

K-PROFI

international edition

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- › Trendsetting know-how
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Two spin-offs of the Fischer Group have combined their know-how to create a compound screw in seven length variants.

Fully automated moulding of screw dowel sets

What **Greiner Packaging** achieves with r-PET. How **Wirthwein** establishes a ship-to-line for BSH. How **Varioplast** links its processes. How **Poli** thermoforms individual packaging. How **Oventrop** saves energy with a 3D-printed hot runner nozzle. And how **Wefapress** copes with a major fire.



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Courageous decisions with a future

Dear reader

In this issue you will again read about exciting technologies for plastics processing, impressive entrepreneurial personalities, and courageous decisions for the future.

The EFSA has so far only confirmed the food suitability of recycled goods for PET. How Greiner Packaging makes packaging for dairy products heat-sterilisable: page 6. Intelligent inline linking of injection moulding and surface finishing in series projects in the automotive industry is a unique selling point at Varioplast: page 22. A major fire destroyed parts of the production at Wefapress Beck + Co. at the beginning of July. What the manufacturer and processor of semi-finished plastic products experienced and learned: page 28.

Wirthwein and BSH Hausgeräte have optimised their fence-to-fence cooperation. Wirthwein now transports lye containers for washing machines without a driver, and a tugger train delivers them directly to the assembly lines at BSH: page 34. Polish thermoformer Poli has grown from a one-man operation to a specialist in customised packaging for food, cosmetics, electronic products and furniture accessories with 17 machines: page 42.

As an expert for small quantities of engineering plastics, the compounder Sitraplas fights against metallic contamination with detectors and separators: page 54. The Fischer Group's special machine construction and toolmaking spin-offs have combined their



know-how for the fully automated production of a screw anchor set. How a compound screw in seven different lengths is produced: from page 58. Oventrop has converted a 4-cavity mould for a continuous article made of PA66-GF30 to 3D-printed hot runner nozzles. From page 64 onwards, you can read why the injection moulder wants to convert other identical moulds.

The K-PROFI and KI Group teams wish you a lively start to a prosperous 2022. Stay healthy!

Markus Lüling

Markus Lüling, Editor-in-chief

lueling@k-profi.de, Tel. +49 (0)9123/9609-10

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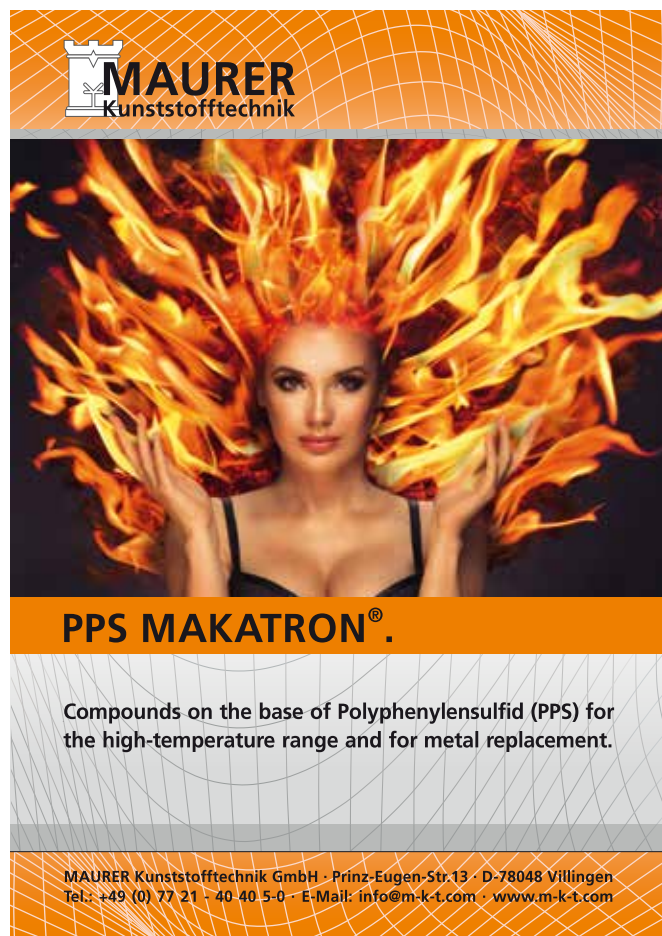
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All photos: Greiner Packaging

The first 500 ml yoghurt cup made of r-PET HTS with a diameter of 95 mm should be on supermarket shelves in early 2022.

Recycled goods with food potential

Why Greiner Packaging sees enormous market potential for r-PET in the dairy industry after initial projects

Joining the two ends of the value chain and thus closing material cycles is currently on everyone's mind. This is also a clear vision of the future for Greiner Packaging. The Austrian packaging manufacturer's specific goal is to produce around 30 % of its packaging from recycled materials by 2025. The problem is the food suitability of the recycled material, which has so far only been confirmed for PET by the EFSA. This leads directly to the next problem: PET cannot be heat-sterilised and has therefore not been used for the packaging of dairy products in Europe. Greiner Packaging has found a solution, which Sales Director Germany Günther Pahlitzsch explains in more detail in an interview with K-PROFI.

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

"We sell many billions of K3 as well as directly printable cups every year for our customers in the dairy industry in Germany alone," Günther Pahlitzsch gives an impression of the market volume. Currently, PP and PS are the materials of choice for their production. However, neither r-PP nor r-PS with food approval are available yet. However, the desire, but also the pressure, to use recycled materials is increasing enormously, even among suppliers of dairy products.

The solution could be r-PET. The material has been available in good quality for about 20 years thanks to well-functioning material cycles of the bottle fraction as well as established recycling processes. Günther Pahlitzsch even sees sufficient availability of the bottle fraction despite many interested parties. "For about 40 % of the bottle fraction, there are currently fixed buyers, mainly the bottle manufacturing industry itself, but the rest is freely available," he estimates. "r-PET has food potential. After all, EFSA approval already exists for many reprocessing methods, or the regenerate produced in them." Great Britain is leading the way, he said. Here, several suppliers of dairy products such as yoghurt, buttermilk or kefir use r-PET to make the cups.

The catch as to why this is not possible in the rest of Europe is sterilisation. While cups in the UK are usually UV-sterilised before being filled with food, in most countries it is a legal requirement and therefore common practice to sterilise the cup with superheated steam. Superheated steam sterilisation means exposing the cup to 100 to 130 °C hot air. "Such high temperatures lead to shrinkage of the cup in PET and thus to unusability", Günther Pahlitzsch explains the tricky situation. So, the solution for Greiner Packaging was to modify an r-PET so that it could be hot-sterilised. And that is exactly what the company has succeeded in doing.

Demand is high

r-PET HTS (high temperature sterilization) is the name of the new material, which allows food contact and can be sterilised with steam at temperatures of up to 130 °C. When asked how Greiner Packaging achieved this, Günther Pahlitzsch answers only this much: "We both slightly modified the polymer with a suitable additive and slightly modified the thermoforming process for producing the cups." At the moment, the project is still on

a laboratory scale, but “we are already working with partner companies that process the purchased bottle fraction for us.”

Overall, Günther Pahlitzsch continues, the interest in the market is enormous, and Greiner Packaging is in talks with many more customers, including those from Germany. For example, the first yoghurt cup with a diameter of 95 mm for a volume of 500 ml should be on the supermarket shelves at the beginning of next year. For the Sales Director it is clear that the first projects and thus the proof that the use of recycled material is possible will lead to a change in the dairy industry. In the future, up to 10 % of all cups - and that would be 1 billion cups per year in Germany - could be made of r-PET HTS.

Günther Pahlitzsch even looks one step further into the future: he predicts that in the long run there will be a separate cycle for these cups. Typically, they are white cups that can easily be sorted out of the post-consumer stream. Their colour makes them easy to sort in the first step and they can be discharged in a water bath in the second step due to the higher density of PET in

contrast to polyolefins. “We assume that a tray-to-tray cycle will, indeed must, become established.”

Even more recycling activities

At Greiner Packaging, the development of r-PET HTS is part of many other activities of the company in terms of higher sustainability and closing material cycles. “We attach a lot of importance to raw materials from mechanical recycling processes, as they have a better CO₂ footprint than chemical ones,” Günther Pahlitzsch presents an important company principle. In the future, Greiner Packaging would even like to go so far as to invest in its own recycling technologies and intensify its cooperation with processing partner companies and disposal companies.

“In the long run, sorting should be even more specific and finer in order to capture significantly more material for high-quality applications from post-consumer residues.” The defined goal is to realise r-PET HTS from the bottle fraction by 2023 after the production of this from trays. In addition to closed material cycles with dairy product suppliers,



Günther Pahlitzsch, Sales Director Germany at Greiner Packaging, predicts that there will be a separate cycle for cups made of r-PET HTS in the long run.

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used PET salad trays, such as those frequently used in supermarkets, could also serve as input goods here.

At the same time, Greiner Packaging is also extending its sustainability strategy to other raw materials. Both PP and PS are important recyclables due to the quantity in which they occur today for both food and non-food packaging. Therefore, the packaging manufacturer has defined to use r-PS in respectable quantities from mechanical and later also chemical recycling processes by 2023, and additionally PP by 2025, this however mainly from chemical recycling processes, in order to ensure food suitability.

First showcase projects realised

The company has already realised its first projects with recycled goods. For example, the lighthouse project that creates a real closed loop with three Upper Austrian companies. It concerns r-PET cups for school milk. "In this case, r-PET is used in the dairy industry, but not yet our new r-PET HTS," Günther Pahlitzsch makes quite clear. This is possible for two reasons, he says: Firstly, school milk only has a minimum shelf life

r-PET HTS is the name of the new material that both allows food contact and can be sterilised with steam at up to 130 °C.

of seven days, which is why the cups do not have to be steam sterilised. In comparison, a conventional yoghurt must have a shelf life of at least 28 days. Secondly, the cups are actually recirculated so that contamination is minimised.

And so, as of this school year, around 36,000 children receive milk from a cup made of 100% r-PET. The joint project of the school milk farmers with PET-MAN, Starlinger Viscotec and Greiner Packaging proves that a sustainable circular economy is possible. Moreover, it is a regional solution without long transport routes in Upper Austria for Upper Austria. With every delivery of school milk products, the used, white and unprinted cups are taken back directly, washed, shredded and reprocessed with the Viscotec technology. According to the companies, it was important to them not only to make their contribution to sustainability

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and CO₂ reduction, but also to sensitise children of kindergarten and school age to this issue.

Greiner Packaging has just realised another large-scale project with recycled goods, in this case with r-PP, with Borealis and Emmi, the Swiss supplier of chilled coffee drinks. From now on, Emmi will use caffè latte cups made of a chemically recycled PP, which is produced by Borealis and processed by Greiner Packaging. According to Emmi, this is a step on the way to using at least 100 tonnes of plastics from recycled sources for its chilled coffee drinks every year from now

36,000 children in Upper Austria receive their school milk in a cup made of 100 % r-PET. Because of the short minimum shelf life, it does not require hot steam sterilisation and therefore no r-PET HTS.

on. This cooperation is a clear expression of Emmi's efforts to bring together the ends of the value chain and close loops. "I am very sure that many more projects will follow in the coming years and that more and more suppliers of dairy products and other food-stuffs will rely on sustainable solutions," Günther Pahlitzsch concludes. 

www.greiner-gpi.com



Emmi now uses a chemically recycled PP for Caffè-Latte cups, which is produced by Borealis and processed by Greiner Packaging.

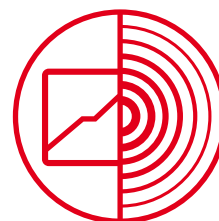


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Start of series production in 2020: Fleig entered the field of processing bio-based plastics with the printable drinking cups from Heybico.

Photo: Heybico



A sure instinct for bio-based plastics

What experience Fleig is gaining in the first series project with injection moulding of bio-materials

“Hey I’m biological and compostable” is the meaning behind the label Heybico and at the same time expresses the requirements for the first product of the start-up of Green Sons GmbH, Sasbach, Germany. With its reusable cups, the young company from the Black Forest wants to create a regional, fair, sustainable and healthy alternative for the out-of-home consumption of coffee and cold drinks. The three Heybico founders were able to win the Hans Fleig GmbH from Lahr, 40 km away, as a development and production partner. Fleig’s Managing Director Wolfgang Isenmann reports on the experiences the company, which focuses on mould making and technical injection moulding, made when entering the field of processing bio-based and (industrially) compostable materials.

Text: Dipl.-Ing. (FH) Sabine Rahner, Editor K-PROFI

Fleig quickly understood the enquiry from Heybico two years ago as an opportunity. “Together with my three management colleagues, I knew it would be a lot of work. But the topics of sustainability, organic, renewable raw materials and compostability are gaining in importance. Moreover, the end date for the ban on single-use plastic articles, which has now been in force since July 2021, was already on the horizon at that time,” informs Wolfgang Isenmann. Fleig did not have any significant experience with bioplastics at that time: “We had sporadically tested materials for their processability, but this project also meant new territory for us.”

Together with Heybico, Fleig designed two versions of a food-safe drinking cup: a cup including the lid, twist-off cap and seal for hot drinks, and a pure cup, without latching for clicking in the lid, for cold drinks. Due to the high workload in the in-house mould making department at the time, Fleig built the moulds for the drinking closure and seal from TPE itself, while the moulds for the cup and lid were made by a nearby partner company. An interchangeable insert for the lid latch allows a single tool to be used for both cold and hot beverage cups.

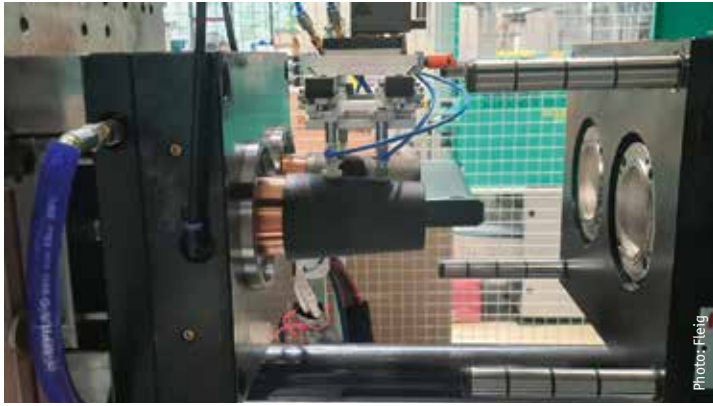
Heybico had already brought a favourite material into play, which was to prove itself in the first samples. A material based on approximately 80 % renewable raw materials and compostable. “The material flowed very viscously, there were flow lines, and the parts

really did look retro and organic. But the argument ‘it’s just organic’ didn’t satisfy us, because apart from the unsightly appearance, we didn’t achieve a stable process even after weeks.” An alternative was needed. During a visit to the Swissplastics trade fair, Fleig came across the offer of FKUR Kunststoffe GmbH, Willich, a supplier and producer of organic plastics. In a first step, FKUR provided a

The Fleig management team was delighted with the order, far from the everyday automotive projects (from left): Wolfgang Isenmann, Thorsten Braun, Edmund Barth and Bernhard Vetterer.



Photo: Fleig



Fleig produces the drinking cups in a two-cavity mould. A mould insert makes it possible to switch between hot and cold beverage cups.



Stable process: The peculiarities of processing bio-based and compostable materials for these returnable cups are manageable.

one-to-one alternative, which, however, showed similar problems. With support from FKUR on-site directly at the injection moulding machine at Fleig, a material adapted to the special challenges was finally found.

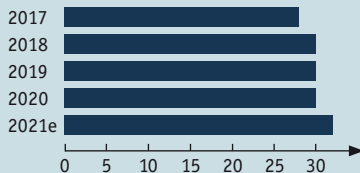
“The flow index improved, we had easier mould filling, the cycle approached the calculated value and above all: we had a nice homogeneous surface”, Wolfgang Isenmann is pleased about the first successes. The choice fell on a PLA blend (polylactide acid) from FKUR's Bio-Flex range, a biodegradable and compostable compound certified according to EN 13432 with a bio-based content of 75 %, which, according to FKUR, is suitable for a wide range of injection moulding applications due to its good flowability and high-temperature resistance. In addition, this material was able to cover another requirement: “Cups made of the predecessor material had an insufficient heat resistance of only 82 °C. The cups, when filled with coffee at

a temperature of 86 °C, became plastic.” Post-crystallisation of the structure through heat exposure would have prevented this. However, Fleig wanted to avoid this additional step. “The Bio-Flex material does not post-crystallise. In combination with a wall thickness of 2.2 mm, we achieve a heat resistance of 108 °C.” For comparison: the wall thickness of the returnable cups of a well-known deposit system is around 1 mm. Reason: the conventional PP used has a significantly higher heat resistance.

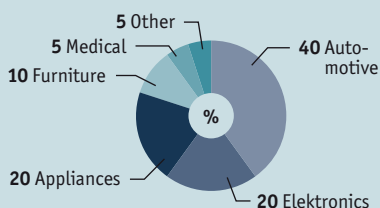
Fleig produces the lids in six different colours, the cups in two versions, natural and black. The corresponding masterbatches come from Granula's all-colour concept. In this, the manufacturer combines its pigments tested for biodegradability and compostability according to EN 13432. These enable end customers to certify their products quickly and easily according to the home or industrial composting standard. Processing is straightforward. “After



Employees



Markets



Management



Edmund Barth
Head of Mold Making and Construction



Bernhard Vetterer
Quality Management and Sales



Thorsten Braun
Production Management Injection Molding

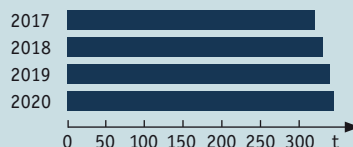


Wolfgang Isenmann
Purchasing and Plastics Technology

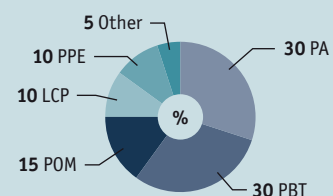
History

- 2012 Development of thin-wall technology in injection molding.
- 2016 Plant expansion: doubling of injection molding production
- 2019 Winner of the „Großer Preis des Mittelstandes“ award
- 2020 Start of series production and processing of bio-based plastics

Processing quantity



Processed plastics



Heybico specified the colours and Granula sampled them, we hit all the colours immediately in the first shot," affirms Wolfgang Isenmann.

In general, finesse and a sure instinct are required when processing bio-based materials. Moisture and heat are the enemy of bio-materials, knows Managing Director Isenmann. Accordingly, material drying is a sensitive process. "The higher the temperature or the longer the drying, the better, as we know from other sensitive materials from the PPE, LCP or PPT sector, does not work here. The producers recommend drying at a maximum of 50 to 60 °C for two to a maximum of three hours. That's why we use dryers directly on the injection moulding machine with container volumes adapted to the hourly throughput. If the drying time is too long, the processes get out of hand and you quickly see that on the moulded part."

In addition, the processing window of "the entire organic range" is also much narrower. In contrast, a bulk plastic such as PE or PP behaves very well with regard to temperature and dwell time. Bio-materials also do not forgive being injected too quickly and the frictional heat that this generates. This is where a high-quality hot runner, or rather the precise control of the temperature in a "narrow temperature window of perhaps ten or 15 degrees", comes in handy.

Wolfgang Isenmann's summary, however, is very positive: "We have the right material, we have the right machine parameters, the process is in place. The peculiarities are controllable and with experience, the whole thing is fun now. Recently, we moulded more than 10,000 cups at a time - including colour changes. Of these, we only discarded the first 50 from the start-up process and maybe one or two more per day. So our calculation also works out." In the meantime, customers are increasingly requesting the use of bio-plastics. But with price-intensive mass-produced or disposable articles, the idea of sustainability is usually not pursued. The coffee-to-go cup is the successful counter-example: as a reusable cup, it is also used, for example, in deposit systems, for equipping canteens and cafeterias or generally as an advertising medium with an individual logo. ■

www.fleig.de; www.fkur.com;
www.granula.eu; www.heybico.com



Photo: Granula

Granula supplies compostable masterbatches for the project based on pigments that are tested according to composting standards.



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More comfort with synthetic fibres

Where textiles made of synthetic materials are superior to natural products

For thousands of years, mankind has used natural fibres for a wide variety of purposes. And even today they still enjoy a high status for textiles of the most diverse kinds. Nevertheless, in recent decades synthetic fibres have been able to assert themselves in numerous applications, such as outdoor clothing, home textiles and cleaning cloths. In part seven of the series on the occasion of the anniversary “100 years of plastics”, the K-PROFI editorial team uses some examples to show where and why they can show off their advantages.

Text: Dipl.-Ing. Karin Regel and Dipl.-Chem. Toralf Gabler, Editors K-PROFI

Obviously, Edmund Hillary and Tensing Nor-gay already wore a warming and water-repellent down jacket when they made the first ascent of Mount Everest in 1953, after all, it had been invented by the American Eddie Bauer in 1936, but the material did not yet have much in common with today's functional outdoor clothing. But the basic requirements have remained the same: Lightweight with high functionality. Natural textiles made of wool and cotton, which were protected against wind and weather with a layer of wax, have been largely displaced by functional synthetics and are now worn mainly for fashion reasons. Today, those who want to engage in outdoor activities such as hiking, cycling, jogging, or climbing rely mainly on functional synthetic products.

“Today's demands for comfort and function can no longer be met with natural materials alone,” reports Clement Affholder, Innovation Manager at Vaude Sport GmbH & Co. KG from Tettnang, who admits, however, that natural materials with special properties such as coffee grounds or wood fibres have been very much in the news for some time.

Dry in the tent

Vaude knows the market very well. After all, the company, founded in 1974, quickly developed into one of the largest manufacturers

of outdoor articles in Germany. Around 60 % of all the items Vaude produces are clothing items, mainly jackets and trousers, plus backpacks, bike bags and tents, to name but a few items. “Especially with tents, our customers today are looking for a small pack size, low weight, high weather resistance, functional design and appearance,” explains Clement Affholder. Typically, tents therefore consist of a double-walled construction, an inner and an outer tent. While the inner tent is made of a simple polyester or polyamide fabric, the polyester fabric of the outer shell is given a polyurethane or silicone coating to make it waterproof.

Jackets made of several layers

Vaude also uses the same materials in the production of garments such as rain jackets. These come as two- or three-layer laminates. If the membrane and outer fabric are firmly bonded together using heat, then this is a 2-layer laminate. An inner lining lies loosely underneath and protects the exposed membrane from dirt, abrasion, and body fat. Vaude's waterproof but at the same time breathable membrane is called Ceplex, is made of PU or TPU rather than PTFE for ecological reasons, and has a waterproof rating of at least 10,000 mm, or even 20,000 mm for some models. In the three-layer jacket, the outer fabric, membrane, and lining are firmly bonded together.

Lightweight, waterproof, and breathable

Vaude emphasises that this creates a very durable yet lightweight material that has both the highest waterproof rating and high

2 layer fabric

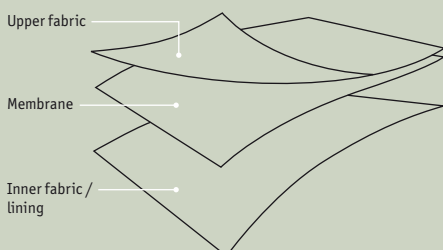


Illustration: K-PROFI; Source: Vaude

Top: Skarvan trekking trousers are made from bio-based polyamide 610, which is 62% castor oil-based.

Left: In a 2-layer laminate, the membrane and the outer fabric are firmly bonded together. The inner lining lies loosely underneath.

breathability. “A typical waterproof outdoor jacket from us weighs around 400 g. Coated jackets made of natural textiles such as cotton or wool would certainly weigh more than twice that,” Clement Affholder is sure. In addition to weight, synthetic fibres also have decisive advantages over natural materials, especially in terms of breathability. “Non-breathable jackets can of course also protect against rain, but they lead to moisture from the inside, which is produced by sweating, not being able to escape. This in turn leads to the wearer starting to freeze,” explains Clement Affholder.

More recycled and bio-based plastics

In short: plastics have become the norm in the outdoor sector. Polyester, PA 6, PU, TPU and spandex are mainly used. In the meantime, however, bio-based plastics and innovative natural materials with functional properties are also on the rise. Since these are considered more ecological and Vaude is committed to protecting people and nature, the company has set itself clear goals. “We have been working with recycled PA and PET for some time now and have already been able to build up expertise. Our



Innovation Manager Clement Affholder from Vaude is sure that the trend towards recycled or bio-based raw materials for the production of functional outdoor clothing will continue.

goal is to produce 90 per cent of all product collections with at least 50 per cent bio-based raw materials or recycled plastics by 2024.” In this context, Affholder names a

polyamide based on castor oil as a very interesting raw material, from which Vaude has already manufactured its first products. “The water absorption of the bio-based plastic is even lower than that of conventional polyamide.” At the same time, he says, the technical properties are somewhat different, but very good, so that the first products made from the sustainable raw material are already available.

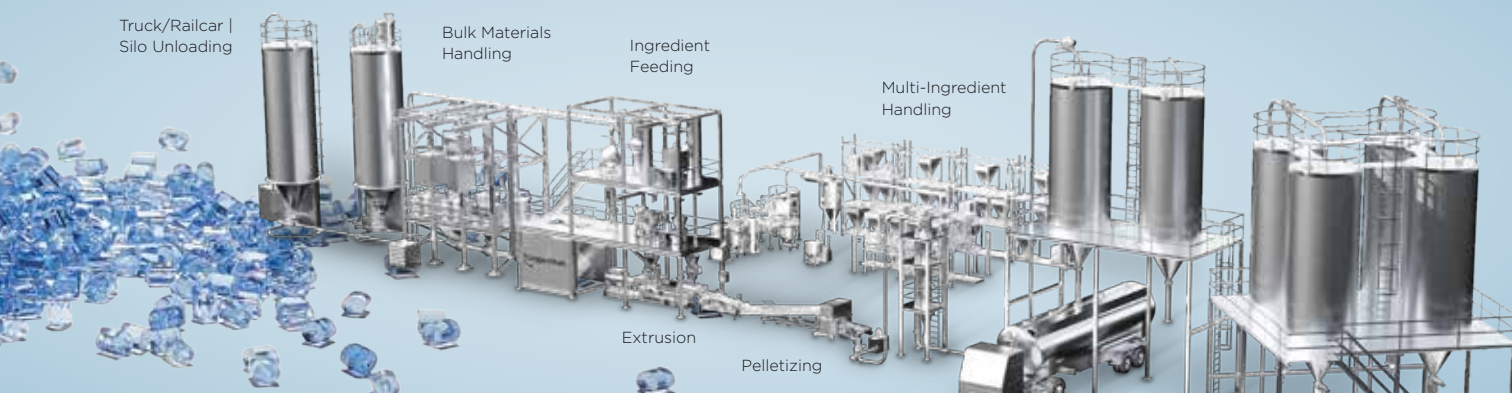
Synthetic fibres underfoot

Home and household textiles have a long tradition. Nomadic peoples probably made the first carpets - similar to felt - from sheep's wool around 10,000 years ago. After all, a carpet provides warmth and cosiness, and this has not changed over the years. What has changed are the colours, shapes, and manufacturing techniques. Other natural animal materials such as silk and plant materials such as jute, hemp, sisal, coconut, and cotton have been added to the carpet manufacturing process. Their product characteristics, their appearance, often with religious motifs, and not least their environmental balance make carpets made of natural materials still popular with buyers

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today. Yes, they are even experiencing increased demand in times of greater sustainability and conservation of resources.

Resistant to moth damage

From carpets, carpeting developed as an all-over textile floor covering. The “wall-to-wall carpet” has been around since the 1950s. Initially cellulose fibres were used, but at the end of the 1950s the rise of synthetic polyamide and acrylic fibres began. From 1962, PP and later PET were also used for carpet yarns. The advantages of carpets made of synthetic fibres include their wool-like structure with a wide range of usability and textures from very soft to very hard, high lightfastness and colour quality. They are dirt-repellent, quick-drying and easy to clean, and are also immune to moth damage, which is often not the case with natural materials.

In addition to the many positive properties, the rapid rise of synthetic fibres is also due to their easy availability. In Europe, for example, around 1.1 billion m² of carpeting is now installed every year, making it the most popular floor covering of all, accounting for more than 40 % of the total volume. Much of the carpet is made from polyamides. “We make all our carpets from polyamides because they are particularly high-quality and durable products,” explains Eric Fricke, Senior Marketing Manager at Vorwerk & Co. Teppichwerke GmbH & Co. KG in Hameln, which produces 3.5 million m² of carpets and carpet tiles annually.

Large variety

For this purpose, threads are first spun in spinning plants, stretched, and then processed into either filament or fibre yarns. Tufting, which was also developed in the 1950s and is used in about 80 % of all manufacturing processes, produces carpeting. For this, a synthetic backing fabric or fleece is pierced simultaneously with several hundred needles, creating thread loops similar to a sewing machine. If these are left like this, they are called loop pile; if they are cut open, velour is produced. Finally, the backing fabric is reinforced from behind, usually with a synthetic latex, partly foamed. Hardly any other floor covering offers such a wide variety in terms of structure, colour, and design. The main advantages of carpets and rugs, apart from design and emotional effects, are their heat and impact sound

insulation. This applies equally to natural and synthetic materials, with synthetic materials clearly leading the field in terms of market volume.

Sustainability in view

Here, too, the topic of sustainability has found its way in. Carpet recycling has already been successfully implemented for many years. Vorwerk also already uses recycled products in its production. “Today, for example, the backs of our carpets are made of 100 % r-PET, and Econyl fibres are

used in part as fibres,” emphasises Eric Fricke. Aquafil produces Econyl fibres by chemically recycling old fishing nets and other industrial waste.

Interface Inc, one of the world's leading manufacturers of modular textile and resilient flooring, headquartered in Atlanta, USA, also focuses on sustainable products and recently launched the Embodied Beauty carpet tile collection, which includes three CO₂-negative product variants. The company speaks of CO₂-negative because these are products that store more CO₂ in the form of



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carbon than they emit from the extraction of raw materials through manufacturing to the finished product. In this way, the company wants to make its contribution to tackling the climate crisis. According to the World Green Building Council, the building sector is responsible for about 40 % of all CO₂ emissions, of which 11 % are caused by building materials and construction.

Really clean with PET microfibres

While in the past the worn-out cotton vest sometimes found its second use in house

cleaning, today the supermarket shelf offers a large selection of special cleaning cloths made of synthetic materials. With more than 7 million packs sold in the traditional trade, Freudenberg Home und Cleaning Solutions GmbH from Weinheim with its well-known Vileda brand is the market leader in Germany for mechanical cleaning equipment. Dr Julia von Grote Pastré, Director in Research and Development for the Cloths, Sponges and Gloves division at Vileda, gave K-PROFI an insight into the secrets of the special cleaning effect of synthetic fibres. "The first Vileda product ever was the Vileda

window cloth and came onto the market in 1948," von Grote Pastré knows. The non-woven cloth consisted mostly of a mixture of cotton and rayon and at that time had a latex-based coating. "It feels like the chamomile leather that was widely used at the time and is great for cleaning windows as it leaves panes streak-free." The company still has the product in its range. Today it is made of 100 % coated viscose fibres. The first Vileda cleaning cloth made purely of synthetic fibres was an all-purpose non-woven cloth. It was made of microfibres and only came onto the market in the 1990s.

High surface contact and absorbent

"The synthetic and natural fibres in the Vileda cloth assortment differ in their cleaning properties," explains von Grote Pastré. Microfibre cloths make up the largest share in the collection. "The cloths are made of synthetic material and are particularly effective in cleaning surfaces because they consist of extremely thin fibres, which increases surface contact compared to other fibres." This makes it easier to remove dirt with less effort. In addition, the cloths absorb water quickly because of the capillary effect between the fibres.

Von Grote Pastré sees another advantage of microfibres compared to cotton/viscose as the good cleaning performance of a merely damp cloth on greasy dirt residues, such as fingerprints or oil splashes in the kitchen, even without using cleaning agents. "Thus, cleaning with microfibre cloths can save detergents." Since the cloths are made of synthetic material, they can also be reused for a particularly long time if properly cared for, he said. "This means that our products contribute to environmental protection, especially compared to disposable alternatives," says von Grote Pastré.

Cellulose and cotton have not had their day

However, the Weinheim-based company also has cleaning cloths made of purely natural raw materials in its range. "Our sponge cloths made of cellulose and cotton are 100 per cent degradable on domestic compost within a few weeks," explains the expert. These wipes are characterised by a particularly high absorbency. One sponge cloth alone can replace up to 15 rolls of kitchen paper. The cotton makes the cloth stable and resistant. They can be washed many times



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Photo: Vorwerk

Today, carpets are important components in interior design and also provide thermal and impact sound insulation.

Microfibres, like any other fibre, can be processed into a fabric in various ways. "At Vileda, the fine fibres are spun into threads and then woven into a fabric," explains von Grote Pastré. The quality of microfibre cloths is often not recognisable at first glance, but usually only reveals itself during use. "But good workmanship usually also indicates good material quality." Tightly set seam stitches, for example, protect the fabric better from premature fraying. "In addition, the edges do not curl after washing, and the cloth remains very usable even after frequent washing," Dr von Grote Pastré knows. The sponge cloths are produced in a viscose process. According to the R&D Director, it is becoming increasingly apparent that among the synthetic wipes on the German market, textile/knitted microfibre wipes are more in demand than non-woven wipes. This is due to the volume and the feel of the cloth in the hand. "Consumers prefer more voluminous microfibre cloths with a textile character." ■

in the washing machine and reused without losing their high absorbency. "In comparison, however, microfibre cloths last longer than sponge cloths," von Grote Pastré knows. According to the R&D director, most Vileda

microfibre cloths are made of a mixture of polyester and polyamide. PET makes up the largest share. Since 2021, Vileda has also had a microfibre cloth in its range that is made entirely of recycled PET.

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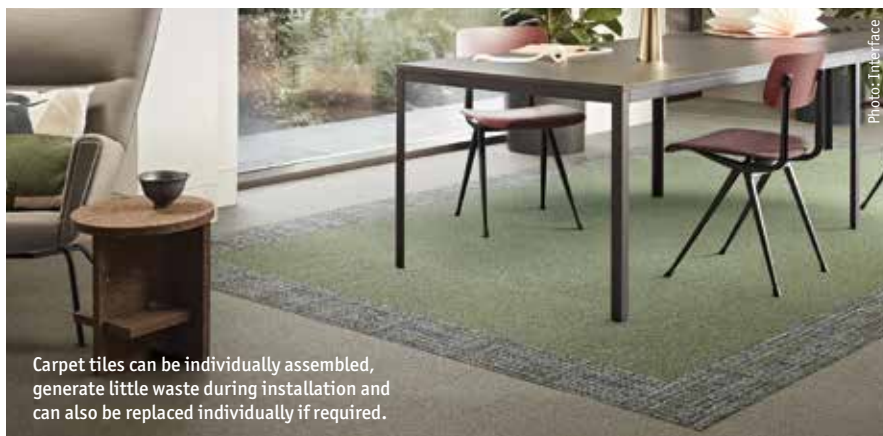
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The Vileda microfibre cloths are made of a mixture of polyester and polyamide and develop a high cleaning effect even without the use of cleaning agents.



Product classic since 1948: Today, the Vileda window cloth is made of coated viscose fibres.



Carpet tiles can be individually assembled, generate little waste during installation and can also be replaced individually if required.

Photos: Interface

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Photos: Vileda

Dr. Julia von Grote Pastré from Vileda knows all about the special cleaning effect of synthetic fibres.



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“Understanding the plastic”

How a sustainable solution for stable concrete floors with hollow core filling was achieved



Photo: Peter Gehle

It is important to Ludger Dieckmann to implement individual solutions with plastics.

At -30 °C in St. Petersburg, the concrete floor must support just as well as at +50 °C in Dubai – that's a basic requirement. What does a concrete floor have to do with plastic? K-PROFI talked about this recently with Ludger Dieckmann, Managing Director of DK Kunststoff-Service GmbH in Bielefeld. In order to turn a solid concrete floor into a “light” version, it is filled with hollow plastic elements. This makes it not only lighter, but also more load bearing. And more sustainable! The inventor of the special solution is Heinze Cobiax Deutschland GmbH from Herford, which has already accompanied many interesting construction projects with its products.

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

The administration building for the German Bundestag in Berlin, Exhibition Hall 5 in Frankfurt am Main and the Medical Centre in Tbilisi have one thing in common – they are among the many construction projects that will soon be realised with “Cobiax” hollow core plastic elements in concrete floors. The reasons for this are the same as for the already completed construction projects T-One in Bangkok, Fresenius Medical Center in Schweinfurt, Felix Platter Spital in Basel or Arburg's training centre in Lossburg, to name just a few examples.

With the Cobiax displacement bodies, lighter concrete floors can be produced, which is of particular interest for multi-storey buildings. At the same time, the concrete slabs have a higher load-bearing capacity than a solid concrete slab or can be made thinner with the same load-bearing capacity. The hollow plastic elements save concrete. “Saving concrete means helping the environment,” explains Ludger Dieckmann, because after all, sand as a component is a resource that is becoming scarce, the energy input for the production of concrete is high and so are the CO₂ emissions of the many concrete mixers that have to travel to a large construction site.

Two half-shells are each assembled into hollow bodies, which are then bound into the metal reinforcement.



Photo: Heinze Cobiax Germany



What is sustainable is the substitution solution itself; what is also sustainable is that the plastic used to make the hollow bodies comes from post-consumer waste. And this is exactly where the distributor DK Kunststoff-Service came into play. Managing Director Ludger Dieckmann says: "The solution of partially replacing the concrete with plastic hollow bodies is simply ingenious. However, the hollow bodies need ideal mechanical properties, and therefore the demands on the plastic used are enormous. Together with Wela-Plast GmbH from Golderstedt, we have developed the M10 type."

M10 is an additivated polyolefin that is largely obtained from post-consumer waste such as agricultural films or artificial turf. "Our strength is that we understand the plastic, which we have proven once again in this project," emphasises Ludger Dieckmann, who admits that it was not trivial to realise the many demands on the plastic,

such as a wide temperature application range and high mechanical strength with post-consumer material.

The hollow bodies themselves are offered by Cobiax in three sizes, each consisting of two injection-moulded half-shells joined together by a kind of bayonet fitting. These spheres are firmly connected to the metal mesh, the reinforcement, in the concrete slab and reduce the total weight of the concrete floor by up to 35 %. This creates a concrete slab with minimal weight, minimised costs, and maximum load-bearing capacity. According to Cobiax, the use of the hollow bodies also contributes to reducing the CO₂ balance of a building by up to 20 % already during construction. The demand for primary energy is up to 22 % lower than for a conventional solid floor construction. ■

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Towards climate neutrality without CO₂ certificates

How Varioplast saves resources, increases quality, and reduces costs through process networking

With the intelligent inline linking of injection moulding and surface finishing processes, Varioplast Konrad Däbritz GmbH, Ötisheim, Germany, has created a unique selling point on the market. Ten years ago, the first fully automated inline process went into series production. In the meantime, inline production has become more of a standard at Varioplast than the conventional serial linking of process steps. With each new system implementation, Varioplast increases its know-how and its lead in automation technology, which is realised in-house. Managing Partner Michael Däbritz provides an insight into current series projects in the automotive industry, which are particularly promising in terms of resource conservation.

Text: Dipl.-Ing. (FH) Sabine Rahner, Editor K-PROFI

During a visit in 2013, K-PROFI learned how Varioplast uses intelligent surface finishing to turn Germany, a high-wage location, into a best-price location. Eight years later, on the occasion of the tenth anniversary of inline linking, Michael Däbritz confirms the success of the path taken and reports on a further technological development.

K-PROFI: You are looking back on ten years of experience with process linking in painting. How many systems have you already realised and what aspects are decisive for success?

Michael Däbritz: We reduce personnel costs, we save resources, we can improve quality and drastically reduce the reject rate. In every project, our goal is to improve the reject rate by a power of ten with inline linking compared to conventional production. For single-layer inline painting - we call this technology InstantCoat - we are currently building the sixth system, which is already the second for the production of head-up displays. We launched a novelty in 2020: the first line to produce a two-coat painted component for the current Mercedes E-Class. This is the decorative frame for the front display in chrome look, which we initially produced conventionally for a year. That means we sprayed the components, put them

Michael Däbritz (centre) shows the trim frame for the Mercedes E-Class. Frank Huthmacher (left) and Mesut Demirdag (right) from the automation technology department were instrumental in the development of this two-layer InstantCoat system.



Photo: Varioplast



Inline linking of all process steps via six articulated-arm robots, among others: **1** injection moulding, **2** CO₂ pre-cleaning, **3** priming, **4** drying, **5** effect painting, **6** drying, **7** visual inspection by workers.

in storage, took them out of storage again, to the power wash facility, then applied the primer and finally the effect paint by surface spraying. An immense effort compared to the current concept.

Why did you change the production concept after one year and what does it look like in concrete terms?

We wanted to change the production to the inline process in order to be able to ensure the increasing call-off quantities. And of course, the quality is better as a result, the process is more reproducible, the risk of damage and contamination in intermediate steps is eliminated. Nevertheless, we first had to convince our customer and were able to achieve this by re-qualifying the process, or respectively by re-sampling the components. Now an articulated-arm robot removes the component from the injection moulding machine, places it directly into the CO₂ cleaning chamber, removes it again, from a transfer station another articulated-arm robot transfers to the primer,

then it goes into a drying paternoster, for effect painting, again into a drying paternoster and finally for visual inspection by a worker.

What concrete savings are associated with this?

We work in three shifts, and previously six to eight employees per shift were involved in storage and retrieval, packing and unpacking, the intermediate visual inspection, and the removal of the coating substrates. The manual workload, which has now been reduced significantly and essentially to parts inspection, provides some breathing room in times of staff shortages. In addition, we were able to achieve a significant conservation of resources. In this respect, additionally to the aforementioned reduction in time directly after injection moulding, the power wash system has been replaced by a much less energy-intensive CO₂ pre-cleaning system. Here, a robot in a cabin scans the part geometry with the snow-jet nozzle. This geometry-related pre-cleaning requires only

a tenth of the energy. The same applies to painting: the robot applies the paint precisely to the contours and does not unnecessarily cover the two large openings of the frame as is the case with the surface sprayer. As a result, only about 30 per cent of the paint is used. The solvent content in the exhaust air could thus be reduced by 90 per cent. Linked to this is the fact that we can forego thermal afterburning - for one thing, this process is a real CO₂ slinger, and for another, there is no gas consumption for combustion. Incidentally, we also no longer need painting supports and reduce cleaning and maintenance-related downtimes.

You also mentioned a reduction in the reject rate.

Conventionally, the reject rate was around 30 per cent. By implementing inline linking alone, we were able to halve the reject rate immediately. In the meantime, we have learned a lot more, for example about the air flow in the system, the nozzle guidance for the coating strategy, the filtering of the



Mercedes E-Class: In the production of the decorative frame for the front display in chrome look, the process linkage reduces resources, rejects, and costs.

supply air, etc., so that we have been able to make further adjustments and currently have a reject rate of only about ten per cent, i.e. a third of the original value.

Sustainability and resource conservation are the buzzwords of our time. How can the CO₂ balance of this optimisation be assessed?

We have commissioned the SKZ to evaluate the resource savings of our inline process compared to the conventional sequence specifically in relation to this component and thus also to know, officially confirmed, by how much the CO₂ footprint is reduced. We hope to have the certificate by Fakuma. According to our assessment and calculation, we have halved the consumption of resources. We want

to make these savings transparent and show that this path towards climate neutrality makes much more sense than acquiring compensation certificates. I hope that the one or other potential buyer will look at this and that not, as is often the case, only the costs count. The beauty here is that we focus on resource conservation, but in addition we can actually reduce costs. We save manufacturing costs in the double-digit percentage range.

To what extent do you as a processor benefit from this approach yourself?

As far as I know, our integrated manufacturing philosophy is unparalleled. I don't know of any competitor who implements this degree of process linkage. Our level of automation is very high. The

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robot density in the manufacturing industry, i.e. the number of robots per employee in per cent, is 3.46 per cent in Germany, and with us it is higher by a factor of ten. Each robot works for one or few already rare production employees and does so for three shifts. These savings sometimes make us unbeatable. This makes us competitive here in Germany, both in terms of price and quality, and even for smaller quantities. In addition, it makes us more crisis-proof in case of quantity fluctuations, keyword chip shortage or lockdown. We don't have to send people home and can act more calmly.

How do you realise these systems?

We regularly reinvest more than 90 per cent of our earnings, mainly in new technologies. Our own automation technology department with six regulars builds these special machines. They design the electronics, the controls, program and construct the mechanical components. Our know-how is neither in injection moulding alone nor in painting alone, but it is in this overall system technology. With every new system, significant improvements are made. Whether it's how to clean them better, how to achieve less overspray, how to optimise the air flow, we are always learning. I encourage other manufacturers to do the same, but it's not easy. We try to avoid conventional manufacturing. It no longer makes sense for us in most cases when compared with inline process linking.

What was the big challenge with the inline linked two-layer coating that has now been realised for the first time?

There were many challenges. In general, the conception of the system, then that all the steps in the sequence are synchronised with each other, that the transfer of the parts between the stations works, that there is sufficient drying capacity - with the paternoster solution we have made things a little easier for ourselves. Next to the two spray booths are the paint mixing units. Linking all the components of the installation and, in this case, six jointed-arm robots with each other in terms of control and workflow is a major challenge.

What are your visions?

There is so much potential in automation. For us, manual activities are largely limited to visual inspection. Of course, this is



Photo: Varioplast

Trim frame with large openings: Precise contour traversal by robots during painting saves paint, reduces solvents in the exhaust air and makes it possible to dispense with thermal afterburning.

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Photo: Varioplast

Varioplast Managing Director Michael Däbritz: „We try to do without conventional production. It doesn't make sense for us in most cases when compared with inline process linking.“

subjective. An automatic visual inspection, where all parties involved, manufacturer, customer, and OEM, can measure quickly and reliably with the same scale, is unfortunately still a dream of the future. However, this could make us even more efficient. ■

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Varioplast at Fakuma

Varioplast provided information on the possibilities for conserving resources at Fakuma. In addition to the inline-linked two-layer coating presented here, the team there presented the concept of series production of a chrome ring trim for the black panel in the BMW mini, which is also manufactured variothermally by Varioplast. The inline linking of injection moulding and PVD coating, marketed as InstantChrome, was first presented at Fakuma 2012 and has now been realised in a

second installation. While PVD coating in the first system was limited to parts with a diameter of up to 180 mm, the new investment with a 200x300x400 mm chamber allows for the coating of larger components. A special feature of the BMW mini project is that no primer is required. This means that the PVD coating is applied to the injection-moulded part, which places extremely high demands on cleanliness and surface quality in injection moulding.



Photo: Varioplast



Management



Michael Däbritz
Managing Director
(CEO)



Rainer Anritter
Authorised signatory
(CTO)



Karlheinz Denner
Authorised signatory
(CQO)

Own brands

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Integrated process injection moulding-painting

INSTANTCHROME

Integrated process injection moulding-metallising

VARIOBLEND

Process for processing mixed plastics (recycling)

VARIOBOXX

Transport and storage packaging

History

- **2019 Series start** injection moulding-PVD metallising-painting inline (Instantchrome plus)
- **2020 Series start** injection moulding plus two-coat painting inline (Instantcoat plus)
- **2021 Commissioning** of the 5th and installation of the 6th Instantcoat line, replacement of 20 % hydr. in fully electr. machines
- **2022 New construction and expansion** Logistics and production

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Several production halls on an area of 8,000 m², surrounded on all sides by other buildings, were destroyed.



Photo: K-PROFI

“There is no manual for such an event”.

How semi-finished products specialist Wefapress copes with the aftermath of a major fire

Saturday, 3 July 2021, 4:20 in the morning: an electrical defect triggers a major fire. For 40 hours, up to 200 firefighters and members of the Federal Agency for Technical Relief fight against flames and embers. In the end, four factory halls and large parts of the production facilities fall victim to the inferno. Since then, Wefapress Beck + Co. GmbH in Vreden has been working in emergency mode. The manufacturer and processor of semi-finished plastic products will restore its production. Managing Director Gerrit Beck and Marketing Manager Jeanne Beck report on their experiences in the first few weeks after the loss during K-PROFI's visit to the German-Dutch border area.

Text: Dipl.-Ing. Markus Lüling, Editor-in-Chief K-PROFI

“Our fire protection concept proved to be viable, all fire walls on the perimeter withstood the immense fire load of the stocked plastic warehouse,” Gerrit Beck sums up. Nevertheless, the firefighters were faced with a major challenge. In addition to the in-house extinguishing pond, the nearby

Berkelsee was tapped. “Without the water from the lake, only a controlled burn would have been possible, the fire brigade told us.” No one was injured during the fire and its combat, and all adjacent buildings, including a state-of-the-art hall, were spared. In the end, about 8,000 m² of the 20,000 m²

production area and parts of the 2,000 m² semi-finished products warehouse were destroyed. Nonetheless, the damage was in the millions, the exact amount of which has not yet been determined. Despite all this, it is certain that the company can be saved. Gerrit Beck: “We had taken out a good insurance package that covered most of the damage.”

Semi-finished and machined finished parts made of many plastics

In 1895, the forefathers started the production of loom accessories made of rawhide leather as the picker factory “Westfalia”. Since then, the family business has changed several times. In 1955, it became the first company in the world to start producing

moulded parts from ultra-high molecular weight polyethylene (PE-UHMW) by means of press sintering and its mechanical processing. Today, the portfolio of Wefapress Beck + Co. GmbH includes semi-finished and finished parts made of PE-UHMW, PE-HMW, POM, PA, PET, PTFE, and other plastics. The high-molecular PE types are compounded in 40 standard colours and processed into semi-finished products, profiles and guides as well as individually developed custom-made products. The machinery for sawing, milling, turning, profiling, drilling, welding, and tempering can produce semi-finished and finished parts up to over 10 m long, up to 2.56 m wide and up to 200 mm thick. Today, with 145 employees, Wefapress supplies the food industry, the mechanical engineering industry, the chemical industry, the bulk goods industry, or paper manufacturers with individual plastic parts. The company's own foreign subsidiaries in Belgium and South Africa, the Wikiplast machining plant in Italy and numerous partner companies serve customers all over the world. The fourth generation since 1895 consists of the two brothers Lutz Beck (59) and Gerrit Beck (57) as managing partners. The fifth generation is



Photo: Feuerwehr Borken

Up to 200 firemen and helpers from the Technical Relief Organisation fought the major fire at Wefapress for 40 hours

Gerrit's daughters Jeanne and Clara, who work in marketing and sales respectively. Gerrit Beck is in charge of sales and distribution, Lutz Beck is mainly responsible for internal tasks.

Taking stock after the loss

The mixing department, the compounding department, the older of the two press departments, the turning department in the machining department, the administration department, and the in-house subsidiary plast-R-us, which currently handles the

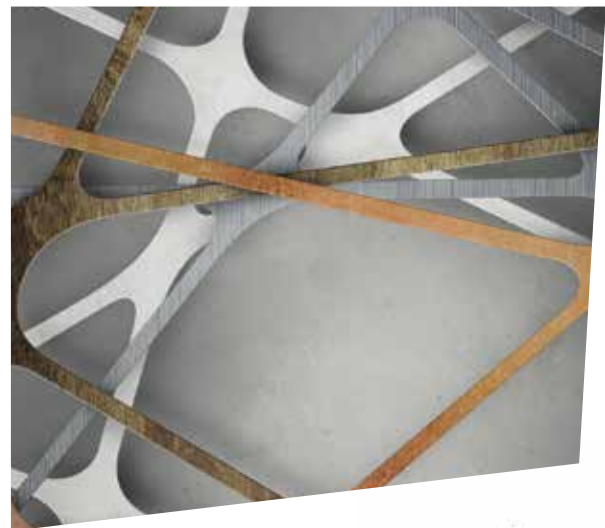
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The fire protection doors to neighbouring halls withstood the forces, as did the fire wall to Wefapress' newest warehouse to date.

complete machining of Wefapress, were not affected by the fire. Destroyed were the newer press department, the sawing and milling department and the semi-finished product warehouse before the machining department. The planing line was quickly up and running again after a repair job. In addition to the productive areas, however, infrastructure such as power, network and telephone lines were also destroyed, which paralysed the ability to work in the other parts of the factory as well. The production of the rubber graphite moulded parts "FlexGuard", a Wefapress speciality for the paper and pulp industry, was not affected by the fire.

The management opted for transparent communication about the crisis, and the sales department informed customers about the situation. This is where Jeanne Beck learned to appreciate the company's social media channels. Via LinkedIn and with up-to-the-minute

detailed information on the website, she kept business partners up to date, and via Facebook and Instagram, the plant neighbours, and the local communities. "We used social media for communication and always provided transparent information," she sums up, "we were surprised ourselves at how well it worked."

Nine weeks after the night of the fire, Gerrit Beck admits that the family briefly wondered whether they could continue the business themselves. The family was deeply affected by the rumours that had arisen about an alleged "warm rehabilitation" of the business with the help of insurance payments – especially because the company was in good health, as Gerrit Beck emphasises. After a short deliberation, he says, a clear decision was made to continue and rebuild the destroyed production. "My brother and I had made our management contracts with our father, who has died since then. There is nothing in there about liquidation or sale, but about management and further development of our own company," Gerrit Beck states, "we don't bury our heads in the sand."

First steps after the disaster

"There is no manual for such an event," Gerrit Beck looks back on the fire, "you experience it, you master it, or you fail at it." Of course, there was a lot of support, but also setbacks. "First, we felt strong support in the market, in the region, among the employees,

The entrepreneurial family expressed confidence during K-PROFI's visit: (from left) Managing Director Gerrit Beck, Marketing Manager Jeanne Beck and Managing Director Lutz Beck (Clara Beck is missing).



also from the authorities. Since the fire at our site, two other major fires have occurred in North Rhine-Westphalia – at the tyre warehouse in Bochum and at the landfill site in the Chempark Leverkusen. And it is precisely at the landfill in Leverkusen that parts of our residues should actually be processed and disposed of.”

Even though fire residues and a lot of scrap from hall constructions and installations are still piling up on the fire site and at the edge of the factory premises after two months, a lot has already been achieved in the existing building. Gerrit Beck: “We had a remediation company here on the site for eight weeks. With 50 employees, it cleaned the remaining halls and installations. The smoke from the burning plastic caused precipitation everywhere, so really every machine, every piece of equipment and every installation had to be cleaned.”

Production thus resumed relatively quickly in the undamaged parts of the plant: “On 13 July we restarted the first parts of production – machining with double shifts and 40 out of 100 employees. The rest are in shutdown.” Then, in mid-August, the older press section went back into production with an annual capacity of 1,800 t of semi-finished products. “This allowed us to process special compounds again relatively quickly, because we didn't want to give the corresponding recipes, mixtures and processing parameters out of house under any circumstances.” During a so-called business interruption, the insurance company continues to pay the basic salaries of the employees, and the company can flexibly call up its staff. Gerrit Beck: “Currently we have the rough formula of a 6-day week of work and then a week off.”



Capacity swap with competitors

“In terms of the market situation, it was the worst conceivable time for such a disaster. At the moment, everyone's order books are full, capacities are utilised, material availability is low and prices are high,” is how Gerrit Beck assesses the situation. In the relatively small sector of semi-finished product manufacturers and processors, almost all market participants know each other well. It is not uncommon for there to be long-standing customer-supplier relationships between several players. “The first competitor offered his help on Monday without being asked. Some other market players gave us the cold shoulder and tried to exploit our problematic situation for sales purposes.” In the process, those companies signalled no capacities

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and no willingness to provide emergency help, from which Gerrit Beck had never expected it. "One of them told me that we don't support anyone in such situations." Others, with whom Wefapress felt a greater distance, signalled willingness to help. "Even different shareholders of the same company expressed different opinions to me," Gerrit Beck reports. "In that situation you learn very quickly: who is friend, who is foe." His interim summary: "The companies that were rather inconspicuous in the past now support us best."

Capacities were quickly transferred to the subsidiary Plast-r-us directly in the Vreden neighbourhood and to the Italian partner Wikiplast. Since then, Plast-r-us has been producing in a 3-shift system, the Italians also with considerably increased capacity. Where neither could help, Wefapress sought talks with loyal market partners to sound out cooperation possibilities: "Where are our strengths, and where do we have free capacities? What do we lack, and where do we need help?" It clearly emerged that Wefapress itself can use its capacities in turning and increase their utilisation in double-shift operation. Thus, market partners have diverted turning orders to Vreden and taken over milling and drilling orders from Wefapress in return. "We have come to an understanding – at absolutely fair prices."

Unique selling points from before the fire are also unique selling points now. "Our pet project is parts over 6 metres long and more," explains Gerrit Beck. Machining and transporting a 10-metre-long part requires a lot of know-how and is therefore a unique selling point for Wefapress. Despite all the outside help, Gerrit Beck could not accept all the orders. "Unfortunately, we had to turn down an order from China because neither we nor any competitor had the possibility to produce the parts in the desired size. Currently, we are indeed unable to supply certain products in certain dimensions. And neither can any market partner or competitor manufacture them."

Plans for reconstruction

After clearing the construction site, Wefapress will rebuild its production halls, but will not install an exactly identical machine inventory as before the fire. "Some of the machines were fully depreciated, no longer the most productive or not really well utilised," Gerrit Beck reports, "Instead, we will align the new capacities with current needs." Capacities for new special presses for sintering plastics have already been reserved with specialised suppliers, without the presses having been precisely specified yet. Gerrit Beck: "This is due at the end of 2021."

The major fire on 3 July 2021 was the biggest disaster in 126 years of the company's history. The historic neon sign with the former company logo remained undamaged.



What can be learned from Wefapress

- › Open communication of the situation to the factory environment via social media channels
- › Openly communicating the situation to customers via the sales department
- › Search for collaborative partners with similar competencies but complementary capacities
- › Checking the implementation of product ideas that have been nurtured for a long time
- › Examining the optimisation of processes, production and logistics
- › Realising that not every friend from good times also helps in bad times
- › Not accepting orders that would really require elementary know-how to be given out of the house to third parties to fulfil them

With the first replacement of destroyed equipment, however, it does not take until the destroyed hall is rebuilt. "After three days we ordered the first equipment, and since then small equipment has been coming in every day. The milling capacities – there are some off-the-shelf machines, but also special productions – are being rebuilt. That is why we have ordered new CNC milling machines, which will find additional space in existing halls. Two machines have survived, they have to be repaired, but they will come back, and three more are still being tested."




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As experts for the reconstruction, the Beck brothers have hired a site manager who used to be, among other things, a production planner at a major German machine manufacturer. "We are now planning to rebuild the halls – on a greenfield site, so to speak, even though it is bordered on all sides by existing buildings. Wefapress is very well positioned," says CEO Gerrit Beck, "but we don't just want to return to the starting level, we want to use the opportunity to be in a better position after the crisis than before. The current situation enables us to think outside the box and see what other, additional activities might be interesting. Because we could just put in one more machine and thus add something – but the first product we have in mind will be 99 per cent for export."

In exchange, older machines or machines that are no longer being used to capacity will be sold. Gerrit Beck: "We don't like to put machines on the second-hand market. Because we know from experience that machines we sell, are put up again within a 20 km radius. That's why we have only ever given surplus and discarded equipment to our subsidiaries and cooperation partners or sold it intercontinental – always far away. At the same time, our milling machines are very much in demand on the second-hand machine market because they are mechanically little stressed throughout and mostly technically flawless, but perhaps outdated in terms of computer technology."

A feeling of solidarity among the workforce

The deep caesura of the fire has not triggered any staff movements at Wefapress. On the contrary: "A special feeling of solidarity has developed," Jeanne Beck has observed. And this has lasted throughout the weeks of the special situation. At the beginning, there were some worrying questions: Can we ever work again? Employees were deeply concerned and worried about the continuation of operations and the resumption of production. "During the crisis, however, many employees function even better than they normally do in normal operations," Jeanne Beck has noted.

Wefapress customers have reacted quite calmly to the shock news. "Our delivery time is now ten to twelve weeks on average instead of six or seven before. For a surprising number of customers, the delay is not a serious problem because other critical

supplier parts also have greatly extended delivery times. We are registering much more relaxed planning among our customers than under normal circumstances," Gerrit Beck reports.

In every crisis there is also an opportunity, and this is also the case with the Beck family: "This year we have just had a generation change in production responsibility and have anyway issued the slogan to rethink production. In the past, we installed new machines wherever there was space. Today we have to think differently. The processing sequences

have changed, the logistics requirements are different today than they were decades ago. That's why we can optimise the flow of materials." It will take two years to rebuild the destroyed halls, install the new presses and milling centres, ramp up capacity again and secure the future of Wefapress. Gerrit Beck: "We expect to be back where we were on 2 July 2021 by mid-2023, but certainly miles better than before." ■

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Leaner logistics – higher efficiency

How Wirthwein establishes ship-to-line delivery for BSH Hausgeräte in Nauen

25 years ago, the former Bosch-Siemens Hausgeräte GmbH (today: BSH Hausgeräte GmbH) set up a production plant for white goods in Nauen in the Havelland region west of Berlin. As one of the most important suppliers, Wirthwein was also challenged to build up capacities for injection moulding, especially of lye containers. The plastics processor established its plant next to that of its customer fence by fence. The intensive cooperation was further optimised in the summer of 2020: Wirthwein is converting its in-house moulded part transport to a driverless system, and a tugger train now delivers the lye containers directly to the assembly lines at the BSH site. Only a narrow slot remained for those responsible for the changeover. K-PROFI was allowed to look over their shoulders during the first weeks after installation.

Text: Dipl.-Ing. Markus Lüling, Editor-in-Chief K-PROFI



A lye container consists of two half-shells: The lighter front part has a round recess for the filling opening. Bushings for the drive shaft are inserted and overmoulded into the heavier and closed rear part. Therefore, two machine sizes with 6,500 and 8,500 kN clamping force from KraussMaffei and Engel are in use. The larger of the two has a supply station for the insert bushings. All the lye containers are made of polypropylene. Wirthwein procures these various compounds via silo trains. The material is conveyed directly from the silo to the corresponding machine and processed.

Change in delivery logistics as an opportunity

Up to now, Wirthwein delivered the lye containers on special pallets of 120 x 120 cm, 24 pieces each, via shuttle vehicles. The linear removal robots of the injection moulding machines stack the container parts onto the special pallets with a defined accuracy of max. 5 mm.

Against the background of a planned new delivery logistics, BSH and Wirthwein jointly considered further optimisations, which should also be reflected in cost reductions if possible. The end result was a concept based on two key measures: Firstly, the introduction of a driverless transport system (AGV) in Wirthwein's in-house logistics. And secondly, a ship-to-line concept with delivery of the lye containers via tugger train directly to the assembly lines, combined with the elimination of the buffer warehouse at BSH in Nauen. In this context, new special pallets with the dimensions 204 x 120 cm and 30 pieces each were introduced.

AGV instead of PTS

Up to now, Wirthwein used injection moulding machines to produce on the 120 x 120 cm special pallets and conveyed them along the outer wall of the production hall with the help of a common pallet transport system (PTS) for all seven machines (see illustration above on the left). "Converting the then very modern system to the new pallet dimensions was impossible. A completely new PTS would have been out of date and much more expensive than any other solution," reports Plant Manager Garri Genrich about the early considerations. In addition, Wirthwein wanted to banish the forklifts, which previously brought empty pallets to the injection

At seven injection moulding machines, the driverless transport system switches the special pallets with lye containers at the front of the closing side. It brings full pallets to the station, and empty pallets from there.

moulding machines, even further from production. "That's why we planned the dismantling to use the freed-up space for an alternative transport method."

After internally evaluating various concepts, those in charge decided on a driverless transport system. Among the AGV providers, Safelog from Markt Schwaben made the running with its concept. "This was an autonomous decision by the site, albeit within a given budget," points out Klaus Seybold, Head of the Household Appliances and Electrical Industry Business Unit at Wirthwein. The project was managed by Jürgen Wilhelm, Head of Group Logistics at Wirthwein, and Nicole Mahnke, Industrial Engineer at the Nauen site.

The new planning of the in-house logistics had to take into account the travel axes and, above all, the supports of the linear robots. As a result, five injection moulding machines are equipped with two pallet positions each and two with one pallet position each. The construction of the push and lift tables on the machines and in the

Garri Genrich, who had already been working at Wirthwein in Nauen for some time, has in the meantime managed the Wirthwein plant in Sasbach and since October 2018 has been at the helm of Wirthwein Nauen GmbH & Co. KG.

station was carried out by Wirthwein itself. The three autonomous, electrically driven transport robots of the type Safelog AGV L1 can move omnidirectionally and are thus very flexible. The transport device with the pick-up points for the pallets is raised and lowered via four lifting columns. The AGVs each have a fixed "home base" under one of the pallet locations and charge their batteries there while there are no transport orders. The AGV station adjacent to the injection moulding plant has seven stations (see illustration below on the left).

In order to realistically test their operation with lye containers, Safelog set up drive-ways, pick-up stations and a station in a rented hall in the run-up to the installation. Here, a trial run was simulated – with the standard vehicles, empty and fully loaded special pallets and the pallet pick-ups



designed by Wirthwein itself at the transfer stations to the injection moulding machines and in the station.



A trolley train supplies the assembly lines at BSH with lye containers every quarter of an hour and in the correct sequence. To do this, an employee removes trolleys with empty pallets from the four trailers and loads them with trolleys with filled pallets.

Conversion during the customer's production break

The conversion in the existing building and on the seven included existing machines was concentrated during ongoing operations in calendar week 30/2020, when BSH had suspended its assembly for a maintenance week. Essential steps were the dismantling of the pallet transport system, the establishment of a manual interim operation to maintain production and the installation of the new AGV.

To optimise the use of space, the production grid of the seven machines was also condensed and two machines were moved slightly. In fully automatic operation, one container part per machine per hour is automatically separated as a QA part via conveyor belt. In the days of the conversion, this manual discharge path for QA and defective parts was also used to discharge the regular production. With the conversion, Wirthwein also installed a new WLAN illumination system to ensure internal communication between the AGVs. The vehicles have a sensor-supported, automatic recognition of people, machines and vehicles in the movement area.

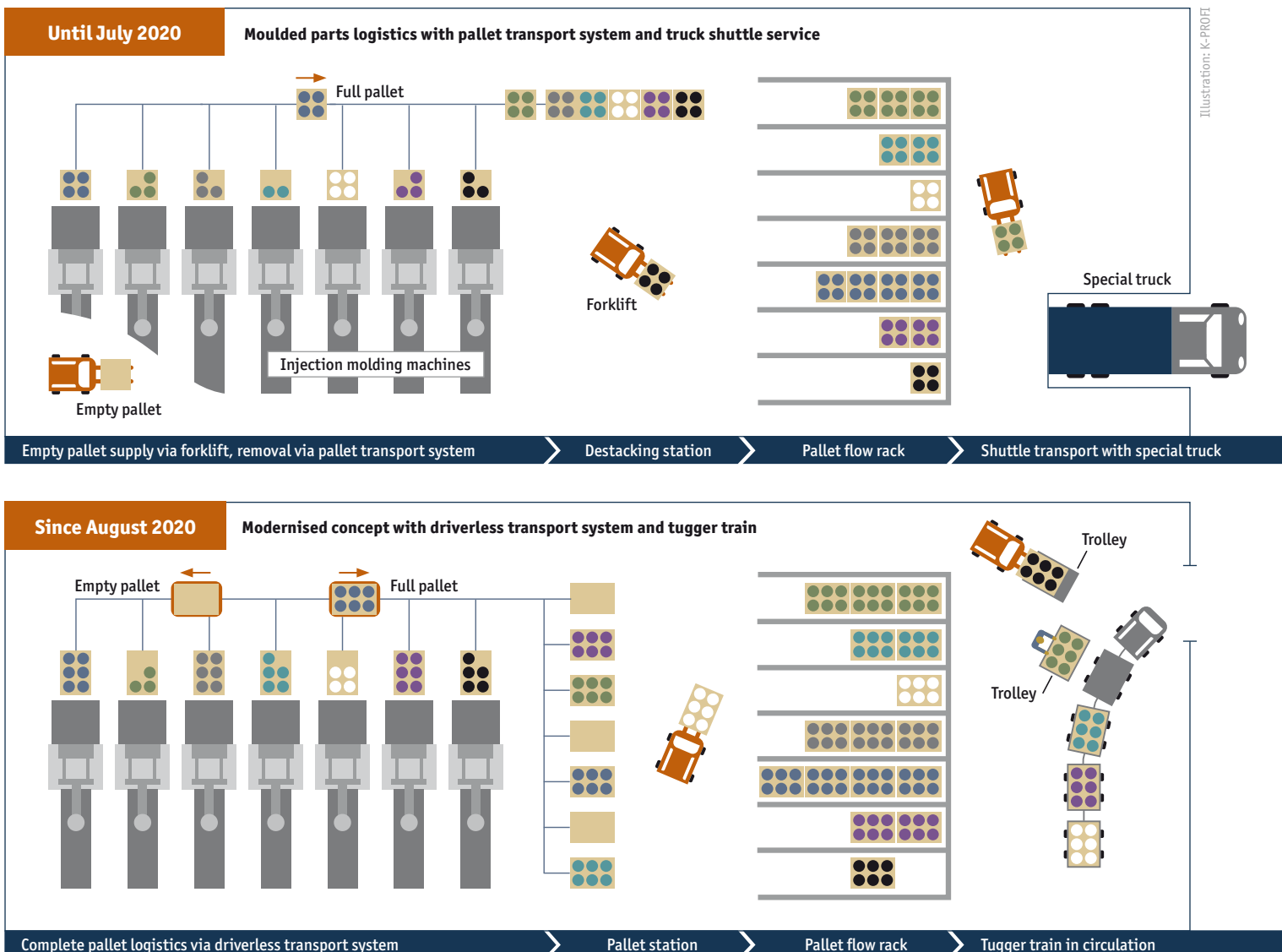
In-house contribution as a leap of faith for one's own team

"The biggest challenge was neither the mechanics nor the moving of the machines, but the programming of the interfaces and the IT linking of the production systems", Garri Genrich reports the experiences of the first days. After all, interventions in the communication structure and in all machine controls were necessary, the communication of each machine with the conveyor system had to be adapted and the AGV had to be integrated vertically and horizontally into the IT systems.

The biggest surprise for him was the discovery of "hidden talents" among the staff: "Being allowed to do most of the tasks themselves is seen by the staff as a vote of confidence." Much of the work on machines and fixtures as well as the safety control system could well have been contracted out to the machine manufacturers or the AGV supplier, but "we wanted to do a lot ourselves. Ultimately, we have to be able to control our system in regular operation. Then it's good not to have to call a service at the slightest problem."

Material flow of the lye containers - in the past with pallet transport system and truck shuttle to BSH (above) and today with driverless transport system and circulating tugger train (below).

Wirthwein Nauen

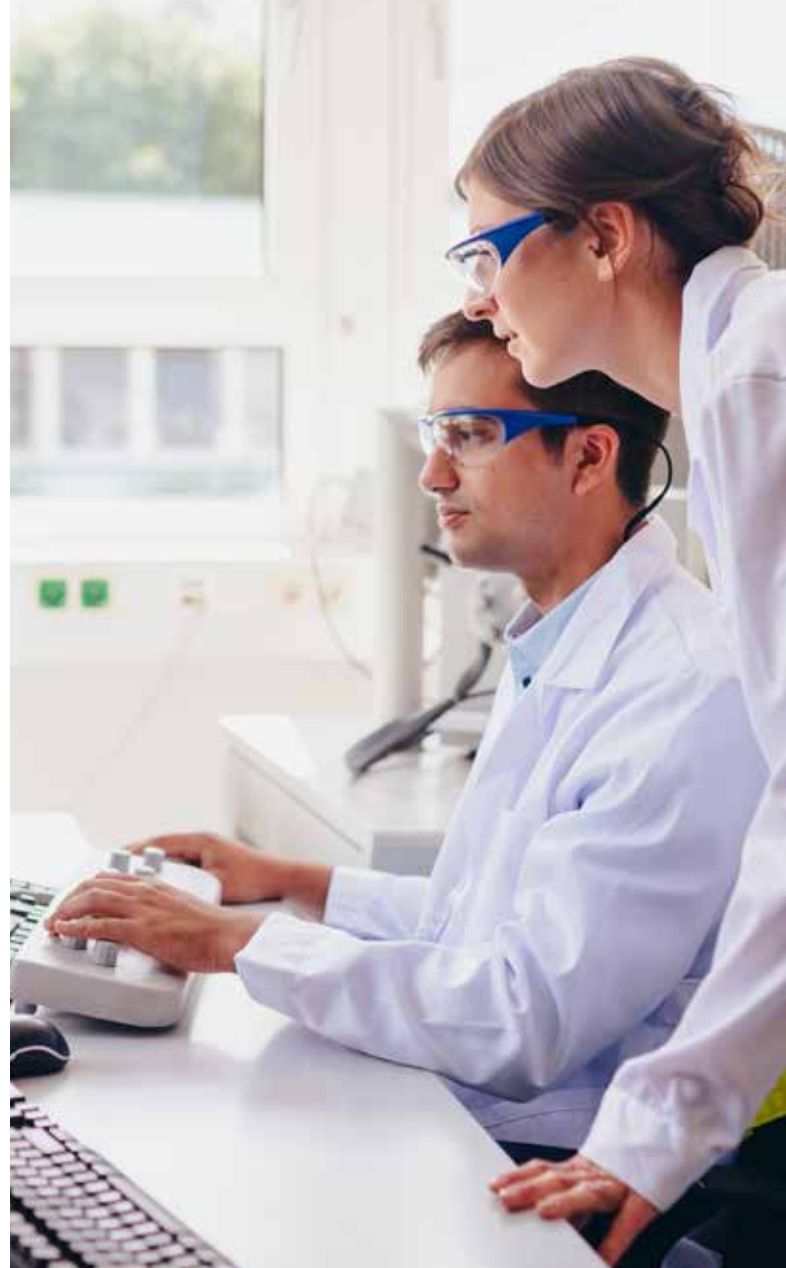
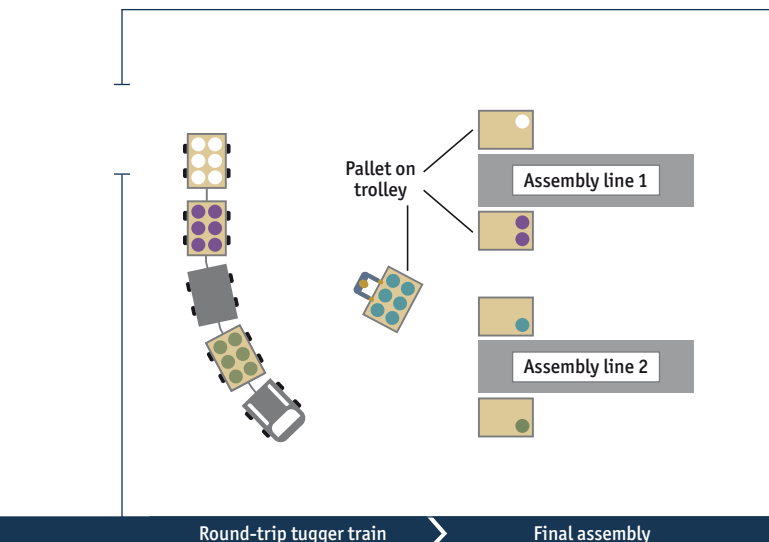
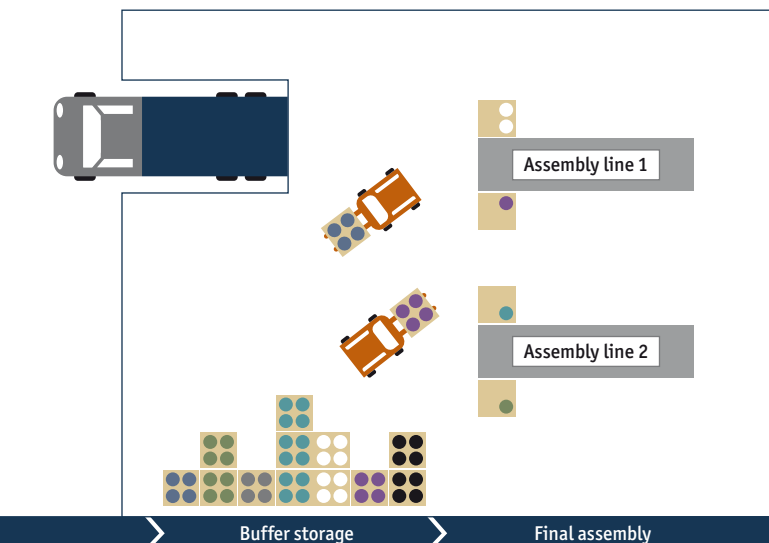


And that's despite the fact that the system here is not completely off the shelf." The automation technology team at the Nauen site around Danny Schmidt worked very closely with the Safelog technicians to ensure the sophisticated control and communication between the systems.

Ship-to-line instead of shuttle traffic and buffer storage

Directly opposite the AGV station with its seven stations is a pallet flow-through warehouse. Forklifts, which have been given 70 cm longer tines because of the larger pallets, take the loaded pallets out of the station and lift them into the predefined tunnel of the buffer warehouse. The entire storage rack is inclined to the rear and equipped with free rollers and brake rollers in such a way that the pallets line up at the rear removal position without further intervention. The buffer storage is necessary to be able to react quickly and flexibly to all customer requests and changes in quantity, even at short notice.

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The vehicles orient themselves on fixed magnetic strips placed at right angles on the floor. They can turn on the spot. Each vehicle has its own parking position for recharging its batteries.



The supports for the linear robots on the various existing machines required several layouts in order to optimally arrange the pallet positions on each injection moulding machine.



The injection moulding machines dispense the products on the operator side - the finished parts to the clamping side, the QA parts to the injection side. The larger machines have a feeder for the insert bushings (under the conveyor belt).



At the station (in the foreground) in front of the buffer warehouse, the driverless transport system sets down filled pallets and picks up empty pallets. On the opposite side, a forklift takes over and lifts them into the buffer warehouse.

Profile of BSH Hausgeräte

With sales of around 13.9 billion euros in 2020 and 60,000 employees, BSH Hausgeräte GmbH is a global leader in the household appliance industry. In addition to eleven well-known household appliance brands such as Bosch, Siemens, Gaggenau and Neff, the Group's brand portfolio also includes the Home Connect ecosystem brand, as well as various service brands, including Kitchen Stories. BSH produces in 39 factories and is represented in around 50 countries. At its Nauen site, BSH Hausgeräte GmbH has been successfully producing premium washing machines for the global market since 1994. BSH is a company of the Bosch Group.



Klaus Seybold, who has been with Wirthwein since 2011, is now Head of the Household Appliances and Electrical Industry Business Unit. This means he is responsible for sales and project management for the division across all locations.

While the AGV is a reactive system that functions without an interface to the ERP system, SAP Warehouse Management (WM) is indispensable for warehouse management. It regulates the loading and unloading from the storage system and observes the necessary curing time of the lye containers. With the support of the SAP WM team from the head office in Creglingen, this challenge was also mastered well.

Previously, Wirthwein had used a special truck adapted to the pallet size to shuttle to a rear docking station at BSH, where the pallets filled a small buffer store (see illustration above on the right). Forklifts then moved pallets to the assembly lines as needed. Today, the tugger train from Still, equipped with four trailers at Wirthwein, delivers trolleys with preassembled pallets directly to the two BSH lines in the right sequence (illustration below on the right). For each assembly line, one trolley is loaded with front parts and one with rear parts of the lye containers. The tugger train runs in a delivery cycle harmonised to the production lines, bringing the trolleys with empty pallets from BSH and picking up loaded ones. The tugger train system has an extremely tight turning circle. In the first few days after commissioning, the logisticians and forklift drivers optimised the route and the parking positions for unloading and loading.

Expandable and adaptable logistics concept

The AGV and the concept of the tugger train are not tied to the lye container project at BSH but can be expanded and reused in many ways – at all locations. Only the receptacles designed for special pallets and the programming had to be adapted. “It was a special challenge to implement the new logistics concept with seven machines within the very short time window available,” explains Garri Genrich, but in terms of forklift freedom and occupational safety, the AGV was the best solution. Klaus Seybold finds the pilot project interesting

Profile of Wirthwein Nauen

Wirthwein Nauen has been in operation since 1996. Initially designed exclusively to supply BSH with products for white goods, the automotive industry was added as a second customer sector in 2006. The main product of the location with a total of 150 employees continues to be plastic components for household appliances, and BSH continues to be the main customer in Nauen. A total of 21 injection moulding machines in the clamping force range from 3,500 to 16,000 kN and with a focus between 6,500 and 8,500 kN are distributed between a hall section for the production of household appliance parts and a hall section with automotive interior parts. Seven of the 21 injection moulding machines produce the two halves of lye containers. The main automotive products are door modules for passenger cars and light trucks, some of which are foamed and finished after injection moulding. The site processes about 9,000 t of plastic annually and is mainly supplied by seven double-chamber silos with 25 t per chamber, six of which are designed for PP and one for polyamide.



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To pick up the pallets in the station, the driverless transport system raises its loading platform by a few centimetres; to set it down, it lowers it. Wirthwein built the pick-up devices itself.



To lift the 204 x 120 cm special pallets into the buffer store, the tines of the forklifts were extended by 70 cm.

for other plants as well, because Wirthwein operates another fence-to-fence plant in addition to Nauen, as well as a shop-in-shop model for or with BSH in Poland and another shop-in-shop model in the railway technology division at a Chinese customer.

In his quest to create more value for Wirthwein, Klaus Seybold is always on the lookout for new products and processes that can be transferred from one location to another through knowledge transfer. For him, it is

quite conceivable that the now experienced employees from Nauen will accompany an AGV introduction at another Wirthwein location. "In autumn, we run into the months with the highest turnover in white goods," Klaus Seybold reports. "That's a big task every year, and a particularly exciting one this year with the introduction of the AGV."

Garri Genrich hopes for orders from a new automotive customer in the medium term. In any case, there is room for additional

machines to injection mould automotive parts in Nauen – also due to the reorganisation in the production of lye containers. ■

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In the inclined pallet flow storage, the loaded pallets roll to the removal side. The colour of the lye containers marks the filler and glass fibre content of the PP compound used.

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Photo: Poli

17 thermoforming machines produce packaging and furniture accessories at two locations.



Photo: Poli



Marian Holz looks back: "In 1992 I was at K in Düsseldorf for the first time. I saw all the modern machines. It was clear to me: that's where I want to head."

From the Stone Age to the Modern Age

How the Polish plastics processor Poli went from a one-man operation to a specialist for individual packaging solutions

17 thermoforming machines work at full speed in the halls at Poli's two sites in Inowroclaw, about 100 km from Poznan. Here, packaging is produced for food, cosmetic products, electronic products as well as furniture accessories. 90% of the goods produced are individually designed to meet customer requirements, 10% are standard. In the spick-and-span halls one can find the Who's Who of German thermoforming machine manufacturers: Geiss, Illig, Kiefel. It was quite different in the early 1990s.

Text: Dipl.-Ing. Gabriele Rzepka, Editor K-PROFI

Company owner Marian Holz started his own business in 1982 – initially as a one-man operation. The dedicated entrepreneur recalls: "I wanted to build a secure future for my family with my own business." The company produced number plates for cars, and Holz designed and built the necessary machines himself. A single room served as production hall, storage room, office, and canteen. In 1985, the smart engineer expanded his business field and began to produce packaging. He also constructed the thermoforming machine required for this himself.

The business developed, and with it the number of employees. In 1990, the company moved to new premises. By then, 13 employees were already pitching in. Despite the difficult economic and political conditions over the years, Holz held on to his dream: "We wore trousers with holes in them, we couldn't buy enough material, we didn't have modern machines. It was really hard. Still, I always said to my

staff that one day we would get on a plane and buy modern technology worldwide. That we would grow into a big company that could play globally. I always believed in that. And we have done it."

Time of upheaval

With perestroika, the process of economic and social restructuring of the Soviet Union, initiated by Mikhail Gorbachev in 1986, there was no stopping Poland either. The independent trade union Solidarność, with Lech Walesa, pushed for change, and so the former People's Republic of Poland officially transformed itself into a democratic constitutional state on 1 January 1990. This brought the dream of wood within reach: "In 1992 I was at K in Düsseldorf for the first time, the first time in the West. I saw all the modern machines. At that time I still lacked the money for investments, but it was clear to me: that's where I want to head."

A Sealing machine from Illig moved to Inowroclaw five years later; it took until 2004 for the first professional thermoforming machine, an RV53 from Illig. Since then, the company has bought a new machine practically every year, and the signs are pointing to further expansion. Today, there are KMDs 78 and KMV 78 from Kiefel, RVs 53, RVs 74 and UA's 155/4Gs from Illig and a T10 accompanied by a milling machine FZ2000 from Geiss. "We work with a diverse range of machines. We adapt the choice of machines to the dimensions of the products, their quantity and the type of material," explains the daughter of the company founder and Plant Manager Malgorzata Holz.



Photo: Poli

The bathroom drawer insert in action: depending on the drawer size, furniture manufacturers can cut it to fit exactly.

The increase in machinery also meant a constant expansion of the production area. As early as 1990, Poli invested in the first new building with an area of a good 400 m². Since then, the company has gone from strength to strength. The last expansion of 4,500 m² was just five months ago. In the meantime, the company produces on well over 15,000 m² at two locations in Inowrocław and has another 20,000 m²



Photo: Poli

of land up its sleeve. As an employer, Poli is a valued one, with almost 40 years of experience. In 2020, 140 employees processed around 4,000 t of plastic and generated a turnover of EUR 15 million. The lion's share of the plastics processed is PET for food and cosmetics packaging. But PS, ABS, PMMA and PP also run through the company's machines.

There are about ten mould changes a day, and the 17 thermoforming machines produce about 1 million products a day. Plant Manager Holz explains: "Because we hardly ever produce standard products, we have a completely new setting in production every week. Sometimes we make small batches for one customer, sometimes we're talking about a few million pieces."

Hybrid roll-plate

The latest addition, a few months ago, is the T10 sheet forming machine from Geiss. Not just any T10, however, but a model that can process both plates from the automatic feeder and material from the reel. The machine builder from Sesslach, Germany, spent a long time tinkering with the system. "We did not find such a machine on the market. We wanted a solution with which we could form both films from the reel and sheets at high drawing depths, negatively and positively. And a machine with an adjustable stenter frame," Malgorzata Holz recalls.

The new development, for which Geiss has applied for a patent, fully meets the requirements. Poli uses the new machine to process film rolls from a thickness of 2 mm and, of course, sheets. But why did the Polish plastics specialist decide on a roll-sheet hybrid? The plant manager doesn't hesitate for a second with the answer: "We produce virtually no standard products, but highly individualised components. That means frequent changes, both in terms of tools and materials. With the new machine we are absolutely flexible and can process everything." Some of the roll-fed machines

View of the automation developed by Poli for packaging ink cartridges: Depending on the colour pattern, the packages are fed via the diverters into the corresponding station.

From the reel and from the plate – the new T10 can do both. View of the reel infeed, the plate infeed with extended transfer table, plate supply and infeed trolley.

Quality control is part of the production process.



Photo: K-PROFI



Photo: Poli

would also be able to handle the film thickness, but: "The forming area on the roll-fed machines is limited. We can't produce large parts on them, but we can on the new machine," adds Holz.

The forming area of the new "baby" is 1,200 x 2,000 mm. Thanks to the adjustable clamping frame, the processed sheet size remains flexible. But how does the roll-to-plate system actually work? If the T10 processes the classic panels, the press works as usual. The loading trolley equipped with vacuum suction cups transports the semi-finished product into the machine from the panel supply of the loading machine. There it is fixed in the clamping frame, the heating system with the halogen lamps moves over and under the semi-finished product and then back again once the heating process is complete. Moulding, cooling, removal – and the next cycle begins.

But beyond that, the new system is equipped with an extended loading carriage. If production is from the reel, it is preheated, unrolled to the desired length, diverted, and cut. At this stage, the cut panel is still slightly bent. For this reason, it is then stored on

the transfer table of the extended loading carriage. From there, it is placed on the actual loading table by means of vacuum suction units. During this process, the next panel blank is already being produced and arrives on the transfer table.

The forming process starts: The cut panel stored in the infeed is moved from the infeed carriage into the machine by means of vacuum suction units. During this movement, the next blank is simultaneously transported from the transfer table into the infeed, and from the reel the production of the next panel takes place, which lands on the transfer table. "Once started up, we have no loss in cycle time due to this process," explains Malgorzata Holz. The appeal of the process lies in the fact that any physically possible drawing depth can be realised.

In operation

The new addition is already in full action. From a 2.5 mm ABS/PMMA semi-finished product, the company is producing a new development that is to become a standard product in the medium term: Bathroom drawer inserts. "We found out there was a need for

this after a market survey," explains Malgorzata Holz. The machine uses a 4-cavity mould to form the base from the decorative panel and another mould for each of the containers and lids that can be inserted into the base. Holz describes the highlight of this process as follows: "We form the bathroom drawer inserts from the 1,600 x 1,200 mm panel, and this can be cut to size as required. This allows us to offer a standard product whose size can be customised." The cycle time for bathroom furniture use is 60 s.

In addition to the new development, three other moulds are running on the new machine this year – essentially cutlery inserts made of PS. The company produces about half a million pieces a year, as they are among the standard articles for the furniture industry.

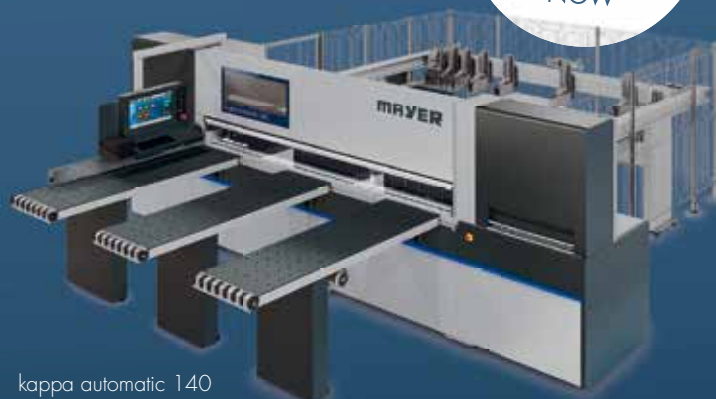
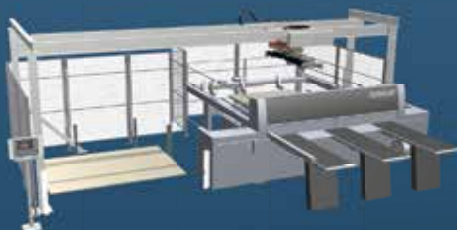
In the neighbouring hall, a KMD78 from Kiefel produces packaging for ink cartridges. What sounds so simple required a special design and automation that Poli came up with. The reason: numerous different products are produced simultaneously from the pre-printed film. The 16-cavity mould produces the front and back of the packaging from the film, whereby both sides must



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The ABS/PMMA semi-finished product is heated, and the mould moves into the mould.



The machine operator removes the bathroom drawer inserts from the machine.

Plastic versus natural fibre

The two new machines are still in Freilassing, in Kiefel's halls. The final fine-tuning is being done there before delivery to Inowroclaw. The machines are two Kiefel Naturformer KFT90 plus the corresponding fibre preparation system. The demand for fibre packaging is increasing. Poli has responded to this by investing in the two machines. Malgorzata Holz gives an assessment of the development of fibre thermoforming and an insight into her own experiences in an interview with K-PROFI.

Ms Holz, are you now taking a completely new technological direction for the company with the investment in fibre thermoforming?

Malgorzata Holz: No, by no means do we want to replace plastics processing with fibre processing. But we want to respond to our customers' wishes and take their needs seriously. The demand for fibre-based packaging is increasing because the end consumer

perceives it as more sustainable. We want to give our customers the choice: Plastic or fibre. We are able to design and manufacture products from both plastic and fibre. It is up to the customers to decide which material to use. We will be ready for any option.

Do you already have a first order for the new machines?

Yes, we even already have the tooling for the new product. It is a cosmetics packaging. Kiefel is currently running trials, because it is a real challenge to produce the packaging in the desired quality. For us it is a completely new process, a completely new technique. We don't know yet how long it will take until we really master it.

You have invested a lot. Do you trust that the market will accept the new fibre-based packaging?

Fibres will not replace plastic, but they will complement it. It's a really interesting development for us too and absolutely new territory. In the wake of the plastic bashing, more and more companies are jumping on the fibre solution. We want to be able to make an offer and diversify. We are following the wishes of our customers. We are sure that the demand for fibre packaging will increase strongly very quickly. Nevertheless, we want to continue to expand the plastics division because it also has undeniable advantages.

Can fibre packaging keep up with plastic packaging in terms of price?

No! Fibre is more expensive than plastic. This is because the cycle times are much higher. To produce the amount of packaging we do with a plastic thermoforming machine, we need four to five fibre machines. We need much more energy, water, space, infrastructure and of course the fibres. Fibre packaging is more expensive than plastic, but the demand is there. That's why we want to go twin-track.



Photo: K-PROFI

match the colour pattern one hundred per cent. The cut of the film must fit, otherwise the front and back do not harmonise. Malgorzata Holz explains: “We developed this solution together with Kiefel. It consists of a movable cutting station. A laser recognises the colour patterns and moves the cutting station so that the cut edges fit exactly.”

After forming and cutting, a conveyor belt transports the cut packages in 4 x 4 rows according to their colour imprints out of the machine into the stacking station. From there, the stacks of 20 pieces each go by conveyor belt over a switch system and a moving table in 16 directions, where they are removed manually.

Independent thanks to in-house toolmaking

The plastics processor not only develops the products for its customers, the aluminium tools are also made in-house. Malgorzata Holz explains the reason: “We make all our tools ourselves. Having our own design studio and toolmaking is worthwhile for us, because we constantly need new tools given the variety of products. This way, we are not dependent on delivery times from other manufacturers, remain independent, can react quickly and respond flexibly to customer wishes.” In toolmaking, the company works with four CNC machines from DMG Mori and Hermle. Geiss is currently still providing support in adapting the tools for the “hybrid machine”. But according to Holz, this will not remain the case in the long term: “The machine is still completely new and we are going through a learning process here. Geiss is supporting us in this process so that we will soon be able to build the tools for this machine ourselves.”



In the last step, the inserts are trimmed.

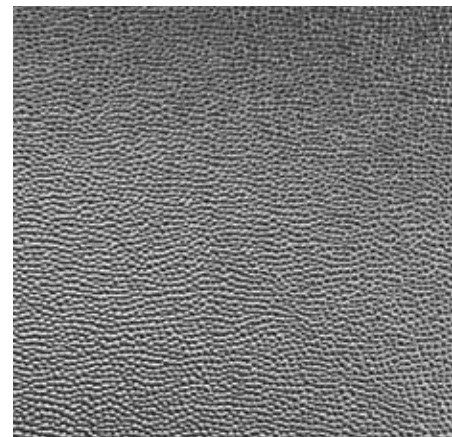
Despite the Corona pandemic, business is good. Most customers come from Europe, many have a branch in Poland. The company exports around 25 % directly into foreign countries, and a large proportion of domestic sales are also exported. Marian Holz is satisfied. His summary: “In 1990, we were still in the Stone Age technologically compared to the West. But today, 30 years later, we are able to compete successfully with the best thermoformers in the world.”

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Where plastics offer advantages over paper

After decades of faithful hygienic service, the plastic bag is now frowned upon. Contrary to reputable scientific studies, paper is often considered the more ecological alternative. In other areas, such as filter media and identity cards of all kinds, plastic holds its own against paper. Even the daily newspaper is often no longer a folded pile of paper on the breakfast table. Reading is increasingly done with the help of electronic devices – thanks to plastic, perhaps soon even on flexible displays. In Part 8 of the series on the occasion of the anniversary “100 years of plastics”, the K-PROFI editorial team uses selected examples to show where plastics can score points over paper.

Text: Dipl.-Ing. Gabriele Rzepka, Dipl.-Ing. Karin Regel and Dipl.-Chem. Toralf Gabler, Editors K-PROFI

With the advance of industrialisation, the importance of purified air and thus of filters has increased more and more. Be it air filters in cars, room air filters, dust filters in industrial plants, filters in paint shops – the list of technical applications could go on and on. As early as around 1900, a paper filter protected the engine in a car. It cleaned engine intake air, oil and fuel. Paper is always wet laid, i.e. it is made from an aqueous mixture of fibres, binders and additives. Dr Henrik Badt, Managing Director of Kalthoff Luftfilter und Filtermedien GmbH, Selm, explains: “In the past, mainly natural materials such as cellulose or cotton were used as fibre material. Natural materials usually do not behave sufficiently inert during supply air filtration and store moisture. In addition, they are difficult to weld and are not available in the required fibre finenesses.”

View of the production process of a filter.



Photo: Kalthoff

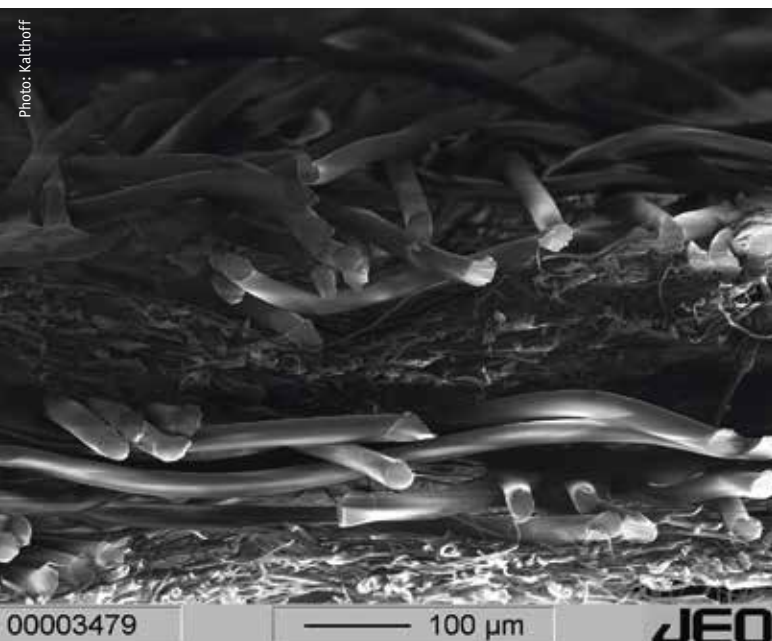
Boost from polymer-based nonwovens

A boost in filter technology came in the 1950s with the development of filter media made of polymer-based nonwovens. These include staple fibre and spunbond nonwovens. With the former, a so-called carding machine refines pre-spun polymer fibres in various lengths and finenesses into a nonwoven fabric. Spunbond nonwovens, on the other hand, are produced directly from a plastic melt. The continuous fibres with diameters from <1 to approx. 30 µm are spun into a nonwoven fabric.

Air cools the fibres after they leave the spinnerets. They are then drawn and deposited on a collecting belt. The parameters of the spinning process can be used to adjust fibre properties such as diameter, strength, elongation, or shrinkage. The evolution of polymer fibres began with polyester, followed by polypropylene, polyethylene, polycarbonate and also polyamide. In the meantime, PLA-based polymers are also being tested.

It all depends on the fabrication

But it is not only the diameter and the properties of the fibre as well as the number of layers on top of each other that make a good filter. It also depends on how it is made up. Simple mats were among the first industrial filters. They remove coarse particles from the air but cannot handle fine dust and large amounts of dirt. The motto is therefore a lot of filter surface in a small space, with fibre diameters decreasing from large to small. One example is pleated filter cells, which create a



Filter medium of an air filter made of polymer fleece under the scanning electron microscope.

Photo: Kalthoff

large separation surface in a small space. Or pocket filters, which consist of a front frame and the pocket-shaped filter medium. Particles are separated in the depth of the filter medium. Through a progressive filter layer structure – first the coarse, then the fine fibres – first the coarse particles, then with increasing filter layer depth more and more fine particles are retained. Badt illustrates: “Air filters require a certain fibre fineness, i.e. fibre diameters in the range of 1 to 20 µm, with a simultaneous high void volume. Air filters are depth filters, which must be easy to flow through. In an air filter, the void volume is greater than 98 percent, the fibre volume proportion is less than 2 percent. So, the filter consists mainly of air.”

In the cabin air filter of the micronAir proTect line, four filter layers protect against allergens, fine dust, micro-organisms, harmful gases, emissions from the car interior and also have an antiviral effect.

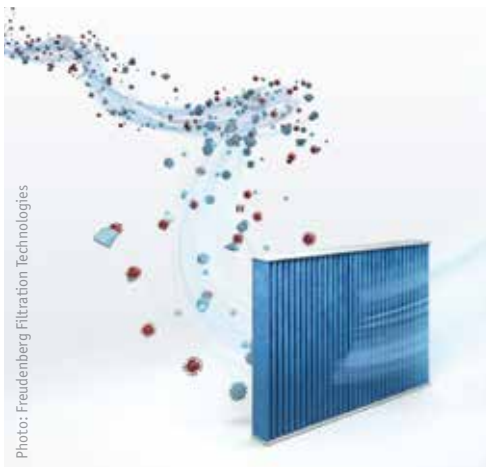


Photo: Freudenberg Filtration Technologies



Final assembly of an air filter.

For air filtration, the development of synthetic filaments was a stroke of luck. Badt specifies: “Air filtration is still a young technology and has been used since about the 1970s. Coarse synthetic fibres were processed into coarse dust filters. Since the 1990s, meltblown processes have allowed us to make ultra-fine filters from polymer fibres.” The plastic fibres are dry-blown, and this enables the production of very voluminous filter sheets that filter more effectively and generate less differential pressure than papers. “In the highest filter classes, the HEPA filters, there are still mainly

micro-glass fibres finer than 0.5 µm and only a few plastic products. Most of these are PTFE membranes,” Badt continues.

Air filters should be inert to microbiological growth, resistant to moisture and not pose a health hazard. Ductility and a melting behaviour that allows pleating, the use of welding processes, bonding techniques and compatibility with common sealing materials are important for the processing procedures. “We use PES/PP fibre blends on a large scale, which are pleated, joined with hotmelt processes and stabilised. The filters

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Bank cards, identity cards, health insurance cards and loyalty cards are now almost exclusively made of plastic.



Photo: Klöckner Pentaplast

are then bonded with hotmelt and a synthetic nonwoven frame, resulting in fully synthetic plastic products,” describes Badt.

No matter whether bags, filter cells, cassettes, or cartridges: The surface area of the filters has grown, they can store more particles before the pressure loss becomes so great that they have to be replaced. Today, in industrial air supply systems such as painting lines, gas turbines or air conditioning systems, there are entire filter houses in which different filters are connected in series.

The “rag” is history

The good old rag, as the German blue-grey paper driving licence is affectionately called thanks to its high textile content, is almost a thing of the past. So is the pink paper driving licence, which has been issued since 1986. Since 1998, the driving licence has been available in cheque card format. Just like the bank cards that give them their name, identity cards, health insurance cards and various loyalty cards, the important information now comes on a plastic card and has almost completely replaced paper-based solutions. The main advantages of the practical small plastic cards are their sturdiness, resistance to moisture, durability and, of course, the possibility of integrating additional functions via antenna or chip card. The Klöckner Pentaplast Group, which is active at 18 locations worldwide and has its headquarters in Montabaur, produces the appropriate semi-finished products for two of the three areas of application, bank cards and customer or loyalty cards. “We do not produce films for identity cards, such as ID cards and driving licences,” explains Falko Linnert, Application Engineer Cards at KP. For the cards, the special films manufacturer produces either format goods or roll goods made of PVC, depending on the customer's requirements, whereby format goods are more common. If rolls are supplied, winding cores are needed to wind the films. These are almost always still made of paper or cardboard; plastic winding cores

have not yet been able to establish themselves here despite certain advantages. "We have few customers who only want plastic cores," reports Falko Linnert. The main advantage of plastic cores is their abrasion resistance, i.e. freedom from lint, which is an advantage for some applications. However, this is more in demand in the medical and pharmaceutical sectors, where the additional advantages of sterilisability and insensitivity to moisture are in demand. Sustainability is, as everywhere, also an issue here. K-PROFI learned this in a conversation with Grzegorz Kedzierski, Managing Director of the Polish film manufacturer Ergis S.A.. The company changed its paper cores from the conventional 1.5 kg cores to thinner cores weighing only 800 g, which significantly reduces the CO₂ footprint during transport due to the weight savings alone. Further savings potential is offered by cardboard sleeves produced with water-soluble glue, as this allows the disposable sleeves to be recycled.

Plastic cards with recycled content

"Sustainability has of course also become a big issue in connection with all kinds

of cards," Falko Linnert of KP reports further. On the one hand, one notices that the previous steady growth in loyalty cards is slightly slowed down not by Corona, but also by the search for alternative materials that are considered more sustainable, such as paper or wood. Other customers are demanding plastic cards with recycled content. "We have established internal recycling cycles and have been offering white PVC rigid films with recycled content of now up to 80 per cent for many years," Falko Linnert explains further. In addition to its own residual materials, KP also uses punching and cutting waste that comes back from customers. Other PVC residues, which arise in the pipe or profile industry, for example, are out of the question, as different raw material properties are required for the extrusion process than for the calendaring process. "In addition, we have very high requirements for the quality of the residual materials, as the card films must be optically flawless." Further processing of the PVC semi-finished products produced by KP is carried out by the customer, who usually chooses a multi-layer structure for his cards. For example, he creates a special print with a recognition effect on a loyalty

card, an integrated security barrier on a hotel card, an embossed number on a credit card or inserts an antenna in the middle layer of an EC card so that it can be used for contactless payment.

Screens as flexible as paper

Since the commercial availability of flat screens, e-papers of newspapers and magazines as well as e-books are on the rise. The advantages are obvious: the entire contents of the bookcase fit into the holiday suitcase, there are no stacks of magazines on the desk to remind us of what we have missed, and the current issue of the regional daily newspaper can be read anywhere in the world. What the underlying display technologies have in common is that, in contrast to the classic cathode ray screen, the pixels consist of individually controllable electronic components arranged in a matrix, which makes the low overall height possible. Over the years, such displays have become thinner and thinner, so that mobile phones, tablets, or e-book readers are now almost as comfortable to hold as printed paper. But many people of the generation that still grew up with books miss the paper

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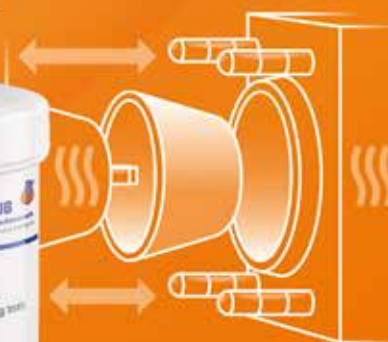
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Prof. Dr.-Ing. Norbert Frühauf heads the Institute for Large-Scale Microelectronics at the University of Stuttgart.

Photo: IGM Uni Stuttgart



feel because conventional screens are rigid. "This is because the imaging electronics are usually applied to a glass plate," explains Prof. Dr.-Ing. Norbert Frühauf, head of the Institute for Large-Area Microelectronics at the University of Stuttgart, where, among other things, concepts for novel display technologies and new manufacturing techniques are researched and developed. One topic here is flexible screens.

"A few years ago, the first mobile phones with flexible displays already appeared on the market," emphasises Prof. Frühauf. The most important difference: instead of glass, a plastic film is used as the substrate layer. However, a simple replacement is not enough. "Using a flexible film instead of a solid substrate is by no means trivial," the expert knows, "because the placement of the individual pixel elements requires the utmost precision. If the pixels are not arranged exactly, it will result in a distorted or faulty image later on the display." For this reason, most manufacturers do not use a prefabricated film, but first apply the polymer as a film to a rigid glass substrate. This is then fitted with the electronics through various coating processes and removed from the glass substrate as a film. "This avoids distortions that

would occur with a free-standing film during the individual manufacturing steps," explains Prof. Frühauf.

Polyimide as the material of choice

Polyimide is often used as the plastic for the substrate layer. "The material has to withstand a lot during the manufacturing process," emphasises the institute director. Not only does it have to withstand high temperatures in some cases, but also the solvents to which it is exposed when the electronics are affixed. The latter is often the greater challenge in the specific selection of the film material. "The surface finish of the film is also important," he points out another aspect. "The semiconductor layers, transistors and conductive tracks that are applied there often have a thickness of only ten to a few hundred nanometres. Unevenness in the micrometre range already has a fatal effect." Since the usually slightly yellowish colour of polyimide is problematic for optical applications, special types are used that are transparent like glass. In addition, the film is refined with further barrier layers – mostly of an inorganic nature. "OLEDs are extremely sensitive to oxygen and moisture," says Prof. Frühauf.

In principle, the various types of flat display technologies that have been in use up to now are possible. "However, most commercial flexible displays currently use OLEDs," emphasises Prof. Frühauf. These could be vapour-deposited, while LCD technology is more complex. With LCDs, two substrates are glued to each other at a precisely defined distance, creating a gap into which the liquid crystals are inserted. "This distance has to be kept to within a few tens of nanometres over the entire display area," says Prof. Frühauf, "which makes manufacturing with flexible films even more challenging than with a glass substrate, for example."

Special plastic films are also used as polarisation filters for LCD displays. These consist of stretched foils, which creates a preferred direction. Iodide crystals are then embedded. These align themselves in the direction of stretching and thus produce the desired light polarisation. In the meantime, there have also been first developments with inorganic LEDs. Here, each sub-pixel has to be applied individually, but the technology enables not only bendable but also stretchable displays. "Such a display can even be wrapped around a sphere," explains the head of the institute.

Stack of foils makes a display

In the end, a complete flexible display consists of several layers of foil. In the case of OLED displays, there is typically another polyimide film as a top layer over the film with the electronics. On top of this is a circular polarisation filter film. This has the task of filtering out interfering reflections, e.g. from the metallic conductor tracks, and improving the contrast. A final upper layer protects against external influences. "Nowadays, even flexible displays use glass that is so thin that it can be bent," says Prof. Frühauf. "Glass simply has a higher hardness for this purpose."

Electronic paper

A completely different technology for flexible displays that comes even closer to "real" paper is so-called electronic paper. The underlying principle of electrophoresis is also used in e-book readers, for example. Here, electrically charged microparticles are located between two plastic films. By applying a voltage, the particles are aligned per pixel so that either the light-absorbing or reflecting ones are on the surface. Gradations are created by corresponding screens, as in classical printing. Colour is also possible – either through coloured particles or upstream colour filters. The advantage over LEDs and LCDs is that the pattern created – graphics or text – is retained even when no voltage is applied. Power is only required again for a change. "This technology is not suitable for moving images because of its sluggishness," Prof. Frühauf knows. "But it consumes extremely little energy." Electronic paper is



Photo: IGM Uni Stuttgart

This flexible OLED display was produced at IGM as part of an EU project.

therefore used, for example, for longer-lasting content, such as price signs in supermarkets or signs in conference rooms.

And for an electronic newspaper with an almost paper feel, such flexible displays actually also seem well suited. Field trials like the one conducted by a Belgian business newspaper have apparently met with little interest so far. But who knows, given the current paper shortage, perhaps the breakthrough is already imminent. ■

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How Sitraplas recovers the investment costs for a new metal separator

Small quantities are the norm at compounder Sitraplas. Small quantities of engineering plastics, around 80 % of which are used in the automotive industry. Similar to the food industry, the demands on the purity of the materials are enormous here. Metallic impurities are a no-go. “We consistently use metal detectors and separators in our production plant to avoid contamination,” explains Managing Director Tim Hencken. The problem: when metal particles are discharged, good material is also discharged, which is neither economically nor ecologically tolerable. Tim Hencken explains the solution he has found to his problem in an interview with K-PROFI.

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

Sitraplas GmbH in Bünde produces about 2,600 t of compounds annually from high-tech materials based on PMMA, PC, ABS, ASA or PBT. These are often translucent or transparent as well as tribologically optimised and are used, for example, for smoked glass panels in car centre consoles, rotary controls or also for digital displays on technical equipment. Logically, optical material defects are not tolerated in these applications.



Photo: K-PROFI/Hauptmann



Photo: K-PROFI

Sitraplas Managing Director Tim Hencken

In the re-sorting unit, metal parts are safely discharged and up to 98 % of good material previously removed is recovered.

Sitraplas plays it safe: metal separators are integrated in all raw material supply lines.

"At the same time, the calls, especially from the automotive industry, for the use of recycled goods and the closing of material cycles are getting louder and louder," Tim Hencken reports from everyday life and continues, "we use both an internal cycle for start-up waste and faulty materials as well as purchased regrind, which we first subject to very extensive quality control." Unfortunately, the tense raw material situation is causing his company problems: "Previously, we had to reckon with impurities in the regrind of about 1 per cent, but since the shortage it can sometimes be as much as 4 per cent."

The metallic impurities are almost his favourite, because they can be removed. And that is exactly what his company has been doing for years with equipment from Sesotec GmbH in Schönberg, Bavaria. Other tiny particles can be removed in the melt and, of course, the quality of the regrind determines in which application it can be used.



Photo: adamski-fotografie

Well-rehearsed production routines

"When using regrind, quality must not fall by the wayside under any circumstances," says Tim Hencken. That's why at Sitraplas not only every incoming product is subjected to a thorough inspection, but also a small quantity of every granulate produced for a specific order. "We first extrude a small

quantity, examine it in detail in our laboratory and only produce the complete order quantity after a positive feedback." A total of five twin-screw extruders from Coperton, two of which are laboratory extruders and three production extruders, are available in Bünde for the production of the special compounds. While the smallest particles can be removed from the melt with suitable



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filtration, all metallic impurities must come out before the extruder, as these cause damage to the processing machine. For this purpose, Sitraplas uses one each of 20 metal separators, all from Sesotec, in all conveying lines and upstream of each extruder. “We are very satisfied with the separation performance of the devices and can avoid metallic contamination in our products with a high degree of certainty,” says Tim Hencken, praising the machine supplier.

Treading alternative paths

“However, we have not been satisfied so far with the amount of good material that is discharged with the metal particles,” Tim Hencken qualifies. This is due to the functional principle of a separator that ejects the metallic impurities from the granulate stream by means of compressed air via a separating flap, taking good material with it. “When sorting about 2 t of regrind, about 80 kg of good material is also discharged.”

Especially against the background of significantly increased raw material prices, which are now around 2.50 EUR/kg for PC (previously it was 1.40 EUR/kg), this means a loss of 200 EUR. Expensive scrap that can now be avoided. Sesotec developed the mobile metal

separation unit Re-Sort for material recovery. The company presented the prototype to the public for the first time during Fakuma and then delivered it to its customer Sitraplas. “We presented our new metal separation unit here in Friedrichshafen for the first time and received an enormous response,” says a pleased Stefan Hopfinger, Product Manager at Sesotec. The special feature of the new system is that it can be operated both inline and offline and achieves a high degree of purity at a maximum throughput of 2,000 l/h. “This means that up to 98% of the good material that was previously discharged with can be recovered.”

Rapid amortisation

The functional principle of the new re-sorting unit looks like this in detail: The metallic impurities with a relatively high proportion of good material that were ejected during the usual quality control process are introduced into the separation unit via a hopper. First, the material is separated by the vibrating chute and then passes through the extractor magnet, which separates ferrous metal parts. The granulate then passes through the Rapid Vario-FS metal separator, which removes the remaining magnetic and non-magnetic impurities. What remains



Photo: K-PROFI/Hauptmannl

Product Manager Stefan Hopfinger presented the first Re-Sort at Fakuma, which was delivered to Sitraplas after the fair.

is the processed granulate, which can now be used again for production and does not have to be disposed of as waste.

“Especially with our high-quality materials, the use of the new system is worth it,” Tim Hencken is certain and is pleased with the result of the constructive cooperation with Sesotec. The cost of the modular system is between 5,000 and 20,000 EUR, depending on the equipment. “The amortisation period is of course dependent on the quantity that is re-separated and the raw material prices of the processed materials, but is certainly less than a year,” Stefan Hopfinger of Sesotec is certain, who is already in contact with many interested customers after Fakuma. ■

www.sitraplas.com
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Photo: Sesotec

Ideally, the new metal separation unit ejects all metallic impurities without taking good material with it.



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The anchor sleeve with plate as well as the steel-plastic compound screw are delivered in different lengths as a pre-assembled set.

“No time to lose”

How the Fischer spin-offs Special Mechanical Engineering and Toolmaking combine their know-how

For fixing composite thermal insulation systems to facades, the Fastening Systems Division of the Fischer Group, Waldachtal, Germany, produces a screw anchor set consisting of an anchor sleeve, plate, and steel-plastic compound screw. The compound screw is produced by overmoulding in a fully-automated production plant with intelligent feeding, which offers seven length variants including automatic set-up changes. This was designed and built by Fischer Sondermaschinenbau GmbH and Fischer Werkzeug- und Formenbau GmbH within a mere six months. The respective persons in charge, Andreas Gebele and Bernd Ströhlein, give an insight into the cooperation and their offer for external customers.

Text: Dipl.-Ing. (FH) Sabine Rahner, Editor K-PROFI

Six years ago, the Fischer Group of Companies, Waldachtal, spun off both its internal special-purpose machine construction and its in-house toolmaking operations as a limited liability company. Since then, Fischer Sondermaschinenbau GmbH, Waldachtal, and Fischer Werkzeug- und Formenbau GmbH, Horb, have been operating on the market as independent companies. Both companies compete in the market for external as well as internal orders and score points with their many years of experience: Special machine construction was founded in 1969, toolmaking as early as 1954. “We are on the right track,” says Bernd Ströhlein, Head of the Tool and Mould Making Division, happily. “Especially in the 2K area and in high-cavity moulds, we are very competitive and gain many orders from external customers. In doing so, we are aiming at high-growth business areas such

as medical technology, packaging, and consumer goods, where toolmaking still takes place in Europe. Meanwhile, the share of outside projects is well into double digits of sales.”

Full automation for the external market

Andreas Gebele, who is responsible for project planning and sales of external projects in special machine construction, also knows that a basis of mutual trust is the central building block for outside customer projects. These account for up to 70 % of turnover at Fischer Sondermaschinenbau, which operates under the Fischer Innovation label. Customers come from the automotive industry, the sanitary sector, and medical and dental technology, among others. “They are mainly companies that have their headquarters here in Germany or Europe and want to continue to produce mainly here.”

Fischer Innovation describes itself as an expert in complex automation processes with over 50 years of experience. “In wall plug production, almost everything is fully automated. From material flow to the injection moulding machine to packaging, labelling, and palletising. We compete on the external market with this know-how.” Andreas Gebele, who took over the development of the external business with the spin-off of the special machine construction in 2015 and is now the contact person for outside customers, outlines three focal points. One focus is equipment for assembly technology. “These are very different processes that we integrate in the automated flow up to packaging, such as gluing, screwing, welding, joining, assembling, pressing.” Another focus is on interlinking



Fully automated production line with intelligent feeding, which produces seven length variants including automatic set-up changes.

Photo: K-PROFI



Want to link their know-how even more closely in future: Andreas Gebele (left) from Fischer Innovation and Bernd Ströhlein, Division Manager Fischer Toolmaking.

Photo: K-PROFI

systems, with the injection moulding process being just one of many topics. And finally, working with assembly assistance systems forms a third focus. “Higher variances and smaller series demand more flexibility. The great appeal is low set-up times as well as a cost-effective and fast solution for changes or new component types,” Andreas Gebele is convinced.

Joint compound screw project

Both Fischer spin-offs contribute their accumulated production experience and process-optimised working methods to all product developments, internally as well as externally – and increasingly also in joint projects. The most recent example of cooperation is the realisation of a system for the production of so-called compound screws, which are included in a three-part pre-assembled screw anchor set from Fischer for external thermal insulation composite systems (ETICS).

The ThermoZ CS II screw anchor set is used to fasten ETICS insulation boards to house facades made of concrete or masonry. For this purpose, the complete set is inserted into the drill hole. When the steel-plastic compound screw is screwed in, the anchor sleeve expands in the masonry and ensures secure fixing. The special expansion zone of this anchor sleeve makes the ThermoZ CS II set the first insulation anchor with an approval for hammer-drilled holes in vertically perforated bricks, says Fischer, and continues: “The geometry of the plate underside reduces the



Markus Schröter, Production Team Leader: “When changing to a different length, all you have to do is change the inserts in the master mould and fill in the matching screw tips.”

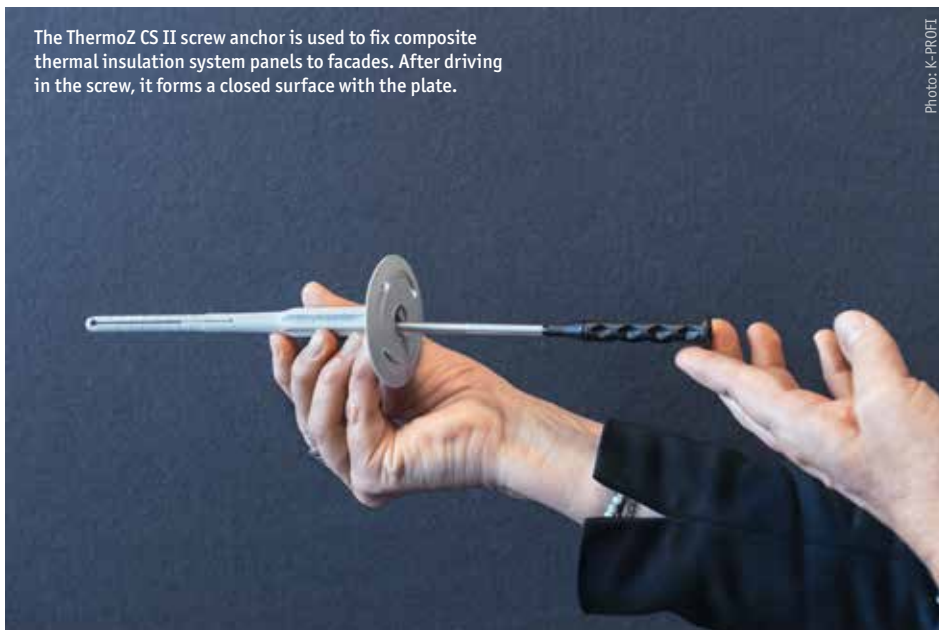
Right: An Allrounder 630 A injection moulding machine is part of the fully automated system for overmoulding with intelligent feeding of the screw tips.

insertion torque for convenient and fast installation. As soon as the compound screw is fully screwed in, it forms a closed surface with the plate, thus preventing dirt from being ejected and ensuring a clean setting pattern on the facade surface without anchor marks.”

The compound screw is a steel screw overmoulded with PA6-GF50. The plastic shaft sheathing is used for thermal decoupling and avoids thermal bridges. The installer



The ThermoZ CS II screw anchor is used to fix composite thermal insulation system panels to facades. After driving in the screw, it forms a closed surface with the plate.



uses a hexagonal hole (Torx) on the front side to screw in the screw. Different thicknesses of ETICS insulation boards require just as many different anchor and screw lengths. Fischer offers the ThermoZ CS II set for seven different drill hole depths between 150 and 270 mm. The lengths of the anchor sleeves and the steel screws vary, but the length of the plastic shaft of the compound screw is always the same.

24-cavity master tool for seven length variants

Fischer Werkzeugbau built six moulds for the complete anchor set: One mould for the plate, four moulds for the sleeves of different lengths and one master mould for the steel-plastic compound screw, where the length variants are realised via interchangeable inserts. “With this 24-cavity mould, we can change over to the seven conversion variants very quickly directly at the machine and lose no production time at the machine,” reports Bernd Ströhlein. “In addition to the high-quality requirements

The gripper can be used for all component sizes without retooling by positioning it appropriately for picking, transferring, and repositioning.

of the individual mould elements for an injection mould with a large number of change parts, compensating for the spread of the tolerance of the metal inserts was a major challenge in this project. The metal inserts are held in position by magnets. We realised the 24-cavity hot runner mould with valve gate direct gating within eleven weeks. A real challenge in this project, on the other hand, was the automation of the entire process for manufacturing the compound screw, for which Fischer Innovation was responsible."

The mould and automation were completed at the end of 2020. The system has been in production at Fischer Befestigungstechnik since the beginning of the year. "The previous product had a similarly high level of automation. So we were able to draw on experience and lessons learned. After all, we only had six months to automate the process, which is very ambitious for a project of this size. After all, we design and build our

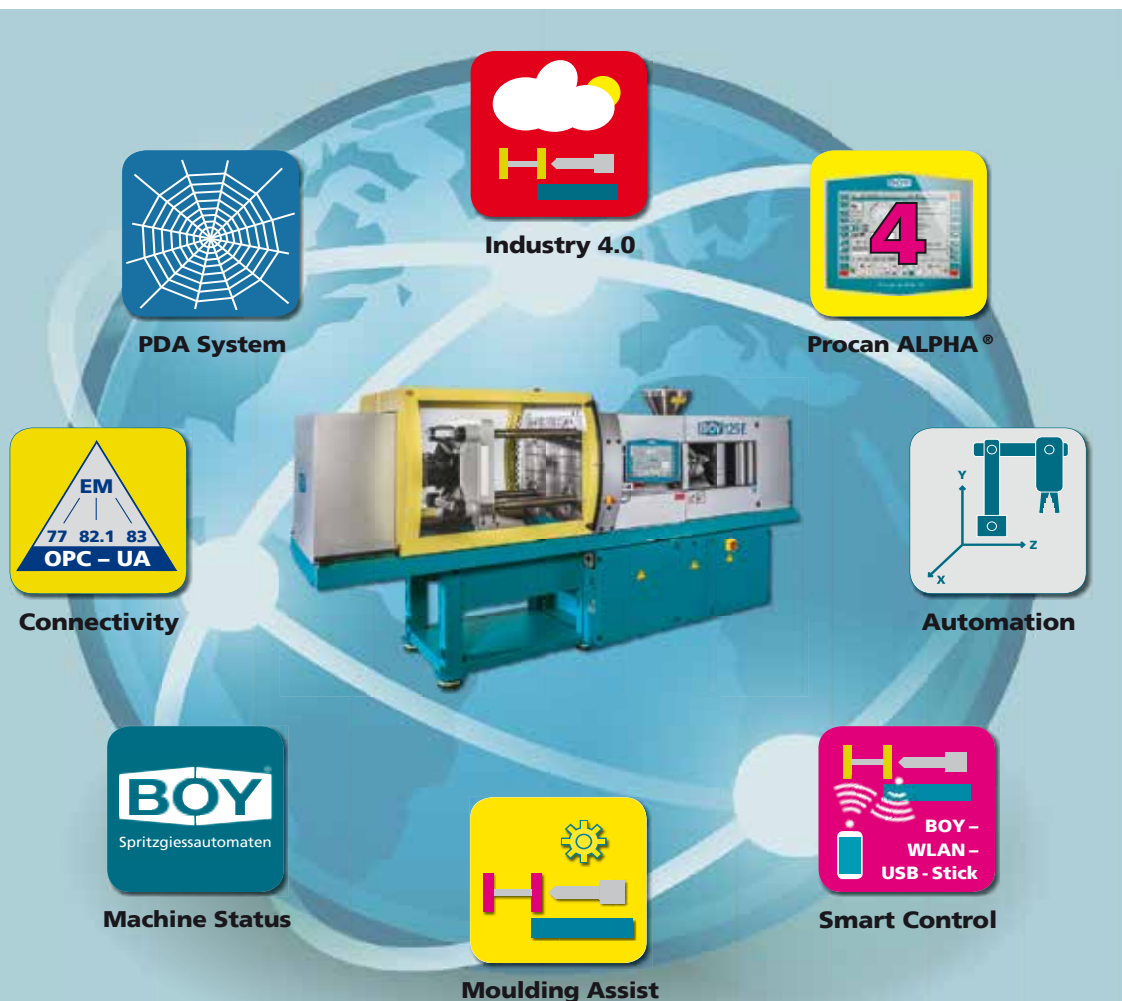


plants 100 per cent ourselves. We have the engineering and software know-how," says Andreas Gebele.

Intelligent feeding system with transfer to the mould

The process: The metal inserts are fed as bulk material in a step conveyor. Length tolerances are detected via magnets. The parts are

checked for straightness and for the position of the tip. Crooked inserts are ejected, inserts that are incorrectly sorted in terms of position are turned over. The metal inserts are then placed on a workpiece carrier in a 12+12 pattern. There, the Kuka six-axis machine equipped with a lightweight carbon gripper takes them over and places them in the 24-cavity mould of the Allrounder A 630 injection moulding machine.



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Photo: Fischer

The Innovation team during set-up: A 12+12-cavity lightweight carbon gripper with zero-point clamping system picks up the precisely aligned screw tips.

The automation of wall plug production already starts with the provision of the material.



Photo: K-PROFI

After overmoulding, the compound screws are ejected and fed as falling parts, i.e. bulk material, to the downstream process.

Andreas Gebele goes into detail: "This concept is an intelligent feeding system with transfer to the mould. The injection process is controlled via the parameters of the injection moulding machine. The tricky thing about this automation task was to design the system in such a way that it can map the different lengths and have it set up automatically at the same time. When a set-up

In a bay with a fully automatic assembly machine, the compound screws, plates, and anchor sleeves are pre-assembled into a set, packed fully automatically by a Kuka six-axis machine, labelled and placed on the Euro pallet.



Photo: K-PROFI

change is due, the line automatically runs empty. Sophisticated programming is behind this. In addition, the inserts must be fed in the appropriate cycle time, regardless of whether they are shorter or longer. For this, the performance of the step conveyor must be suitably designed. The positions for picking, transferring, and repositioning must also be mapped so that the gripper works for all component sizes. The gripper has a zero-point clamping system, so we can realise all lengths without having to retool it."

A complete truckload every day

Facade insulation is carried out by the trade mainly from March to October. Therefore, the screw anchor set is one of the few seasonal products at Fischer. During these months, production runs around the clock. Two fully automatic assembly machines assemble the compound screws as well as the plates and anchor sleeves, which are produced on separate injection moulding machines, into a set fully automatically. This is packed, labelled, and placed on the Euro pallet in the flow directly in the attached booth with a Kuka six-axis machine. "During the season, we produce a complete truckload every day," says Andreas Gebele.

The high engineering effort in special-purpose machine construction is managed by 35 employees, including nine designers and six programmers who are responsible for the application software. At the end of 2021, Fischer Sondermaschinenbau will move to the Horb site. With the move, Fischer Innovation will, on the one hand, increase its space and, on the other hand, get even closer to Fischer Toolmaking at the same location. "We want to work together even more closely in the future and offer our customers a complete technology solution with efficient production systems and high-quality injection moulds," Bernd Ströhlein holds out the prospect. ■

www.fischer-innovation.de
www.fischerwerkzeugbau.de
www.fischer.group



Photo: K-PROFI

Bernd Ströhlein: "We built six moulds for the screw anchor project, including four moulds that map seven different sleeve lengths."

Trade Fair Calender

Trade fairs related to plastics processing in 2022 and 2023

All information without guarantee. Short-term cancellations or postponements are possible at any time.

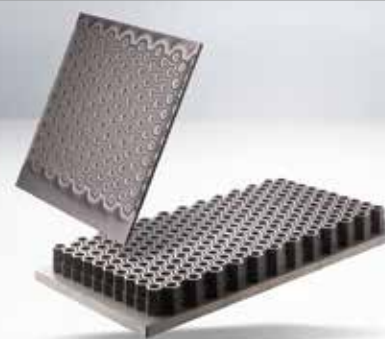
Trade Fair	Location, Country	Fair runtime	Homepage
Interplastica 2022	Moscow, Russia	25.01. - 28.01.2022	www.interplastica.de
Samuplast	Pordenone, Italy	03.02. - 05.02.2022	www.samuexpo.com
T-Plas 2022	Bangkok, Thailand	09.02. - 12.02.2022	www.tplas.com
JEC World 2022	Paris, France	08.03. - 10.03.2022	www.jec-world.events
Plastimagen 2022	Mexico City, Mexico	08.03. - 11.03.2022	www.plastimagen.com.mx/en
Plast Alger	Algiers, Algeria	14.03. - 16.03.2022	www.plastalger.com
ICE/CCE/InPrint	Munich, Germany	15.03. - 17.03.2022	www.ice-x.com
Swiss Plastics Expo 2022	Lucerne, Switzerland	15.03. - 17.03.2022	www.swissplastics-expo.ch
Injection Molding Expo	Detroit, MI/USA	16.03. - 17.03.2022	www.injectionmoldingexpo.com
Plast Expo Nordic 2022	Helsinki, Finland	16.03. - 17.03.2022	pfsptec.messukeskus.com
France Innovation Plasturgie	Lyon, France	05.04. - 08.04.2022	www.f-i-p.com
Chinaplas	Shanghai, China	25.04. - 28.04.2022	www.chinaplasonline.com
GreenPlast	Milan, Italy	03.05. - 06.05.2022	www.greenplast.org
Kuteno	Rheda-Wiedenbrück, Germany	10.05. - 12.05.2022	www.kuteno.de
HanoiPlas	Hanoi, Vietman	18.05. - 21.05.2022	www.chanchao.com.tw/hanoiplas
Argenplas	Buenos Aires, Argentina	06.06. - 09.06.2022	www.argenplas.com.ar
Plastics Recycling Show Europe	Amsterdam, The Netherlands	22.06. - 23.06.2022	www.prseventeurope.com
Plastics Live	Coventry, UK	05.07. - 06.07.2022	www.plasticlive.co.uk
Indoplas 2022	Jakarta, Indonesia	31.08. - 03.09.2022	www.indoprintpackplas.com
Kunststoffen 2022	's-Hertogenbosch, The Netherlands	14.09. - 15.09.2022	www.kunststoffenbeurs.com
Colombiaplas	Bogota, Colombia	26.09. - 30.09.2022	www.colombiaplast.org
Taipei Plas	Taipei, Taiwan	27.09. - 01.10.2022	www.taipeiplas.com.tw
K2022	Dusseldorf, Germany	16.10. - 23.10.2022	www.k-online.com
Formnext 2022	Frankfurt/Main, Germany	15.11. - 18.11.2022	www.formnext.de
Vietnamplas 2022	Ho Chi Minh City, Vietnam	23.11. - 26.11.2022	www.chanchao.com.tw/vietnamplas
Plast India 2023	New-Delhi, India	01.02. - 05.02.2023	www.plastindia.org
Interpack	Dusseldorf, Germany	04.05. - 10.05.2023	www.interpack.com



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Manfred Göke from Industrial Engineering at Oventrop tested the 3D-printed nozzle on an electric injection moulding machine.

22.6 percent less energy

What Oventrop appreciates about 3D-printed hot runner nozzles

A 4-cavity mould for a technical continuous article has been converted by Oventrop GmbH & Co. KG in Olsberg to hot runner nozzles which are manufactured in the SLM process and thus by means of 3D metal printing. Manfred Göke from Industrial Engineering explains what the injection moulding company noticed in addition to significant energy savings and why it now wants to convert further identical moulds.

Text: Dipl.-Ing. Markus Lüling, Editor-in-Chief K-PROFI

Oventrop manufactures a large, modularly combinable product portfolio for installations in the applications room climate, hydraulics, drinking water, stations, and smart home. The hydraulic components are used in sanitary, heating and air conditioning technology for heating, cooling, and clean drinking water. As one of its continuous products, Oventrop uses 4-cavity moulds to produce a

so-called take-along, a 4.1 g light component made of PA6.6-GF30, which is in contact with hot water in the application. It is produced on an electric Allrounder 370A injection moulding machine from Arburg in a cycle time of 23 seconds.

For test purposes, Oventrop replaced the existing conventional hot runner nozzles from Witosa in one of the 4-cavity moulds with new, 3D-printed, and completely hard-coated nozzles with a length of 60 mm, a trigger body with a diameter of 20 mm and a 1-hole tip (type Monolith-20.60.1.C). Manfred Göke from Oventrop's Industrial Engineering reports on his experiences.



Photo: Witosa

Take-along for hot water contact, produced in a 4-cavity mould at Oventrop.



Illustration: Witosa

The hot runner system for use at Oventrop with manifold and four 3D-printed 60-mm nozzles.

K-PROFI: Mr. Göke, what was the motivation to deal with the new nozzle technology?

Manfred Göke: Witosa asked whether we were interested in a 1:1 comparison of the new technology against existing hot runner nozzles. Since we operate several identical moulds as continuous processes, the comparison was of interest to us, especially with regard to possible energy savings.

Were there any reservations about using it?

No, none, because the new nozzles are compatible with the existing system.

What fascinates you about the new nozzles?

The technology of 3D printing and that it can be used to produce a one-piece nozzle.

What encouraged you to use the new nozzles?

The prospect of energy savings.

What has been your experience?

Assembly is easier because we have fewer components. We see less build-up due to outgassing, so we have longer cleaning intervals and it is easy to maintain. We haven't noticed any signs of wear yet.

And in terms of energy consumption?

Measured by us, we have 22.6 percent less in relation to the entire system. The system reacts more sensitively to temperature changes, start-up is faster, and the target temperatures are reached faster.

Would you recommend the nozzle to others?

Our experience so far has been nothing but positive.

Are you already planning to equip other hot runner moulds with the new nozzles?

Yes, initially the identical moulds for other take-alongs.

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Printed to fit every application

Witosa is using the increased possibilities of injection moulding simulation, Industry 4.0 and 3D printing of metals to produce the world's first additively manufactured, one-piece hot runner nozzle. K-PROFI spoke to Torsten Glittenberg about details of the new concept. Together with his father Willi Glittenberg, he is Managing Director of the hot runner technology manufacturer in Frankenberg an der Eder.

K-PROFI: Mr Glittenberg, why the completely new approach?

Torsten Glittenberg: There are more and more applications that are difficult to cover with the standard catalogue programme of hot runner manufacturers – more types of plastic, differentiated requirements, more and more niches. A standard catalogue programme that tried to cover this diversity would get lost in variants. In addition, many patents relating to the basic design of hot runner nozzles have expired. So, the systems on the market have become very similar, and customers can hardly tell the difference.

Why the focus on the nozzle?

The hot runner nozzle plays a decisive role in determining the quality of the manufactured article and the injection moulding process. The nozzle is decisive for the correct temperature control of the melt, the opening behaviour of the injection point during the injection process, the temperature entry into the mould insert and the break-off quality of the injection point. It is therefore the technological part of the hot runner. Manifolds can almost all be produced conventionally with the deflection elements we use. 3D printing them is not an option for us – apart from the smallest manifold systems that have to be fitted into the tightest spaces and where the hot runner nozzles do not determine the dimensions, we do not see any economically viable application.

Torsten Glittenberg, Managing Director of Witosa Heißkanalsysteme, with the new hot runner nozzles at Fakuma 2021.



Photo: K-PROFI

How do you manufacture the new nozzles and what are the Monolith nozzles made of?

We print the nozzle blanks from the powder bed using the SLM process, 25 to 30 pieces per production run. We work in thicknesses of a few hundredths of a millimetre and print such a set in six to 24 hours. The printed nozzle blanks are then mechanically processed. Hot runner nozzles are subjected to up to 2,000 bar of pressure during the process, so they need high mechanical strength in the shaft and high abrasion resistance in the nozzle tip. When using flame-retardant plastics, high chromium contents are necessary to prevent corrosion. This already results in a wide variety of material requirements. We have also installed new hot runner systems with printed nozzles at pilot customers and collected data. In the field, we mainly looked at wear phenomena – for GF30 and GF50 types. This has provided insights that have also been incorporated into the material selection for the design of the nozzles. That is why we use different materials in 3D printing and can thus guarantee 1 million shots even when using GF30 until a wear limit is reached.

Printing alone is not enough, is it?

No, with a printed surface a uniform flow without build-up in the structure of the melt channel cannot be achieved. That's why we machine everything that carries melt – to the highest surface qualities. In order to machine the melt channel to this quality, we had to develop special tools. The nozzle tips are variable; we offer one, two or three openings as melt outlets, which we insert mechanically into the cylindrical nozzle body. How pointed or blunt these are designed is generated from the model.

How is the model for the nozzles created?

A preliminary analysis using Moldflow is indispensable. We agree with the customer on central process parameters and do the thermal simulation. From a point cloud, the system calculates the nozzle as a fully parametric model. When the point cloud was still small, we could only interpolate linearly. But the more data and the more points we have, the more accurate the system works and the more

accurate the model becomes. This is what we understand by AI: the more applications you know, the better the system can calculate the new model. With every use case that we calculate and execute, the system learns something new. This is how we ultimately make every nozzle customer-specific with Industry 4.0.

What changes in the simulation?

We go deeper into detail than most processors. We know a few who simulate similarly deeply as we do, but most of them don't do it as intensively. In such cases, we pass on our parameters for optimal performance of the simulations to the injection moulders.

What ultimately makes the nozzle customised?

Externally, the nozzles are not that customised, except perhaps for the narrower range of outer diameters compared to the standard product. But the real know-how is inside: the insulating gap at the tip of the nozzle is imprinted. The principle is clear: where we imprint material, heat flows, while the air gaps insulate. The material tube on the inside is individually connected to the outer contour in order to perfectly shape the temperature pattern of the specific nozzle. The aim is for the nozzle to be centred in the processing window and to deliver good opening behaviour coupled with high tear-off quality thanks to a quickly adjustable tip. In conventional nozzles, a very homogeneous temperature distribution is only possible to a limited extent, especially with long and slim designs. The design freedom of 3D printing provides countless possibilities for homogenising the temperature pattern.

Why less energy consumption?

Thanks to the very good insulation from the injection mould, we need less heating power overall than with conventional nozzles. The heating runs vertically up the outer contour, meandering around the tip and back down again. The heat is distributed over the structure in the nozzle because the structure determines how the heat flows to the material tube. The aim is also to have the fastest possible response to the heating. Therefore, we have also reduced the

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weight of the nozzles compared to the conventional design. That is why we rely on a hexagonal honeycomb structure in the nozzle body, because it offers the highest mechanical strength with low weight.

You emphasise the leakage safety of the new nozzle.

Yes, the one-piece design solves the problem of the conventional nozzle, which consists of several components in the area of the nozzle tip. In the gaps between the components or the threads that connect them, there is always a latent risk of leakage in case of wear. We also print the mounting nut for assembly with the manifold system directly onto the Monolith nozzle. In this way, the perfectly fitting nut remains movable but fixed to the nozzle, which can be screwed onto the manifold without rotation. The melt exits in the nozzle tip can thus be positioned freely and securely in terms of rotation.

What happens if the tip of the one-piece nozzle is worn?

You send the nozzle in. We print a new tip and profile it again using the CNC process. This can be done within 48 hours. So, you don't need to keep expensive spare parts in stock. Previously, customers also needed trained personnel and the capacity to replace wear parts. These maintenance measures are therefore understandably unwelcome, even after several million cycles. No leakage can escape from the new one-piece design and maintenance is much cheaper and easier than before. The customer can still replace the sensor and heater itself within a few minutes if necessary. A printed, undercut groove in the nozzle body safely accommodates the lines.

What is the hard coating for?

The black hard material coating on the nozzle leads to a further increase in wear resistance, and fortunately it also enhances the appearance.

What do customers report back?

Energy costs are currently of great importance to injection moulders. We have also carried out tests and measured the power consumption. The purchase costs are comparable to standard products, so in some cases the investment pays for itself in about eight months. In commercial terms, then, it's the energy savings. But we also provide arguments for the CO₂ footprint and the goal of CO₂ neutrality. This pays off in terms of image, but VW, for example, is now obliging its suppliers to address CO₂ issues. So, the nozzle can reduce the consumption

of electricity not generated by the company itself. And with up to 35 percent less energy being fed into the mould via the nozzles, the injection moulder also saves on cooling capacity and, depending on the situation, a few tenths of a second on cooling time.

What are the technicians' experiences?

Flexibility can be gained in terms of process technology: The processing windows, especially for temperature- and shear-sensitive technical materials with many additives and reinforced materials, are becoming narrower and narrower: when new, customers aim for the average value of the processing window in order to have

leeway in case of batch fluctuations and peak wear. A more controllable temperature pattern brings clear advantages here. Designers are pushing for less installation space through smaller nozzles. At Witos, we classically serve smaller moulded parts. The greatest difficulty is very thin, very long nozzles. Here, an exactly homogeneous temperature pattern is difficult to achieve with conventional hot runner nozzles. The slimmer the nozzle, the greater the added value of customisation through additive manufacturing.

Will the overall mould-making process become faster?

The hot runner is rarely the time-critical component in mould making, but if it is, any size of monolithic nozzle can be printed in 24 hours, so delivery bottlenecks due to many components and problems in material availability are not an issue for us.

For which of your customers is the new nozzle an economical alternative?

For all of them. Series production has started. We no longer see any application for which conventional nozzles remain superior. In time, the new product will therefore replace our existing programme to a large extent. The conventional, multi-part, machined nozzle will gradually disappear. We will continue to support them in after-sales, that is clear, but the future belongs to monolith technology. When customers ask us for an open system, we now always offer them the new system as an alternative. The hard

facts speak for themselves. At comparable acquisition costs, the printed nozzles offer better performance in every respect.

Thank you very much for the interview, Mr Glittenberg. 

www.witosa.de
www.true-monolith.com



The 3D-printed Monolith nozzles are available with take-off bodies of 16, 20, 22 or 24 mm diameter (and fixed flow channel diameters of 4, 5, 6 or 8 mm respectively). A 28-mm variant with a 10-mm flow channel will be launched before the end of 2021.



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www.blowmoldersale.com
www.flexblow.com
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www.hosokawa-alpine.com

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www.chemtrend.de

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Generation Home-Office

The conflict of goals for our future viability

If there was one topic apart from technical innovations at the trade fairs in recent months, it was the shortage of skilled workers and managers. I have already tried to point out possible solutions and approaches to this several times in the past. Unfortunately, there is now an exacerbating aspect that cannot be ig-



Dr.-Ing. Arno Rogalla is an internationally active interim manager and management consultant in the plastics processing industry: redaktion@k-profi.de

nored: due to the Corona situation that has been with us for a long time, a “home office” generation is being raised that believes it can control production from its desk, so to speak. It is certainly possible to understand processes with “artificial intelligence” much better today than ten years ago. But one should not think that everything that cannot be objectively communicated in “Teams” or “Zoom” does not exist.

Where is the generation just entering the workforce supposed to get to know a normal working day if they are taken to empty offices or simple school internships can no longer take place in production, the bank, the craftsman's shop, etc. because everyone is afraid of direct contact and prefers to keep their businesses self-contained rather than continuing to operate and make them interesting with the appropriate effort?

The young people lose the social contact that is important later on, to interpret interpersonal sentiments correctly and to actively pursue a common goal together with others – and this also gladly

in constructive, controversial discussions that open up a larger solution space. Process optimisation must take place directly on the processing machines in a timely manner. Only those who understand and experience the interaction of man, machine, material, and environment can achieve a good result. This is not possible from home, when time just fits between – unfortunately today not always self-directed – activities such as unscheduled childcare and doctor's appointments. A company cannot wait, it only makes money when things are going well.

If you look further into the future, it becomes very exciting. The generation that is now growing up is forgetting how to lead, promote and motivate. Where are inspiring entrepreneurs and leaders supposed to come from if the “home office” generation is left to its own devices and is not even allowed to really try itself out on the playing field? A good leader must be experienced and chosen as a role model. That can only be done live!

On the other hand, and this is a contradiction, the job market is really soaking up every applicant right now. Graduates are hired by companies so early that research institutes have difficulty filling their positions for young scientists. Where is the free innovative power supposed to come from in the future? Only from the companies? We are in a clear conflict of goals for our future viability!

Our sector in particular is struggling with an image problem spurred on by politics and the press. Young people would rather get involved in other areas than understand plastics technology in depth so that they can make a competent contribution to solving the challenges associated with plastics. Will the “home office” generation work on practical solutions without ever getting their hands dirty? Corona waves need to be properly understood and managed with foresight. But we have an equally great responsibility to teach the next generation more than just looking at the screen and not daring to do anything. ■

Imprint

**K-PROFI international –
Inspiration for plastics processors**

Editors

Dipl.-Ing. Markus Lülting, Editor-in-Chief (responsible)
Tel. +49 (0)9123 9609-10, lueling@k-profi.de

Dipl.-Chem. Toralf Gabler, Specialist Editor
Tel. +49 (0)9123 9609-11, gabler@k-profi.de

Dipl.-Ing. (FH) Sabine Rahner, Specialist Editor
Tel. +49 (0)711 8877248, rahner@k-profi.de

Dipl.-Ing. (FH) Karin Regel, Specialist Editor
Tel. +49 (0)2433 938941, regel@k-profi.de

Dipl.-Ing. Janne Reisch, Esq., Copy Editor
janne.reisch@gmail.com

Dipl.-Ing. Gabriele Rzepka, Specialist Editor
Tel. +49 (0)6172 8689940, rzepka@k-profi.de

Editorial address

Luitpoldstr. 5, 91207 Lauf an der Pegnitz, Germany
Fax +49 (0)9123 9609-29, redaktion@k-profi.de

Publisher

Kunststoff-Profi Verlag GmbH & Co. KG
Saalburgstr. 157, 61350 Bad Homburg, Germany
Tel. +49 (0)6172 9606-0, Fax +49 (0)6172 9606-99
info@k-profi.de, www.k-profi.world

Personally liable shareholder:
Kunststoff-Fachmedien GmbH
Saalburgstr. 157, 61350 Bad Homburg, Germany

Management

Andreas Hertsch, Markus Lülting

Advertising management

Gero Trinkaus, P.O. Box 31 24, 29231 Celle, Germany
Tel. +49 (0)5141 99 32 026, trinkaus@k-profi.de

Distribution and reader service

Katharina Kolk
Tel. +49 (0)6172 9606-71, vertrieb@k-profi.de

Subscription

K-PROFI international is available to plastics and rubber processors as an ePaper or PDF free of charge upon registration. Registration requires some information about the person and the function in the company. Registration is possible at any time at www.k-profi.world/registration

Design concept and layout

Dipl.-Kommunikationsdesigner (FH) Oliver Schneider
Tel. +49 (0)9123 9609-15, schneider@k-profi.de

Production Sigrd Seffner

Tel. +49 (0)9123 9609-12, produktion@k-profi.de

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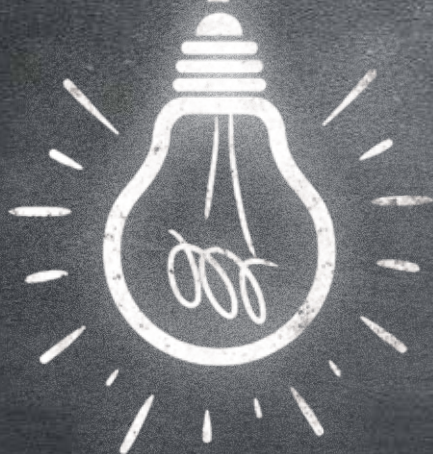
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K-PROFI international is a publication of the KI Group.

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