PRODUCT PORTFOLIO
FOR FILM INSERT MOLDING (FIM)
in Automotive & Electronics Industries

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What is Film Insert Molding (FIM)?

• A process for decorating plastic materials which later will be using a high pressure forming machine.
• Film products that allow both form and function in FIM applications
• This process is used in the automotive, electrical appliances, and medical devices industries.
What is Film Insert Molding (FIM)?

Differentiations between IMD & FIM

**In-mold decoration (IMD)**
- is a decorative technology to use a transfer film from a roll transfer graphic in injection mold process.

**Film Insert-Molding (FIM)**
- The production method in which a printed sheet is formed (sheet-by-sheet) and then cut film is inserted inside a injection tool.

**In-mold Electronics (IME)**
- Integrating electronics into plastics with conductive inks and encapsulate discrete semiconductor chips within molded parts.
What is Film Insert Molding (FIM)?

Development of Film Insert Molding (FIM)

With the advancement in designing automotive interior as well as the development of specialty films using in FIM technology, FIM can now deliver any color and variety of effects, even circuit printing, creating more than just a case of producing colored plastic shapes, its capability is also being used to create and enhance brand value.
FIM enables one-step fabrication of plastic components with a decorated or functional surface.

Many manufacturers are looking for better materials, methods, and processes by which to manufacture their products. One alternative for decorating plastic products that is becoming more in demand includes Film Insert Molding (FIM).

**Advantages of FIM (1/2)**

- **Eliminate** secondary decorating operation, e.g. spray painting, laser marking
- **High precision parts** and reduce reject rate from secondary decoration.
- **High durability**, e.g. chemical resistance and scratch resistance
- **FIM can create** a huge variety of visual effects, e.g. surface texture, metallic or functional printing
- **Decoration** can be changed by simply inserting different printed films from shot to shot.
- **Environmentally friendly**, with the reduction of raw material such as metals, circuit wires, etc., resulting in decreased danger in case of a car accident.
- **Unique and sophisticated** appearances
What is Film Insert Molding (FIM)?
Advantages of FIM (2/2)

**How it was done before**
• 35mm part thickness
• 64 parts + PCBA
• 470-gram weight

**Doing it with IMSE**
• 4mm part thickness (~90% reduced)
• 1 molded part + PCBA
• 200-gram weight (~58% reduced)
What is Film Insert Molding (FIM)?

Film Insert Molding Process (1/2)

**Processes and Materials of FIM**

1. **Decorating Process**
   - Screen printing a decorative image onto flat film
   - Printing inks

2. **Forming**
   - Forming the printed sheet into a forming machine

3. **Trimming/Cutting**
   - Trim the parts free from the sheet using trimming tools

4. **Injection Molding**
   - Plastic resin is injected behind the film to form a solid part

**Film Insert Molding**

- Plastic Films
- Screen Printing Machine and Drying & Curing Systems
- Printing Accessories
Video: Niebling’s High Pressure Forming (HPF) of functional films
### What is Film Insert Molding (FIM)?

**Differentiations between Thermo-/Vacuum Forming and High Pressure Forming (1/2)**

<table>
<thead>
<tr>
<th><strong>Thermo- / Vacuum Forming</strong></th>
<th><strong>High Pressure Forming by Niebling</strong></th>
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<tbody>
<tr>
<td>• Material is heated up to the melting temp.</td>
<td>• Material is heated up to glass transition temp.</td>
</tr>
<tr>
<td>• Material becomes very soft.</td>
<td>• Material becomes formable (with stable core)</td>
</tr>
<tr>
<td>• Vacuum &amp; low pressure (6-8 bar / 90 psi)</td>
<td>• High pressure heated air (90 bar / 1300 psi)</td>
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</table>

- **210 °C / 410 °F**
- **6-8 bar / 90 psi**

- **150 °C / 300 °F**
- **90 bar / 1300 psi**
What is Film Insert Molding (FIM)?

Differentiations between Thermo-/Vacuum Forming and High Pressure Forming (2/2)

<table>
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<tr>
<th>Thermo-/Vacuum Forming</th>
<th>High Pressure Forming by Niebling</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Higher material distortion</td>
<td>• Low material distortion</td>
</tr>
<tr>
<td>• Less precision / less repeatability</td>
<td>• High precision / high repeatability</td>
</tr>
<tr>
<td>• Evaporation of humidity (water spots)</td>
<td>• No evaporation of humidity</td>
</tr>
<tr>
<td>• Glue between laminates suffer</td>
<td>• Glue between laminates resists</td>
</tr>
<tr>
<td>• Printed (electronic circuit) inks/solvents suffer</td>
<td>• Printed (electronic circuit) inks/binders resist</td>
</tr>
<tr>
<td>• Surface treatments suffer (e.g. hard coat)</td>
<td>• Surface treatments stay (e.g. hard coat)</td>
</tr>
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</table>
Decoration – Enabling surface design & technology trends by innovative toolbox for the automotive industry.
Automotive Interior
Automotive Interior

Application: Samples (4/5)
Products
Application: Samples (5/5)

Electronics

Consumer electronic products like household appliances.
The process runs through the key 4 stages:

1. Plastic films
   - PC Film
   - Hard-coated film
   - Finished film, e.g. chrome, pattern, etc.
2. Printing inks
   - Decorative ink
   - Functional ink (Printed Electronic Ink)
3. Pre-press & Printing Machine
   - Stencil & Squeegee
   - Printing Machine
4. Drying Systems
   - Hot Air, IR, UV curing
5. Forming Process
   - High Pressure Forming Machine
   - Forming Tools
6. Cutting Process
   - Cutting Tools
7. Injection Process
   - Injection Tools
Products
Product Solution Partners

- Film Material
- Decorative film
- Screen Printing Ink
- Stencil
- Screen Printing Machine
- RKS Squeegee
- Drying Systems
- Forming/ Cutting/ Injection
<table>
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<th><strong>SCREEN PRINTING INKS</strong></th>
<th><strong>MATERIALS</strong></th>
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<tr>
<td><strong>PROELL : NORIPHAN HTR N</strong>&lt;br&gt;One component system - Enable to back-molded directly in injection molding process</td>
<td><strong>COVESTRO : MAKROFOL® DE</strong>&lt;br&gt;High heat resistance, impressive toughness and elasticity over a wide temperature range</td>
</tr>
<tr>
<td><strong>PROELL : NORIPHAN XWR</strong>&lt;br&gt;Halogen free ink system (back molding of screen printing films)</td>
<td><strong>COVESTRO : BAYFOL® CR</strong>&lt;br&gt;Blend films made from Polycarbonate and other engineering thermoplastics</td>
</tr>
<tr>
<td><strong>PROELL : NORIPHAN N2K</strong>&lt;br&gt;Ink for second surface (back molding of screen printing films)</td>
<td><strong>TORAY : PICASUS</strong>&lt;br&gt;Formable film with metallic luster</td>
</tr>
<tr>
<td><strong>PROELL : NORIPET</strong>&lt;br&gt;Ink system for second surface IMD technology with polyester film</td>
<td><strong>WAVELOCK : MTIA6236</strong>&lt;br&gt;Three dimensional metallic decorative film</td>
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<tr>
<th><strong>PRINTING ACCESSORIES</strong></th>
<th><strong>More Info:</strong></th>
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<tr>
<td>Squeegee</td>
<td>[QR Code]</td>
</tr>
<tr>
<td>Stencil</td>
<td>[QR Code]</td>
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## SCREEN PRINTING MACHINE

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<th>Machine</th>
<th>Features</th>
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<tr>
<td>THIEME 3000</td>
<td>3/4 automatic screen printing machine with mobile printing table and variable print delivery</td>
</tr>
<tr>
<td>THIEME LAB 1000</td>
<td>High precision screen printer with automatic screen alignment and automatic substrate alignment with CCD cameras</td>
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## DRYING & CURING SYSTEMS

<table>
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<th>System</th>
<th>Features</th>
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<tr>
<td>NATGRAPH: Air Force High Temp / IR Combination Dryers</td>
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<tr>
<td>NATGRAPH: Air Force UV Combination Dryer</td>
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<tr>
<td>NATGRAPH: Freestanding UV and Compact UV Dryers</td>
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## HIGH PRESSURE FORMING MACHINE

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<th>Machine</th>
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<tbody>
<tr>
<td>NIEBLING: SAMK 400</td>
<td>Semi-automatic High Pressure Forming is designed for the precise 3D forming of plastic films with maximum forming areas up to 400 x 245 mm.</td>
</tr>
<tr>
<td>NIEBLING: SAMK 650</td>
<td>SAMK 650 are designed for forming plastic films with maximum forming areas up to 650 x 400 mm.</td>
</tr>
<tr>
<td>NIEBLING: SAMK 1200</td>
<td>SAMK 1200 are designed for forming plastic films with maximum forming areas up to 1200 x 300 mm.</td>
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Please check the specification, which meet your requirement from our customer service at order@taobangkok.co.th
Another services that we provide you to fulfill the FIM’s solution.

Niebling can design and build the molds for forming and cutting tools needed for the process on demand in their own tool construction department.

If required, we will support you for coordinating with Niebling and facilitating you in the design and building of injection molding tools.
T.A.O. Bangkok Corporation Ltd. is the leading company in Printing, Packaging and Decorative Industries. The company operates more than 20 years in Thailand and over 6 years in Vietnam. Trusted by more than 18 of the world’s leading manufacturers of 300 products, we are the authorized distributor and have been recognized by the local and international customers.

ABOUT T.A.O.

T.A.O. provides the consultation with requirement analysis as the customer-oriented to get end-to-end approach. Our services also include Color Matching, Quality Control, Customer Service and completed after-sales services to meet our customers’ satisfaction.

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