

VOELPKER® WAX 4418



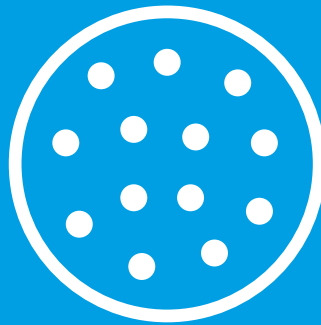
**Enhanced Flow
Improvement**



**Faster Part
Production**



**Reduced
Ejection Force**



**Improved
Dispersion**

**INNOVATIVE AND RENEWABLE:
THE NEW VOELPKER® WAX 4418**

95%
biobased

INNOVATIVE AND RENEWABLE: THE NEW VOELPKER® WAX 4418

VOELPKER® WAX 4418 is a patented organic ester wax, based on renewable plant waxes. It optimally combines the characteristics of a multi-purpose plastics additive with the appeal of biobased raw materials. It is therefore also perfectly suitable for thermoplastic polymers derived from renewable resources.

In **VOELPKER® WAX 4418** natural long-chain fatty acids have been modified by innovative technology to create a biobased polymer additive that meets the highest standards in the polymer industry.

The product is predominantly derived from acids and alcohols in the C26 – C30 range.

General Advantages

High-effective in low concentrations:

VOELPKER® WAX 4418 reveals a broad spectrum of effects: it is extremely versatile and suitable for a wide range of plastics applications as a multi-purpose additive, e.g. release agent, flow improver, dispersing agent and cycle time reducer.

46% reduced cycle time
15% enhanced flow improvement
46 – 49% reduced ejection force

Examples of Use

Thermoplastics: PA, TPU, PLA, PBT, PC, PVC, styrene

Thermosets: Epoxy resins, phenolic resins, polyurethane

Dispersing agent for colour master batches and filled plastics (mineral, glass fibre)

Characteristics	Unit	Target value	Method
Acid value*	mg KOH/g	12 – 25	ISO 2114
Drop point*	°C	83 – 90	ASTM 3954
Colour	–	Pale yellow	AA 3.2.1.505

Table 1: Delivery specification **VOELPKER® WAX 4418**

VOELPKER® WAX 4418 | A Technical Study: PA 6

Matrix	Additives	%	Comments
PA 6 Durethan® B 29-Irgafos® 168 [0.2 wt.%]	–	–	Blank 1
PA 6 Durethan® B 29-Irgafos® 168 [0.2 wt.%]	Microtalc IT extra	0.2	Blank 2, with nucleating agent
PA 6 Durethan® B 29-Irgafos® 168 [0.2 wt.%]	Microtalc IT extra VOELPKER® WAX 4418	0.2 0.5	Renewable long-chain ester wax
PA 6 Durethan® B 29-Irgafos® 168 [0.2 wt.%]	Microtalc IT extra WARADUR® E	0.2 0.5	Montan ester wax
PA 6 Durethan® B 29-Irgafos® 168 [0.2 wt.%]	Microtalc IT extra Amide wax	0.2 0.5	Ethylenebisstearamide (EBS)
PA 6 Durethan® B 29-Irgafos® 168 [0.2 wt.%]	Microtalc IT extra Ca-stearate	0.2 0.5	Calcium saponified fatty acid

Table 2: Material – Dosage of wax additives in PA 6 Durethan® B 29 (Lanxess)

1. Reduced Cycle Time and Enhanced Flow Improvement

The **Cycle Time** of the aforementioned PA 6 matrices was investigated in an extensive injection moulding study¹. Unmodified Durethan® B 29 (Lanxess) was stabilised with Irgafos® 168. Microtalc IT extra (Mondo) was added as a nucleating agent. Blank 1 (without nucleating agent) was tested for control. The effect of VOELPKER® WAX 4418 was compared with WARADUR® E, amide wax and Ca-stearate.

In the applied experimental set-up, using standard tools and test specimens, the nucleating agent alone reduced the cycle time by 7%.

The resulting 56% reduced cycle time compared to Blank 1 for WARADUR® E is attributed to the known dispersing effect of the wax, which leads to a much better distribution and efficiency of the nucleating agent.

VOELPKER® WAX 4418 produces a similar cycle time reduction of 46% and significantly outperformed amide wax and Ca-stearate.

The **Spiral Flow Number** (SFN) was determined by injecting the molten resin into a long, spiral-channel testing mould. The SFN is defined as the flow length of the resin. It was demonstrated, as expected, that the flow ability can be significantly increased by using wax additives.

The best flow result was achieved with VOELPKER® WAX 4418. The flow spirals are longer than the reference by >15%. The extension in the equipment set-up used with Waradur® E is about 8%. Calcium stearate and amide wax: ca. 5 – 5.5%.

¹ipt – Institut für Polymertechnologien e. V., Wismar. Unpublished results 2017. Experimental details available upon request.

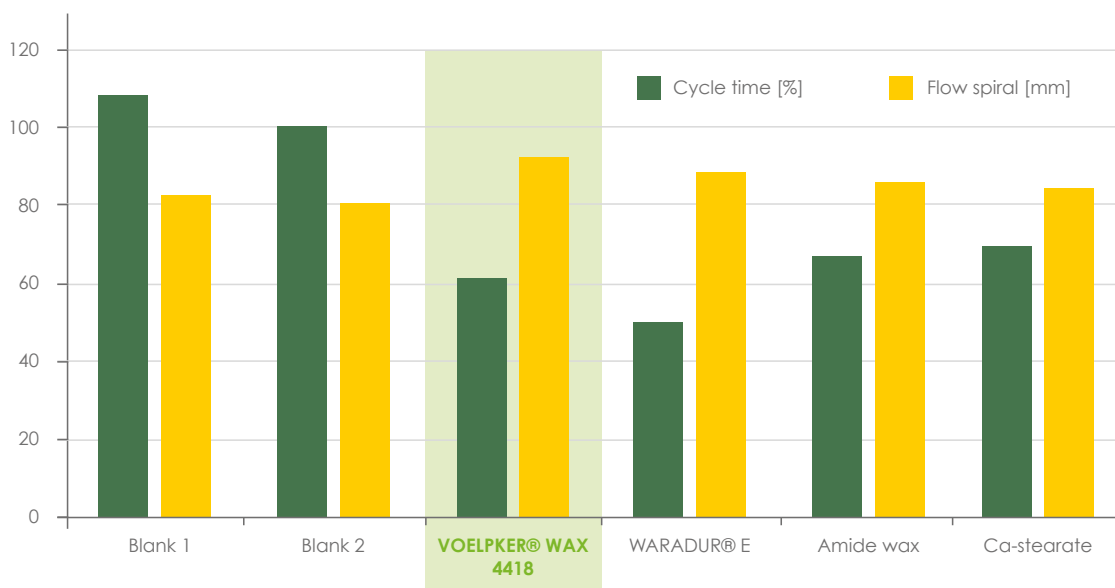


Fig. 1: Cycle time reduction and flow improvement

2. Improved Mould Release by Reduced Ejections Force

The present studies also analysed the effect of VOELPKER® WAX 4418 on the demoulding properties as an additive in PA 6. The ejection force was analysed in particular. The ejection force (or demoulding force) is defined as the force required to strip the moulded parts from the mould cores. It was demonstrated that the ejection force can be significantly reduced using VOELPKER® WAX 4418: 45.9% compared to Blank 2 and 49% compared to Blank 1.

Slightly better results were only received with WARADUR® E: the ejection force reduction was 50.1% and 53.1% respectively.

The ejection force reduction for amide wax and calcium stearate was between 21% and 31%.

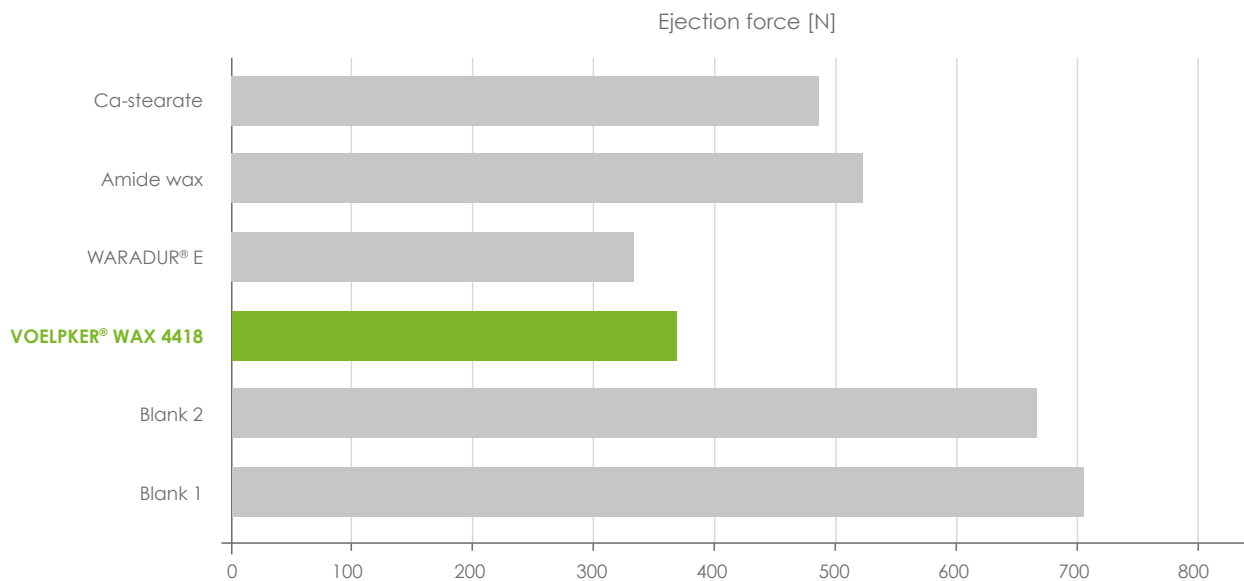


Fig. 2: Ejection force reduction

3. Low Volatility (TGA) and Good Colour Stability

TGA (Thermogravimetric Analysis) measures the weight change of a material, either as a function of increasing temperature, or isothermally as a function of time, in an atmosphere of nitrogen, helium, air, other gas, or in vacuum. The present study was performed under nitrogen with a temperature gradient of 10.00 K/min (25.0 – 800 °C).

VOELPKER® WAX 4418 weight loss curve shows a very similar profile compared to that of the montan wax WARADUR® E, which is known to satisfy “extra-stringent requirements in terms of performance, compatibility, low volatility or thermal stability”².

²Peter W. Duffton: Functional Additives for the Plastics Industry: Trends in Use Smithers; Rapra Publishing, Shawbury, Shrewsbury, Shropshire SY4 4NR, UK, 1998, p. 96

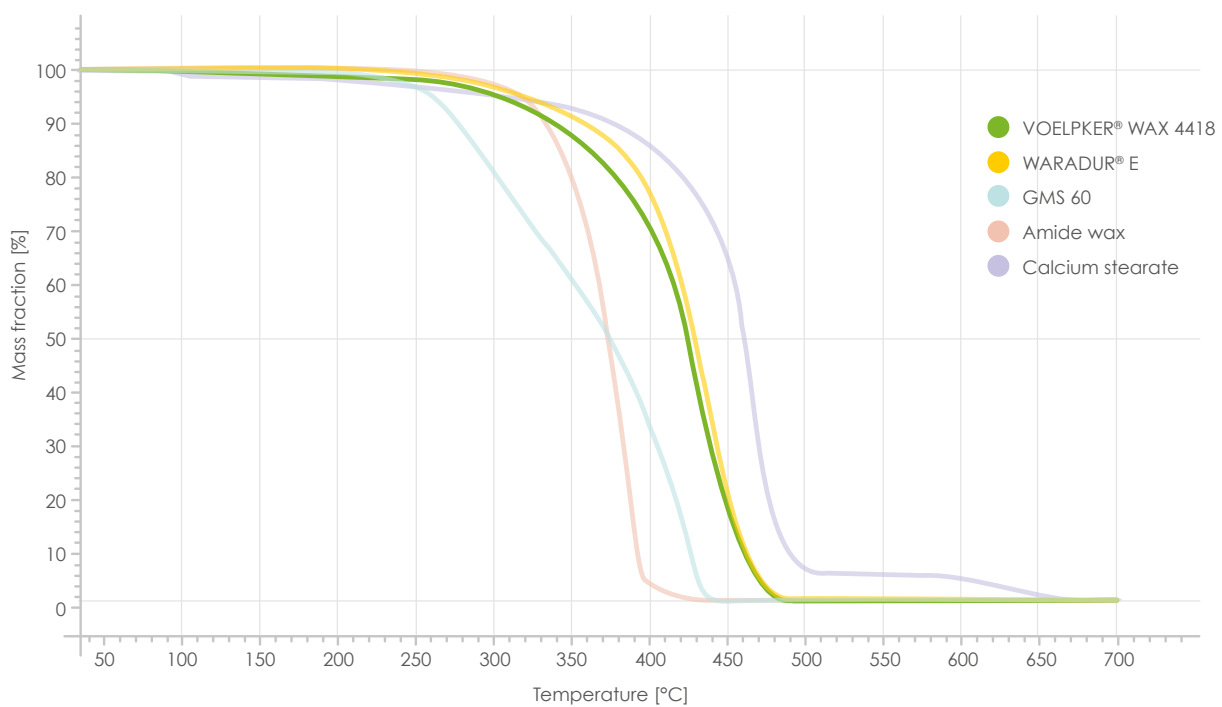


Fig. 3: Thermogravimetric analysis (Fraunhofer-Institut WKI, Braunschweig)

This low volatility is combined with good colour stability (Fig. 4), especially in comparison to amide wax and Ca-stearate.



Fig. 4: Colour stability under thermal stress (Laboratory Air Circulation Oven Heraeus UT 6120: 250 °C/30 min; Ca-stearate: 10 min)

Voelpker – a Family-owned Company with Innovative Strength

With more than 115 years of production history, Voelpker is among the most long-standing wax producers in Europe and is renowned worldwide as a reliable manufacturer and supplier of montan waxes and special wax blends. Due to their unique properties, special waxes developed and produced by VOELPKER are used as high-performance additives in the plastics industry. They serve as combined external and internal lubricants, nucleation additives and dispersing agents in many types of plastics and processing methods.

True to the motto 'to make ideas work', we do everything to improve and optimise our customers' products and processes. We design special waxes that are precisely tailored to their requirements. We served our customers as a reliable partner and have developed individual solutions for many branches over the last few decades.



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