

Bicor™
OPPalyte™
Metallyte™
Alox-Lyte™

Jindal
Films



PP MONO-MATERIAL SOLUTIONS

Selecting the right OPP films for your recyclable packaging

Improved flexible packaging recycling

Numerous flexible packaging applications use multi-material laminates which are considered non-recyclable in Europe and can be converted to mechanically recyclable solutions by using polypropylene (PP) films. PP resins are light weight due to a very low density (0.9g/cm³) and are naturally easy to recycle (no crosslinking, no gels, no strong discoloration) and very well suited for multiple re-extrusions, favoring its use in mechanical recycling operations.

*OPP films provide the best balance of properties to maintain all the key essential packaging functions, such as stiffness, heat resistance, barrier, heat seal and optical properties. Specific OPP films are commercially available for the 3 main functionalities of flexible laminates: **PRINTABILITY, BARRIER** and **HEAT SEALABILITY**.*

PRINTABLE WEBS

Replacing Paper or PET with OPP films

Some of the most demanding packaging formats and product segments are using paper, oriented PET films or other harder to recycle substrates in laminate forms. Papers and PET films are stiff, heat stable and tolerate high seal jaw temperatures allowing for a robust packaging operation.

To replace Paper or PET films, OPP films are available with a broad range of features. Commonly available in white or clear, matt or glossy, one or two-side processable, heat sealable or non-sealable, barrier or non-barrier formulations and typically compatible with most printing and lamination processes.



Paper can be substituted either with OPPalyte™ white films (MW647) or Bicolor™ clear films with a matt-look (CSR-M). Using non heat sealable matt OPP will help for packaging efficiency while providing a paper finish aspect.

Paper replacement with OPP films

| PAPER LOOK ASPECT | | OPP FILM | GAUGE (µm) | HEAT SEAL* | FILM DESIGN (OUT/IN) | KEY FEATURES |
|---------------------|------------------------|----------|------------|------------|----------------------|----------------------------------|
| CLEAR REVERSE PRINT | MATT | CSRM | 18, 25 | NHS | Matt/TRT | Good jaw release |
| | PARTIAL MATT AND GLOSS | NNH | 20 | NHS | TRT/TRT | 2-side treated; good jaw release |
| | | MB666 | 20-40 | HS | Acrylic/Acrylic | Aroma & MOH barrier |
| | | MB866 | 21 | HS | Acrylic/PVOH | High gas, aroma & MOH barrier |
| WHITE SURFACE PRINT | PARTIAL MATT AND GLOSS | MW647 | 35-45 | HS | Acrylic/Acrylic | High gloss; Aroma & MOH barrier |
| | | MH647 | 42 | HS | Acrylic/Acrylic | High gloss; Aroma & MOH barrier |

* NHS= Non-Heat Sealable

Glossy or matt PET films can be replaced with Bicolor™ clear OPP films (MB100, NND, NNH, CSRM) to deliver various functional features or visual aspects depending on the final use.

Optionally **clear barrier OPP films** (MB890, MB866, AO894) are also available in various gauges for two-ply applications using reverse printing. Alternatively, **coated white barrier OPP films** (MW647, MH647) provide outstanding glossy white aspect with excellent barriers to aroma and mineral oils.

PET replacement with OPP films

| VISUAL ASPECT | | BICOR FILM | GAUGE (µm) | HEAT SEAL* | BARRIER | FILM DESIGN (OUT/IN) | KEY FEATURES |
|---------------------|----------------------|------------|------------|------------|------------------------------|----------------------|--|
| CLEAR REVERSE PRINT | GLOSS | NND | 12, 20, 25 | NHS | - | NHS/TRT | Non-sealable; Good jaw release |
| | | MB100 | 12 | NHS | - | NHS/TRT | Improved heat resistance; High stiffness |
| | | MR100 | 25 | NHS | - | NHS/TRT | Tailored heat resistance for retort |
| | | MR103 | 25 | NHS | - | TRT/TRT | Tailored heat resistance for retort |
| | | MB400 | 15-50 | HS | | HS/TRT | Lap Seals with CPP or Coex OPP |
| | | MB666 | 20-40 | HS | Aroma | Acrylic/Acrylic | High gloss, MOH barrier; O/O seals |
| | | MB890 | 16 | HS | Gas, aroma | HS/EVOH | MOH barrier; O/O & O/I seals (PP) |
| | | MB866 | 21 | HS | Gas, aroma | Acrylic/PVOH | MOH barrier; O/O seals (acrylic) |
| | | AO894 | 16 | HS | H ₂ O, gas, aroma | HS/AIOx | MOH barrier; Flexo print only |
| | Matt | CSRM | 18, 25 | NHS | - | NHS/TRT | Non-sealable; Good jaw release |
| | PARTIAL MATT & GLOSS | NNH | 20 | NHS | - | TRT/TRT | Two side treated; Good jaw release |
| | | MB666 | 20-40 | HS | Aroma | Acrylic/Acrylic | MOH barrier; O/O seals |
| | | MB866 | 21 | HS | Gas, Aroma | Acrylic/PVOH | MOH barrier; O/O seals (acrylic) |

* NHS= Non-Heat Sealable

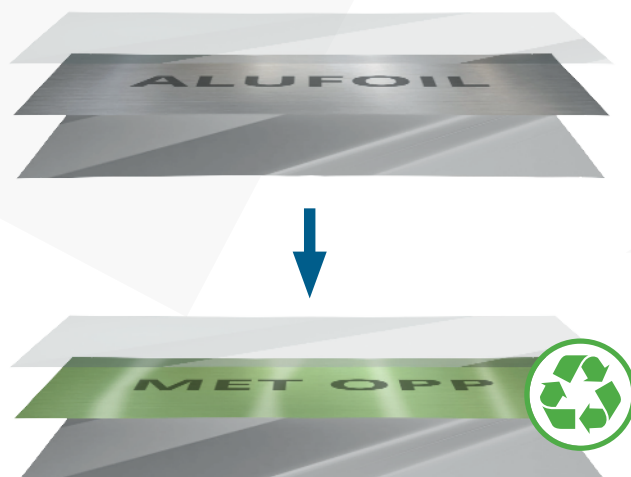
To help replace PET films in more demanding applications, Jindal Films is developing improved heat resistance OPP films for general outer web applications (Bicolor™ MB100), or for more specific market segments where extra heat processing is used (Bicolor™ MR100) such as retort or sterilization.

Please contact us for more details on these developments.

BARRIER WEBS

Replacing Alu Foil or vacuum coated PET with high barrier OPP films

For sensitive products, many barrier laminates still use thin Aluminum foils or vacuum coated PET films (clear coated or metallized) that are non-recyclable when combined with printable or sealable polyolefin films. Outstanding moisture, gas, aroma and mineral oil barriers can be delivered with specific OPP films, usually also resulting in improved mechanical properties such as puncture or flex-crack resistance.



Alu foil and Met-PET can be replaced with Metallyte™ high barrier (MM288) or ultra-high barrier (MM883, MML883) OPP films - typically in 2-side processable form – or optionally with white metallized high barrier (MU842).

Aluminum Foil & Met-PET replacement with OPP films

| BASE FILM ASPECT | METALLYTE FILM | LAMINATE TYPE | WVTR 38C 90%RH | OTR 23C 0%RH | Aroma & MO Barrier | TYPICAL MARKET SEGMENTS |
|------------------|----------------|---------------|-------------------|-----------------|-----------------------|--------------------------------|
| CLEAR | 15MM288 | 3-PLY | 0.1 | 25 | + | Soluble drinks, instant coffee |
| | 16MM883 | | 0.1 | 0.1 | +++ | Dry milk, roasted coffee |
| | 18MLM883 | | 0.1 | 0.1 | +++ | Liquid Packaging |
| WHITE | 28MU842 | 3-PLY | 0.1 | 0.1 | +++ | Dry yeast |
| | 35MU842 | | 0.1 | 0.1 | +++ | Baby food |
| | 28UBWES | 2-PLY | 0.1 | 0.1 | +++ | Dehydrated soups |

For transparent applications, Alox-Lyte™ films (AO894, AO893, AOL893) or Bicolor™ coated films (MB866, MB890) are suitable to either replace **SiOx or ALOx vacuum coated PET films**, or to shift thicker barrier layers (EVOH) from the coextruded PE or PP sealants to the middle or outer webs of laminates and results in improved PP mono-material composition that are recyclable.

Clear Coated PET replacement with OPP films

| BARRIER TECHNOLOGY | BARRIER OPP FILM | WVTR 38C 90%RH | OTR 23C 0%RH | Aroma & MO barrier | TYPICAL MARKET SEGMENTS |
|--------------------|------------------|-------------------|-----------------|-----------------------|--|
| ACRYLIC | 20MB666 | 3.5 - 7 | 500-1000 | +++ | PET, Cellophane, PVdC-OPP, Paper replacement |
| EVOH/PVOH | 16MB890 | 5 | 0.5 | +++ | PVdC-OPP, EVOH coex PP or PE, Dry applications replacement |
| | 21MB866 | | | | |
| ALOX | 16AO894 | 0.7 | 0.5 | +++ | PET-AIOx, PET-SiOx, PET-PVdC, PVdC-OPP replacement |
| | 16AO893 | | | | |
| | AOL893 | 1.5 | 1.5 | +++ | Liquid Packaging |

HEAT SEAL WEBS

Replacing PE films with enhanced seal performance OPP films

Many demanding packaging applications – such as for powdered products or those using MAP - use blown or cast polyethylene heat seal films that contribute to strong pack integrity. Cast PP or enhanced seal OPP films can be used to shift the final laminate towards a PP mono-material composition, resulting in improved recyclability. OPP films provide enhanced mechanical properties (e.g. stiffness, puncture resistance) over blown or cast films, to help significantly down-gauge the sealant webs and provide additional features such as easy-tear from a notch or from a crimp-seal.



Jindal Films has developed specific Bicolor™ or Metallyte™ films with higher seal performance to partially close the gap with PE-based sealants. The latest generation of Bicolor Ultra Seal films (MB344US) delivers 6 times higher seal strength than most standard coex OPP films, with exceptional hot tack window and often with lower seal initiation temperatures (SIT) than most cast PP films.

OPP films with improved seal performance

| MATERIAL REPLACEMENT | HEAT SEAL PERFORMANCE | OPP FILM | BASE FILM ASPECT | SIT (°C) | SEAL STRENGTH | WVTR 38C 90%RH | OTR 23C 0%RH |
|---------------------------|----------------------------|----------|--------------------|----------|---------------|----------------|--------------|
| STANDARD OPP APPLICATIONS | Broad Seal Range (low SIT) | HLD | CLEAR | 80 | + | | |
| | | MH347 | WHITE | 80 | + | | |
| | | MLB | METALLISED | 85 | ++ | 0.3 | 40 |
| | | MM398 | METALLISED | 85 | ++ | 0.3 | 50 |
| | | QFM | WHITE / METALLISED | 85 | + | 0.2 | 30 |
| EXTRUSION COATED PE | ENHANCED SEAL | UBWES | WHITE / METALLISED | 80 | +++ | 0.1 | 0.1 |
| PE & CPP | ULTRA SEAL | MB344US | CLEAR | 95 | ++++ | | |

Please contact us for more details on these developments.



Jindal Films provides PP mono-material solutions with a broad range of films - printable, barrier and heat sealable - to help brand-owners and converters launch their multi-material flexible packaging laminates on a journey towards a more sustainable future, feeding the rPP recycling streams progressively being implemented across Europe.



Packaging for our Planet



Please contact us for more details.

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