

Building knowledge on additives for recyclate

R&D in additives is leading to development of products that counter degradation and improve the properties of recyclate so they match the quality of virgin materials. By Peter Mapleston



IMAGE: BASF

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Additives specialist Völpker Spezialprodukte has several Cevo branded products that are finding use in plastics recycling. Lutz Matthies, Head of Business Development, says they make use of the mechanisms of dispersion, stabilisation, compatibilisation and chemical intervention in the chemical structure of the polymer, depending on the required tasks. "The use of synergisms of the additive components used plays an important role here," he says. "The focus of Cevo for recycling is on engineering plastics but use in the area of commodity plastics such as polyethylene has also proved successful."

Matthies highlights the company's CEVO-master A-2020, CEVO-master D-2050, CEVO-stab F-5510 and CEVO-master B-6000 products. The CEVO-master A-2020 grade is intended for use in polyamides. "Especially in the field of polyamide recycling, the repeated thermal stress on the polymer leads to chain degradation, which is reflected in a reduction of viscosity," says Matthies. This is accompanied by a loss of mechanical properties, especially toughness. "Through the targeted use of CEVO-master A-2020 in the compounding process, the polyamide chains can be repaired, and the desired viscosity numbers (a measure of molecular weight) can be specifically set. The reactive extrusion step can also be used to counteract degradation reactions caused by processing in general."

CEVO-master D-2050 is developed for use in polycarbonates, with the aim to enable production of fast-flowing regenerates and compounds based on regrind (even when the easy-flowing regrinds required are not available). The use of the additive allows production of compounds based on recyclate that have properties very similar to those of virgin material. Further investigation has also shown that CEVO-master D-2050 is suitable for converting high-viscosity cast PA6 into a low-viscosity grade via compounding, says Matthies.

CEVO-stab F-5510 stabilises the reprocessing process of polyacetal (POM) copolymer waste. Thermal stress on POM can cause degradation and the formation of formaldehyde. This creates not only an unpleasant odour, but also bubbles in the feeding region of injection moulded parts. The addition of 0.3–0.5% of CEVO-stab F-5510 radically reduces these phenomena, according to Matthies.

Finally, CEVO-master B-6000 is designed for a wide range of applications in recycling of post-consumer and post-industrial polyolefin recyclates, where it acts as a compatibiliser, reducing problems caused by impurities of foreign polymers. The flow behaviour of the recyclates can also be improved in a targeted manner. In parallel, says Matthies, it acts as a process stabiliser and is also suitable as an impact modifier.

Table 1: Effect of the addition of CEVO-master A-2020 on viscosity and toughness of re-compounded PA6 derived from fibres

Formulation	Viscosity number ml/g	Notched impact strength kJ/m ²
97,3% PA6-agglomerate + 0.5% CaSt + 0.2% Irgafos 168 + 2% black masterbatch	120	12
97.3% PA6-agglomerate ¹⁾ + 0.5% CaSt + 0.2% Irgafos 168 + 2% black masterbatch + 0.5% CEVO-master A-2020	134	13
97.3% PA6-agglomerate ¹⁾ + 0.5% CaSt + 0.2% Irgafos 168 + 2% black masterbatch + 1.0% CEVO-master A-2020	145	16

Source: Völpker Spezialprodukte

Table 2: Melt flow and physical properties of recycled PC compounds containing Cevo additives

Formulation	MVR300°C/ 1.2 kg cm ³ /10 min	Vicat B50 ° C	Tensile strength MPa	Notched impact strength kJ/m ²
PC-regrind + 0.4% CEVO-process J-3400	7	145	68	79
PC-regrind + 0.4% CEVO-process J-3400 + 1.5% CEVO-master D-2050	20	138	67	49
Lexan 121R ¹⁾	21	140	65	65

¹⁾ Values taken from supplier's TDS

Source: Völpker Spezialprodukte