

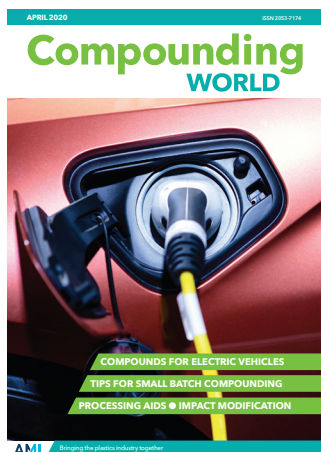


Sustaining innovation in processing aids

Manufacturers of processing aids have added sustainability to the list of essential innovations. Peter Mapleston reports on some of the latest developments

This is an excerpt from the original article, prepared by VOELPKER®.
Source: www.compoundingworld.com (April 2020).

Main image:
Processing aids such as waxes are essential in polymer processing. Latest developments focus on improving performance and sustainability



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IMAGE: VÖLPKER



Above: Völpker produces a broad range of wax processing aids

pigments and additives in masterbatches. Clariant is moving ahead on more developments. "Additional work on compatibilisation needs to be done to further the efforts towards realising a circular economy, via re-use and recycling of often impure materials," says Neuber. "Functional waxes and polymers can certainly help this area. Also, more nucleation development with lubricating and processing aids can surely help reduce energy consumption and make for better quality finished goods for work, home and transportation."

System performance

Montan wax producer **Völpker Spezialprodukte** markets its products as Waradur and Cevo, which is a more recent introduction. Its main development emphasis is on improving sustainability through improved system performance of its products, but it is also working on bio-based grades.

Looking first at the performance work, Business Development Leader Dr Lutz Matthies says the company recently carried out investigations into how these products can affect the distribution of carbon fibres in polypropylene. It has also shown that significantly reduced cycle times can be achieved in injection moulding of PA66.

Matthies says use of one of its waxes, Waradur E (an ester wax consisting of montanic acids with ethylene glycol), enabled a compounder of carbon fibre-reinforced polypropylene compounds for electrical and electronic applications

to reduce expenditure on raw materials. When using 0.5% Waradur E in a compound containing 8% carbon fibre, a reduction in electrical resistance (ohm) and specific electrical resistance (ohm. mm²/m) in the range of two orders of magnitude was measured (Table 1).

"Waradur E causes a very good distribution and alignment of the individual fibres, so that the conductivity is significantly improved, which manifests itself in a drop in resistance values," says Matthies. "This significantly-improved carbon fibre distribution ultimately leads to a reduction in the cost of raw materials, for example up to 50% less carbon fibre usage with about the same conductivity."

In investigations into the protection and distribution of flame retardants in compounds, Völpker was able to overcome a problem for a compounder of a glass reinforced FR grade of PA66 that was unable to efficiently mould the compound without strong foaming. The FR additive was being partially degraded as a result of the high shear forces that occurred during processing, with the acid that was produced initiating degradation of the polyamide resin.

"The use of Waradur OP (0.3%) instead of calcium stearate reduced the shear stress of the melt to such an extent that foaming did not occur," says Matthies. "The compound could be produced without problems while maintaining the required fire classification V0 (UL94)." Waradur OP consists of esters of montanic acids with multi-hydroxyl alcohols; it also contains calcium montanate.

Specialised solutions

Völpker's Cevo waxes enable the innovation potential of specialised waxes to be fully exploited, according to Matthies. "Cevo additives can be used to solve processing and application-related issues," he says. He highlights aspects such as material distribution, fast injection, filling long flow paths, the avoidance of friction peaks, fast demoulding, and process stabilisation of the compound.

"These wax additives perform very specific tasks," Matthies says. He cites the example of a compounder that was using re-milled and agglom-

Table 1: Data showing a significant reduction of electrical resistance in carbon fibre reinforced PP through the use of Waradur E and OP montan waxes as dispersing agents

	PP +8.0 % carbon fibre	PP + 8.0% CF + 0.5% Waradur E	PP + 8.0% CF + 0.5% Waradur OP
Electrical resistance [Ω]	2.5 x 10 ⁴	4.5 x 10 ²	4.2 x 10 ²
Specific electrical resistance [Ω mm ² /m]	1.2 x 10 ⁷	2.0 x 10 ⁵	2.0 x 10 ⁵

Source: Völpker Spezialprodukte

IMAGE: EMERY OLEOCHEMICALS



Above: Emery's **Loxiol external lubricants for PVC processing** are bio-based

erate-based polyamide for the production of polyamide compounds that was unable to improve and stabilise product quality.

"The quality of such polyamide compounds is normally more volatile than that of virgin polymer-based compounds. The reasons for this are primarily the degradation induced in polyamides initiated by thermal preloads and processing-related inhomogeneities of the recycled material," he explains. "The use of Cevo-process A-3110 enabled the production of compounds with low variation in mechanical characteristics and consistent processing properties." The A-3110 additive is described as a special one-pack including a synergistic combination of different lubricating

agents as well as a balanced mixture of stabilisers.

Another compounder producing glass fibre reinforced and impact modified polyamide compounds was able to improve its product's mould filling by 45% (spiral flow test) using 0.5% of Cevo-process A-3100 instead of zinc stearate. The additive is said to have further improved the surface quality of the injection moulded parts produced. A-3100 includes a synergistic combination of different lubricating, release and dispersing agents.

In a third case, a microtalc-filled PA6 compound showed ineffective processing behaviour in injection moulding. The customer replaced the wax additive it had been using with 0.5% Cevo-process J-4418 (which is based on renewable plant waxes). "The flow behaviour was improved by 15% and both ejection force and the cycle time were reduced by more than 40%," says Matthies. Cevo-process J-4418 contains modified natural long-chain fatty acids (mainly C19 - C32).

Polish company **Euroceras** has been making synthetic waxes for more than 45 years. It has reactors for production of polyolefin waxes as well as polar copolymer waxes and what it describes as "unique polyester waxes". The main plastics application areas for the Ceralene-branded waxes are for dispersion in colour and additive masterbatches, external and internal lubrication in PVC processing, as well as flow improvement in techni-



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