Evaporation System Based on Efficient Induction Heated Crucible – EWA Series

Presented by Mr. Kousuke Higashide
Outline of presentation

1. ULVAC Roll Coater
   - About ULVAC
   - History of ULVAC

2. Introduction of EWA-Series
   - Application
   - Internal Structure

3. Efficiency of EWA-Series
   - Induction Heating with respect to uniformity, pinholes
   - Deposition thickness control
   - Cooling system
   - Web winding control
   - Pre/Post Processing
Applications - Web Coating Technology

Flexible Electronics
AR Film
Smart Phone
Film Capacitor
Hybrid Car
Magnetic Tape/
Storage
Film Package
Food
Barrier Film
Diverse App
Flexible
Display
Cond. Film
Touch Panel
Film Capacitor
Conventional
Construction
Tool Parts
Decoration
Metallic Yarn
Stamp Foil
Labels

SPW
Series
EWE
Series
EWA
EJW
Series

* All figures based by ULVAC calculation
ULVAC Roll Coater History and Future

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<tr>
<td>Capacitor</td>
<td>Zn, Al / Paper, PET, OPP, Film Thickness: PET 1.3μm, OPP 1.5μm</td>
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<td>Battery</td>
<td>Li/PET, Cu</td>
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<tr>
<td>Method</td>
<td>RH</td>
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<td>Decoration</td>
<td>Al / PET, OPP, CPP, Film Width: max. 3.2m</td>
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<td>Magnetic Tape</td>
<td>Co-Ni, Co-O, PET, PEN</td>
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<tr>
<td>Barrier</td>
<td>AlOx, SiOx/PET</td>
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<td>FCCL (Flexible Cu Clad Laminate)</td>
<td>NiCr-Cu/PI, PET</td>
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<td>Touch Panel</td>
<td>SiOx, ITO/PET</td>
<td>Optical/PET</td>
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<td>SiOx, SiN/PET</td>
<td>Cu/PET</td>
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<td>Metal Mesh</td>
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RTR Evaporation system EWA Application

Window Film
Al, Ag, Sn, etc

Food Packaging
AI

Transparent Packaging
AlOx, SiOx

In Mold + NCVM
Al, Sn, In, etc

EMI Shield, Electrode material
Cu, Ag, Al, etc

Reference: TATSUTA Web site

Transfer, Stamping, Security
Al, Cr, In, Sn, Zn, etc

EWA-Series

Transfer, Stamping, Security
Al, Cr, In, Sn, Zn, etc

Ultrathin Al Film for Microwave Oven
AL

Reference: http://www.package-mall.com
EWA-Series

- Vacuum roll coater system
- Crucible Source with Induction Heater

**EWA-250**

<table>
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<tr>
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<th>EWA-165</th>
<th>EWA-210</th>
<th>EWA-250</th>
<th>EWA-330</th>
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<tbody>
<tr>
<td>Web Width</td>
<td>Max.1650mm</td>
<td>Max.2150mm</td>
<td>Max.2500mm</td>
<td>Max.3300mm</td>
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<td>Crucible Qty.</td>
<td>11</td>
<td>14</td>
<td>16</td>
<td>21</td>
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<td>Web Material</td>
<td>PET, CPP, ONY, OPP, Paper</td>
<td>PET, CPP, ONY, OPP, Paper</td>
<td>PET, CPP, ONY, OPP, Paper</td>
<td>PET, CPP, ONY, OPP, Paper</td>
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<tr>
<td>Winding Speed range</td>
<td>100~600 m/min (Higher speed is optional)</td>
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Materials: Al, Ag, Sn, AlOx, SiOx, Cr, In, Sn, ZnS, Cu
Features of Induction Heating

【Features】
・Hi-rate
・Stable Deposition
・Easy to control
・Pin Holes are Less

Reference:  http://www.best-system-t3.com
Pin Hole less Deposition

**Boat type (RH)**

- Melt during evaporation

**Crucible type (IH)**

- Melt before evaporation

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**Pin-hole comparison IH vs RH**

- **Number of Pin Hole (/1000m²)**
- **Pin Hole Size (mm)**
  - 0.5-1.0
  - 1.0-1.5
  - 1.5-2.5

- **Boat(RH)**
- **Crucible (IH)**

※ Induction Heating 0.1pcs/m², Resistance Heater 1pcs/m²
※ Test condition 400m/min x 450Å (ULVAC's comparison)
Deposition Thickness Control System

Schematic of Feedback system
Deposition Thickness Data

- Deposition with Feedback system
- AL thickness: 400Å (Specification ±5%  Actual Data ±3%)
- Web Length: 36,000m

![Graph showing deposition thickness data with 400Å ±3% tolerance]
Cooling system

Cooling temperature: -20°C

**Cooling Roller**
For after Deposition

**Main Roller**
For middle of Deposition
Web winding Control

6 motors system

- Drive Roller
- EXP Roller

Control

Expand

Shrink by Heat load

No Shrink
Pre/Post processing

- Compact BMB Unit
- Easy to Maintenance

Single electrode  double electrodes

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<tr>
<th>Size</th>
<th>W</th>
<th>L</th>
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<tr>
<td>Single</td>
<td>100</td>
<td>150</td>
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<tr>
<td>Double</td>
<td>100</td>
<td>200</td>
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【Effect】
- remove static electricity
- improve adhesion by cleaning

Electrostatic Charge (V)

Film Width

With BMB
Without BMB

Film Width
1. Induction Heating
   1) evaporate various materials
   2) Film defects and pin hole are less

2. Deposition thickness control
   Control Deposition thickness automatically by transmittance monitor

3. Cooling system
   Using Cooling Rollers for reduction of heat load

4. Web winding control
   6-motors drive multi control system ensure stable winding performance for various films.

5. Pre/Post processing
   Pre/Post processing are selectable for production quality improvement depending on process
Leading the World
In Vacuum Technology
ULVAC