

# Advantages of multimodal PE for packaging films

Higher expectations from packaging converters and consumers alike are driving the demand for multimodal PE, which have been shown to display a combination of superior processability and improved mechanical properties

Flexible packaging converters are always looking for innovations that will enable them to use polyethylene to enhance the shelf-life of food, improve the appearance of products and provide new types of packaging options. They also want higher extrusion speeds, better packaging efficiency and the possibility of downgauged solutions.

The two multimodal PE grades with a characteristics of "Density 0.923 g/cm<sup>3</sup>, MI 0.25 g/10 min" and a characteristic of "Density 0.931 g/cm<sup>3</sup>, MI 0.20 g/10 min" have been in the market place for several years and see strongly growing demand due to high satisfaction among flexible packaging converters. In particular for Form-Fill-Seal (FFS) films, they offer the following main benefits.

## Matt and non-blocking surface

Multimodal PE used as a monolayer film or as the surface layers of a co-extruded film gives a hazy film with an exclusive matt outer surface which is ideal for high quality printing. It allows the packaged product to be noticeably differentiated from other competitive glossy surface offerings on the display shelf. The matt outer surface has a low-medium coefficient of friction (COF) of 0.4 that is ultra consistent. This allows the film to flow through the automatic packing machine more smoothly. Moreover, the non-blocking inner surface gives a lay flat film that is easy to open and run well on high speed packaging machines.

## Enhanced balance between stiffness and toughness

Figure 1 shows a Yield Strength versus Dart Impact Strength chart comparing multimodal PE against other LDPE and LLDPE grades. The unique balance between stiffness and toughness of the multimodal PE films enables FFS packaging converters to pack their products at a higher speed, with better pack integrity and hence reduced spoilage of products, especially in food. Also worth noting is the superior low temperature impact performance of multimodal PE, which exceed conventional materials in the market today (Figure 2).

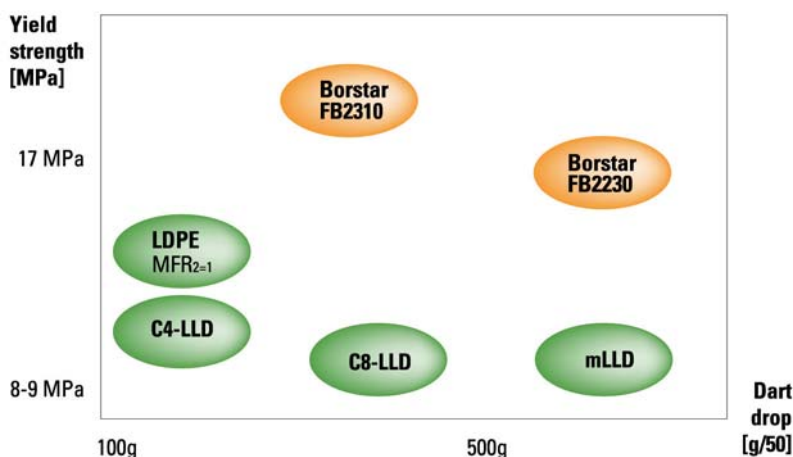


Figure 1 - Yield Strength versus Dart Impact Strength chart

This makes multimodal PE well suited for the production of any packaging material that needs to be tough and resistant to deep freeze conditions.

## Excellent Optical when used in the core layer

Although multimodal PE provides a very attractive matt outer surface for printing, transparency and gloss is specified for a large proportion of flexible packaging. FFS packaging converters will need their laminated or non-laminated films to be transparent in order to see the packed products inside. Here multimodal PE can be used in the core layer of a 3 (or 5 layer) co-extruded film, with other PE materials on the surface layers. The resultant film will take on the clarity and surface gloss of the other PE products, while retaining many of the advantages of multimodal PE such as increased mechanical strength, stiffness and improved processability.

## Better Sealability

The sealing behavior of multimodal PE is characterised by a beneficial balance of hot tack force and seal strength. Used pure, multimodal PE has a broader sealing window than LDPE, its copolymers and conventional C4 LLDPE. Used as the core layer with other sealing layers, multimodal

PE brings improvements in sealing characteristics:

- Its inherent melt strength supports the sealing layer and avoids deformation, leading to faster conversion with no seal breaks.
- The increased delta between melting points of seal layer and core layer leads to broader sealing window that can offer increased output on packaging lines.

Figure 3 shows multimodal PE (Borstar Enhanced PE FB2310) increasingly replacing an originally pure C8 LLDPE in the core layer of a 3 layer co-ex film. The broader sealing window and higher hot tack force not only enables cost reduction through less usage of expensive alternative sealing materials, but also allows the FFS packaging converter to increase its packing speed.

## Low Taste and Odour

Due to its base technology and its low additive content, multimodal PE exhibits low migration and consequently low taste and odour. This makes it ideal for food packaging applications. Borstar multimodal PE fulfills the specific packaging regulations in European countries as well as 2002/72/EC and FDA in the US.

By providing cost and performance

# Technical Guide

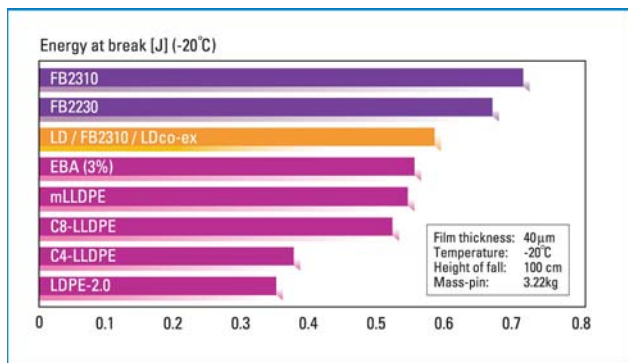


Figure 2 - Borstar Enhanced PE outperforms conventional materials in terms of its toughness at low temperature

benefits, Borstar multimodal PE is gaining ever widespread use among FFS packaging converters. The unique combination of stiffness and mechanical properties such as tear and impact strength, offers a genuine downgauging potential for packaging film, in addition to a characteristic matt printing surface. Features otherwise normally obtained by co-extruded structures combining blends of different PE's in each structure, may now be achieved with a single material.

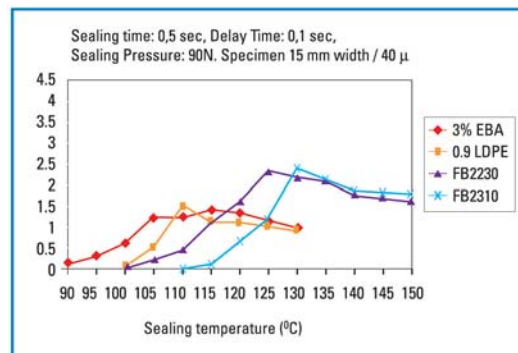


Figure 3 - Borstar Enhanced PE exhibits a broad sealing window

Borouge provides a range of innovative plastics solutions utilising proprietary technologies, Borstar and BNT (Borealis Nucleation Technology) for a variety of high-performance flexible packaging applications, especially in co-extruded structures such as lamination, exclusive carrier bags, highstrength packaging, frozen and snack food packaging, shrink films and greenhouse films.

Borouge also provides innovative plastics solutions for rigid plastic applications such as healthcare, boxes, trays, pallets, bottles and caps and closures. With over 50 years of experience and pioneering solutions, Borouge together with Borealis have established a leading position on the film and molding market across Europe, the Middle East and Asia Pacific.