

Flexible Polymers _ Blown & cast film



LUCOBIT resins and their use in blown & cast film applications

_ 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 its 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	Colour	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® 1494	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 ¹⁾	PP EPM	natural	90	0.6
Lucopren® EP 1500M-90 ¹⁾	PP EPM	natural	88	8

¹⁾ average ²⁾ MFR 230°C / 2.16 kg

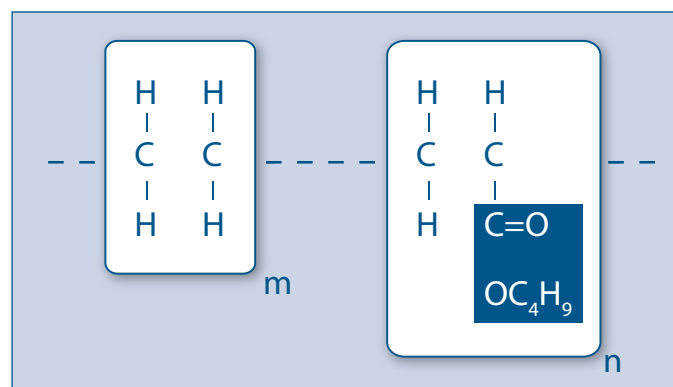


_ LUCOBIT products

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 multi layer 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.



Our Brands

Lucofin®

Lucopren®

Products – that makes you successful

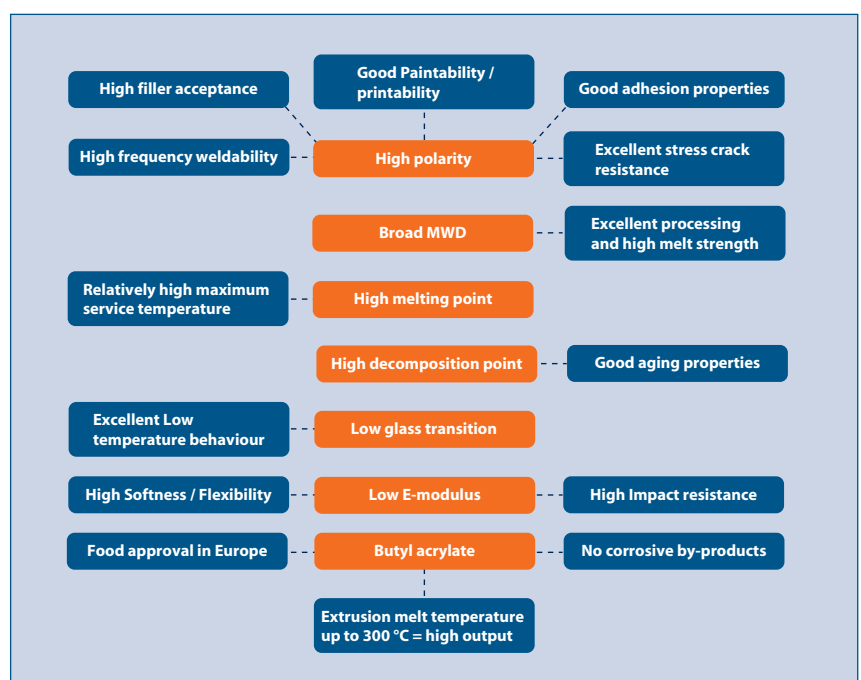


Advantages of LUCOBIT products compared to plastomers and EVA

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 names 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 the value attached to the technical advantages afforded from the use of Lucofin® EBA. The following table illustrates the key properties – as marked in orange – and the resulting advantages – as marked in blue – 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.





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

Properties – you need



Some key properties of EBA based blown & 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.

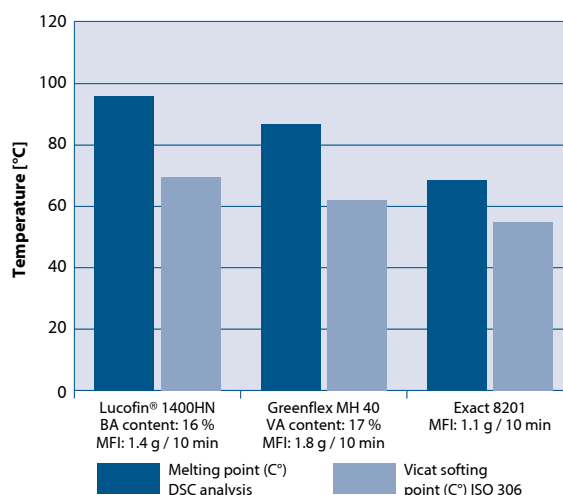
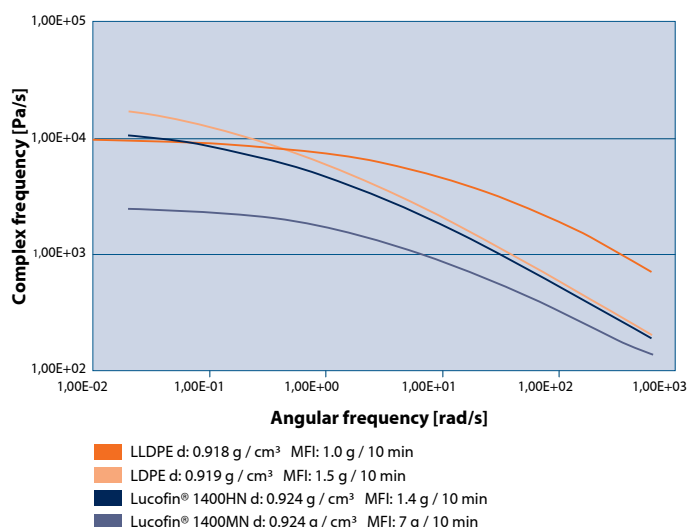
The response of the various types of polyethylene resins to increasing shear is a function of their degree of long-chain branching and molecular weight distribution. Lucofin® 1400HN and Lucofin® 1400MN with their high degree of long-chain branching and broad molecular weight distribution show a shear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

posite 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 have only 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



Solutions in flexible polyolefins

_ Competence and diversity

LUCOBIT AG develops, produces and sells top quality materials for the plastics processing industry. Our focal area of business is in high-quality speciality plastics based on flexible polyolefins which are used in waterproofing, asphalt and in numerous other segments of flexible polymers. LUCOBIT products are supplied to compounding companies all over the world.

Competence, experience and the specialist knowledge from 40 years of product history are the reasons behind LUCOBIT AG's success as a first class point of reference on the national and international markets. As a flexible and group-independent company, we are present and active in all significant plastics markets around the world – supported by a far-reaching sales networks which offers our customers a direct contact partner wherever they need one. Wherever they can be found, LUCOBIT AG products and services stand for consistently high quality standards, top rate workability and diverse opportunities for use.

_ Thinking and acting

Constant innovation and the willingness to venture into new terrain – this approach is an integral part of the way we think and act. In this way, we not only secure our own future, but also that of our customers. The LUCOBIT materials research is also always using the latest knowledge and methods to further optimize our products. The responsible use of our natural resources is of equal importance to us. Development and production of lasting products and a distinctive environmental awareness are deeply rooted within our company. An ecological approach is top priority for us.

The compliance with international standards is a matter of course. LUCOBIT AG is ISO-certified according to the standards DIN EN 9001 (quality management) and DIN EN 14001 (environment management).

_ Services and solutions

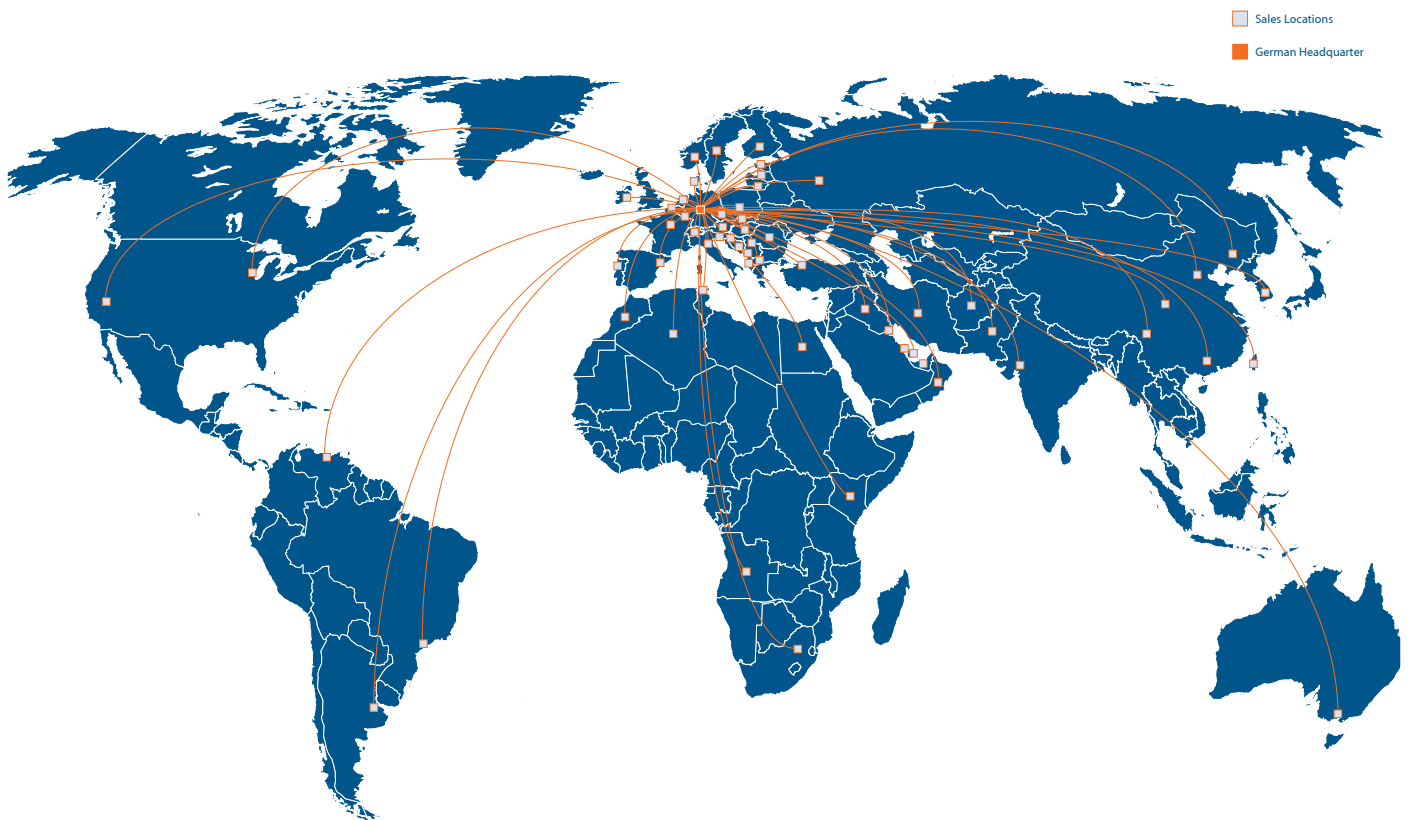
The focal point of our daily work is the task to satisfy our customers and to offer them tailor-made solutions which suit their specific requirements. Customer-oriented service therefore has top priority at LUCOBIT AG. This is reflected in our business processes and organisational structures. Short decision-making processes and reaction times are as much a part of this as binding agreements and the targeted

implementation of agreed arrangements. High qualification demands on our employees are a guarantee for the observation of these principles. Our work is characterised by our reliability, readiness for action and flexibility.

Uncompromising quality and first class services are our trademarks. We offer our customers comprehensive consultancy services and support ranging from product development and the calibration of specialty plastics for their specific production facilities to the optimisation of production processes and concepts for transport and logistics. Your task is our challenge. Together with you, we want to use perspectives in markets of the future and help these grow.



Locations



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.



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