Metallyte™
high and ultra-high barrier metallized OPP films
A world of applications

A worthy alternative

Jindal Films has developed a broad range of high-barrier vacuum-metallized oriented polypropylene (OPP) films to meet the flexible packaging industry’s needs for barrier applications used in packages for dry foods and beverages that require long shelf life.

Traditionally, thin aluminum foils were used to protect products from moisture and oxygen. But today, the industry can also rely on Jindal Films’s Metallyte™ OPP films. By combining the inherent advantages of biaxially-oriented polypropylene with state-of-the-art metalization technologies, Metallyte OPP films are more than a viable alternative. They are cost-effective solutions that combine puncture and flex-crack resistance with barrier levels previously unavailable in OPP films.

Some Metallyte OPP films allow structure simplification by shifting from 3-ply to 2-ply laminated structures enabling simpler converting processes, reducing raw materials and improving the life cycle inventory (reduced emissions, energy requirements and solid waste).

Enhanced barrier integrity

- high barrier technology for cost effective aluminum foil replacement in hygroscopic packaging applications
- ultra-high barrier technology for oxygen-sensitive dry products in modified atmosphere packaging (MAP) applications to help achieve long shelf life periods
- both technologies deliver excellent light-barrier characteristics to protect sensitive products from UV rays
- improved barrier integrity compared to aluminum foil across distribution chain (packaging and transportation)

Enhanced puncture resistance

- three-fold improvement in puncture energy compared to thin aluminum foil structures
- protects barrier layer from sharp dry products (e.g., coffee beans, noodles, croutons, etc.)

Replace to enhance

Substrate replacement

The flexible packaging industry is using Metallyte OPP films to replace thin aluminum foils and enhance packaging performance. The biaxial orientation process provides OPP films with high puncture and flex-crack resistance. Puncture resistance helps reduce product-induced barrier loss from sharp ingredients perforating the foil layer, while flex-crack resistance maintains pack barrier integrity in comparison to more brittle barrier materials such as aluminum foils.

These technical performance advantages create interesting possibilities. Stand-up bags and pouches (SUP), for example, are proliferating in stores in response to an increasing consumer need for convenience. Consumer packaged goods companies can now effectively address barrier loss (flex-cracking) in their folded bottom or side gussets. Metallyte OPP metallized films enable brand-owners to take advantage of SUP package formats to differentiate their products on the store shelf, while not having to compromise packaging quality, thus maintaining product quality across the packaging and distribution chain.

Enhanced puncture resistance with oriented polypropylene films

Source: Jindal Films laboratory data
**Substrate replacement**

### High barrier

**Metallyte™ 15MM288 and 12MM281 films** are non-sealable metallized OPP films used to protect hygroscopic product with long shelf life requirements. They are both designed for adhesive lamination to provide robust barrier performance during packaging and converting processes.

These products are intended for use as the middle layer between a printed outer substrate (e.g., paper, PET or OPP) and an inner sealant (e.g., PE or CPP).

### Ultra-high barrier

**Metallyte 18MM883 film** is a non-heat sealable metallized OPP film that is intended to protect oxygen and moisture sensitive products with long shelf life requirements, typically using gas flushing (N₂ or CO₂) in modified atmospheric packaging (MAP) applications. Metallyte 18MM883 film is designed for adhesive lamination in a three layer structure.

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**Note:** Typical barrier values and Jindal Films laboratory data

*Source: Jindal Films laboratory data*

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**Substrate replacement**

Metallyte OPP films provide a significant reduction in density (ρ_{OPP} = 0.91 g/cm³) when replacing aluminum foil (ρ_{AL} = 2.7 g/cm³) as a barrier material. This difference in density results in a significant surface yield or unit weight improvement for barrier laminates as illustrated below. For example, replacing 7μm aluminum foil with Metallyte 18MM883 film yields a weight reduction of 13%, and results in a significant reduction in energy consumption, green house gas (GHG) emissions and solid waste.

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**Metallyte 18MM883 film life cycle inventory data**

*Source: Franklin Associates Ltd. “LCI of Film Packaging Structures” April 2008*
**Structure simplification**

Metallyte™ UBW-ES film is a white opaque metallized OPP film utilizing Jindal Films’s proprietary UHB technology. It provides exceptional oxygen, aroma and moisture barrier and is combined with the new enhanced sealant technology (ES) that can replace extrusion coated or extrusion laminated sealants and deliver high seal strength in most cases.

This new proprietary sealant technology allows brand owners to simplify their foil based flexible packaging structures and helps provide such benefits as:

- reduced packaging weight and cost
- reduced converting complexity with a simplified process
- improved mechanical properties
- reduced life cycle green house gas (GHG) emissions, energy consumption and solid waste

Replacing aluminum foil and PE sealant with Metallyte 28UBW-ES film provides energy and solid waste reductions, per the life cycle inventory data shown in the diagram below.

Replacing aluminum foil and PE sealants with a single web, Metallyte 28UBW-ES film offers significant material reduction opportunities. For example:

- old structure: 57 g/m² MG paper / 11 g/m² PE / 7.0 μ foil / 23 g/m² PE
- new structure: 57 g/m² MG paper / 11 g/m² PE / Metallyte 28UBW-ES film

Results in:

- 55% weight reduction of total structure
- 92% reduction in solid waste
- 64% reduction in energy consumption
- 72% reduction in CO2 emissions

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**Reduce to improve**

Metallyte 28UBW-ES film life cycle inventory data

<table>
<thead>
<tr>
<th>Description</th>
<th>Packaging weight (kg)</th>
<th>GHG emissions-fuel (kg CO2 Equiv.)</th>
<th>GHG emissions-process (kg CO2 Equiv.)</th>
<th>Total energy (GJ)</th>
<th>Solid waste (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 μ Alu Foil/30PE</td>
<td>10</td>
<td>6</td>
<td>6</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Metallyte 28UBW-ES film</td>
<td>10</td>
<td>6</td>
<td>6</td>
<td>8</td>
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</tbody>
</table>

Weight, Energy or Emission units per 1,000m² area

Source: Franklin Associates Ltd. “LCI of Film Packaging Structures” April 2008
Structure simplification
Jindal Films challenged and surpassed previous limits of OPP seal capability through the development of its new enhanced sealant technologies (-ES).

In combining this new -ES sealant platform with its barrier technologies, Jindal Films aims to replace the barrier (e.g., thin aluminum foil) and sealant webs or extrusion coated PE in flat seal formats. The combination of barrier and enhanced sealant provides opportunities for structure simplification and allows the packaging industry to reduce packaging weight.

Improved seal performance
• approximately 2-fold seal strength improvement over standard sealable coextruded OPP films
• good seal performance in flat seal formats (pouch, sachets, SUP, etc.)
• lap seal capable with most sealable OPP films
• available with ultra-high barrier OPP film technology

Sealing performance using the -ES technology provides seal strengths approaching that of extrusion-coated polyolefin sealants and thin cast or blown polyolefin sealant films.

Metallyte™ OPP films using Jindal Films’s Enhanced Sealant technology help provide good seal performance for dry food and beverage applications in stand up pouches and four-side seal packaging.

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Breakthrough OPP seal performance

<table>
<thead>
<tr>
<th>Sealing temperature (deg C)</th>
<th>Seal strength (g/inch – g/25mm)</th>
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<tbody>
<tr>
<td>85</td>
<td>0</td>
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<tr>
<td>95</td>
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<td>165</td>
<td>1600</td>
</tr>
<tr>
<td>175</td>
<td>1800</td>
</tr>
</tbody>
</table>

Test Conditions: Hayssen VFFS: 72 ppm empty / 65 ppm filled, 14” L x 5.25” pkg layflat, Velcro “wool” back-up pad, 1/2” platen gap

Source: Jindal Films laboratory data