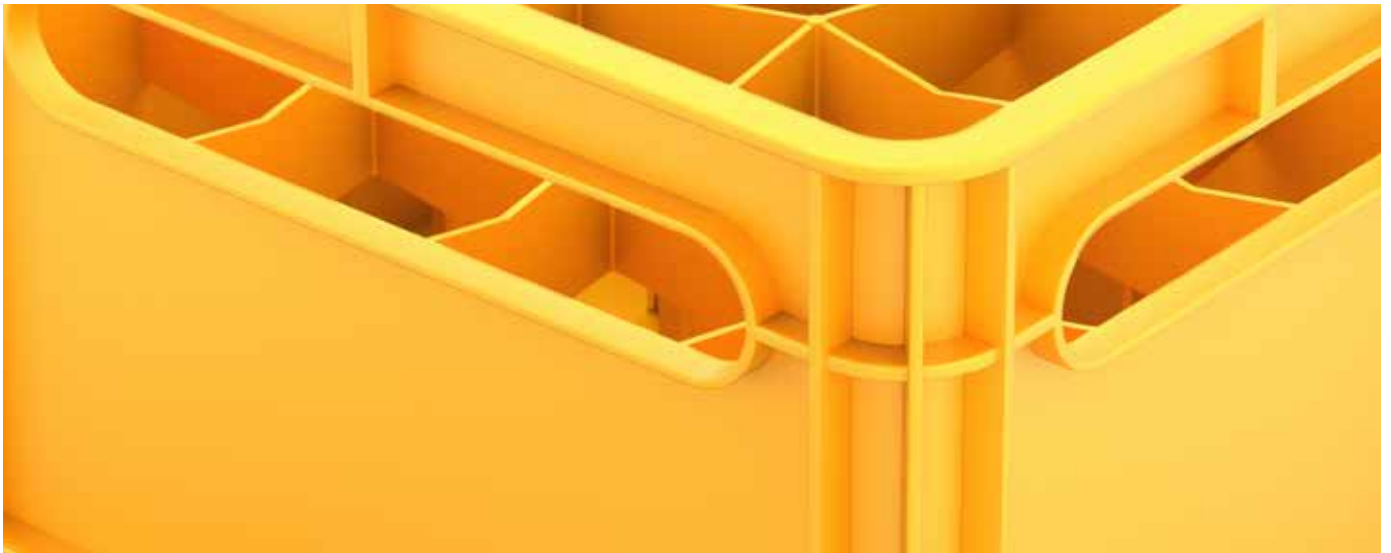


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# FLEXIBLE POLYMERS

## INJECTION MOULDING

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... we improve your polymer

# LUCOBIT RESINS AND THEIR USE IN MOULDING APPLICATIONS

## GENERAL

Injection moulding is the mother of all processes for dealing with plastics. Here, the desired polymer – neat or compounded with others- is melted and shaped in a respective injection moulding machine. The molten plastic hardens within the tool's cavity in a custom-made form on cooling with the pre-determined surface structure. Consequently, this process generates quality products in large numbers cost-efficiently.

With injection moulding, great flexibility with respect to product's shape and surface structure is obtained. Thus, smooth or grained surfaces as well as a great variety of color schemes or any other desired surface feel is possible.

Injection moulding's economics renders this process to one of the most widespread for many end-user applications.

LUCOBIT AG's Lucofin® products are well suited for injection moulding applications either neat or compounded: our thermoplastic copolymer based on ethylene and butylacrylate (EBA) depicts incredible versatility ranging from flexibility, high temperature stability, chemical resistance etc. to name only a few.

The following table shows LUCOBIT AG products with their main properties suitable for use in injection moulding applications:

PRODUCT	MATERIAL	COLOR	SHORE A	MFR <sup>1)</sup> 190°C / 2.16 KG
Lucofin® 1400HN	EBA (16 % BA)	natural	90	1.4
Lucofin® 1400MN	EBA (17 % BA)	natural	88	7
Lucofin® 1492M HG	MAh grafted EBA (17 % BA)	natural	92	5 <sup>2)</sup>
Lucofin® 1400PN	EBA (17 % BA)	natural	90	15

<sup>1)</sup> average <sup>2)</sup> example value



## LUCOBIT PRODUCTS

LUCOBIT AG products are the right choice for injection moulding applications. Please find below injection moulding process recommendations.

Injection moulding processing guidelines for Lucofin® 1400MN:  
Heating Zones:

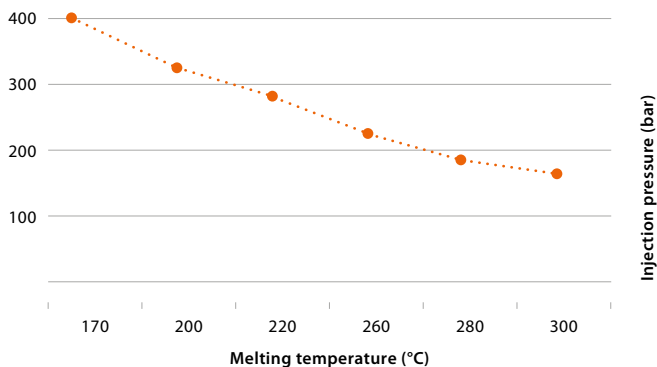
INITIAL HEATING ZONE:	30-40 °C	30 °C*
Zone 1:	170-270 °C	230 °C*
Zone 2:	180-280 °C	240 °C*
Zone 3:	190-290 °C	250 °C*
Injection Nozzle:	190-290 °C	250 °C*

*\*For high flow distance/thick walls and high quality surfaces*

Dosing Speed:	High
Dynamic Pressure:	50-100 bars
Injection Speed:	Medium
Holding Pressure:	Approx. 60% of injection pressure
Tool Temperature:	10-50°C
Data for Tool dimensions:	90mm x 148mm x 2mm .... to 5mm

This injection moulding part was conducted on a modern injection moulding machine with a top closing force of 130 t, max. dosing speed: 200 cm<sup>3</sup>/s at a holding pressure of 100 bars and dosing volume of 200 cm<sup>3</sup>.

The Figure below shows the injection pressure vs. melt temperature (injection nozzle temperature):



The material was easily processable at an average injection speed of approx. 100-200 cm<sup>3</sup>/s. The holding pressure can reach up to 60% of the required injection pressure. The dialed dosing speed can be very high; care must be taken with respect to mechanical strain and stress due to shearing within the melt. For a homogeneous melt, the holding pressure averages 50-100 bars.

### BLEND PP/PE + LUCOFIN® 1400MN

Materials: Polypropylene (PP) homopolymer (Injection moulding quality), MFI = 50g/10min (ISO 1133: 2,16kg, 230°C), Polyethylene (PE) (Injection moulding quality), MFI = 12g/10min (2,16kg, 190°C)

Both polymers exhibit similar properties when blended so that similar settings can be chosen. The pre-determined temperature range was 200-290 °C for a trouble-free processing. To obtain a homogeneous polymer melt, it is recommended to apply a fairly high dynamic pressure as well as a fairly high dosing speed so that significant shearing is introduced.

# PRODUCTS –

# THAT MAKE YOU SUCCESSFUL



## ADVANTAGES OF LUCOBIT AG PRODUCTS

LUCOBIT AG markets specialty plastics based on flexible polyolefin copolymers under the trade name Lucofin®. For many years, these proved to be again and again as high quality products our customers learned to appreciate and value.

Over time, we added grafted and non-grafted and specialty grades to our product portfolio. Many of our customers tested them and showed their exemplary cost-effectiveness retaining expected characteristics in most applications compared to other alternatives fulfilling required technical specifications. Especially the comparison to other plastomers), Lucofin® EBA's proved to be the superior solution.

The following Figure illustrates and exemplifies key properties and the resulting advantages of Lucofin® 1400 HN, 1400 MN, 1400 PN and their grafted equivalents. Taking these factors into account, cost effectiveness of Lucofin® EBA's becomes apparent and consequently constitutes the best solution.



# MOULDING SHRINKAGE OF LUCOFIN® 1400MN



Sample Preparation: The sample preparation abides by DIN EN ISO 294-1

Machinery:	Battenfeld TM130/750	
Heating Zones:	Initial Heating Zone:	30 °C
	Zone 1:	230 °C
	Zone 2:	240 °C
	Zone 3:	250 °C
	Injection Nozzle:	250 °C

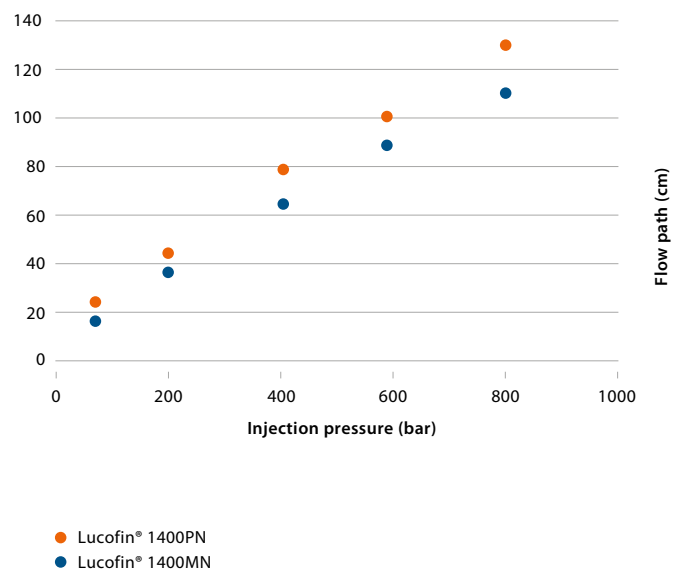
Temperature of the Material:	244,2 °C
Tool Tempering Unit:	30 °C
Tool Temperature:	31,89 °C (Cavity Surface)
Injection Speed:	20 mm/s
Injection Time:	2,5 s
Holding Pressure:	20 MPa (200 bars) & 30 MPa (300 bars)
Holding Time:	35 s
Cooling Time:	30 s
Cycle Time:	78,1 s
Sample Weight:	58,8 g
Thickness of obtained sample:	3 mm

These settings yield a sample moulding shrinkage of 1,31% near to the sprue and 1,41% far from the sprue; in direction of the melt flow an average moulding shrinkage of 1,54% and 1,52% respectively were measured. Increasing the holding pressure reduced material shrinkage somewhat.

## ADDITIONAL REASONS TO USE LUCOFIN® IN INJECTION MOULDING

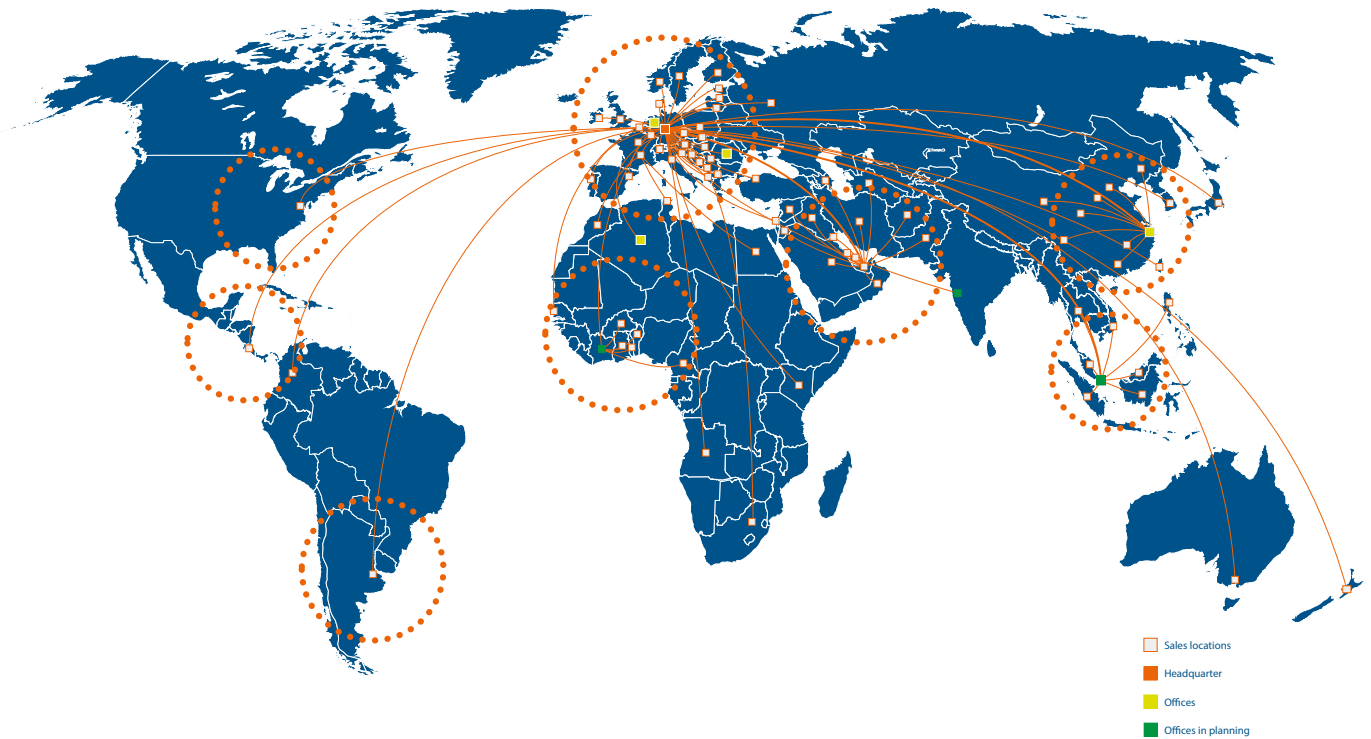
- Lucofin® 1400MN to be added to e.g. PP pallets in order to increase PP's CoF (coefficient of friction) value preventing boxes to slip away from the pallets
- Lucofin® 1400HN reduces viscosity of PP-recycled materials
- Lucofin® 1400MN can be used as impact modifier on an injection moulding machine for e.g. PA6 without a pre-compounding

- Lucofin® 1400MN and Lucofin® 1400PN are used for blends with renewable raw materials without the necessity to use processing aids
- Lucofin® products yield a high quality, non-sticky, dry-haptic to injection moulding parts
- Lucofin® 1400PN exhibits a doubled MFR compared to Lucofin® 1400MN while mostly retaining structural viscosity important in applications for e.g. injection moulding with black/colored masterbatch.



## LOCATIONS

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