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How Südpack and Vorwerk recycle plastic together

What does a leprechaun have to do with film recycling?

Offprint

Recycled materials from Südpack are used for the VK 7 cordless hoover with squeegee from Vorwerk.

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No, the leprechaun (Kobold) is not the little green man who makes new granulates out of film scraps at night. The Kobold is the one for which recycled film, among other things, is now being used. Its exact name: Kobold VK7 cordless hoover with SP7 suction wiper. It comes from Vorwerk and has recently been made of injection-moulded parts from recycled materials. The supplier of the recycled material is the film manufacturer Südpack, which operates its own compounding lines at its site in Schwendi and produces high-quality individual recyclates here. Dr Kylie König, Business Development Manager Compounding at Südpack, and Dr Michael Kroh, R&D, Principal Materials Engineering at Vorwerk, explain the not-so-ordinary project in more detail and present the activities of both companies on the subject of recycling.

Text: Dipl.-Ing. (FH) Karin Regel, Editor K-PROFI

Vorwerk Elektrowerke GmbH & Co. KG, which has its headquarters in Wuppertal, is well-known for its hoovers and Thermomixers. The long-standing company sells the Kobold VK 7 alone about 400,000 times a year, the Thermomix about 1.2 million times, in addition to other products. Most of the production takes place in Wuppertal, where the majority of the 1,660 employees work. Other production sites are located in Cloyes, France, and Shanghai, China. The products are sold all over the world by about 85,000 independent associates who offer direct sales, including advice and demonstrations.

With this very successful system, the Vorwerk Group generates an annual turnover of about 3.3 billion EUR. “Sustainability has always been a top priority for us, after all, our products are characterised by an enormous lifespan”, Dr. Michael Kroh of Vorwerk is convinced and emphasises that many hoovers, or blenders are already 30 or 40 years old and thus in use over several generations.

Dr Michael Kroh, R&D, Principal Materials Engineering at Vorwerk

Dr Kylie König, Business Development Manager Compounding at Südpack

Jochen Schofer, Head of Sales Recycling at Coperion

But of course, Vorwerk also wants to meet the current demands for greater use of recycled materials and a lower CO_2 footprint.

Sustainable materials desired

Dr. Michael Kroh says: "Our goal is to switch all the materials we use in-house to a sustainable alternative. This includes recycled materials as well as materials from renewable sources (e.g. biomass balancing or chemical recycling) or plastics based on renewable raw materials, but also the replacement of more CO_2-intensive raw materials with alternatives." By this he means, for example, replacing PA with PP, the polymerisation of which requires significantly less energy.

And this is where Südpack comes in. "The PP compound we buy from Südpack consists of more than 40 % recycled material," says Michael Kroh. He is enthusiastic about the very trusting cooperation and the speed of the project. "We had the first talks about a year ago, the production tests have been completed and the first batch of material has already been ordered." In addition, further recompounds are being sampled. A long-term cooperation is planned. "Since all the raw materials we use are continuously put to the test, we are very happy to have found a competent and reliable partner in Südpack."

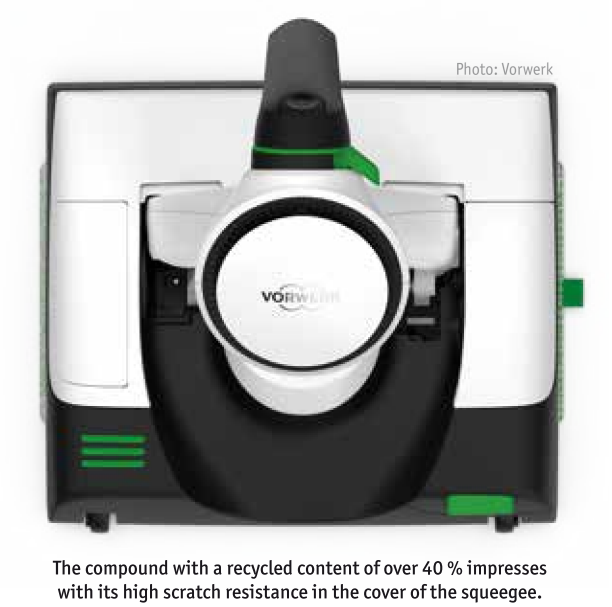
Südpack is one of several raw material suppliers for Vorwerk, as the company not only has to ensure its material procurement, but also needs very different raw materials. As an example, Dr. Kroh names the tub of the TM 6 "Black Edition", which was produced from 100 % recycled ABS. "For the recycled material, the CO_2 equivalent is 0.22 kg, while for virgin material it is more than fifteen times that at 3.46 kg."

The challenge of colour

The special features of the Südpack recompound used to produce the white PP housing parts of the Kobold SP7 (the attachment for simultaneous wet wiping and vacuum cleaning) are its quality and its colour: signal white. Both are ensured by the high-quality raw materials, the enormous recipe knowledge and, of course, the processing technology. "Südpack pursues a clear zero-waste strategy based on several pillars," explains Dr Kylie König *(see K-PROFI 9/2022, p. 64ff. and www.k-profi.de/heft/220964)*. One pillar is the company's own compounding plant in Schwendi, not far from the company headquarters in Ochsenhausen. "Here we process our film residues from production into high-quality regranulates."

For this purpose, the post-industrial waste is collected in the main plant according to the exact formula and, due to its purity and cleanliness, offers ideal conditions for high-quality compounds. "The formulation knowledge here in-house is enormous thanks to the many years of experience for the various film formulations," Dr Kylie König points out. Both the formulation knowledge and the extensive testing facilities are now also being used for compound development. "We have already put together a certain basic portfolio of different compounds, including for the automotive and household sectors, but we also develop customised formulations."

This is also the case for Vorwerk. "We start by talking to the customer to find out exactly what he wants and needs, then we produce an initial test material based on



The compound with a recycled content of over 40 % impresses with its high scratch resistance in the cover of the squeegee.

that, modify it if necessary and then go into production," says Dr König, describing the procedure. The challenge in the recipe for Vorwerk was the colour. Producing a signal white from residual materials, even if they are post-industrial residues, is not entirely trivial. "We work closely with various masterbatch manufacturers who help us find the colour."

The PP compound for Vorwerk is based on PP/PE/PA composite film remnants mixed with virgin material, but consisting of over 40% recycled material. "We were even able to improve the scratch resistance in the end product, the cover of the squeegee, compared to before." Vorwerk is not only very satisfied with the mechanical properties of the compound, but also with the colour setting. "In the nozzle of the squeegee, we now actually use different polymers for different parts, all in signal white, and this is only noticeable when you know it," says Dr Michael Kroh, praising the compound supplier.

Processing challenge

For the production of its high-quality compounds, Südpack relies on Coperion from Stuttgart, among others, and operates ZSK twin-screw extruders at its compounding plant in Schwendi. "There are again two challenges in processing the multilayer compounds: the first is optimum dispersion of the polyamide content in the PE matrix. Otherwise, this leads to speck formation in the finished injection moulded component," explains Jochen Schofer, Head of Sales Recycling at Coperion.

Together with his team, he therefore offers all customers and those who would like to become customers the opportunity for pilot plant trials. "Südpack has also taken advantage of this service. Together we developed the right screw configuration and the right process unit design for the desired recipe," continues Jochen Schofer, naming challenge number 2: "Multilayer residues have to be degassed particularly well in order to remove all volatile components." That's why Südpack works with a two-stage high-performance degassing system. The combination of very fine dispersion and high-performance degassing ultimately leads to the high-quality compound that Vorwerk uses for its nozzle cover.

Incidentally, since recycling and such tasks are increasingly in demand, Coperion presented the ZS-B Megafeed at K 2022. The side feed unit enables the efficient feeding of particularly light and fluffy residual materials, e.g. film shreds, compresses them before they reach the compounder and thus not only allows a higher throughput and thus efficiency, but also makes it possible to feed particularly difficult materials into the extruder in the first place. "In the future, we will also offer a combination of a shredder and a ZS-B Megafeed to enable further processing options for residual materials and thus make our contribution to the circular economy," summarises Jochen Schofer.

www.suedpack.com
www.vorwerk.com
www.coperion.com

The starting material for Südpack's compounds is its own clean film scraps.

Südpack received support with formulation and system configuration in the Coperion Technical Centre.