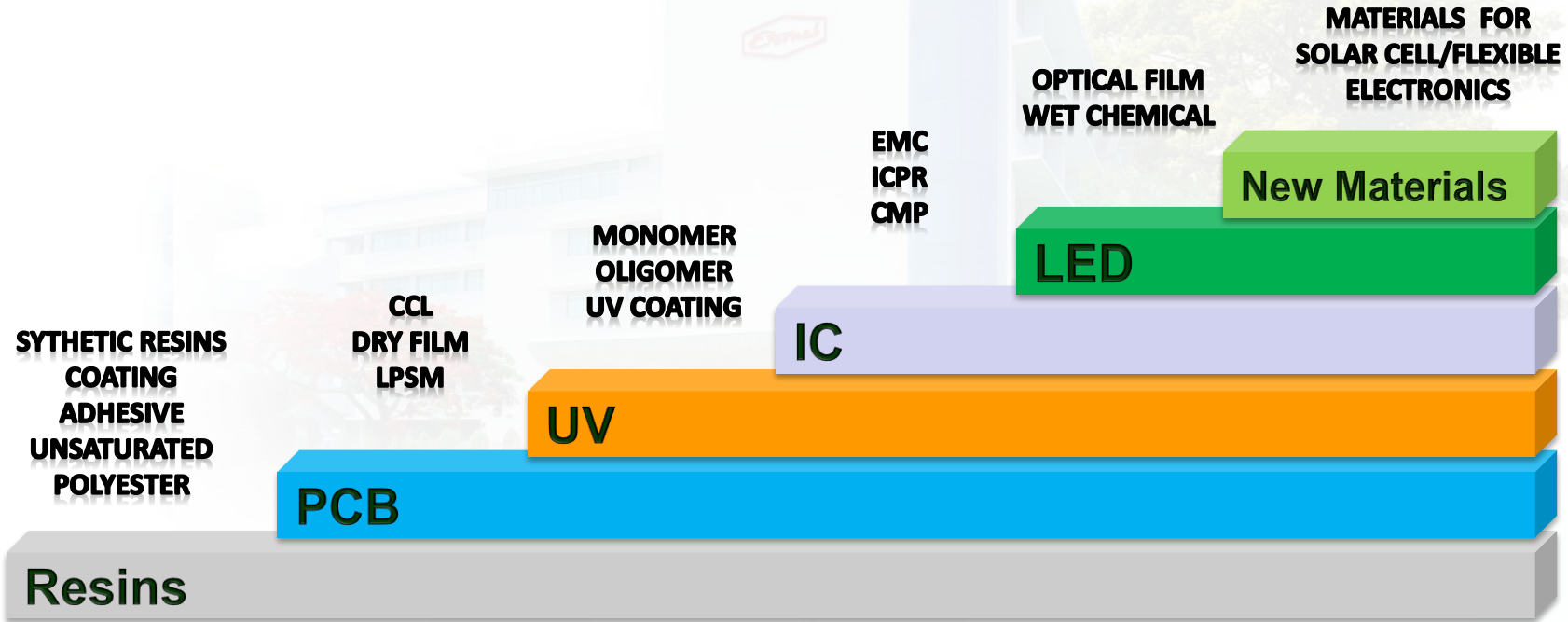
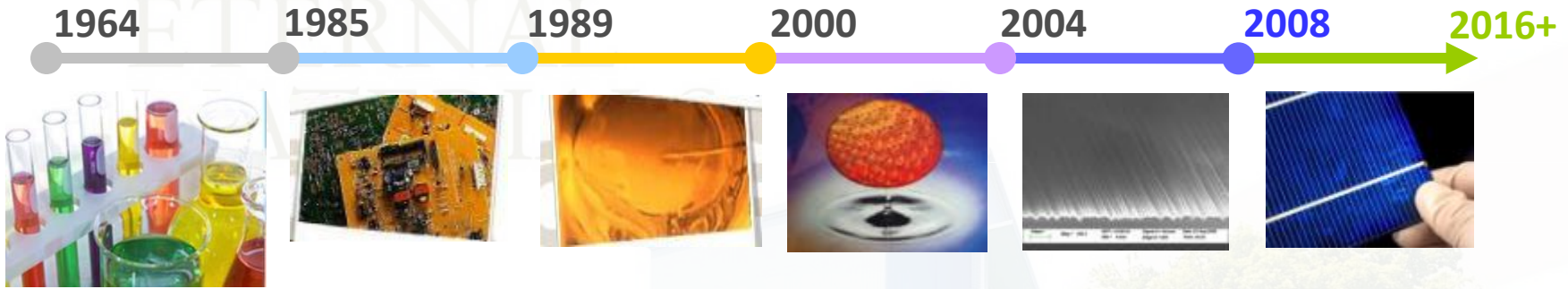
## Eternal is:

- One of the leading suppliers of Dry film photoresist in the world.
- One of three largest UV curable Monomers & Oligomers material suppliers.
- One of the leading suppliers of synthetic resin in Asian.

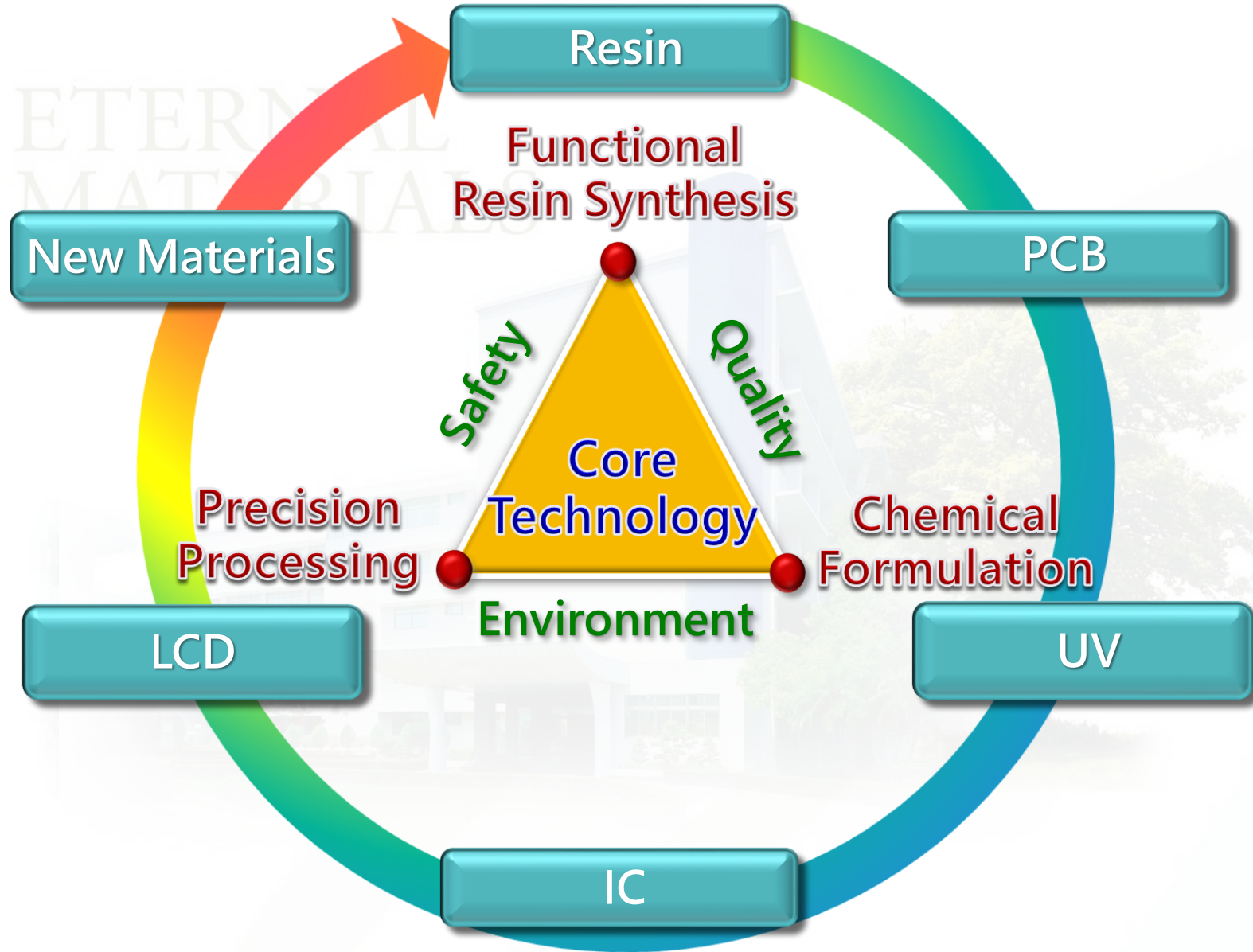
•1.Number of Employees on December 31,2020  
 •2.refer to year 2020 Consolidated statement



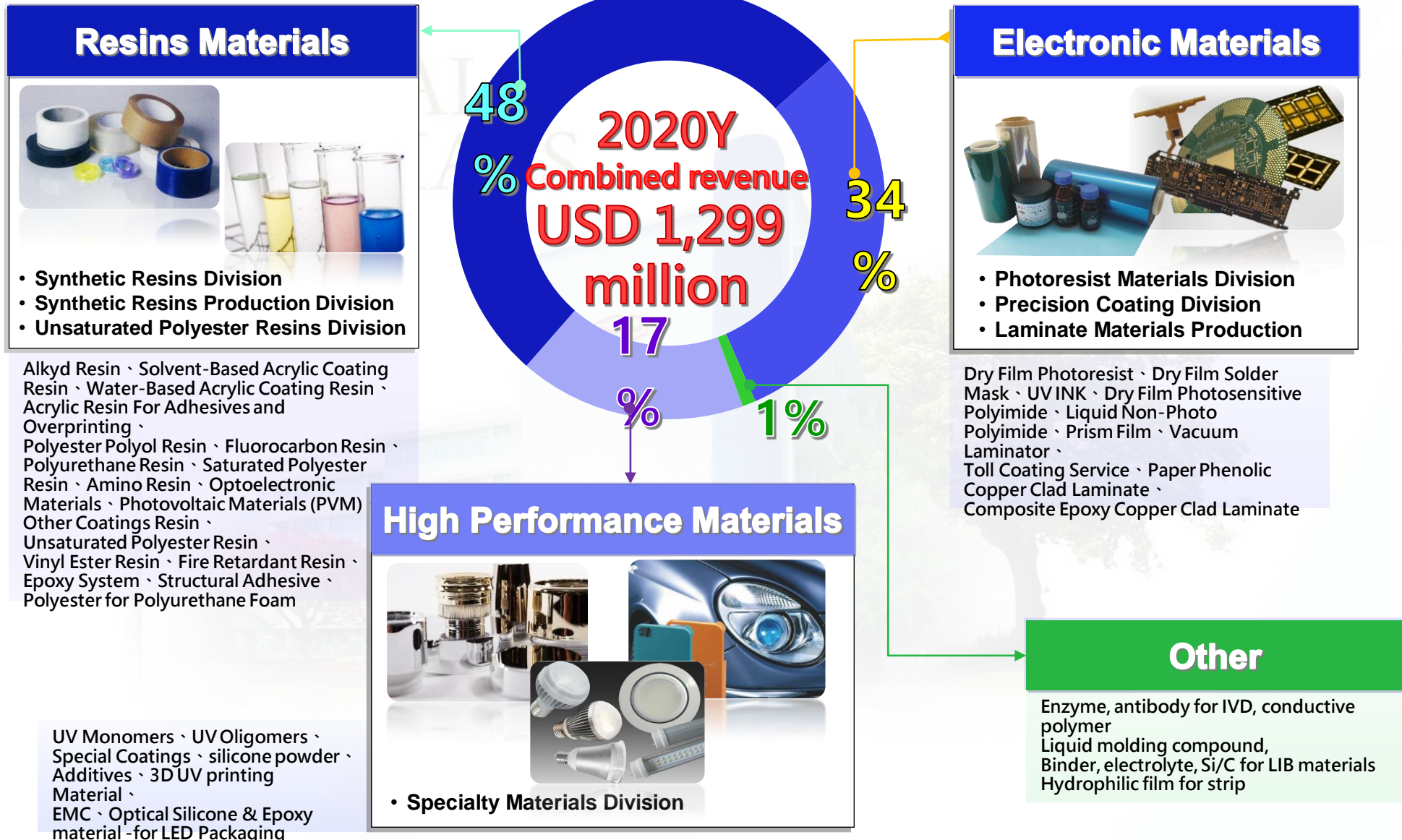
# Profile-Development Milestones



# Profile-Core Technology



# Profile-Business Group

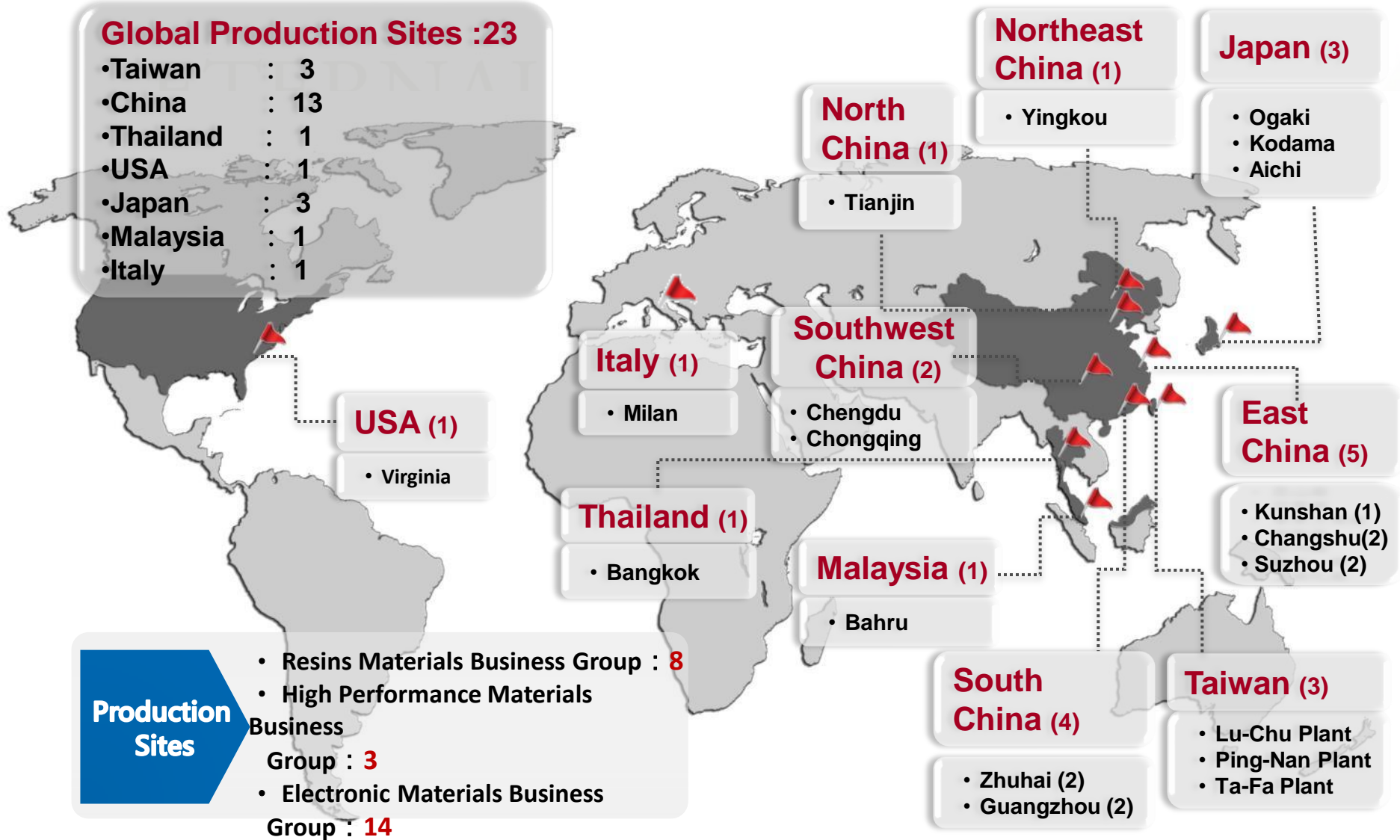


Alkyd Resin · Solvent-Based Acrylic Coating Resin · Water-Based Acrylic Coating Resin · Acrylic Resin For Adhesives and Overprinting · Polyester Polyol Resin · Fluorocarbon Resin · Polyurethane Resin · Saturated Polyester Resin · Amino Resin · Optoelectronic Materials · Photovoltaic Materials (PVM) Other Coatings Resin · Unsaturated Polyester Resin · Vinyl Ester Resin · Fire Retardant Resin · Epoxy System · Structural Adhesive · Polyester for Polyurethane Foam

Dry Film Photoresist · Dry Film Solder Mask · UV INK · Dry Film Photosensitive Polyimide · Liquid Non-Photo Polyimide · Prism Film · Vacuum Laminator · Toll Coating Service · Paper Phenolic Copper Clad Laminate · Composite Epoxy Copper Clad Laminate

UV Monomers · UV Oligomers · Special Coatings · silicone powder · Additives · 3D UV printing Material · EMC · Optical Silicone & Epoxy material -for LED Packaging

# Profile-Global Production Sites

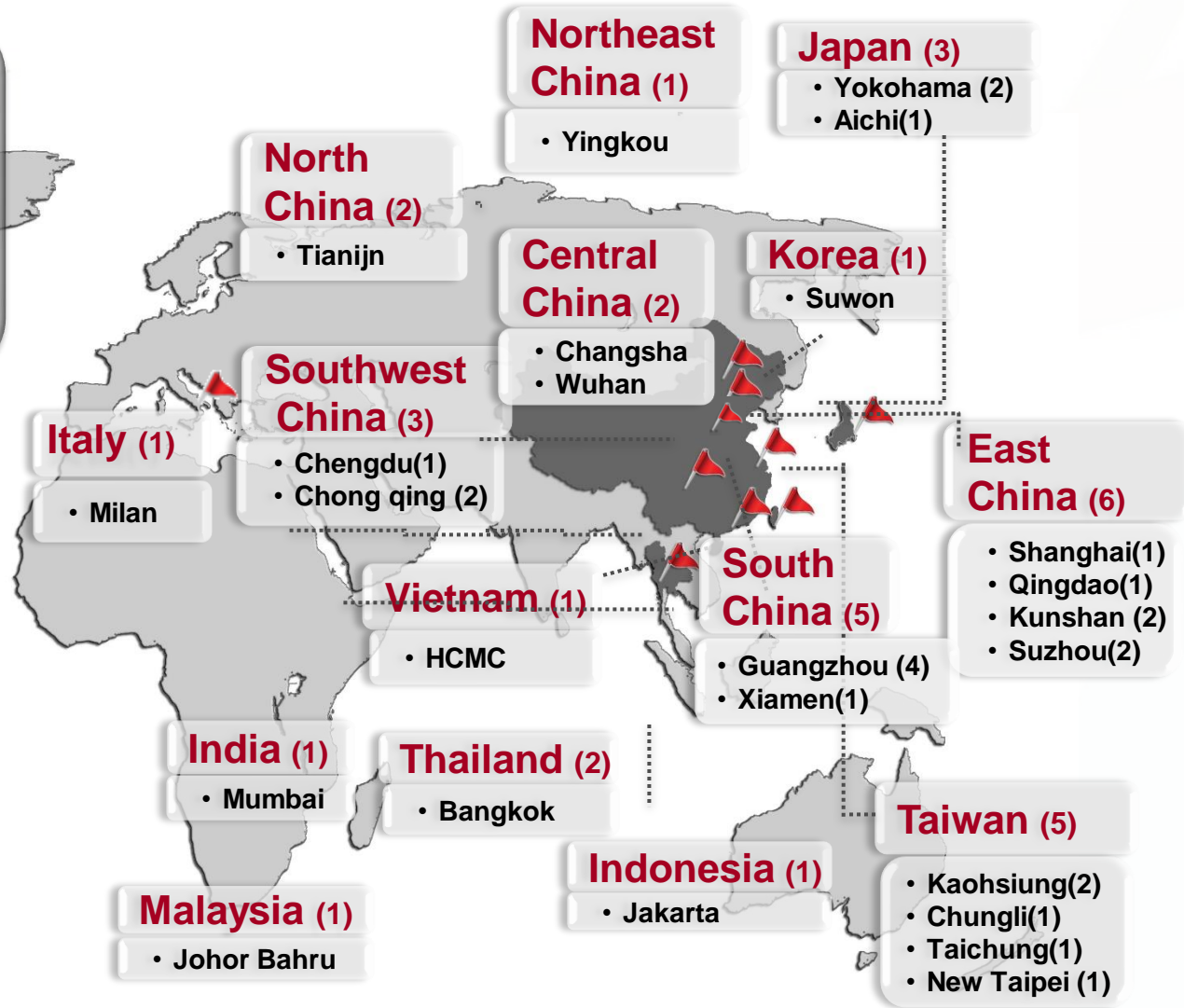




# Profile-Global Service Network

**Global Service Network : 36**

|                 |                |
|-----------------|----------------|
| ◆ Taiwan : 5    | ◆ China : 19   |
| ◆ USA : 1       | ◆ Japan : 3    |
| ◆ Thailand : 2  | ◆ Korea : 1    |
| ◆ Indonesia : 1 | ◆ India : 1    |
| ◆ Vietnam : 1   | ◆ Malaysia : 1 |
| ◆ Italy : 1     |                |



# Profile-R&D Sites

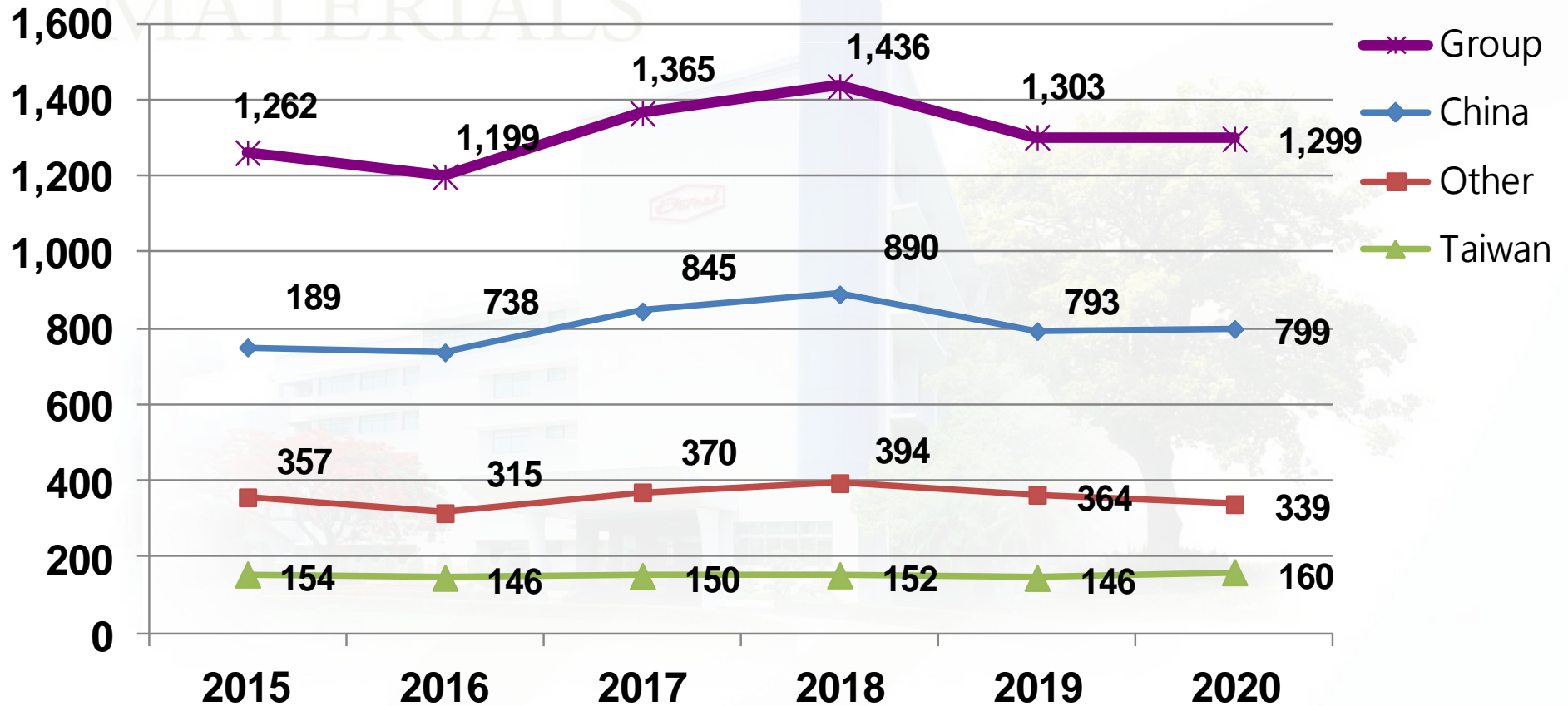
- 1. Taiwan - Research & Development Center
- 2. China - Mainland China R&D Center
- 3. China - Beijing laboratory
- 4. The laboratory of plant (\*8)



# Profile-Annual Sales Distribution

(In the recent 5 years)

Unit :  
USD million



# R&D Honor

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- 1990 **Best performance manufacturer on new product R&D for Specialty Monomer products**
- 1992 **Best performance manufacturer on new product R&D for Dry Film products**
- 1993 **Outstanding Award for Industrial Technology Advancement granted by MOEA**
- 1995 **Excellent Award for Industrial Technology Advancement granted by MOEA**
- 1997 **Best performance manufacturer on new product R&D for Image Material**
- 2001 **Distinguished Award for Industry Technology Advancement, the highest honor granted**
- 2005 **Honored NBIA International Incubation Award from Open Laboratory /Incubation Center of ITRI**
- 2007 **Awarded Innovation Elite Prize of Taiwan nanotechnology (Industry Award) by Taiwan Nanotechnology Industry Development Association**
- 2008 **Awarded Industrial Contribution Prize in TCIA Industrial Excellent Award 2008**
- 2010 **Awarded Outstanding Enterprise Innovation Award by Taiwan Nanotechnology**
- 2018 **Awarded Chinese Society for Management of Technology**



# Financial Information-Balance Sheets & Key Indices

Unit : NT\$ Millions

|  | 2020          |                   | 2019          |                   | 2018          |                   |
|--|---------------|-------------------|---------------|-------------------|---------------|-------------------|
|  | Amount        | %                 | Amount        | %                 | Amount        | %                 |
| Cash and cash equivalents and current financial assets | 6,170         | <u>11</u>         | 6,076         | <u>11</u>         | 6,327         | <u>11</u>         |
| Accounts receivable                                    | 17,523        | <u>31</u>         | 15,361        | <u>29</u>         | 14,783        | <u>27</u>         |
| Inventories  | 7,493         | <u>13</u>         | 7,182         | <u>13</u>         | 7,918         | <u>15</u>         |
| Financial assets                                       | 3,344         | <u>6</u>          | 3,043         | <u>6</u>          | 2,820         | <u>5</u>          |
| Property, plant and equipment                          | 16,623        | <u>30</u>         | 17,436        | <u>32</u>         | 18,792        | <u>35</u>         |
| <b>Total Assets</b>                                    | <b>56,189</b> | <b><u>100</u></b> | <b>53,797</b> | <b><u>100</u></b> | <b>54,360</b> | <b><u>100</u></b> |
| Short-term borrowings                                  | 4,404         | <u>8</u>          | 4,415         | <u>8</u>          | 5,146         | <u>10</u>         |
| Current portion of long-term borrowings                | 2,211         | <u>4</u>          | 4,547         | <u>9</u>          | 3,676         | <u>7</u>          |
| Long-term borrowings                                   | 13,185        | <u>23</u>         | 11,924        | <u>22</u>         | 14,166        | <u>26</u>         |
| <b>Total Liabilities</b>                               | <b>32,950</b> | <b><u>59</u></b>  | <b>31,877</b> | <b><u>59</u></b>  | <b>32,735</b> | <b><u>60</u></b>  |
| <b>Total Equity</b>                                    | <b>23,238</b> | <b><u>41</u></b>  | <b>21,920</b> | <b><u>41</u></b>  | <b>21,625</b> | <b><u>40</u></b>  |
| <b>Key Financial Ratios</b>                            |               |                   |               |                   |               |                   |
| Average cash collection days                           | 159           |                   | 139           |                   | 128           |                   |
| Average days required for sale                         | 93            |                   | 86            |                   | 81            |                   |
| Current ratio  | 210           |                   | 191           |                   | 212           |                   |

# Financial Information-Statements of Comprehensive Income

Unit : NT\$ Millions

|  | 2020    |      | 2019    |      | 2018    |      |
|--|---------|------|---------|------|---------|------|
|  | Amount  | %    | Amount  | %    | Amount  | %    |
| Operating Revenue                                |         |      |         |      |         |      |
| Gross profit                                     | 38,370  | 100  | 40,363  | 100  | 43,300  | 100  |
| Operating expenses                               | 8,886   | 23   | 7,857   | 19   | 7,280   | 17   |
| Operating Income                                 | (5,747) | (15) | (5,522) | (14) | (5,467) | (13) |
| Non-operating income and expenses                | 3,139   | 8    | 2,335   | 6    | 1,813   | 4    |
| Net profit attributable to owners of the company | 6       | 0    | 579     | 1    | 51      | 0    |
| Operating Revenue                                | 2,543   |      | 2,466   |      | 1,550   |      |
| <b>Key Financial Ratios</b>                      |         |      |         |      |         |      |
| Net profit margin                                | 6       |      | 6       |      | 3       |      |
| EPS  | 2.05    |      | 1.99    |      | 1.25    |      |
| ROE  | 11      |      | 11      |      | 7       |      |

# Financial Information-Cash Flow Statements

Unit : NT\$ Millions

|   | 2020    | 2019    | 2018    |
|---|---------|---------|---------|
|   | Amount  | Amount  | Amount  |
| Cash and cash equivalents at the beginning of the year        | 6,010   | 6,085   | 7,984   |
| Cash flows from operating activities                          | 4,148   | 4,946   | 2,883   |
| Acquisition of property, plant and equipment                  | (1,458) | (2,111) | (2,479) |
| Increase (decrease) in short-term borrowings                  | (4)     | (931)   | (873)   |
| Issuance of Corporate Bonds                                   | 0       | 3,000   | 0       |
| Increase (decrease) in long-term borrowings                   | (993)   | (4,297) | (1,338) |
| Dividends paid  | (1,736) | (1,116) | (579)   |
| Other items   | 134     | 914     | 627     |
| Effects of exchange rate changes on cash and cash equivalents | 7       | (480)   | (140)   |
| Cash and cash equivalents at the end of the period            | 6,108   | 6,010   | 6,085   |
| Free cash flow  | 2690    | 2,835   | 404     |

*Note:* Free cash flow=

Cash flows from operating activities - Acquisition of property, plant and equipment

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A faded background image showing a modern building with a prominent vertical tower, surrounded by trees and a clear sky.

# Introduction of the Photoresist Materials Division



# PM Division-Product Category

**Liquid Non-Photo Polyimide**  
液態非感光型聚醯亞胺

**Liquid UV Curable Marking Ink**  
液態文字油墨

**Vacuum Laminator**  
真空壓膜機

**Dry Film Photoimageable Solder Mask**  
乾膜防焊光阻

**Toll Coating Service**  
精密塗佈代工

**High Functional Film**  
**Optical Film**  
**Photoresist Marking Film**

**Hydrophilic Film**  
親水膜

**Photo-Imageable Coverlay**  
感光型覆蓋膜

**Dry Film Photoresist**  
負型水溶性乾膜光阻

**Copper Clad Laminate**  
銅箔基板

**Dry Film Photosensitive Polyimide**  
薄膜感光型聚醯亞胺

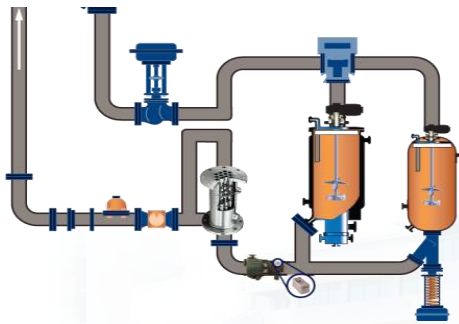
光阻事業部  
Photoresist Materials Division  
[www.eternal-group.com](http://www.eternal-group.com)

# PM Division-One-Stop Service



**For Better Quality and Higher Efficiency**

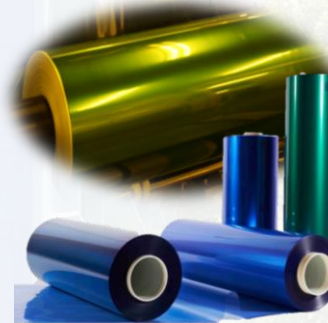
## Varnishing



## Coating



## Slitting



## Logistics

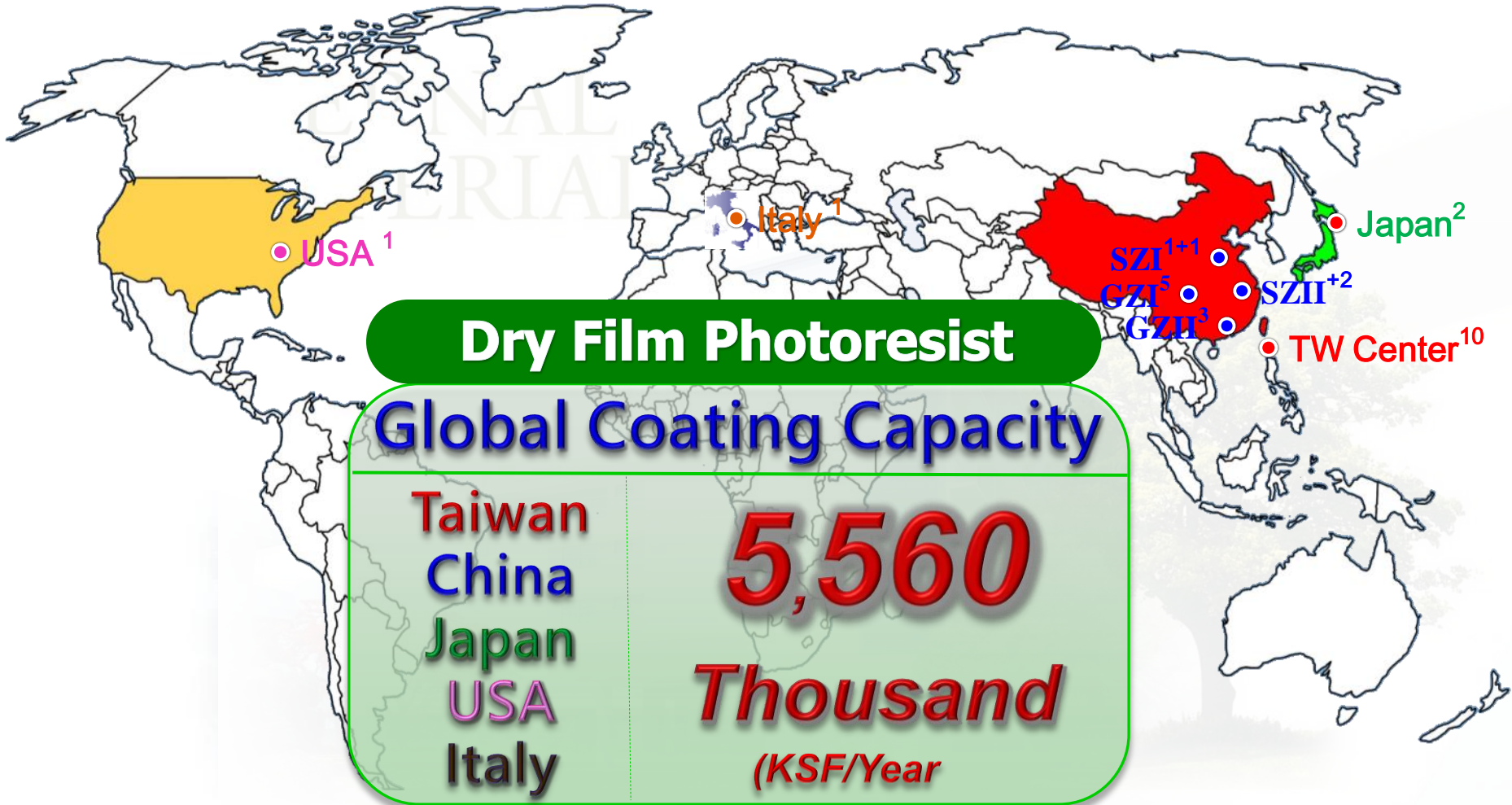


- ①  $22\pm 2^{\circ}\text{C}$ ,  $<60\%RH$
- ②  $5\pm 3^{\circ}\text{C}$
- ③  $-20\pm 2^{\circ}\text{C}$





# PM Division-Global Coating Capacity

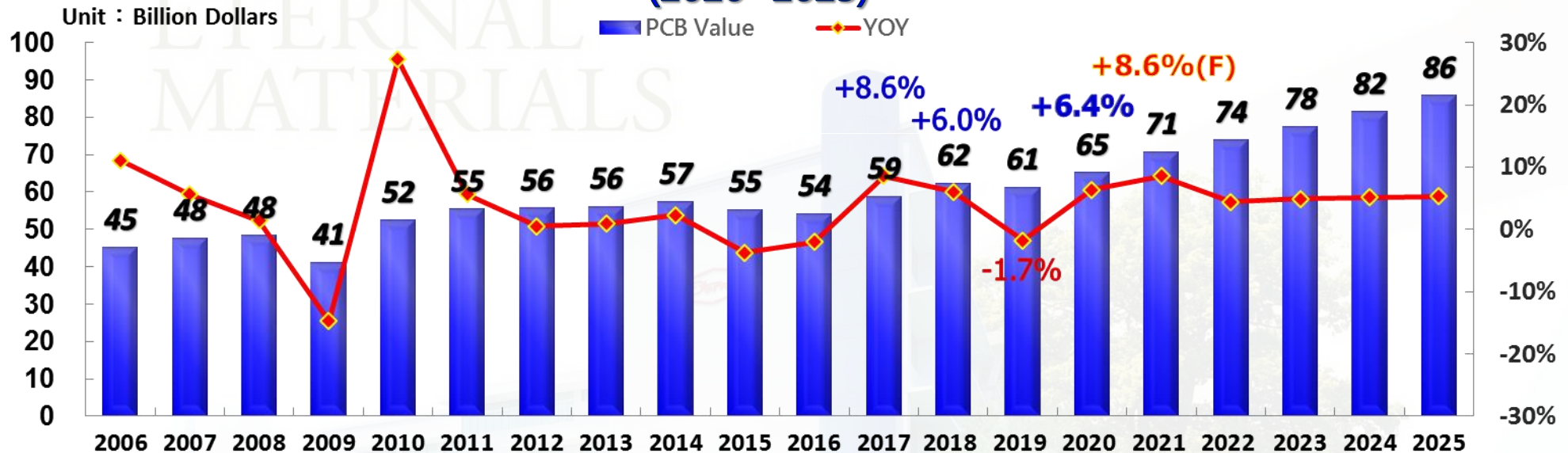


*Coating Process Capability Thickness*  
**50nm ~ 300um**

# PM Division-Global PCB Forecast

## Global PCB Forecast Update

(2020~2025)



**2017 : + 8.6 %**  
**2018 : + 6.0 %**  
**2019 : - 1.7 %**  
**2020 : + 6.4 %**  
**2021 : + 8.6 % (F)**  
**2020 ~ 2025 CAAGR 4.3%**

Source : 2020 Prismark Report and Eternal Market Summary



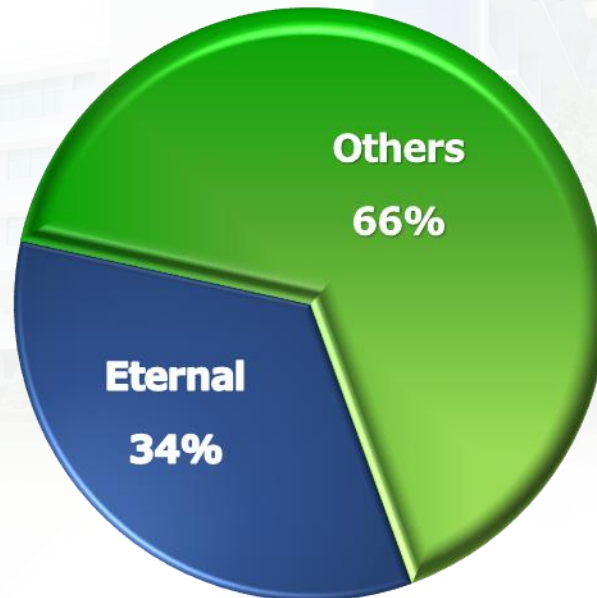
# PM Division-Dry Film Market Share

## Global Dry Film Market Size Update (2016~2021)

### ■ Global DRF Market Size ( 2016 ~ 2021 )

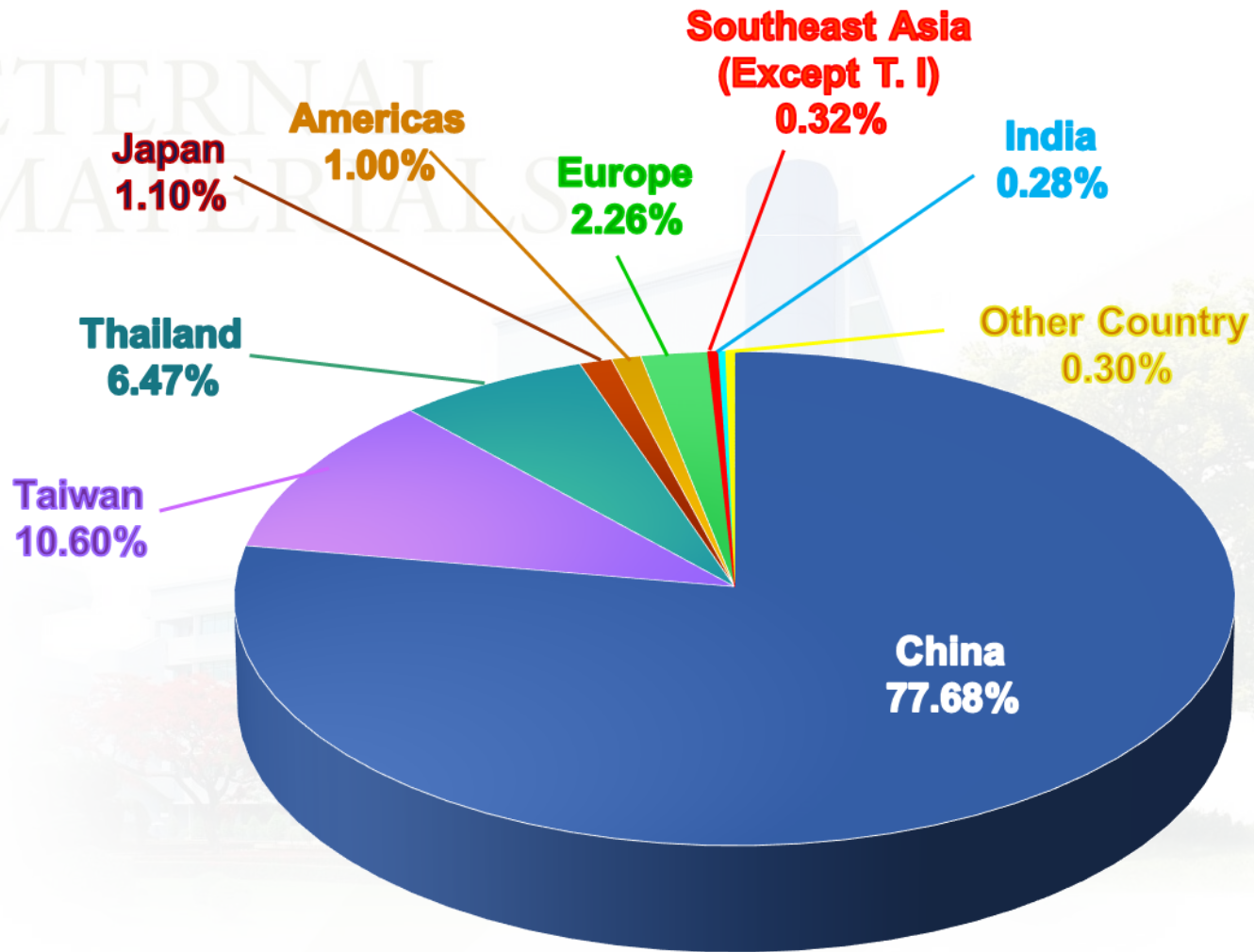
| 萬 KSF                       | 2016         | 2017         | 2018         | 2019         | 2020         | 2021(F)      |
|-----------------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| <b>Dry Film Market Size</b> | <b>1,020</b> | <b>1,122</b> | <b>1,206</b> | <b>1,170</b> | <b>1,212</b> | <b>1,282</b> |

### Eternal's Dry Film Market Share 34%



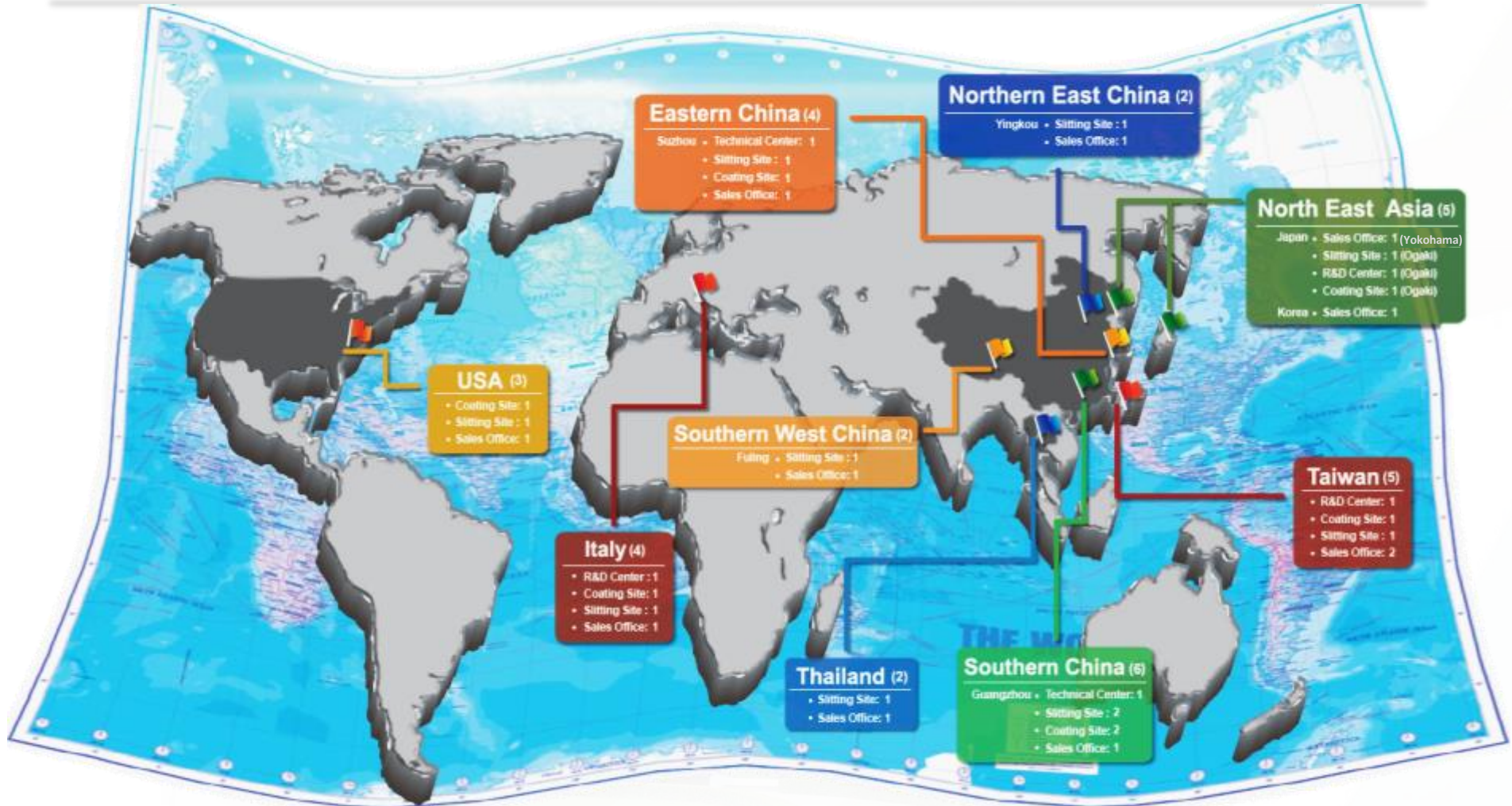
Source : Analysis and update by Eternal Market Report

# PM Division-Dry Film Market Share



Statistical Period: 2020.Jan ~ 2021.Feb

# PM Division-Global Layout



## Worldwide Locations

- R&D Center: 3
- Slitting Site: 10
- Taiwan: 5
- Thailand: 2
- Coating Site: 7
- Sales Office: 11
- Japan: 4
- USA: 3
- Technical Center: 2
- Korea: 1
- Italy: 4
- China: 14



# PM Division-Coating Sites

USA –Virginia (1)



Europe –Italy (1)



Eastern China  
Suzhou (1)



## 7 Coating Plants

Taiwan – Kaohsiung  
Coating Research Center (1)



Japan – Ogaki (1)



Southern China  
Guangzhou (2)



# PM Division-Coating Sites

## 2 Coating Lines for Metal Foils

**South China  
Guangzhou**

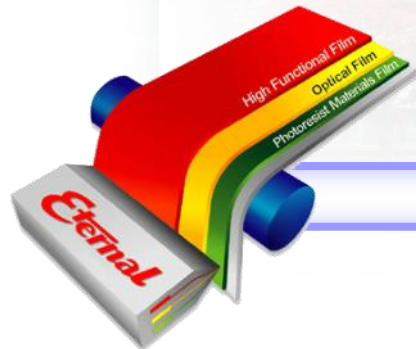


**China: 1 Coating Line**

**Taiwan – Kaohsiung  
Coating Research Center**



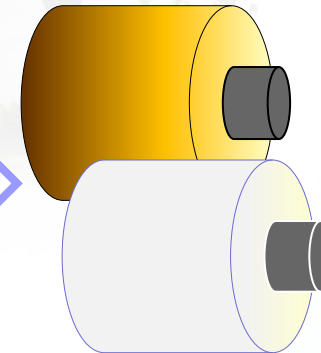
**Taiwan: 1 Coating Line**



**Copper Foil**



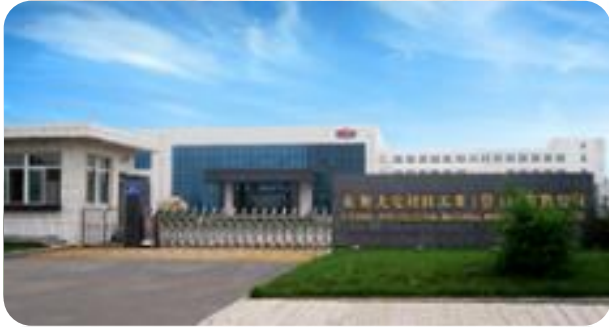
**Aluminum Foil**





# PM Division-Slitting Site/Sales Office

## Northern East China



**Yingkou (Slitting:1 / Sales:1)**

## Eastern China



**Suzhou (Slitting:1 / Sales:1)**

## Southern West China



**Fuling (Slitting:1 / Sales:1)**



**China**  
Slitting:5  
Sales:4

## Southern China



**Guangzhou (Slitting:2 / Sales:1)**

# PM Division-Slitting Site/Sales Office

|              |            |
|--------------|------------|
| USA : 2      | Japan : 2  |
| Italy : 2    | Korea : 1  |
| Thailand : 2 | Taiwan : 3 |

## Japan



**Ogaki**  
(Slitting:1)



**Yokohama**  
(Sales:1)

## Taiwan



**Ta-Fa Plant**  
(Slitting:1 / Sales:1)



**Zhongli Office**  
(Sales:1)

## Italy



**Milan**  
(Slitting:1 / Sales:1)

## Korea



**Gyeonggi-do**  
(Sales:1)

## Thailand



**Bangkok**  
(Slitting:1 / Sales:1)

## USA



**Virginia**  
(Slitting:1 / Sales:1)

# PM Division-Related Certificates

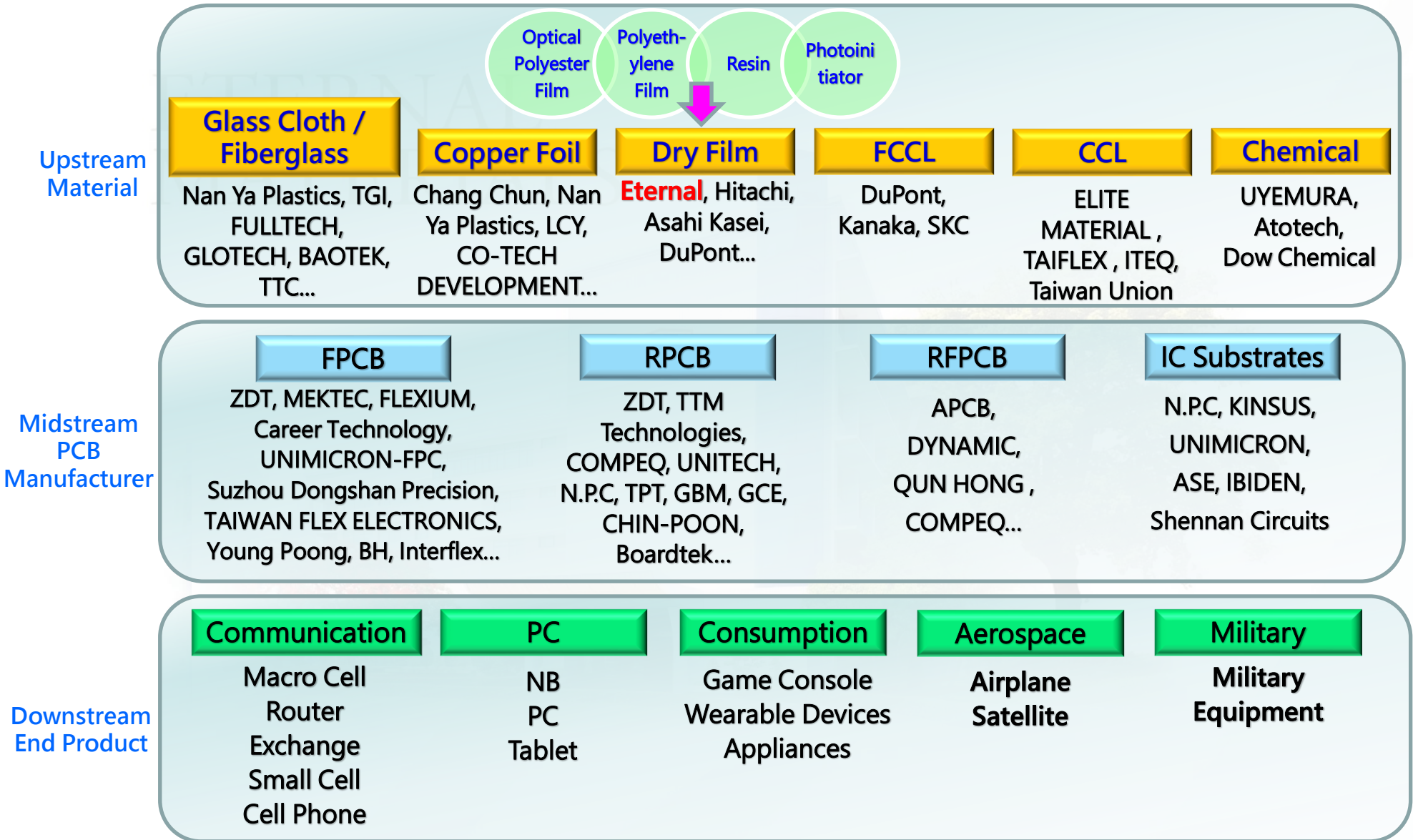




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**Dry Film Photoresist  
Applications and Opportunities**

# PCB/DRF - Industry Chain





# PCB/DRF - Applications and Opportunities

## ● Rigid PCB HDI Technology / Process Drive by Smart Phone

|       |                              |  |                           |
|-------|------------------------------|--|---------------------------|
| ~2014 | iPhone 6/6 +                 | 4+2+4HDI ,L/S=45/45                            | iPAD1(1+8+1),iPAD2(3+4+3) |
| 2015  | iPhone 6S/6S +               | 4+2+4HDI ,L/S=45/40 , FPC for touch force      | 14 x FPC                  |
| 2016  | iPhone SE/7                  | 4+2+4HDI ,L/S=45/40 , A10 of TSMC InFO tech.   |                           |
| 2017  | iPhone 8/8 +<br>iPhone X     | 4+2+4SLP, L/S=30/30um MSAP, OLED, A11 InFO     | 19 x FPC , 4 x LCP        |
| 2018  | iPhone XS/XSMax<br>iPhone XR | 4+2+4SLP, L/S=30/30um MSAP, A12 InFO           | 22 x FPC , 4 x LCP        |
| 2019  | iPhone 11                    | 4+2+4SLP, L/S=30/30um MSAP, A13 InFO, 3 Camera | 1+1 HDI Main board        |
| 2020  | iPhone 12                    | 5G L/S=30/30 um MSAP, A14 InFO PoP, 3 Camera   | Single HDI Main Board     |
| 2021  | iPhone ....                  | 5G L/S=30/30 um MSAP                           |                           |
| 2021  | iPad Pro, MacBook            | MiniLED back light , 5G (?)                    |                           |

- 2020 iPhone will apply 5G application, SLP L/S=30/30 design Single Main Board but Areas > 1+1 iPhone 11 Main Board
- 2021 iPhone still not know L/S design spec. But the Camera Module might change from Rigid-Flex to SiP + Flex



資料來源:工研院 IEK(2017/12)

# FPC - Industry Chain

Upstream  
Materials

|  |   |   |  |   |  |
|--|---|---|--|---|--|
| <b>FCCL</b>                                | <b>PIC/PSPI</b>                                     | <b>Coverlay</b>                             | <b>Solder Mask</b>                           | <b>EMI</b>  | <b>Other<br/>(Dry Film<br/>/Chemical...)</b> |
| TAIFLEX, AEM,<br>MICROCOSM,<br>ThinFlex... | <b>Eternal</b> ,<br>TAIYO,<br>ARISAWA,<br>TAMURA... | DuPont,<br>TAIFLEX,<br>AEM,<br>MICROCOSM... | TAIYO, TAMURA,<br>TeamChem,<br>Techniflex... | <b>Eternal</b> ,<br>Guangzhou<br>FangBang<br>TATSUTA, TOYO,<br>AEM... | <b>Eternal</b> ,<br>HITACHI,<br>ARISAWA...   |

Midstream  
FPC

|  |   |
|--|---|
| <b>Flexible Printed Circuit<br/>Single / Double / Multi FPC</b>          | <b>Rigid-Flex Board<br/>Rigid-FPC</b>             |
| ZDT, MEKTEC, FLEXIUM, Career Technology,<br>UNIMICRON-FPC, MFLEX, AKM... | Mutual-Tek, QunHongtek, COMPEQ<br>MFG, UNITECH... |

Downstream  
Module

|                              |                              |                            |                                   |                         |
|------------------------------|------------------------------|----------------------------|-----------------------------------|-------------------------|
| <b>Lens Module<br/>Image</b> | <b>Screen Module<br/>TFT</b> | <b>Touch Module<br/>TP</b> | <b>Battery Module<br/>Battery</b> | <b>Other<br/>Module</b> |
| Samsung,<br>Sunny Optical... | AUO, INX...                  | TPK, GIS...                | Sony, BYD...                      |                         |

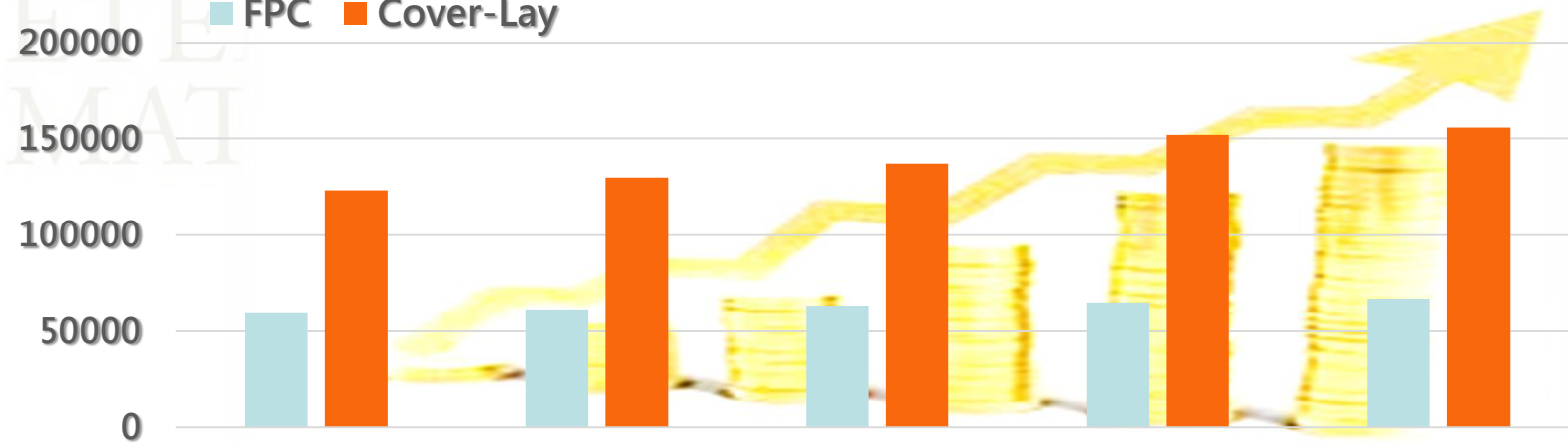
Sales  
Terminal



# FPC - Applications and Opportunities

**2019 ~ 2023 CAAGR >3%**

Unit: KSM



| 2019                 | 2020                | 2021              | 2022           | 2023        |
|----------------------|---------------------|-------------------|----------------|-------------|
| Handset / Smartphone | Tablet PC / E-Paper | LCD / LED Display | Digital Camera | Touch Panel |
| Smart Watch          |                     |                   |                |             |

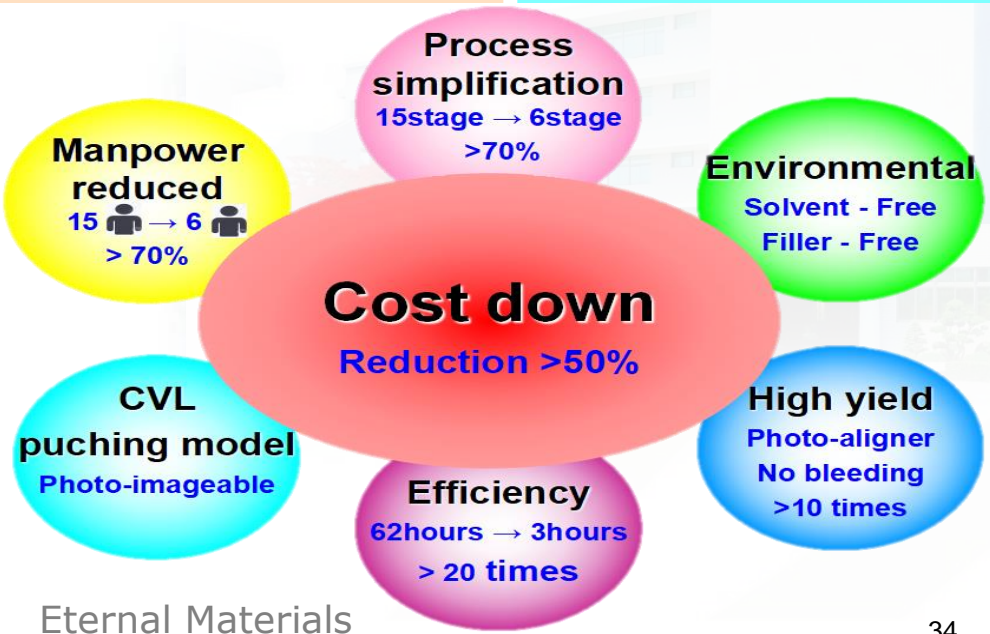
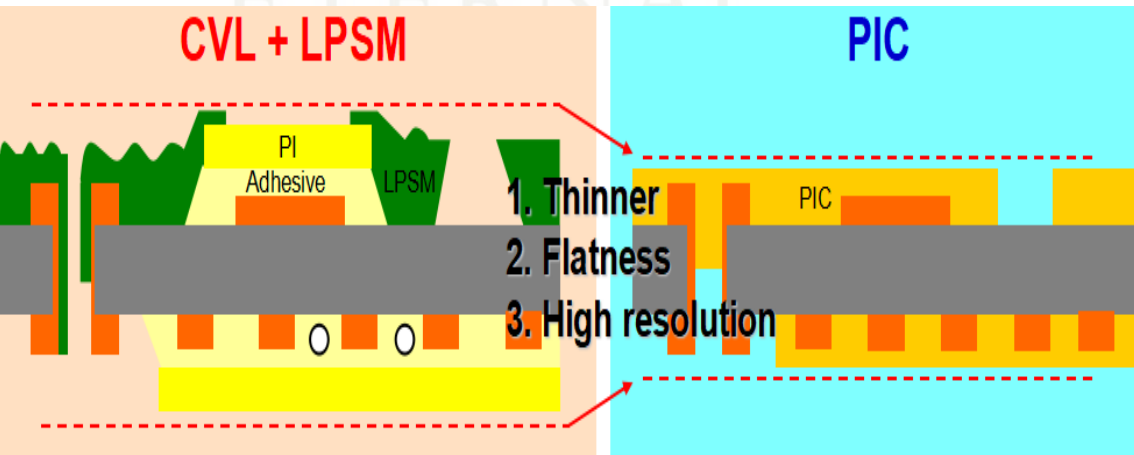
## Sales Terminal

|                      |                |             |                      |                      |             |
|----------------------|----------------|-------------|----------------------|----------------------|-------------|
| GPS & Wireless Power | Storage Device | AutoTronics | Notebook & Light Bar | Flexible Electronics | Smart Glass |
|----------------------|----------------|-------------|----------------------|----------------------|-------------|

# FPC - Applications and Opportunities

- PIC Advantage

PIC Advantage with CVL+LPSM



## Simplified Process

**CVL+LPSM**  
覆蓋膜+液態油墨

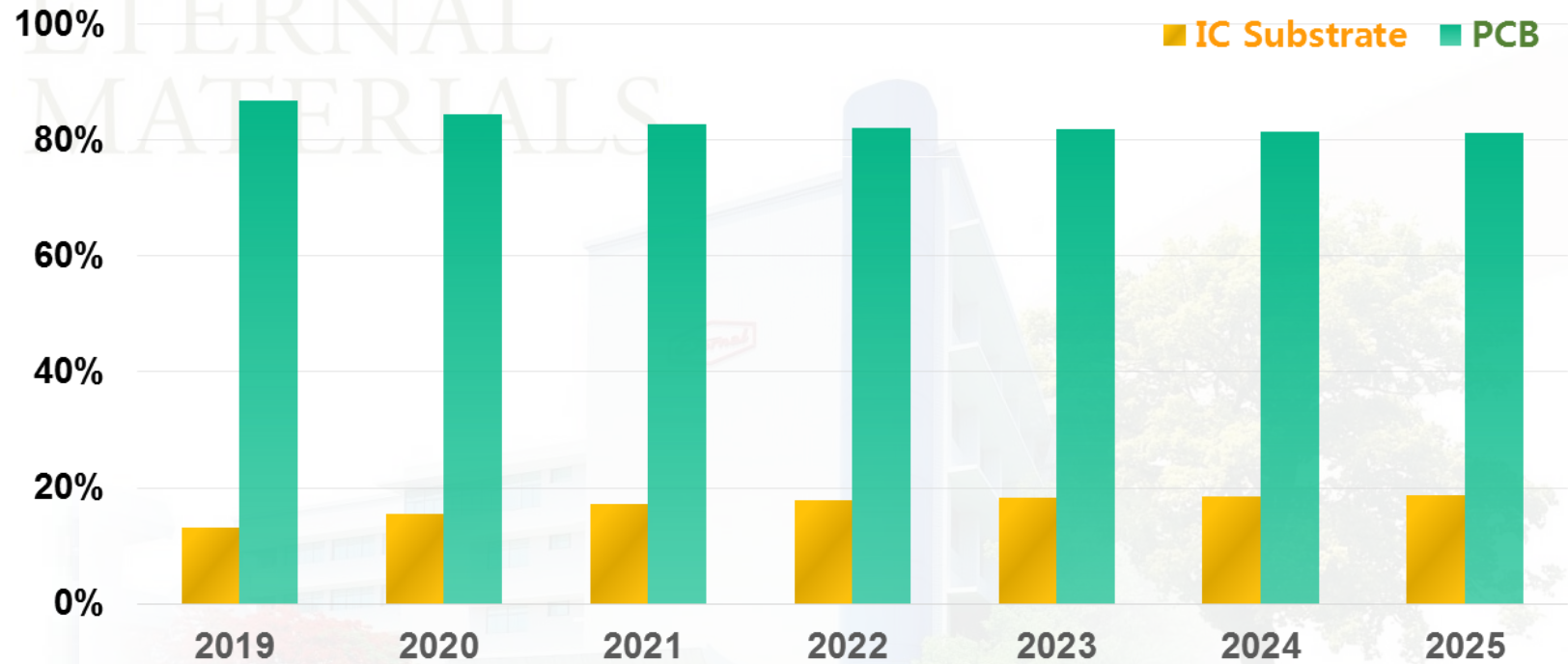
**PIC**  
感光型覆蓋膜

|                               |                 |
|-------------------------------|-----------------|
| CVL Slitting                  | PIC Slitting    |
| CVL Model                     | Pre-Treatment   |
| CVL Punch                     | PIC Pre-take    |
| Pre-Treatment                 | PIC Exposure    |
| CVL Pre-take                  | PIC Development |
| CVL Hot-press                 | PIC Post-bake   |
| CVL Post-bake                 |                 |
| LPSM Stencils                 |                 |
| 1 <sup>st</sup> LPSM Screen   |                 |
| 1 <sup>st</sup> LPSM Pre-bake |                 |
| 2 <sup>nd</sup> LPSM Screen   |                 |
| 2 <sup>nd</sup> LPSM Pre-bake |                 |
| LPSM Exposure                 |                 |
| LPSM Development              |                 |
| LPSM Post-bake                |                 |



# Packaging Substrate - Applications and Opportunities

**2020 ~ 2025 CAAGR 9.7%**



**2019~2025** IC Substrate percentage of sales revenue will grow from 13.2% to **18.8%**

Source: 2020 Prismark Report and Eternal Market Summary

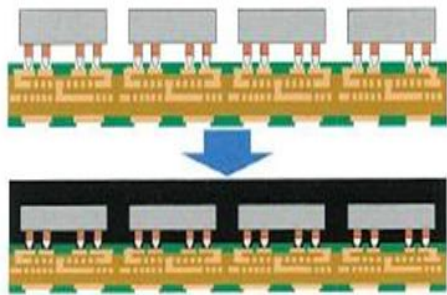


# Packaging Substrate - Applications and Opportunities

## ● Vacuum Laminator for Advanced Package

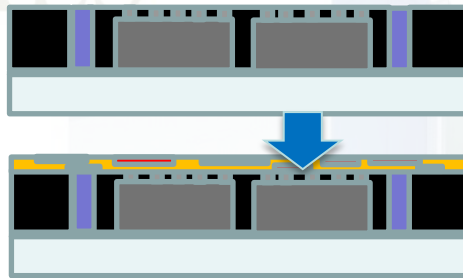
### FOWLP and FOPLP

Lamination of the Mold Sheet



### FOPLP

Lamination of RDL (PSPI Film)

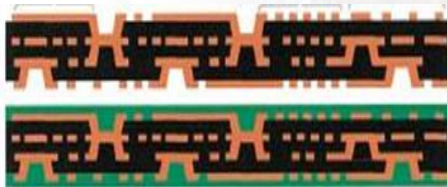


### Advantage :

- High Throughput
- Thickness Uniformity
- High Planarity
- Low loss of RDL Material

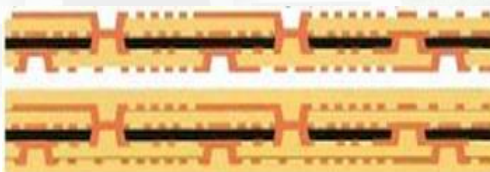
### Build-up Substrate (FCBGA, FCCSP)

Lamination of Dry-Film Solder Mask



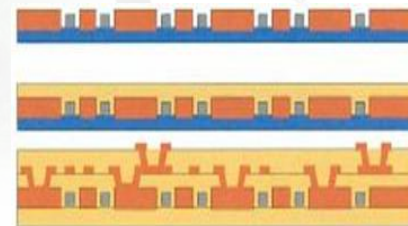
### Build-up Substrate (FCBGA, FCCSP)

Lamination of the Build-up Film



### Embedded Die Process

Lamination of the Sheet for Embedded Process



# Photoresist Materials Applications and Opportunities

## PCB-Photoresist Material

- The industrial trend for 5G, IoT, Electric Vehicle, the demand for PCB/DRF will continue increase in the future.
- Due to the Covid-19 epidemic create home work economy, the demand for NB related products is on the increase.

## FPC-Photoresist Material

- The advantage of process of PIC products, ( Compared with CVL+LPSM Process )
- Thinner , high accuracies trend of products, satisfy BGA needs, process simplification and cost control.

## Packages Substrates-Photoresist Material

- ABF substrate still grow, the increasing demand for server, networking equipment, 5G and data center etc PCB request.
- ICS main customers in Taiwan, has efficiency advantage for test, supply and service. By Vacuum Laminator sales going to launch related new customers.

## Vacuum Laminator

- 5G ,IoT application to grow of IC Substrate, ABF FCBGA. And increase the Vacuum Laminator equipment request.

■ PCB key driving force for next five years :

IC-substrate > HDI > Multilayer(>8L) > FPC > DS PCB

ETERNAL  
MATERIALS

## Q & A



**Thank you**