

PROPERTIES – YOU NEED



SOME KEY PROPERTIES OF EBA BASED BLOWN AND CAST FILMS

Viscosity

The viscosity of all thermoplastic melts is non-Newtonian, i.e., the viscosity is a function of the shear rate at which it is tested. For a given polyethylene resin, the relationship between its measured viscosity and the applied shear rate depends on its molecular characteristics. All polyethylene resins are shear thinning. The general characteristics of the relationship of viscosity to shear rate are shown in left-hand figure. Both viscosity and shear rate are plotted on logarithmic scales, reflecting the wide range of values encountered in commercial processes.

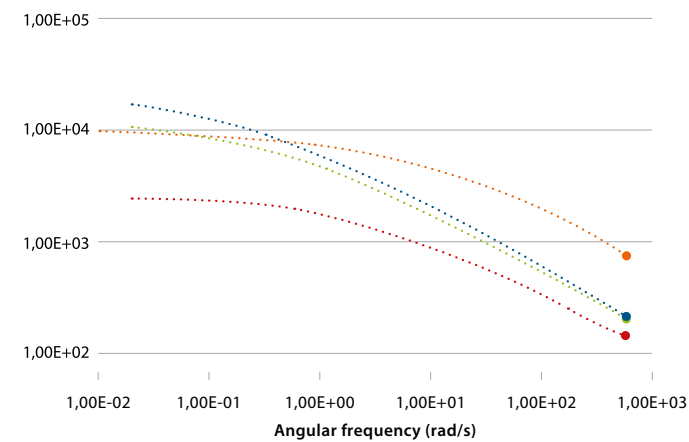
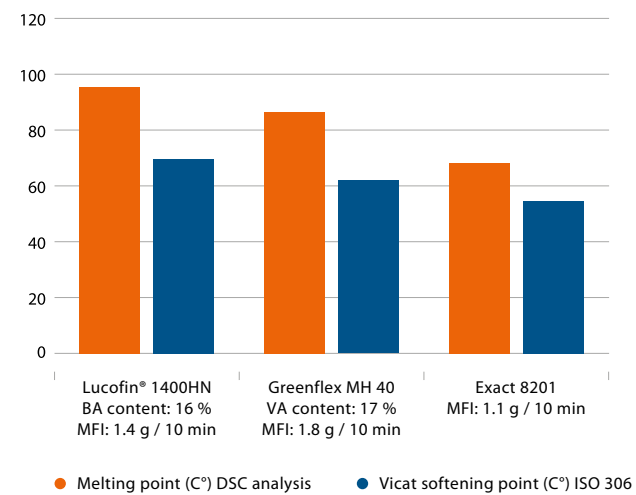
The response of the various types of polyethylene resins to increasing shear is a function of their degree of long-chain branching and molecular weight distribution. Lucofin® 1400HN and Lucofin® 1400MN with their high degree of long-chain branching and broad molecular weight distribution show a shear thinning effect close to that of conventional LDPE. This guarantees a superior processability. Opposite to that finding

LLDPEs -including plastomers- with their rather linear structure and narrower molecular weight distribution show a shear thinning effect to a much lesser degree. As a result, plastomers only have small processing windows prone to instabilities, such as melt fracture and shark skin. This means that Lucofin® resins will run smoothly during blown and cast film extrusion.

Melting point and vicat temperature

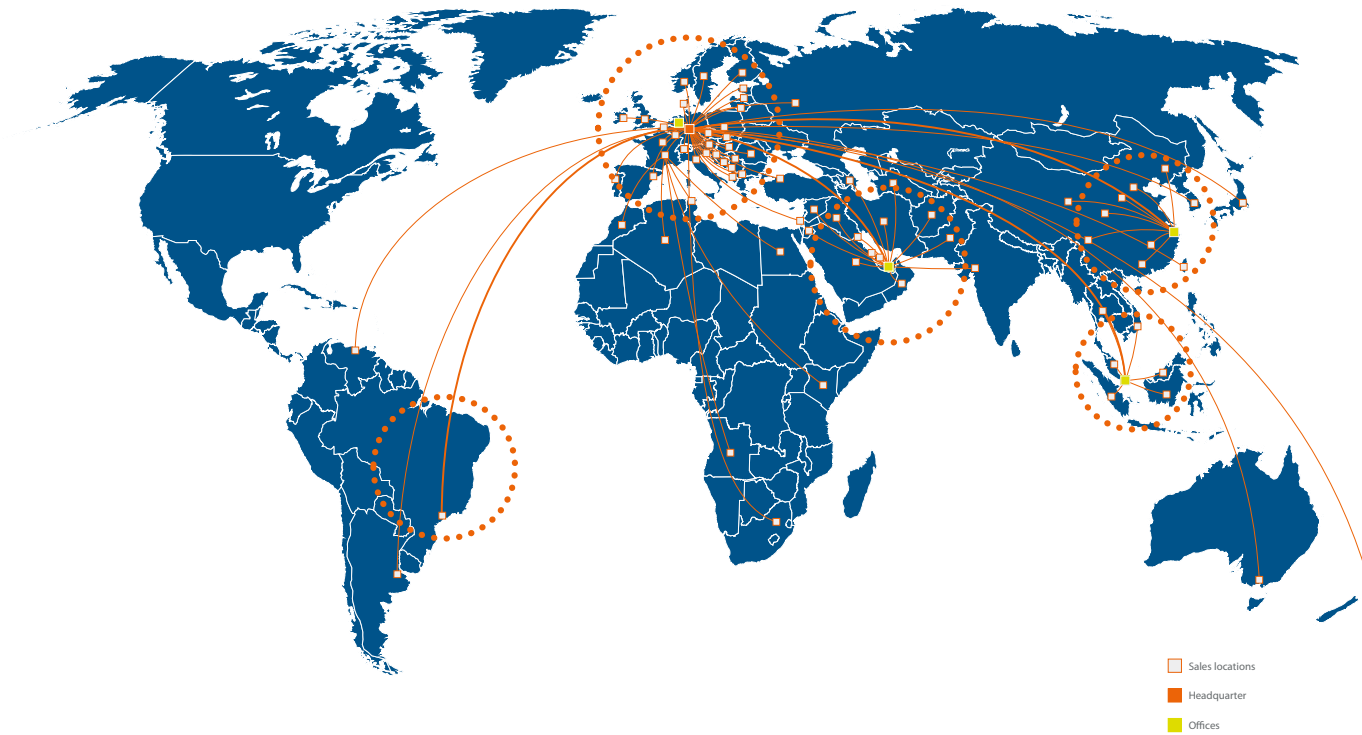
Right-hand figure shows the melting points and the vicat temperatures of Lucofin® 1400HN compared to an EVA with similar comonomer content and MFI and compared to a plastomer with similar MFI. Both the melting points and the vicat temperatures show the highest values for Lucofin® 1400HN. This is a clear indication for the excellent maximum service temperature during end-usage of Lucofin® 1400 HN based compounds compared to competition grade based compounds. All film testing procedures involving elevated temperatures are therefore likely to be passed by formulations based on Lucofin® resins.

Melting point and vicat temperature of Lucofin® 1400HN, typical EVA and typical plastomer



- LLDPE d: 0.918 g / cm³ MFI: 1.0 g / 10 min
- LDPE d: 0.919 g / cm³ MFI: 1.5 g / 10 min
- Lucofin® 1400HN d: 0.924 g / cm³ MFI: 1.4 g / 10 min
- Lucofin® 1400MN d: 0.924 g / cm³ MFI: 7 g / 10 min

LOCATIONS



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Note

The information provided in this document is based on our product tests and present technical knowledge. It does not release purchasers from the responsibility of carrying out their receiving inspections. Neither does it imply any binding assurance of suitability of our products for a particular purpose. As LUCOBIT cannot anticipate or control the many different conditions under which this product may be processed and used this information does not relieve processors from their own tests and investigations. Any proprietary rights as well as existing legislation shall be observed.

FLEXIBLE POLYMERS

BLOWN & CAST FILM



... we make better polymers

LUCOBIT RESINS AND THEIR USE IN BLOWN & CAST FILM APPLICATION



PRODUCTS – THAT MAKE YOU SUCCESSFUL



GENERAL

The most widely used method for film extrusion is the tubular or blown film technology which accounts for about 85 % of all film production. Cast film extrusion is the other major process and accounts for about 10-12 % of all polyethylene film production.

Blown film generally has a better balance of mechanical properties than cast or extruded films because it is drawn in both the transverse and machine directions. The nearly uniform properties in both directions allow for maximum toughness in the film.

Cast film has a more effective cooling process than blown film resulting in less haze and better gloss. In addition, the cast film has a thickness variation of only 1 to 2 % versus the 3 to 4 % for blown film.

The following table shows the LUCOBIT products and their main properties fit for use in extrusion coating applications:

MONOLAYER • MULTILAYER & MODIFIER • HEAVY DUTY FILMS • HF-WELDABLE FILMS • AGRICULTURAL FILMS • GLOVES • URINE POUCHES • PACKAGING FILMS • PEEL / SEAL FILMS • DEEP FREEZE FILMS

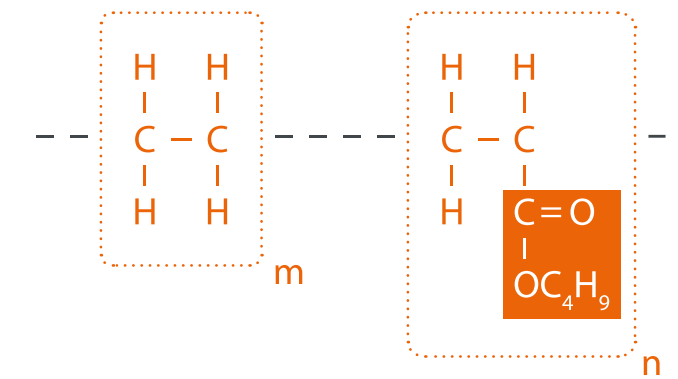
PRODUCT	MATERIAL	COLOR	SHORE A	MFR ¹⁾ 190°C / 2.16 KG
Lucofin® 1400HN	EBA (16 % BA)	natural	90	1.4
Lucofin® 1400MN	EBA (17 % BA)	natural	88	7
Lucofin® 1494M	MAh grafted EBA (17 % BA)	natural	92	7
Lucofin® 1494H	MAh grafted EBA (16 % BA)	natural	90	1.8
Lucofin® 1400SL	EBA (16 % BA) • slip agent (0.2 %)	natural	90	1.4
Lucopren® EP 1500H-90 ²⁾	PP EPM	natural	30 ³⁾	0.6
Lucopren® EP 1500M-90 ²⁾	PP EPM	natural	30 ³⁾	8

LUCOBIT PRODUCTS

Packaging films, heavy duty bags, urine pouches, stretch hoods, agricultural mulch film. LUCOBIT products in film applications offer:

- High frequency weldability
- Excellent hot tack
- Superior paintability and printability making pretreatment obsolete
- Tie layers in multilayer structures

The majority of LUCOBIT products is based on ethylene butyl acrylate copolymer (EBA). The repeat unit of EBA copolymers is shown in the figure. This structure explains many of its unique properties as explained on the next page.



CASE STUDY

CUSTOMER

Multinational packaging company.

PREVIOUS SITUATION

Blown film made of LDPE, LLDPE and plastomer.

SOLUTION NOW

Blown film made of LDPE, LLDPE and Lucofin® 1400HN.

BENEFITS TO THE CUSTOMER

- Price reduction of 10 % due to price advantage of Lucofin® 1400HN compared to plastomers
- Additional 10 % price reduction due to improved printability making pretreatment processes such as corona or flame obsolete
- Sealing process facilitated via high frequency welding

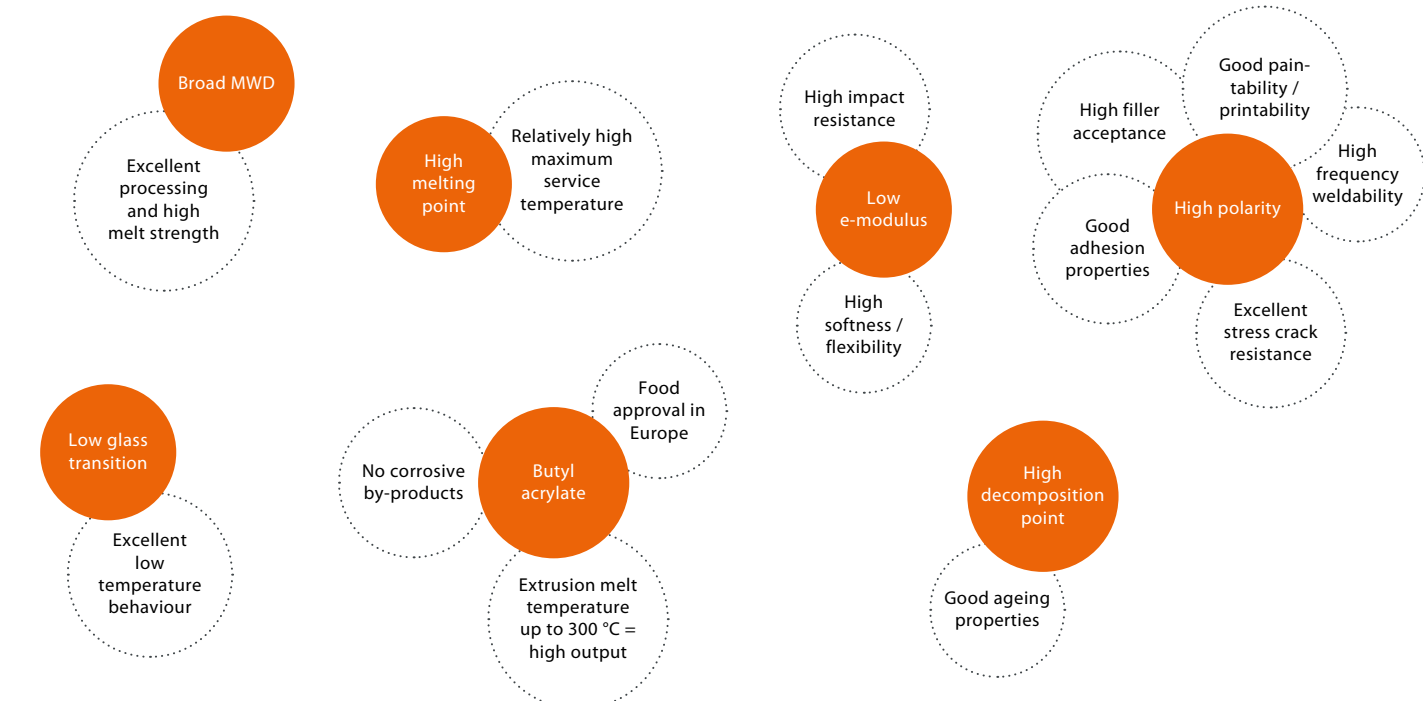
ADVANTAGES OF LUCOBIT PRODUCTS COMPARED TO PLASTOMERS AND EVA

The stream of truth flows through its channels of mistakes. The speciality plastics based on flexible polyolefins which are marketed and sold by LUCOBIT AG under the trade name Lucofin® types are doubtless products that you have long known to be quality materials. Particularly with a view to our grafted and non-grafted EBA grades, our distribution partners repeatedly tell us that there is a certain information gap as far as cost-effectiveness is concerned. What may at first glance appear to be more expensive compared with other polymer systems does in fact almost always, on closer inspection, prove to be the cheapest solution overall and in the long term.

It is essential here not to interpret the performance of a product solely in terms of the price per unit of quantity. You only obtain an objective result if you examine all technical aspects. In terms

of our EBA grades competing on both a commercial and technical basis with EVA, plastomers, but also EBA products from other manufacturers, the Lucofin® materials are proving time and time again to be the optimum solution for an increasingly large number of our customers' end applications.

A sustainable assessment must take account not just of the simple formula of „dosage x price“ but also of the value attached to the technical advantages afforded from the use of Lucofin® EBA. The following table illustrates the key properties and the resulting advantages of Lucofin® 1400HN and 1400MN. If all of these factors impacting on cost effectiveness are assessed in an objective and unbiased way, it is ultimately apparent that Lucofin® EBA materials usually constitute the better solution.



¹⁾ average ²⁾ MFR 230 °C / 2.16 kg ³⁾ SHORE D