

K-PROFI

international edition



**Our quality promise
to plastics processors**

- › Trendsetting know-how
- › Success stories from Europe
- › Magazine Made in Germany

Kirsch Kunststofftechnik in Ebersbach moulds large sheets of PC and PMMA for motorsport and mechanical engineering and coats them in a clean room to make them scratch-resistant and UV-stable.

Between manufacturing and industry

How **Kurz** multiplies the service life of injection moulds. How **Gualapack**, **Memo** and **Rupar Plastika** benefit from **Interzero**. How AI tools accelerate **qualification and validation** in **medical technology**. How **Benker** customises blisters and trays. And why **Spang & Brands** focusses on the medical market.

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Strategies, services and specialisations

Dear reader,

The Kurz Group has multiplied the service life of its injection moulds with new ultra-hard coatings. For the first time in public, Managing Director Jochen Merz and technology supplier Dr Lienhard J. Paterok report on the technology and benefits to Sabine Rahner from page 5. The "Automotive Interiors Expo" recently gave Sabine Rahner a glimpse into the high-quality automotive interiors of the future in Stuttgart: page 10. Benker in Dietenhofen develops customised packaging solutions in the form of blisters, trays and inserts. Gabriele Rzepka describes how the long-established company lives its strategy and has organised small and large-scale production: page 14.

Injection moulding machine manufacturer Engel discussed artificial intelligence and its potential to speed up qualification and validation processes in medical technology with 140 customers. Sabine Rahner summarises possible strategies: Page 19. For more than 40 years, Spang & Brands in Friedrichsdorf has focussed on the development and production of high-precision consumables for the medical, pharmaceutical and laboratory sectors. I was able to experience how the one-stop supplier with USPs in material expertise, toolmaking and cleanroom assembly is moving into the fourth generation: page 22.

Interzero recently opened the only EU-accredited R&D facility specialising in the analysis and development of recyclates in Slovenia. Karin Regel documents how the packaging manufacturers Gualapack, Memo



and Rupar Plastika benefit from recipe development, laboratory and pilot plants from page 28 onwards. Kirsch Kunststofftechnik sees itself on the threshold between manufacturing and industrial operation – with scratch and UV-stable coatings in the clean room and the moulding of large transparent semi-finished products made of PC and PMMA for motorsport and mechanical engineering: Gabriele Rzepka reports from page 32 onwards.

We hope you enjoy reading this issue and find it useful!

Markus Lüling

Markus Lüling, Editor-in-Chief
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"We are now igniting the next stage"

How the Kurz Group is multiplying the service life of its tools with new ultra-hard, carbide coatings

"Only through innovation and our wealth of ideas can we counteract the very high-cost pressure in Germany," says Jochen Merz, CEO of the Kurz Group from Haigerloch, with conviction. The expert in complex insert technology is tackling the problem from various angles. One key is specially coated injection moulding tools, which are much harder than those achievable using PVD techniques, and thus also last much longer. In collaboration with the Technical R&D Centre for Surface Finishing and High-Performance Toolmaking in Schömburg, a further increase in surface hardness has now been implemented industrially using a purely carbide coating. Together with Dr. Lienhard J. Paterok, owner of the R&D centre, Jochen Merz reports on experiences, benefits and challenges.

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

Jochen Merz, CEO of the Kurz Group:
"With innovations such as super- and ultra-hard coatings, we can counteract the high-cost pressure."

In addition to insert technology, Kurz specialises in injection-moulded parts with complex geometries and "tricky plastic parts with high dimensional accuracy". The technology report "Bringing more complexity into the component – How the Kurz Group is expanding its insert technology" (K-PROFI international 1/2024, directly available at www.k-profi.world/issue/240118) and the interview "This is an incredibly good connection – How insert technology specialist Kurz simplifies media-tight overmoulding" (K-PROFI international 4/2023, www.k-profi.world/issue/230420) provide deeper insights.



The company focuses its own toolmaking expertise primarily on fine-tuning the mould and mainly uses the capacities of external toolmaking partners.

K-PROFI: Mr Merz, how long has the Kurz Group been working with the Technical R&D Centre for Surface Finishing and High-Performance Tool Manufacturing, and what benefits do you gain from this?

Jochen Merz: My predecessor started the collaboration over 20 years ago. I myself have known Mr Paterok for 17 years. Since then, we have constantly been learning from each other. As the Kurz Group, we enjoy beta customer status and benefit from developments at an early stage, as we are doing now with the new ultra-hard, purely carbide coatings. With the proven multi-element ceramic nano-hard material coatings from the Technical R&D Centre, we have already been able to gain a competitive edge in various injection moulding applications. These super-hard and now even ultra-hard coatings increase the service life of the tools many times over.

Jochen Merz has been exchanging ideas with Dr Lienhard J. Paterok (right), owner of the Technical R&D Centre for Surface Finishing and High-Performance Toolmaking, for almost 20 years.

Can you describe an example?

Jochen Merz: One automotive application is particularly impressive. We supplied the European market and two competitors supplied the Asian market and the NAFTA region. It was a highly filled component made of PA66 with 50 per cent glass fibres and red phosphorus. While our competitors had to build several follow-on tools, our super-hard coated mould ran continuously. In addition, we supplied the customer with parts during the transition phases until the follow-on tools had been built and sampled. This success has had a ripple effect.

What do the coatings achieve?

Jochen Merz: The demands on the wear resistance of the moulds are constantly increasing. Additives such as reinforcing glass fibres, titanium dioxide for pigmentation or additives such as red phosphorus as a flame retardant have a highly abrasive effect. Glass fibres are often the more harmless component in contrast to red phosphorus, which is considerably harder and at the same time has very sharp edges. Furthermore, we are increasingly seeing that the plastic materials contain uncontrollable residues from the manufacturing process, whether they are separated glass fibre residues or simply dust. We can counteract this extreme stress and wear of the mould with appropriately super- or ultra-hard coatings.

Dr. Lienhard J. Paterok: The microhardness of the elements added to the plastic is crucial for the choice of coating. At the same time, many people are unaware that there are at least six different types of glass fibre. The hardness spectrum ranges from 650 Vickers for the softest glass fibre to 1,200 Vickers for crystal glass fibres, which is almost double. So it is important to know what type of glass fibre is being processed and, in general, what hardness values the additives have. Red phosphorus is already at 1,800 Vickers. And inorganic pigments, such as the white pigment titanium dioxide, which has a hardness of up to 2,600 Vickers, are a major challenge. To minimise wear, we therefore need coatings that are harder than this, because the pure mould steel only has a hardness of up to 740 Vickers. Ultimately, it almost doesn't matter how high the additive or filler content is: even at one percent, the abrasive already takes effect.

What can PVD coatings achieve?

Jochen Merz: PVD coatings reach their limits with geometrically complex shapes. For example, the inside of deep boreholes can only be coated up to the depth of a borehole diameter. The technology of the Technical R&D Centre allows a depth of up to 20D here. These thermochemically produced superhard layers are only 1.5 micrometres thick, whereas PVD layers are almost 5 micrometres thick. For us as a manufacturer of high-precision moulds, positional shifts of about two hundredths of a millimetre can occur with PVD coating technology due to the high layer thicknesses. This is one of the reasons why we hardly use PVD technology anymore. Our experience shows that we can achieve adequate results with a clever choice of steel even without PVD coatings. In addition, with PVD coatings you only double the service life, but you don't multiply it to the same extent as with the coatings from the Technical R&D Centre.



Photo: K-PROFI

Coated mould inserts ensure a long service life and little cleaning effort: The covers of a control unit for electric steering systems consist of PBT with a high glass fibre content.



Photo: Kurz

The mould inserts of the eight-cavity connector mould (right nozzle side, left ejector side) are coated with the new, purely carbide-based hard material system and have a microhardness of 3,200 HV. PPS with more than 50 % glass fibres is processed.



Photo: Kurz

How do these differ fundamentally from PVD techniques?

Lienhard Paterok: We achieve the superhard coatings with a thermochemical process, whereas physical vapour deposition is, as the name suggests, a physical deposition process. Fundamentally, a physical process requires a rough surface so that good adhesion can be achieved afterwards. The surfaces must therefore be sandblasted beforehand. The layers then grow column-like in the form of capillaries and only close once the layer thickness is around 4.8 micrometres. If the layers wear down, the capillaries open up again, various substances are introduced, and the layers can flake off. Nevertheless, we also offer PVD processes, but for other applications, not for injection moulding tools.

How do you rate coating technologies based on chemical vapour deposition (CVD) in this context?

Lienhard Paterok: Normal-pressure CVD techniques, which have been known for 70 years, can indeed be used to deposit titanium carbides, titanium nitrides and titanium carbonitrides. These are ultra-hard coatings that cannot be achieved with PVD techniques. However, the layers can be up to 12 micrometres thick and – which rules out their use for injection moulding tools – they are deposited at temperatures between 750 and 1,020 degrees Celsius, which is well above the tempering temperature of the tool steel. My brother Leonhard Paterok and I always wanted to make ultra-hard titanium carbides available for injection moulding tools as well. We didn't manage it for a long time. However, we were able to solve part of the dilemma almost 20 years ago. Not with titanium carbides, but with a ceramic nano-hard material system. This allowed us to produce very thin and at the same time super-hard coatings at deposition temperatures in the range of 350 to 450 degrees Celsius. This is exactly in the tempering range of injection moulding tools.

What is the technological background of this surface treatment?

Lienhard Paterok: With the 3D-hybrid AU quadro impulse CVD process developed by us in 2007, we were able to create multi-element nanoceramic systems with layer thicknesses of 1 to 1.5 micrometres. In 2012, the Federal Ministry for Economic Affairs and Energy honoured this achievement with the German Raw Materials Efficiency Award. For the surface finishing of injection moulding tools, for example, we were able to use this process to produce a super-hard ceramic high-performance hard material system. It can consist of twelve elements – $(Al_3Fe_bCr_cMo_dTi_eV_fW_g)S_xO_yC_qN_nSi_z$ – and is constructed from nano-hard material layers that flow seamlessly into one another. We established the application of this technology in the plastics industry with the Kurz Group from 2012 onwards.

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Mr Merz, what results were you able to achieve with this new type of coating?

Jochen Merz: We had implemented a few applications with it. We have now “run through” five of these injection moulding tools. These were tools for flame-retardant plastics with a glass fibre content of 50 percent and more. All five moulds have achieved over 3.5 million shots. For a component with 65 per cent

glass fibre content, the output of the uncoated tool version was 90,000 parts, while the PVD-coated version achieved 170,000 parts. The increase to 3.5 million is exorbitant. In addition, contamination has been significantly reduced. It is sufficient to remove and clean the coated moulds only once a month instead of every few days.

What savings are associated with the extension of tool life, and how do your customers benefit?

Jochen Merz: Enormous savings are associated with the multiplication of tool life. Of course, we simply save on follow-on tools and thus on valuable resources in terms of material, production and processing time. However, for me, the focus is not just on the pure tool costs, because that is the smaller part. What weighs most heavily is the effort associated with a new injection moulding tool for sampling. Especially when it comes to parts that belong to an assembly. Tier One has to go through all the tests again. In addition to the time required, huge sums of money come into play here. Just to get a feel for it: let's imagine a multi-cavity mould that costs 100,000 euros. By the time we have measured everything, we incur sampling costs of between 30,000 and 50,000 euros internally. The customer has to cover significantly more interfaces. Here, it can quickly add up to several hundred thousand additional euros. So if we don't need follow-on tools, we can score points with our customers. With these sums, even additional costs of a one-time 20,000 euros for coating are almost negligible. But of course, the buyer must understand these relationships. With injection moulding tools, it always pays off.

Mr Merz, why don't you keep this trump card to yourself?

Jochen Merz: It is important to me that we maintain our technological advantage in our country and help shape the future. That's why I report on our experiences with this technology. As a beta customer, we have the exclusive advantage of being able to test a lot of things in advance. Also, we have already acquired a great deal of know-how in this area, and it's not easy to catch up on this knowledge. However, I have found that many injection moulding companies do not deal with this topic in such depth and seriousness and therefore miss out on potential. With such technologies, we here in Germany are countering the cheap offers from the Far East.

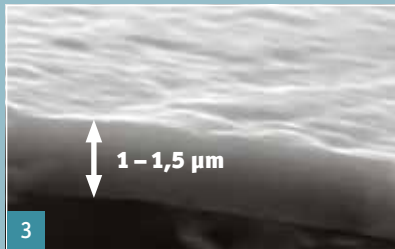
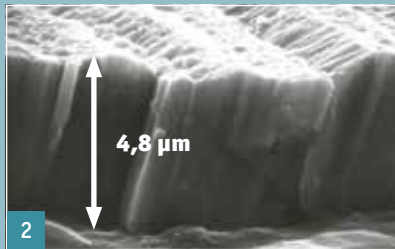
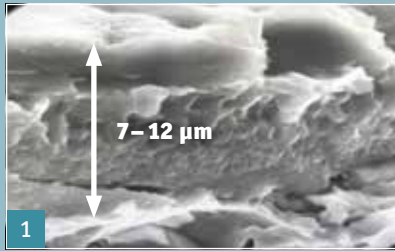
What expertise do you need to use coating technology?

Jochen Merz: Once the mould is coated, no further corrections can be made – that's the challenge. If you want the coating, the mould has to be designed for it from the outset, otherwise it won't work. It starts with the design and also affects the choice of steel. Not all steels are suitable. The processing is also relevant. What feed rates can I use for milling? When do I have to reduce the cutting speed? When do I use which eroding level? Do I use graphite or copper electrodes for die-sinking EDM? All of this has a direct effect on the adhesive strength of the coating. There are a few tricks for causing as little damage as possible to the steel structure beforehand. This expertise also results from feedback and tips from the Technical R&D Centre. I'm grateful for that. The next important aspect is that we have to spray for as long as it takes for the tool to settle completely during the project start-up. Based on our experience, the tool needs about 50,000 to 100,000 closures to do this. Then we first rework the ventilation, check whether all the values are still correct, and only then can the mould inserts be coated.

What happens to the surface during coating?

Lienhard Paterok: First of all, we recommend that the tools be tempered three times. Only then is the structure optimal. Before coating, the mould inserts must be free of rust and plastic, and metallurgically bright. We work in two steps when coating. The first layer serves to prepare and stabilise the substrate and eliminates the effects of the previous processing. To do this, we shoot various elements such as carbon or nitrogen into the top six to seven micrometres of the steel surface to achieve a Rockwell hardness of at least 50 HRC or a Vickers hardness of 510 HV. This high-performance implantation takes about eight hours. The desired layers are then deposited on the prepared surface. These are multi-element systems, because if the moulds breathe, the layers must be able to breathe with them so that they do not flake off.

The ceramic high-performance nano-hard material system made of twelve elements for super-hard surfaces has already been mentioned, but also that you can now offer purely carbide systems for injection moulding tools. What is the story behind this?

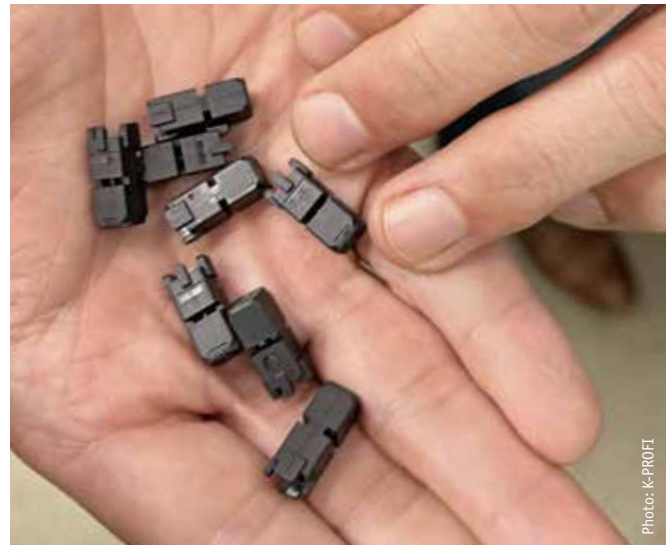


Comparison of the results of various coating technologies:

- 1 CVD hard material coating of the 1st generation
- 2 PVD hard material coating of the 1st generation
- 3 super-hard, multi-element nanoceramic system (3D hybrid AU quad pulse CVD process)
- 4 ultra-hard titanium carbide coating (Bison process)

Lienhard Paterok: After many years of development and failure, we finally managed to make ultra-hard titanium carbides available for injection moulding tools in 2023. We are only going public with this innovation now, at the time of this interview. At the moment, we are the only company in the world that has a 3D low-temperature CVD process to deposit metal-carbon compounds at 480 to 550 degrees Celsius – and thus in the tempering temperature range. The corresponding process is based on our Bison technology. Titanium carbides achieve an even higher surface hardness than ceramic high-performance nano-hard material systems, combined with all the advantages mentioned above, such as extended tool life and more. Multi-element, graded carbide hard material systems with a hardness of 750 Vickers to 3,200 Vickers and a thickness of 1.5 to 1.6 micrometres are deposited on injection moulding tools. Despite the enormous microhardness, the elasticity of the layer is more than twice as high as that of the injection mould.

Jochen Merz: This new development is a giant step forward, with hardness values of over 3,000 Vickers. This has allowed us to ignite the next stage. It enables us to handle highly filled materials even better. We currently have two injection moulding tools with ultra-hard coated mould inserts in operation. With the Bison coating on current tool steels, we achieve increases in service life by a factor of 5 to 8 with highly filled materials. It should be noted that, on the one hand, the experience gained in steel processing in preparation for coating already has the effect of increasing service life, while, on the other hand, additives for flame retardancy and the like reduce service life with current tool steels. Generally speaking, even a doubling or tripling of service life is a huge advantage. The next step has therefore



When it comes to high volumes or multi-cavity moulds, such as those used for these connectors in electric vehicles, the additional coating costs are quickly recouped.

already been planned. We will coat a reel-to-reel tool for an insert application accordingly. We are preparing to expand our coating spectrum for the special application of organic, inorganic, and metallic fillers using this thermochemical finishing method. 

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Plenty of room

Where is the journey headed in vehicle interiors? Answers were provided during Automotive Interiors Expo, which took place in Stuttgart at the end of November 2024. The three-day trade fair and lecture programme, organised by UKi Media & Events, was small but perfectly formed. More than 120 international players presented their offerings for the design of high-quality interiors of the future. K-PROFI gathered impressions.

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

For a long time, real wood trims, leather surfaces and a high-quality sound system defined the idea of premium vehicles. Then displays added to the appearance, replacing physical control switches and buttons, and high gloss was the order of the day. The effects of digitalisation: dangerous distractions and overload on the one hand, helpful digital assistance systems on the other. User experience (UX) design now plays a key role in the design process. UX takes into account the entirety of the user experience. Given

the abundance of possibilities, it is an art to find the right balance between digital and analogue elements and thus to make operation and driver orientation safe, uncomplicated, clear and intuitive. The major automotive trends – connected, autonomous, shared and electric (CASE) – are shaping these developments. On the one hand, the vehicle is becoming increasingly networked with its owner, while on the other hand, the operating concept must also be quick and easy for changing drivers to grasp. The process

towards autonomous driving reveals additional scope: even more interaction and the creation of virtual experiences, i.e. immersion in virtual worlds. Plastics and their innovative processing technologies will continue to play a major role. They are the key to combining function and surface, feel and look. And the buzzword sustainability is at the forefront, as K-PROFI's discussions with exhibitors showed.

www.automotive-interiors-expo.com



Christian Vogler, Business Development Manager Automotive at Mocom Compounds, is holding two exhibits that are representative of current trends. A complete cockpit is integrated into the lightweight display carrier (right). The WIC carbon-fibre compound WIC-PP with 30 % CF replaces PP LGF50, reducing weight by 22 % and adding sustainability thanks to the recycled carbon fibres. Mocom is also showcasing an innovation in the field of illuminated high-quality surfaces: "The use of recycled materials is also helping to improve sustainability in the field of light-optical applications." In the decorative lighting example from the manufacturer of decorative and functional elements Novem, the PCR content in the light-diffusing plastic is 75 %. The challenge: despite the PCR content, the material has to fulfil all the same light-optical requirements as "virgin" material. This is achieved by using the appropriate additives and compounding. www.mocom.eu

Whereas the interior used to be rather small-scale with individual switches and buttons, the trend is now towards large-area components, says Thomas Sommer, Key Account Manager at Hübner-KTB Oberflächentechnik. "Lots of touch, lots of displays – these need to be framed. And that's where chrome and paint come into play." The group, which has held a 45 % stake in Teclac Werner GmbH, Fulda, for almost a year, covers both. While Teclac specialises in painted plastic surfaces, Hübner-KTB contributes its expertise in galvanised plastic parts. "Here in Stuttgart, we are making our first joint appearance as a holistic surface provider." The panel shown contains three different chrome parts that Hübner-KTB assembles for Jaguar Land Rover (JLR). In the automotive sector, which accounts for 80 % of the electroplating business at Hübner-KTB, the company has won several new projects that will go into SOP from the end of 2025. www.huebner-ktb.de



for the interior

Automotive Interiors Expo offers a glimpse into the future of automotive interiors

The surface specialist Silcos from Reutlingen is 100 per cent active in the automotive interior segment. Plastic and silicone components, painting, laser technology, metallisation of plastic surfaces using PVD and various printing processes are part of the spectrum. Account Manager Bernhard Sack identifies the topics of light and individualisation as the main trends. For even illumination over a surface, Silcos has developed a flexible light guide made of silicone that can be adapted to any surface structure and shape. Together with Jana Lorenz, team leader of internal services, Bernhard Sack demonstrates the colour ranges of surface finishing in the Porsche 911 using the gear selector lever and the 5-series switch panel: "With the black chrome look, Porsche has a recognition effect. Our customised PVD colours ensure that even the finest haptic details are preserved." www.silcos.com



"Since the film technology has also been used for exteriors, the areas of exterior and interior have been merging", observes Nils Wehmeier, responsible for sales/project planning at the thermoforming specialist Qin-Form from Herford. The elimination of the radiator grille on electric vehicles results in closed fronts and more creative freedom for designers. Qin-Form manufactures the corresponding film inserts for the integration of lighting effects, sensors, etc. To do this, PC carrier films are screen-printed on the front and/or back depending on the desired effect, then shaped and trimmed before being sent to the injection moulding company. "The first vehicles with such fronts are already on the market. Audi and Daimler are particularly strong here." For large components of up to 1,400 x 800 mm, Qin-Form has recently invested in a thermoforming system from the special-purpose machine construction sector, which is characterised by particularly narrow tolerances. "Competition with the Far East is not so strong because the applications are very technology- and thus coordination-heavy." www.qin-form.de

How can sustainability be visualised? Johannes Grau, Strategic Accounts Mobility Services at Grafe, knows that this is a key challenge for the automotive industry. In this context, textile or terrazzo looks are in demand. "We proactively discuss future trends with OEMs and develop sample plates and trend colours for specific customers." In doing so, Grafe identifies trends and supports the entire product development cycle by developing customised masterbatches or compounds. www.grafe.com





Kunststoff Helmbrechts (KH) presents its know-how spectrum of high-quality decorative surfaces and smart operating solutions in a dodecahedral touchball: lacquered, heated and capacitive surfaces, film technologies, integrated electronics. With "Heat Spider", Bastian Wirth shows the result of the further optimised KHeat process for evenly heatable plastic parts. The basis for this is heating tracks, which are screen-printed onto a film with silver conductive paste. The film is formed, punched out and back-injected. Foliotec has invested in a new screen-printing system for more precision, less warpage and thus reduced waste in IML production. The former subsidiary KH Foliotec became part of KH AG on 1 January 2025. www.kh.de

The Kunststoff-Institut Lüdenschied is the initiator and consortium leader of the "Materials Forum of the Future" project, which has been running for a year. Project manager Katharina Prammer, who spoke at the trade fair about the sustainability of surface-finished parts, said in an interview with K-PROFI: "We want to advance the circular economy in the plastics industry and shape a circular future along the entire value chain. This can only be done collectively, by taking into account all the players in the chain and identifying influences. We are still concentrating too much on recycling. But sustainability can also be achieved through efficient production or a long-lasting design. The topic is complex. We want to shed light on it. The interest is huge, and so is the demand for knowledge." www.werkstoffforum.de; www.kimw.de



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Trade Fair Calendar

Trade fairs related to plastics processing in 2025 and 2026

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

Chinaplas	Shenzhen, China	15.04. – 18.04.2025	www.chinaplasonline.com
Control	Stuttgart, Germany	06.05. – 09.05.2025	www.control-messe.de
Moulding Expo	Stuttgart, Germany	06.05. – 09.05.2025	www.moulding-expo.com
Plasttechnik Nordic	Malmö, Sweden	07.05. – 08.05.2025	www.plasttechniknordic.com
PlastAsia	Bangalore, India	09.05. – 12.05.2025	www.plastasia.in
Cirplex	Klagenfurt, Austria	13.05. – 15.05.2025	www.kaerntnernessen.at
KPA/Kuteno	Bad Salzuflen, Germany	13.05. – 15.05.2025	www.kpa-messe.de/www.kuteno.de
Compounding World Expo	Mumbai, India	14.05. – 15.05.2025	www.compoundingexpoindia.com
Plastics & Rubber Thailand	Bangkok, Thailand	14.05. – 17.05.2025	www.plasticsrubberthailand.com
Plastpol	Kielce, Poland	20.05. – 23.05.2025	www.targikielce.pl/en/plastpol
Greenplast	Milan, Italy	27.05. – 30.05.2025	www.greenplast.org
HanoiPlas	Hanoi, Vietnam	04.06. – 07.06.2025	www.chanchao.com.tw/hanoiplas
Plastec East	New York, USA	10.06. – 12.06.2025	www.imengineeringeast.com
Central Asia Plast World	Almaty, Kazakhstan	25.06. – 27.06.2025	www.plastworld.kz
Kunststoffenbeurs	's-Hertogenbosch, The Netherl.	17.09. – 18.09.2025	www.kunststoffenbeurs.nl
Vietnamplas	Ho Chi Minh City, Vietnam	17.09. – 20.09.2025	www.chanchao.com.tw/vietnamplas
Fachpack	Nuremberg, Germany	23.09. – 25.09.2025	www.fachpack.de
Powtech	Nuremberg, Germany	23.09. – 25.09.2025	www.powtech.de
K 2025	Dusseldorf, Germany	08.10. – 15.10.2025	www.k-online.de
Injection Molding & Design Expo	Cleveland OH/USA	12.11. – 13.11.2025	www.injectionmoldingexpo.com
Compamed	Dusseldorf, Germany	17.11. – 20.11.2025	www.compamed.de
Formnext	Frankfurt/Main, Germany	18.11. – 21.11.2025	www.formnext.de
Plast Eurasia	Istanbul, Turkey	18.11. – 22.11.2025	www.plasteurasia.com
SPS	Nuremberg, Germany	25.11. – 27.11.2025	sps.mesago.de

Plastex 2026	Cairo, Egypt	11.01. – 14.01.2026	www.plastexegypt.com
Swiss Plastics Expo	Lucerne, Switzerland	20.01. – 22.01.2026	www.swissplastics-expo.ch
Plastindia	New Delhi, India	05.02. – 10.02.2026	www.plastindia.org
33. Intl. IKV Colloquium	Aachen, Germany	04.03. – 05.03.2026	www.ikv-kolloquium.de
Wire, Tube	Dusseldorf, Germany	13.04. – 17.04.2026	www.wire.de/www.tube.de
Interpack	Dusseldorf, Germany	07.05. – 13.05.2026	www.interpack.com
Interplas	Birmingham, UK	02.06. – 04.06.2026	www.interplasuk.com
FIP 2026	Lyon, France	02.06. – 05.06.2026	www.f-i-p.com
Equiplast	Barcelona, Spain	02.06. – 05.06.2026	www.equiplast.com
Plast	Milan, Italy	09.06. – 12.06.2026	www.plastonline.org
Compounding World Expo	Frankfurt, Germany	23.09. – 24.09.2026	eu.compoundingworldexpo.com
Fakuma	Friedrichshafen, Germany	13.10. – 17.10.2026	www.fakuma-messe.de
IPF Japan 2026	Chiba, Japan	01.12. – 05.12.2026	www.ipfjapan.jp

Customised packaging solutions

How Benker develops and produces customised blisters, trays and inserts in small and large series



Photo: K-PROFI

Gerald Henke describes the company philosophy: "We are not a big player on the market, but we can keep up with them while being much more flexible. This enables us to develop and manufacture the right product for every customer in any quantity."

Workpiece carriers, sliding blisters, hinged blisters, trays, inserts – and the vast majority of these are custom-made: this is what characterises Benker GmbH & Co. KG from Dietenhofen. Managing Director Gerald Henke sums up the company's USP in a few words: "We are not a big player on the market, but we can keep up with them while being much more flexible. This enables us to develop and manufacture the right product for every customer in any quantity."

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

In figures, this means that the thermoforming company produces small series of just 100 transport packaging units or workpiece carriers, as well as large series of 1 million parts. The company produces around 20 million products a year. These go to the automotive industry as well as to the construction, electrical, toy, pharmaceutical and medical technology sectors. "We supply many packaging solutions for sensitive electronic components. Here, ESD packaging with antistatic or even conductive properties is in demand. These days, they make up a third of our portfolio, and the trend is rising," explains Gerald Henke.

One of the medium-sized company's major advantages is its own design department with two employees and its own toolmaking. When a customer enquiry is received, the specialists develop the optimal solution. This means using as little material as possible while ensuring that the product has a high load-bearing capacity. A recyclate content of up to 80% has been common practice for years. The materials of choice are films in thicknesses of 0.2 to 3 mm made of PS, A-PET, G-PET and GAG-PET. In addition, the company uses film material made of ABS, PE and PC, for example. Some materials are made from 3-layer films with internal recycled material or completely from new material. Henke explains the simple reason for this: "Not all regulatory requirements can be certified for the recycled material. That's why we like to use the three-layer film here, so that we can use a high proportion of regrind."

Benker purchases the film rolls on an order-by-order basis and processes them on one of seven Illig RV 53 or RV 74 thermoforming machines. None of the machines is more than ten years old; a modern machine park is important to Henke. To carry out punching work that would reduce cycle times on the RVs or where very tight tolerances are required, Benker works with a separate bridge punching machine. Folding machines are used for the blister folds. The machine heats the formed tray linearly and then bends the edge along the fold in the next step. The machine can also perform double folding. If a customer wants a logo or other decorative elements, a hot stamping machine is also available.

Delicate yet stable

During a visit to the company, K-PROFI was able to see what the daily routine at Diethenhofener looks like by viewing a workpiece carrier for a compressed air nipple. The tray is designed to automatically insert and transport 63 of the small brass components. The customer requested a disposable solution. Henke reports from experience: "We often produce a disposable solution and then, months later, we find out that the customer is using it as a reusable product after all. Of course, cracks can appear at the edges over time under daily use. If we design a reusable solution right from the start, we factor in higher mechanical strength as early as the design stage, so that the tray can withstand the stresses of everyday use."

The disposable solution is sufficient for the compressed air nipples. The tray consists of a 0.8 mm thin r-PS film. The maximum drawing depth for this product is around 70 mm. The designers created two undercuts on each side at the edges, so that contact surfaces are created here on which the trays can be stacked. When held up to the light, the individual cavities for the compressed air nipples after the moulding process are revealed to be very thin-walled. Nevertheless, the delicate transport packaging, with a net weight of just 60 g, can easily carry the 1,200 g load. In real life, up to ten of the trays are stacked on top of each other, with the upper layer serving as a cover for the compressed air nipples below.



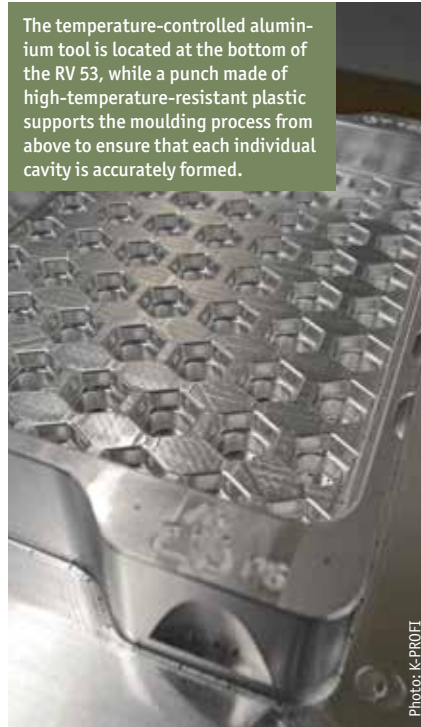
The majority of Benker's products are custom-made. The quality control department checks whether the component meets the required standards.



The transport packaging for the compressed air nipples weighs just 60 g itself but can easily handle the entire 1,200 g load. Up to ten of the trays can be stacked on top of each other.



Lukas Hofmockel has set up the RV 53 for tray production and is monitoring the production.



The temperature-controlled aluminium tool is located at the bottom of the RV 53, while a punch made of high-temperature-resistant plastic supports the moulding process from above to ensure that each individual cavity is accurately formed.

The tempered aluminium tool lies at the bottom of the RV 53. From above, a punch made of high-temperature-resistant plastic supports the forming process to ensure that each individual cavity is accurately formed. The film runs from the roll through the upper and lower heating and is warmed up. During the subsequent vacuum forming, the film is drawn into the tool, the upper punch serves as a drawing aid so that the film material is distributed evenly and that the lower bottom of the individual nests for the compressed air nipples still has a sufficient material thickness. The vacuum forming is supported by compressed air. Once the moulding process is complete, the tray is forcibly ejected

using compressed air. The products are then cut into the desired product geometry using punching knives in the machine.

The company collects all the punching residues in mesh boxes next to the machines and sends them back to the manufacturer, thus returning them to the recycling loop. It is not worth having a shredder of its own because the variety of materials is too great. When manufacturing the compressed air nipple tray, the trained process mechanic for plastic and rubber and team leader Lukas Hofmockel did not equip any automation with. The batch size is not so large, and the workers can conveniently remove and stack the trays manually.



After the moulding process, the punch gives the tray its desired geometry.

Everything from a single source

Tool changes occur several times a day at Benker – this is an unavoidable consequence of the large number of small and medium-sized batches. The company has several thousand tools in constant use. Gerald Henke explains: “We sometimes change tools every hour, and a large batch is produced after a week at the latest. That’s why we have to change tools quickly.” If only the tool is changed, it takes 10 minutes. For more complex set-up processes with robotics and automated stacking, as well as a different punch, it can take up to an hour. The tool storage area and the punching machine are located directly next to or in front of the seven deep-drawing units. This keeps distances short and makes changing tools quick.

The company manufactures the tools and the drawing aids on three CNC machining centres. Henke explains the internal processes in more detail: “Thanks to our high level of vertical integration, we can offer our customers a complete range of services from a single source. We advise on the choice of material, design the component, mill the tool, produce a sample and, after customer approval, we manufacture the product. This enables us to meet customer requirements on an individual basis.” As soon as an enquiry is received, the sales department determines which material in which thickness is to be used for the component and on which of the seven machines it is to be produced. To minimise the number of roll changes per batch, the thermoforming company purchases its goods in the appropriate width, thickness and length for each order. “We always have enough roll material in stock for around four weeks of production and at least two suppliers for each material type that we work with,” explains Henke.

A look at the company

The high degree of customisation results in a very wide range of transport packaging with completely different customer requirements. For example, a tray for circuit boards is currently being produced on an RV 74. The customer produces 20 different circuit boards with the same dimensions. The reusable tray, made of a conductive 3-layer PS-rPS-PS film, has different codes on the edge. The customer’s automation system uses these to identify which tray is intended for which type of printed circuit board. This eliminates the possibility of confusion. Also on an RV74, inserts for tools are produced



View into the machine during production: at the end of the forming and punching process, an operator removes the trays manually.

Photo: K-PROFI



Benker developed the handling systems in-house. Here, the vacuum gripper removes the trays for ceramics and stacks them.

Photo: Benker

next to it. Benker developed the integrated stacking system itself. A vacuum gripper removes the punched tool inserts and stacks them on top of each other.



Photo: K-PROFI

"We do not punch the holes in the bottom of these trays on the thermoforming machine during operation because the trays could get stuck at high production speeds," explains Joachim Geiger.

A workpiece carrier made of 1 mm thick A-PET film has already been produced for an automotive supplier. Some of the workpiece carriers are currently being provided with a total of 36 holes in the bottom using the bridge punch. The purpose of this is to allow some of the components that the tray will later support to be cleaned in the tray at the automotive supplier. The punched holes are necessary to allow the cleaning liquid to drain off. "We don't punch the holes on the thermoforming machine during operation because the trays could get stuck at high production speeds. We would have to slow down the speed, so punching the holes afterwards is the better solution," explains Joachim Geiger, Head of Sales.

Wide range of packaging solutions

A small selection of customer solutions in the showroom demonstrates the wide range of applications for packaging solutions.

Benker has created sliding blisters made of conductive PS for a manufacturer of tiny optics. Thanks to the sliding blister pack, it is possible to remove the optics individually and then close the packaging again.

"This type of packaging is often also in demand for replacement parts. It allows the end customers to remove the parts as needed and keep the rest safely," Henke clarifies.

A tray made of r-PET with a rotating stacker holds components for an electric motor. The components are arranged in each layer

of the stacked trays in an offset pattern, creating a very high packing density. The customer stacks a maximum of twelve layers, which then weigh 2 kg, so that they are still easy for employees to carry. A circuit board manufacturer approached the packaging experts with a completely different set of requirements. They needed a packaging solution that could accommodate three different series of circuit boards with different dimensions. "We developed a suitable solution," Henke confirms and continues: "This saves the customer tooling costs, because they only need one tool for the three series. It also allows him to purchase in larger batch sizes, which also reduces costs. His logistics costs are also minimised. So it's a comprehensive solution in the customer's interest."

Creativity was also called for from the designers when it came to packaging in which completely different components for the final assembly of a part were to be brought together in one container: screws, nuts, O-rings, cable ties. Everything had to be kept together in the smallest possible space, while still being clearly arranged. Since the packaging and its contents are used at an ESD assembly station, it is made of dissipative PS and the lid is made of transparent PET with an antistatic coating. The developers created two levels, with the small parts at the bottom and the O-rings at the top, so that they can be clearly arranged. For delivery, the packaging for the O-rings is placed on top of the small parts. The lid fits both the upper and lower layers of the packaging.

Photo: Benker

Having its own toolmaking shop makes it possible to map customer enquiries from the design and production of the tool to the final product in-house.



Photo: K-PROFI



Benker produced these sliding blister packs made of conductive PS for a manufacturer of tiny optics. The sliding blister pack makes it possible to remove the optics individually and to reseal the packaging.

In addition to the countless special packaging solutions, Benker offers a range of 400 standard products: folding and sliding blisters as well as trays. The blisters are made exclusively from r-PET and are mainly purchased by retailers that do not require precisely fitting packaging. The customer can choose the right size for them from the

standard dimensions provided. The advantage: there are no tooling costs. Henke explains the standard packaging business: "We produce 97 per cent customised solutions for our customers and only around three per cent standard packaging. In total, we produce around 700,000 standard packages a year and these are also exclusively made to order."

Solid family business

The medium-sized company can look back on 140 years of business and is still family-owned. In 1885, August Benker founded the "Bayrische Fichtenpechsiederei" (Bavarian Pitch Distillery) in Nuremberg and processed beer barrels with spruce pitch. The introduction of the beer bottle and the Second World War called for a reorientation. In the meantime, Rolf Benker, the grandson of the founder, had taken over the helm. In the 1950s, the graduate chemist experimented with polystyrene plates and thermoformed advertising signs for breweries.

Rolf Benker gradually entered the transport packaging market and bought more thermoforming machines. In 1994, his daughter Anne-Charlotte Schöllhorn, née Benker, and her husband Thomas Schöllhorn took over the management of the company, which the family placed in the hands of Gerald Henke in 2020. Today, 50 employees work in the company, the atmosphere is familial, everyone knows everyone. Henke is satisfied with the company's development despite the global crises: "Despite the macroeconomic challenges, we have had a positive financial year. This is due to the acquisition of new customers, for whom we were able to develop creative solutions. This has enabled us to tap into new markets and further expand existing ones." 

www.benker-packaging.de

Photo: K-PROFI



A circuit board manufacturer needed a packaging solution that could accommodate three different series of circuit boards with different dimensions. This saves the customer tooling costs, as he needs only one tool for the three series.

Photo: K-PROFI



This packaging, which takes up as little space as possible, holds screws, nuts, O-rings and cable ties for an ESD final assembly station. It is made of conductive PS and the lid of antistatic, transparent PET.

What's next in medical technology?

How digital assistants can accelerate qualification and validation processes

Artificial intelligence and its “tremendous potential” for validation in medical technology were a central topic at the medical technology conference held in mid-February at the Stuttgart Technology Forum of the Austrian injection moulding machine manufacturer Engel. A total of 140 people attended Medcon – more than ever before. Engel used the opportunity to provide initial insights into a project for accelerating qualification and validation processes, which is to be implemented in a joint exhibit with Hack Formenbau and Ilse Automation at K 2025.

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



Pleased with the positive response to Engel's medical technology conference at the Stuttgart site (from left): Christoph Lhota (Vice President Medical and Packaging), Michael Wiesinger (Head of Medical Sales Europe Central) and branch manager Claus Wilde.

The Medcon medical technology conference is one of the regular networking events organised by Engel's southern German branch. This year's record number of participants is an expression of the industry's development. "The medical market is doing well not only in Central Europe, but worldwide," says Claus Wilde, Managing Director of Engel Deutschland GmbH in Wurmberg near Stuttgart. Christoph Lhota, Vice President Medical and Packaging, sees three future markets in particular: immediate diagnostics close to the patient with point-of-care devices (POC), continuous glucose monitoring devices (CGM) with double-digit growth rates and prefilled syringes made from COC/COP. The latter are increasingly gaining ground against the glass version because they offer

various advantages, especially for sensitive mRNA therapies. In line with this, Engel demonstrated an all-electric e-mac 465/80 injection moulding machine in the technical centre, which used a four-cavity mould from Vasantha VTW to produce 1 ml syringe bodies from COC in an 11.5 s cycle.

Auto-injectors are currently booming, driven by their use for so-called weight loss or diabetes injections, in which the patient administers the active ingredient themselves. "This trend is here to stay," says Lhota. He puts the market volume at more than USD 50 billion with impressive annual growth rates of 10 % and more. Engel is also benefiting from this. The injection moulding machine manufacturer already reported on a

special boom for the medical sector in America at Fakuma 2024. "Greenfield production is emerging. Time-to-market has been greatly reduced here."

However, qualification and validation processes take time, usually a lot of time. Accelerating these is therefore a path that pays off. "With our digital systems, the tools are already there, but they are still underutilised," reports Christoph Lhota. One example is the iQ process observer, which reliably recognises when a process is stable again after changing the critical process parameters. Statistical test planning can thus be significantly reduced compared to the conventional approach – where you wait 90 minutes because the process is then considered to have stabilised. As a rule, one hour is saved, says Lhota, as well as the corresponding waste.

Recording mould breathing without additional sensors

Engel worked together with mould maker Hack to find out how embedding modern assistance systems in the validation process creates time and cost benefits. Both companies already offer a variety of digital tools for the injection moulding process. These modules are now to be harmonised with each other specifically for use in medical and pharmaceutical technology. Engel is bringing the result together under the term "iQ validation control". Christoph Lhota recognises great potential in the recording of the mould breathing signal: "This provides us with additional information from the cavity, similar to the cavity pressure, but without the need for additional sensors." In this way, it is not only possible to determine the optimum clamping force and the exact holding pressure time. What is particularly appealing: With the help of the mould breathing



Daniel Leinert (right) from MA Micro Automation: "We will be bringing the very same cell presented here at Engel to Düsseldorf in the autumn to demonstrate our in-house core expertise in image processing."

curve and its monitoring using a tolerance band or reference envelope curve, it is possible to duplicate a validated process on other injection moulding machines – a milestone: "The idea itself did not come from us, but from big players in medical technology." The new concept of shortened process validation using iQ validation control will be demonstrated at K 2025 in an exhibit together with Hack and Ilseman Automann.

Production cell for 96-fold application

Engel is already showcasing a production cell with various digital assistance systems designed in collaboration with partners Männer Group and MA Micro Automation in the technical centre. The all-electric e-mac 1565/220 injection moulding machine (with clean room package) produced protective caps (container needle hub) made of PP in a 96-cavity mould. "The focus here is on output, energy efficiency and unmanned production. We use the iQ weight control and iQ clamp control tools to record the mould breathing curve," explains Michael Wiesinger, Head of Medical Sales Europe Central at Engel. Daniel Leinert, Senior Account Manager Medical Consumables at MA, categorises further key figures: "Our automation concept is based purely on linear technologies. These are repeatable to $\pm 5 \mu\text{m}$. With a cycle time of 5.8 s, 0.8 s is pure removal time; with transfer, 0.9 s is for handling. The limiting factor here is the manufacturing process in injection moulding." The next step is a 100% inspection of the protective caps. In this application, the presence of the components is checked on-the-fly. In a similar system with a 128-cavity mould, however, MA

included an inspection for typical features. "We operate in a niche with our automation concepts: high cavities, fast cycle times, complex component geometries, with the premise of 100 per cent inline inspection." "It is precisely this cell presented here at Engel that we are also bringing to Düsseldorf in the autumn and demonstrating our in-house core expertise in image processing," announces Daniel Leinert, adding: "We have 15 employees who form a separate department for image processing."

Evaluating plastics holistically

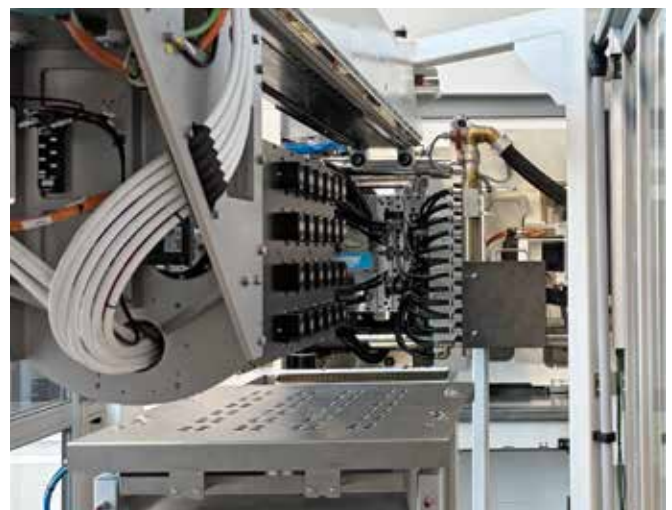
Presentations from partner companies rounded off the knowledge exchange. Lucas Pianegonda, founder and Managing Director of Gradical GmbH from Switzerland, structured the right choice of materials for medical technology applications. The holistic evaluation of plastics according to technical, process-related, economic, regulatory and sustainability requirements is the core expertise of his company, which he offers as a service and which he also reports on in his own podcast.



96 of these protective caps (container needle hub) made of PP are produced in a production cell with an all-electric e-mac 220 injection moulding machine in a cycle time of 5.8 seconds.

Innovative mould technologies for medical technology applications with silicone elastomers were presented by Robert Köttner from Ach Solution GmbH, Fischlham/Austria. Due to the very low viscosity of the material, gap dimensions of less than $2 \mu\text{m}$ are required. "Precision is what counts here," says Köttner. This also applies to various high-cavity moulds that Ach Solution has implemented for needle-free connectors for infusions. As a highlight, Robert Köttner referred to a micro application realised with Engel: a tiny, 0.0005 g LSR part for which Ach Solution developed the material dosing, the sealing nozzle and the LSR cylinder.

The micro-automation concept is based purely on linear technologies, which ensure a high level of repetition accuracy.





Benjamin Henning from Greiner Bio-One in Frickenhausen (shown here with a cell culture bottle) provided an insight into the production of 2,800 different products.

Insight into production at Greiner Bio-One

Plastic laboratory products are the core business of the Austrian medical technology company Greiner Bio-One, based in Kremsmünster, which has almost 2,700 employees and a turnover of 637 million euros. It operates in three business areas: Preanalytics, BioScience and Sterilisation. The German site in Frickenhausen, with over 400 employees, is responsible for the BioScience business area and produces special products for the cultivation and analysis of cell and tissue cultures. Benjamin Henning, Head of Industrial Engineering, provided an insight into the production of 2,800 different products, which require around 1,800 setups per year. In addition to injection moulding, the most important processes used by Greiner Bio-One here are injection stretch blow moulding, IML, laser and ultrasonic welding.

Warema: Breakthrough in the pharmaceutical industry

The Franconian company Warema, founded in 1955 as a sun protection company, started its OEM business 33 years ago and decided 15 years later to focus on the industrial, automotive and medical markets. In the mean-

time, all three sectors are equally weighted in terms of the generated turnover. In the medical technology business unit, Warema combines the development and manufacture of components and assemblies for medical technology, pharmaceuticals and diagnostics. The first clean room was put into operation in 2015. The second followed in 2023, for the production of closure systems for prefillable syringes, so-called Luer Lock systems. This project marked Warema's breakthrough into the pharmaceutical industry. Steffen Grün, Head of Business Unit Medical, and Sebastian Höffken, Director Business Unit Medical,

shared their experiences with the conference participants, from the commissioning of the equipment to the construction of the clean room and on to series production, as well as the scaling up from initially 100,000 to now around 700 million parts per year. 4

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Plastics technology for medicine

How Spang & Brands is entering its fourth generation of business with material know-how, toolmaking, development and assembly expertise

For more than 40 years, Spang & Brands in Friedrichsdorf has focused exclusively on the development and production of high-precision consumables for medical, pharmaceutical and laboratory use. The one-stop supplier supports customers from the product idea to article development, prototype construction, injection moulding production and assembly in the clean room to the ready-to-use packaged assembly. In addition to comprehensive material know-how, the company's unique selling points are its own toolmaking and assembly expertise in a clean and sterile environment. Currently, the family-owned company is undergoing an exciting transition as responsibility is passed on to the fourth generation.

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

Rafaela Echtermied, Head of Business Development (left), and her twin sister Ricarda Echtermied, Head of Customer Relations, are gradually taking over the responsibilities of their father Friedrich Echtermied, who has been managing Spang & Brands for 50 years.



All photos: K-PROFI/Manuel Hauptmann

Spang & Brands was founded in 1909 by Aureus Spang and Jakob Brands as a factory for shoe machines that connected the upper leather material to the soles by sewing or metal staples. When gluing technology replaced sewing and stapling in the early 1950s, the company changed its focus with the technological arc of stapling technology to packaging machines for fruit and vegetables, which were packed in nets and held together with staples. At the same time, the family found its way into the construction of injection moulding tools, which were then used to test the operation of injection moulding machines and thus became the extended workbench for the automotive and toy industries, among others.

In the 1970s, Spang & Brands in Oberursel came into contact with its then still medium-sized neighbouring company Fresenius. "We were able to build a tool for Fresenius and thus received our first order for a medical application in peritoneal dialysis," recalls Friedrich Echtermied, who has been at the helm of the company since 1974. Before a necessary relocation in the early 1980s, he fundamentally questioned the future strategy. The result: Since 1982, Spang & Brands in Friedrichsdorf has been dedicated exclusively to plastics technology for the medical and pharmaceutical industries. "In this respect, we can confidently say that we know the requirements of the medical and pharmaceutical market and therefore also understand our customers."

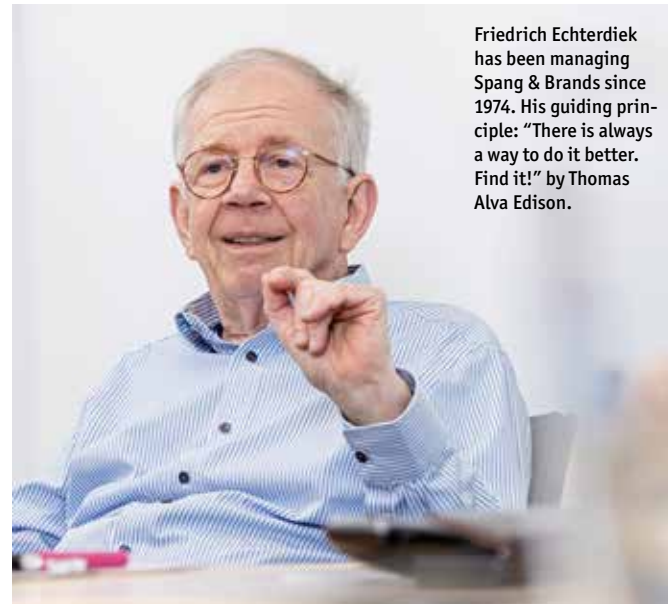
With 180 permanent employees and 40 temporary employees, Spang & Brands generated a turnover of around 34.5 million euros in 2024. In addition to Friedrich Echtermied, the grandson of one of the company's founders, who is the strategic and commercial head of the company, the technicians Jürgen Mader and Alexander März are managing directors. Friedrich Echtermied and his three children Fabian, Rafaela and Ricarda are shareholders. While the son has pursued a medical career, the twin daughters have recently joined the company in order to gradually take over their father's operational tasks.

Early involvement in product development

“Right from the start, we have tried to be involved in the development of the articles as a one-stop supplier, so to speak, in order to be able to influence the design from a production point of view,” says Echterdiek, highlighting what he sees as a key success factor: “Ultimately, we try to offer our customers a complete service,” which ranges from product development to series production and ready-to-use packaged assemblies. “The second focus of our DNA, so to speak, is material expertise,” he emphasises, highlighting the criteria of suitability, compatibility, processability and sterilizability.

“All of our customers’ parts are approved and registered. Any changes, even if only for visual reasons, have many consequences. Our tools must still meet the quality standards of the first day even after 20 years. As you can see, this requires a special way of thinking and an exceptional understanding of our customers. This is another reason why we focus only on medical and pharmaceutical products.” For Friedrich Echterdiek, the second important aspect of this strategy is the employees: “They also need a focus on cleanliness, precision and durability.”

Alexander März, as technical managing director, relies on sensor technology in the injection moulding tool, direct injection with needle valve systems and 3D-printed sintered inserts.



Friedrich Echterdiek has been managing Spang & Brands since 1974. His guiding principle: “There is always a way to do it better. Find it!” by Thomas Alva Edison.

Products and systems with high precision and functionality requirements

In addition to individual components, Spang & Brands also manufactures a whole range of application-ready products on behalf of its customers. These include a variety of functional parts and systems for diagnostics, pharmaceutical applications or medication. A bone cement mixing and dosing system assembled from various injection-moulded parts came to the company via a customer sketch and now integrates numerous functions and application aids. After only nine months of intensive development work with the customer, the manufacture and assembly of these systems began in 2007 – initially in small quantities, in 2024 the figure was almost 500,000 systems.

The Friedrichsdorf-based company is an expert in the processing of soft PVC, which is used, among other things, in the production of blood bags. The trick is to take into account the shrinkage of the PVC after sterilisation, which can be around 8 %, and to keep it under control.

For a world market leader in the field of eye laser surgery, the Friedrichsdorf-based company manufactures so-called contact glass holders. Doctors place these on the eyeball before laser surgery. A vacuum is applied through high-precision, small holes to fix the eye in place. Precision and the absence of burrs are important criteria. Here, too, unit volumes have increased from a few thousand in the early years to around 5 million in 2024.



PVC twist-off ports for blood bag systems have a pierceable membrane and can withstand the shrinkage that occurs after sterilisation without any loss of function.

“Of course, we are pleased when solutions that we have developed together with customers develop positively over time and unit volumes increase. Nevertheless, niche products with small quantities are also of interest to us. New customer enquiries and their requirements have ultimately brought us to where we are today,” says Friedrich Echterdiek, “for example, our development team is currently working intensively on sheathing a steel wire with soft PEEK material.”

To close the chest again after heart surgery, the sternum is pulled together with steel wire. To reduce the risk of cutting and to protect patients with osteoporosis, for example, Spang & Brands is looking for solutions to coat the wire with soft PEEK. The product is currently in the approval process and should be on the market by 2026 at

the latest. “We developed the injection moulding process with a process engineering influence on the application properties in our own technical centre. At a congress, doctors would have liked to take our samples with them, that’s how well they were received,” reports Jürgen Mader.

Rejection of own products: service provider instead of distributor

“But we don’t go to the hospital with our own products,” emphasises Friedrich Echterdiek, citing two reasons: “Firstly, there is the huge effort involved in registration – not only in Germany, but often in 25 or 30 countries. And secondly, we don’t want to compete with our customers. We see ourselves as a service provider, as a supplier, but not as a distributor. Our customer relationships are long-term relationships. Over more than 40 years, we have built up a relationship of trust, including a technical one, with many well-known global players, so that we can really discuss systems and solutions.”



Rafaela Echterdiek,
Head of Business Development

Rafaela Echterdiek worked for the global brewery market leader Anheuser Busch Inbev for eight years, six of which she spent in IT, and was most recently responsible for the digitalisation of 32 breweries in Europe. She joined Spang & Brands in the summer of 2024 and is driving the digitalisation of the family business as Head of Business Development.

K-PROFI: Large-scale brewing and injection moulding for the medical industry – the contrast couldn’t be greater, could it?

Rafaela Echterdiek: You’d be surprised how many parallels there are. The brewery is all about liquids, but at the end of the day, the same difficult questions arise: document management, quality assurance, data requirements and the like. And then there’s the digitalisation of employees, i.e. how everyone can access the information that is relevant to them. It’s not that different.

Which specific projects did you tackle after your orientation?

Here I am mainly concerned with the digitised automation of our production and

Digitalisation creates new control loops

efficiency. Digitisation is extremely important for Spang & Brands, and we have to continuously develop it. That’s where I’m starting – we will replace our current ERP system with a new one in January 2026, which will also bring us new digital possibilities. But beyond that, we also need our own software. I see huge potential there.

Can you give us an example?

We have 70 injection moulding machines and last year we produced 430 different items in batches. I don’t want to say that anyone can produce endurance runs. But the challenge is to realise each product and to produce and document it in every shift in the injection moulding shop with its own requirements and specific quality criteria. Nowadays, you can only master this complexity with data.

What is important with the large amount of data obtained?

The question is how we can provide the data to the right employees at the right time in a well-structured way. Ideally, we also help to interpret the data. I think we are already good at building understanding, but we also have to make use of new, additional possibilities. Artificial intelligence and the question of which algorithms we can work with are crucial for us to continue to be among the top medical suppliers.

And that can’t be done with the ERP system.

We are working on various concepts and with various tools, for example with Arburg on the integrated simulations in the Gestica control system and with tools from ArburgXworld. We are testing and want to tease out: What is relevant for us?

How do employees feel about your digitisation activities?

One crucial point is that employees develop in the direction of digitalised methods in their way of thinking. In the past, the superstar in toolmaking was the person who could grind out mini-contours on the grinding machine. Today, it is young people who programme on the computer. In toolmaking as in injection moulding, we have to ask ourselves together with the people: What do I gain in terms of data, and even more so, in terms of information? Because I can’t do anything with numbers alone.

But what?

We need a combination of information about the material, the tool and the production process in order to manufacture components with a high degree of consistency, product safety and production reliability. Basically, we need a combination of everything, because control loops are created in the machine and beyond – from injection and switching to demoulding and subsequent automatic assembly. The future will be all about using these.



Jürgen Mader shows a steel wire coated with soft PEEK for closing the sternum after heart surgery, which is expected to come onto the market no later than 2026 after approval.

Jürgen Mader, who has risen from toolmaking to injection moulding, development and production management at Spang & Brands to become technical managing director, is still clearly enjoying his work after 45 years. According to Friedrich Echterdiek, Mader is the “technical brain of the company” and has been involved in many products from the ground up. “On the customer side, we are seeing more and more changes,” says Mader, regretting the loss of long-standing contacts. “Sometimes we tell our customers the story of their products.” Alexander März has been working in medical technology for 25 years. The trained toolmaker, master craftsman and business graduate has been with Spang & Brands for ten years and has been responsible for toolmaking and injection moulding production as technical managing director for seven years.

The importance of material properties and in-house material development

Spang & Brands processes many thermoplastics, from PVC to PP and PEEK to polylactides, as well as temperature-free silicones and TPU for sealing functions. Friedrich Echterdiek: “A great deal of material expertise is required to ensure that parts made of materials approved for medical use survive sterilisation, for example steam or gamma sterilisation, without distortion or destruction.” Spang & Brands itself drives the development and production of plastic types for medical products with several compounders in different countries. “We use approved materials to create our own formulations – we now have 30 different ones, often with special functions that our partners compound just for us. For some plastics, certain tests do not exist because the quantities in the medical sector are too small,” says Jürgen Mader, “so we have to do it ourselves, and that’s another area in which we specialise.” The materials, of which special types cost up to several thousand euros per kilogram, are a constant issue for Mader: “Catalyst changes, the switch to phthalate-free types, nitrosamide contamination, new requirements are constantly coming up.”

Spang & Brands has been designing articles and tools and simulating tools for optimal injection and cooling for decades in-house, while structural analyses are carried out with partners. Many individual parts of the medical assemblies have very narrow tolerances – often

because predetermined breaking points have to be precisely represented so that packaging or functional parts can be safely broken, torn or twisted off with defined forces during use. That is why critical parameters are monitored and many injection moulded parts are subjected to 100 % optical inspections.

First-class toolmaking for stable series production

Spang & Brands’ philosophy also includes an in-house toolmaking department, which today employs 30 people in a 1,000-square-metre area. Friedrich Echterdiek: “If I have to produce millions of parts, then I need a first-class tool. Our expertise in in-house toolmaking gives us a decisive advantage: enormous precision and quality for our customers’ products. Whether it’s a small series or a million-piece production run, we stand for an absolute zero-defects strategy.” If there is any doubt as to whether a process can be successfully transferred to a stable series production, he sees few alternatives: “Then we have to work with the customer to change the product design, use different materials or look for other alternatives. And when in doubt, we would rather turn down an order than say yes to everything.”

Spang & Brands mainly supplies itself with tools. “We see our toolmaking not only as a profit centre,” explains Alexander März, “but also as the basis for the quality of our precision injection moulded parts. Accordingly, the construction of a tool goes hand in hand with on-site production at our company.” Spang & Brands would like to take on more toolmaking projects, but the challenge is finding enough staff. Continuously training toolmakers has proven to be a good solution. According to Alexander März, current technical topics here include, in addition to the cavity pressure and temperature sensors that have been installed in the standard for almost 20 years, direct gating with needle valve systems, 3D-printed sintered inserts or cores made of thin-walled stainless steel and curved cores with cooling right up to the tip.

The potential of 3D printing in tool technology and fixture construction

Years ago, it was only used for samples. Today, Spang & Brands relies on generative manufacturing not only for tool elements but also for fixtures, holders and models. Alexander März: “We print components to test processes in automation before we go into steel. The injection moulding shop prints grippers and handling systems, including those made of carbon-fibre-reinforced material.” He is also keeping an eye on 3D printing for the production of small series: “With annual requirements of only 1,000 units, we are wondering whether we will need an expensive tool in the future or whether we will be able to print the products at some point. Either way, we always want to be able to offer our customers state-of-the-art products.”

Jürgen Mader reports that customers are still looking for experience: “Experience and understanding of customer requirements are important success factors because more and more companies are pushing into the stable pharmaceutical and medical industry. It usually takes three years for the investment-intensive process before the first part actually comes out of the mould. The advance performance is very high.” That is why test projects are running in different directions in the in-house technical centre with three injection moulding machines. “We have our own technical centre so that we don’t have to rely on others. We want to be able to carry out our own tests.”

Fully electric injection moulding machines with integrated simulation software

“In addition to development, complete-system supply, materials expertise and tool-making skills, we also need the latest injection moulding technology in-house,” says Friedrich Echterdiek with conviction. 70 injection moulding machines with clamping forces of 350 to 3,500 kN and a focus on 1,000 kN, including several for 2K applications and for moulds with up to 128 cavities, are available in the

clean room. Consistent automation of removal with integrated test routines, as well as storage and packaging sorted by cavity, facilitate traceability. More than 20 assembly machines put large-scale series parts together, while small quantities are completed semi-automatically or manually and packed ready for use. The entire injection moulding halls are clean rooms according to clean room class ISO 8. The assembly of components and completely packed medical devices also takes place in the clean room.

In production, Friedrich Echterdiek relies exclusively on all-electric machines, and has done so since 2000. “We had conventional hydraulic machines from Arburg for a long time, but then we bought Fanuc machines because there were no electric ones available elsewhere, until we became the first customer for electric machines at Arburg.” The main reason for Spang & Brands has always been the precision



Ricarda Echterdiek,
Head of Customer Relations

Ricarda Echterdiek joined the commercial division of Spang & Brands in 2022 after seven years in various sales positions at the confectionery company Ferrero – most recently as a national key account manager. As Head of Customer Relations, she is primarily responsible for strategic customer management, sales, purchasing and human resources.

K-PROFI: You and your sister both come from the brewing and confectionery industries.

Ricarda Echterdiek: *(laughs)* We gave it our all to create patients.

Now you're coming into smaller, long-established structures.

Long-established structures often sound slow and entrenched. But the opposite is the case. We have the ability to make quick decisions and try things out. We can respond quickly to new requirements. In large corporations, politics and hierarchies often play a role that slows down processes. The dynamics in a medium-sized company cannot be compared to those in a large corporation. Of course, our structures are much smaller than those of a large corporation. Nevertheless, we have many long-standing employees at Spang & Brands who have often been with us

The right mix makes for good staff

for over 20, sometimes 30 years. We are very proud of that. It shows that our employees feel comfortable and believe in the company's vision. New employees and fresh minds are also joining us. I think it's this mix that makes us special.

Nevertheless, you have to make a great effort to find personnel.

Absolutely. Unfortunately, we are also affected by the “vexing” issue of the shortage of skilled workers. The effort required to find new or suitable personnel has increased dramatically in recent years. For us, there must ultimately be three matches when recruiting: professional, personal and the desire to be part of a family. Every single employee plays an important role for us. Only if everyone is willing to go the extra mile sometimes can the company continue to be successful.

Where are you experiencing particular difficulties?

Skilled workers who already have a certain level of expertise remain a bottleneck. We invest a great deal of time and energy in identifying interested young people who are keen to learn. It is becoming increasingly difficult to fill positions for toolmakers, which used to be the “gold standard” in technical training with opportunities in all directions.

How successful are you at recruiting employees with an immigrant background?

We have people from 30 different nations working for us. Everyone who accepts our values is warmly welcomed here. Our new

apprentice in toolmaking is from Afghanistan, came to Germany two years ago, speaks good German and is doing his training here. I think that's impressive and great. We're happy to have anyone who wants to get involved, regardless of their nationality or skin colour. The main thing is that they want to make a difference.

What do you still miss?

The machine can be top. The tool can be a Ferrari. The whole system can be top. That someone brings expertise in the materials and in the application technology and also understands the digital possibilities and uses them in a suitable form – I have not yet found an applicant with this mix. Accordingly, the further development of our own employees is important.

What way out do you see?

For several years, we have been trying to work with interns and apprentices. Because young people ask questions differently. They question things that we may have been doing the same way for years. Why aren't we doing it differently? Why aren't we doing it more digitally? And often these are questions that lead to an “aha” effect or to which there are easy and quick answers. On the other hand, we have many experienced employees with expertise in materials, tools and processes. We need to provide better training in how these factors interact, allow new approaches and keep asking new questions. I firmly believe that it's all about getting the mix right.



The precision and quality of the mass-produced goods is not only checked visually on the injection moulding machine, but also in the laboratory, by touch and by computer tomography.

of the electric machines. The company has taken a further step with the integrated configuration based on Cadmould simulations in injection moulding machines. Friedrich Echterdiek: “We initially tested two new Arburg machines with the Gestica control system. Simcon’s integrated simulation software makes it easier for us to find the right process parameters and to precisely monitor the filling process when commissioning the mould. This speeds up the validation process. We have now ordered five more machines from Arburg in this configuration because it gives us a boost in injection moulding production. There is no way around digitalisation and automation if we want to remain competitive in the long term.”

Strategic partnerships and the status as sole supplier

The Friedrichsdorf site has grown organically and through the acquisition of neighbouring existing buildings since 1982. “For a production facility that displays the material flow from A to Z, the location is certainly no longer optimal,” admits Rafaela Echterdiek, “nevertheless, we also see possibilities for expanding production here at the site. For example, we will gradually expand our production to 24/7 by the end of 2025 in order to make the injection



In several clean rooms, 70 injection moulding machines are in operation with automated moulded part removal and integrated test routines.

moulding process more efficient and expand capacities,” says Echterdiek. “Even small green spaces are still available at the site for further expansion.”

“We already have two completely separate production halls and thus some security in terms of production capacities. For some of our long-term customers, we are not only a strategic partner, but the only supplier of certain products. It is therefore important to be in close contact with customers regarding production reliability, safety stocks and possibly additional locations,” explains Ricarda Echterdiek.

“As in the past, we want to remain open to new technologies, new materials, new challenges and opportunities in toolmaking and injection moulding in the future, in order to remain the competent partner for our customers in the field of plastics technology in medicine,” says Ricarda Echterdiek. “For years, our guiding principle has been: ‘There is always a way to do it better. Find it!’ by Thomas Alva Edison. This motto will continue to drive us in the years to come to find solutions for our customers that may not yet exist today.” 

www.spang-brands.de

The cavity-sorted storage and packaging of the injection-moulded parts ensures that the effects of defects are minimised and that traceability is maintained right back to the production stage.



The automatic, semi-automatic or manual assembly of components and medical devices, as well as ready-to-use packaging, takes place in ISO Class 8 clean rooms.



The chemistry has to be right

How certifications and the development of formulations for recyclates are driving sustainable projects forward

For the dyed-in-the-wool chemist and recycling expert Dr Manica Ulcnik-Krump, it all comes down to chemistry. She is certain that chemistry is the key to success, especially when it comes to recycling plastics, and she is proud to head the first and so far only EU-accredited research institution specialising in the analysis and development of recyclates. The Interzero Plastics Innovations competence centre, which is accredited according to ISO/IEC 17025:2017, has just moved into its new location in Lenart, Slovenia. Nine employees with state-of-the-art equipment in chemical-thermal and physical-mechanical laboratories, as well as pilot plants, are advancing plastic packaging such as squeeze bags from Gualapack, mailing boxes from Memo and bottles from Rupar Plastika towards a circular economy.

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



“For us, Interzero’s expertise in testing the recyclability of our Pouch 5 was and is very important,”

says Lorenzo Sacchi,
Sustainability Manager at Gualapack.

“Compromises in terms of printability, feel or functionality were out of the question for us and our customers,” says Lorenzo Sacchi, Sustainability Manager at Gualapack in Alessandria, Italy, describing the premise behind the development of “Pouch 5”. This is the first stand-up pouch with a spout made of PP monomaterial that is 100 % recyclable. Developed in 2020 by the leading supplier of pouches, the innovative packaging was tested for sortability by Tomra and certified chemically and mechanically by Interzero, in compliance with Ceflex guidelines. “Verifying recyclability and optimising packaging for the circular economy is one of our three important pillars,” says Dr Manica Ulcnik-Krump, explaining the collaboration with Gualapack.

Every year, around 250 packaging items from manufacturers across Europe are tested and evaluated in Slovenia in accordance with international standards. Pouch 5 was among them in 2020 and 2022, receiving 20 out of a possible 20 points each time – fully recyclable.

“For us, Interzero’s expertise in testing the recyclability of Pouch 5 was and is essential. We are proud to have developed an optimal product,” says Lorenzo Sacchi. The product’s triumphal march proves how useful it is. In 2021, the PP-Mono-Pouch won the “Best Packaging Award” in Italy. More and more customers, including major brand owners such as Nestle and Kraft Heinz, are using it. “Pouch 5 is now our flagship product. It already accounts for around a third of our flexible packaging sales,” reports Lorenzo Sacchi.



This stand-up pouch with spout from Gualapack was the first to be made entirely of PP, making it recyclable and suitable for both hot and cold filling.

The pouch is available in sizes from 70 to 200 ml, for both cold filling and sterilisation and pasteurisation, and can therefore also be used for yoghurt and baby food. Of course, the packaging needs a good barrier effect for food filling, which in this case is achieved by a 3-layer solution with a biaxially stretched middle film. The monomaterial PP pouches have an outer layer that is easy to print and even allows for a matt varnish effect. The mono version has another advantage over the standard version: it produces around 40 % less CO₂ during production, lifetime and recycling, which makes it particularly interesting for all companies that want to reduce their carbon footprint.

But Gualapack doesn't just offer the flexible packaging itself; on request, it can provide a complete package consisting of pouch, filling line and closure.

Customised material development

The second mainstay of Interzero Plastics Innovations is to develop reusable compounds from non-homogeneous lightweight packaging waste. Manica Ulcnik-Krump explains: "Every year, we develop around 40 new customised formulations, using 100 % recycled materials unless the customer specifically requests otherwise. We only use new materials for additives such as modifiers, stabilisers and colourants."

One example of a successful material development is for Memo, a company based in Greußenheim that offers sustainable products for everyday needs, ranging from stationery and textiles to cosmetics, furniture and garden utensils. Since 2009, the company has offered the Memo Box, a sustainable and reusable shipping option that has just been awarded the German Sustainability Prize in the Products category. "We are particularly proud of the fact that we have been able to raise both the rigidity and the impact strength of the PP recyclate to a level that is almost impossible to achieve even with new material," says Manica Ulcnik-Krump, who sees the solution here as lying clearly in the interplay between the latest technological possibilities and the high level of expertise in polymer chemistry. "Our material knowledge makes us unique." The 100 % recyclates can also be dyed. "The Memo-Box has a great grass-green colour and is the best proof that light packaging residues from the yellow bag can be processed into products with attractive colours again without additional colour sorting."

Fortunately, the market has relaxed a little when it comes to colour preferences, the chemist continues, citing the paint bucket as an example of one of the first products to be made from recycled materials as early as 2010. Whereas it used to be white, the buckets found on the shelves of DIY stores are now grey. "We now supply many paint bucket manufacturers with recomponds that have flow properties adapted to their processing conditions, even with an MFR value (230/2.6) of up to 80 g/10 min," says Manica Ulcnik-Krump with satisfaction. Furthermore, tensile strengths of up to 2,000 MPa can be guaranteed, which means that the stability of the molecular structure is maintained in any case.

Precise production processes

How exactly does the development of a new material come about? "We always adapt the material properties based on the defined functionality and application of the end product. First of all, we need three kilograms of the raw material that the customer uses for their product, along with three kilograms of the plastic part they produce," says Manica Ulcnik-Krump, explaining how a new project gets started. Once again, it all comes down to chemistry. The team uses a variety of tests to determine how the polymer changes during the customer's manufacturing process. The results enable exact conclusions to be drawn about the required property profile, which are then incorporated into the development of the recompond recipe. "As a rule, we develop three types that are slightly different in terms of rheology and mechanics, produce 100 to 300 kg of each type and make these available to the customer for sampling." Speaking of production: this is carried out at the Interzero sites in Eisenhüttenstadt and



Photo: Interzero

40 customised formulations made from 100 % recycled materials are created each year at Interzero's internationally accredited centre of excellence.



In Lenart, a small recycling plant handles the production of small quantities of the recomounds, which is on a par with a large production plant.



The chemical-thermal laboratory is equipped with all the testing procedures required for characterising the incoming and outgoing goods.

Liebenau. Around 40,000 tonnes of PE and PP recycled pellets are produced annually on Erema systems. “We measure both MFR and colour online so that we can always make adjustments,” says Manica Ulcnik-Krump, thus guaranteeing the consistent quality of the products.

Project completion in 36 weeks

“At the beginning of each project, we define with the customer which deviations in the rheological-mechanical or colour characteristics of the compound he can tolerate in the production of his products. In addition, the most important criteria for the processing and the quality of the end product are established.” So the chemistry between the

customer and the supplier of the compound also has to be right. The reason why defining tolerances is so important is that the incoming goods fluctuate both regionally and seasonally. Fortunately, over the last 30 years, Interzero has acquired a great deal of knowledge and an extensive database on the differences between summer or winter packaging in the yellow bag, as well as on packaging use in southern or northern Germany. “We even go one step further: based on our data, we can make forecasts about changes in the packaging market in the next few years,” says Manica Ulcnik-Krump, convinced of her team’s expertise. It usually takes 36 weeks for a project to be completed – from the initial enquiry to the production of the desired tonnage for the customer.

From extrusion to blow moulding quality

The chemist is proud of another fact: “We are currently the only ones who can use mechanical recycling with chemically controlled rheology modification to produce blow moulding products from 100 % light packaging material from post-consumer streams that were previously only suitable for extrusion processes.”

One of the first to use blow moulding quality for the production of hollow bodies for detergents and cleaning agents is the Slovenian company Rupar Plastika from Domžale. Here, too, chemistry was once again important: Interzero developed a mechanical recycling process for light packaging goods with a minimum PE content of 95 %. The process does not require any special preparation, but it does use a chemically controlled rheology modification. A special combination of additives modifies the flow properties of the PE in such a way that the viscosity increases and the melt flow rate decreases – precisely the properties needed for blow moulding.



At the opening of the new Interzero Plastics Innovations site in Lenart, Dr Manica Ulcnik-Krump (left) and Interzero shareholder Dr Axel Schweitzer welcomed the President of the Republic of Slovenia, Dr Nataša Pirc Musar (2nd from left), and the German ambassador, Sylvia Groneick.

“Our knowledge of the chemical relationships enables us to additivate recycled materials in such a way that individual recompounds are created that can meet all customer requirements,”

says Dr. Manica Ulcnik-Krump confidently.



Photo: Interzero

The flow properties of the raw material are of great importance for all processing steps. Among other things, these depend on the polymer chain length, which is almost uniform in the case of new material. The distribution of polymer chain length is quite different for recycled material, where it is non-uniform due to previous processing and possible degradation processes. While it is possible to use chemical crackers and modifiers, which are usually peroxide-based, to shorten and standardise the chain length for PP recompounds, this is more difficult with

PE. Here, an uncontrolled process could even lead to the molecules becoming cross-linked.

Manica Ulcnik-Krump is pleased that Interzero has a head start here. “The quality of the blow moulding has been achieved by combining a thorough understanding of the material and the production technology.”

Equipment leaves little to be desired

Finally, chemistry comes into play again in the third pillar of Interzero – in Persona. “We work with major players in the chemical industry and evaluate the feedstock qualities

for chemical recycling,” says Manica Ulcnik-Krump, introducing another area of expertise. For the evaluation, Interzero uses its extensively equipped laboratories, as in the other areas. In this case, the chemical laboratory is equipped with an energy-dispersive X-ray fluorescence analyser, which can determine the content of all elements in the periodic table in proportions of less than 1 ppm. In addition, there is a calorimeter to determine polyolefinic proportions, a gas chromatograph, and TGA, DSC and microscopes, so that every required method is covered. 

www.interzero.de



Photo: Interzero

Erma recycling plants at the Interzero sites in Liebenau and Eisenhüttenstadt produce around 40,000 tonnes of PE and PP recycled pellets annually.

Not only the mechanical properties, but also the colour of the recompounds can be adjusted according to customer requirements.



Photo: Interzero



The company is now run by the second and third generations: Martin and Anika Kirsch.

Between a boutique manufactory and an industrial firm

How Kirsch Plastics Technology has developed into a specialist in coating solutions and hot forming processes

It all began in 1985, when Elke and Alexander Kirsch started Kirsch Plastics Technology GmbH in their garage in Ebersbach an der Fils, using hot forming processes for small quantities. The entry of son Martin Kirsch in 1989 led to a real surge in growth. He landed major projects, especially in the motorsport and mechanical engineering sectors. By forming large transparent semi-finished products made of PC and PMMA, Martin Kirsch closed the circle with his parents' processes, which he significantly upgraded. Anika Kirsch, now the third generation of managing partners, explains: "My father realised that there were no systems on the market for scratch-resistant and UV-stable surface coating in clean rooms for small and medium quantities. But polycarbonate needs a scratch-resistant coating to protect the component surface."

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

Martin Kirsch inspects the cabin for a cargo bike that the company is manufacturing for Hopper Mobility.

Anika Kirsch confidently explains: "We are big enough to map industrial standards, but small enough to develop individual solutions for our customers."



An employee covers the component with a thin film to protect the surface.



Before CNC machining, all the printed, shaped and coated components are given the thin protective film that protects the surface during processing.



The employee heats the highly transparent PC semi-finished product linearly in the bending machine ...



... and then forms it in the bending template into covers for a dental device.

Martin Kirsch's inventive spirit was sparked, and so he developed the coating systems himself. He even built the first one with his people on his own. Today, the company has three coating systems in three clean rooms – two are manually loaded, the other works semi-automatically. All systems are used to full capacity in three-shift operation. This is because the company not only coats the components from its own hot forming processes but also works as a contract coater.

The coating systems consist of thermally curing nano-paints based on polysiloxane. They are applied with a layer thickness between 4 and 12 µm. Depending on the requirements for the component surface, various coating systems with different performance levels are available. From the simple coating over a pre-applied and then flash-off primer with

subsequent coating to the high-end solution. Here, both the primer and the polysiloxane coating are baked on.

During the on-site visit, 2,400 x 2,100 x 8 mm highly transparent PC plates are waiting to be coated. "I don't know what the customer will use the plates for. This is a contract job," explains Anika Kirsch. Most of the components to be coated are manufactured with an oversize so that holes can be drilled around the edges. The employees hang the huge plates in the anteroom of the clean room by the drill holes and remove the protective films. They then clean the plates with isopropanol and ionised air to remove any electrostatic charge. The plate then enters the clean room. The coating is applied manually. All of the company's coaters have completed special training to ensure they can do the job to the required standard.

The challenge: the coating must be applied absolutely evenly. Equipped with protective clothing and breathing apparatus, the specialist covers the plates with the polysiloxane coating from top to bottom. Anika Kirsch explains: "We have special lighting in the clean room so that the coater can apply the coating very evenly and immediately detect any possible droplets. We can also coat very complex geometries with this manual process – and that from a quantity of one. The flooding also washes away the last dust particles from the surface. This is how we achieve the glass-look surface that our customers appreciate so much." With the glass-look surface, it is actually impossible to tell that the component has been coated.

The overflow of the flood coat is collected in a tray below the component, and the paint is fed into a cycle. Sensors constantly monitor

the solids content of the paint, and solvent is added as needed. In addition to the paint parameters, the company also monitors all parameters such as humidity and temperature in the clean room.

Once all the PC plates have been flooded, the employee moves them to the oven at the back of the clean room. Here, the coating is thermally cured depending on the component. Anika Kirsch: "We can cure the coating together for components of the same thickness but different geometry, because

the curing temperature and duration depend on the material thickness of the component. The geometry of the components is not relevant for the curing of the coating."

In the semi-automatic system next door, numerous motorcycle windshields are currently being coated for OEMs and Tier 1 – within a year, the number of units ranges from just a few to more than 100,000. The Ebersbach-based company can coat a range of different geometries, from simple to complex, in a single process. "That's our strength,"

emphasises Anika Kirsch. "As far as I know, we are the only company that flood coats small and medium-sized series in a clean room. This enables us to offer our customers a very high degree of customisation within a series."

Printing – Forming – Coating

Around 90 % of the components that pass through Kirsch's production halls are made of PC, and the vast majority receive a coating. The company has ECE approval for vehicle windows that are used in the rear and

Before the semi-finished products are transported to the clean room for the coating process, they are cleaned with isopropanol and ionised air.



In the clean room, a specially trained employee floods the semi-finished product and applies the scratch-resistant coating.



Manual flooding makes it possible to coat even complex geometries and achieve a glass-look finish.

side areas of, for example, sports cars, special-purpose vehicles or the Volkswagen Moia. Kirsch also produces decorative trims, front lights and partition windows for vans.

In addition to the automotive industry, other important customers include the mechanical engineering and medical technology sectors. Elegant machine safety doors, surgical lights and panels for charging stations for electric cars greet visitors as soon as they enter the company building. During the tour, machine safety doors are being manufactured in the production area. As with many other components, Kirsch is able to score points here with its various technologies under one roof. The door, made from a 2,000 x 1,800 x 12 mm thick PC semi-finished product, was first sent to screen printing, where the black pattern

and dots were printed on the back. To ensure that the dots and pattern are in exactly the right place after hot forming, a model print is first created on a plate and then formed in the oven. Anika Kirsch describes the background: "The print is not only influenced by the forming process, but the polycarbonate also shrinks due to the heat input – and this even varies from batch to batch. That's why we have to create a new model print for each new batch." The specialists adapt the print image based on the model print. Only then can the small series be produced.

In the case of the machine safety door, the company uses one of its many forming ovens. Employees place the printed semi-finished products on the aluminium or sheet metal tool, which is covered with a special

In the forming ovens, the semi-finished products lie on tools covered with a special cloth, where they are shaped by their own weight and conform to the tool contour.



cloth. They heat the oven in the case of the machine safety door using a system-controlled temperature control. The material softens slowly and settles onto the tool contour under its own weight. Once the moulding is complete, the temperature in the oven is slowly reduced and the component is removed after the cooling phase. "This is how we produce components that are absolutely free of tension. This is important for the coating so that no stress cracks occur in the downstream processes," explains Anika Kirsch.

The flawless Glass-Look surface is the focus of attention throughout the entire manufacturing process. Not a single dust particle, not a single bubble, not a single mould impression must mar the optical appearance. In addition to the flood coating and the careful heating and cooling of the semi-finished products, an optimal tool surface is also required that does not leave any marks in the PC or PMMA semi-finished product. Martin Kirsch, a creative mind, came up with the solution himself: a special fabric that absorbs dust particles and does not leave any marks is stretched over each of the tools.

In addition to the usual scratch-resistant and anti-fog coatings for PC and PMMA, Kirsch also has its own coating systems: infrared-reflective, antistatic, electrically conductive and antibacterial. The electrically conductive coating means that, for example, transparent moulded panes can be heated and functionally controlled. "This is an important step for the future of functional coating systems," explains Martin Kirsch.

Precise bending and folding

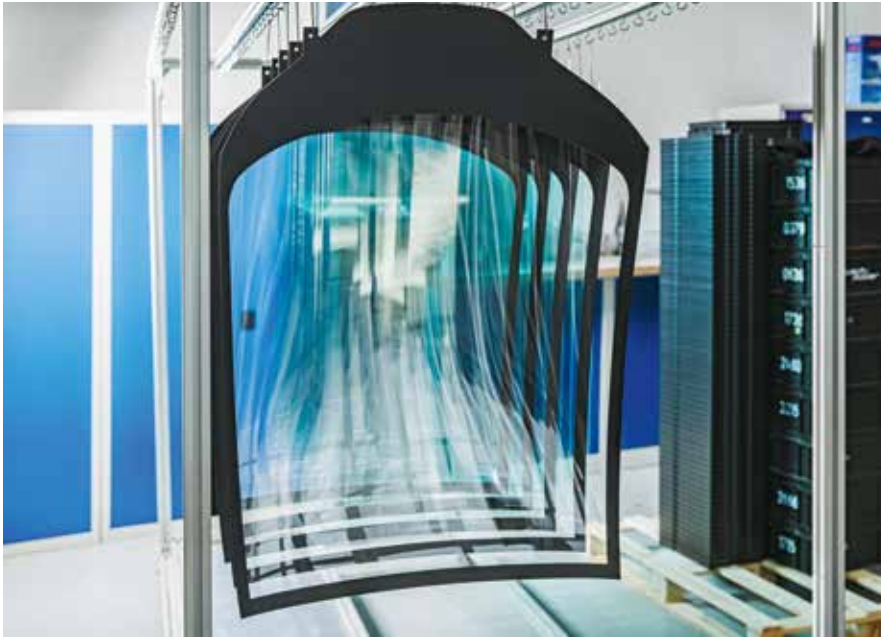
In addition to the forming furnaces, the company also works with bending machines. On these, the semi-finished products are linearly heated with quartz radiators along the bending line. Semi-finished products up to a length of 3,500 mm can be formed. The company achieves precise radii by using bending edges or bending templates. For example, in the case of a 12 mm thick semi-finished PC product, a screen-printed pattern is applied to the back. The operator heats the material at the bending lines and then bends the desired radii on the angle table. The resulting cabin window for a tree harvester is then flood-coated. "This is a challenging component, if only because of its weight. We have to be careful when heating it so that no bubbles form," explains Anika Kirsch.

In addition to the cabin window, the employees use the bending machines to produce a hood for a dental device made of a 1.5 mm thick PC semi-finished product. The plates are heated linearly and then placed in a bending template in which they are folded at two 90° angles. The worker loads the template compartments one after the other. Once the last compartment has been filled, the first hoods have cooled down and can be removed. After the forming process, an employee laminates the components with a thin film to protect them.

The other components are also laminated with a protective film after coating. Only then does the next production step follow: CNC machining. All components are given

The digital printer makes it possible to create large panels with a high degree of design freedom.





For vehicle windows, the semi-finished PC product is screen-printed, formed, coated and finalised in the CNC machining centres before the forming process.

their final form on one of the 5-axis or 3-axis CNC machining centres before they go into assembly if required: gluing, welding, laser marking or even laser cutting are used. The laser cutting system can cut plates up to 2,000 x 1,500 mm. The company uses the system primarily for PMMA, as the cut edge melts slightly, creating a polished edge.

Wide range of design options

Screen printing cannot meet all customer requirements and reproduce all motifs. On the one hand, it only works on flat surfaces and therefore not on moulded components. On the other hand, there is only a limited range of screen-printing colours available. When screen printing is not an option, a spray booth is available that is specially designed for painting plastic. The painting is done using a spray process with liquid paint. The advantage: both large and small components with complex geometries can be painted in all RAL colours and different gloss levels. The company usually paints components made of transparent material from the back, thus creating a special depth effect.

One example is the cabin of the Hopper-Mobility cargo bike. The optically sophisticated deep-drawn PMMA-GS component from Mack Kunststofftechnik is first painted at Kirsch. The employees meticulously mask each individual cabin window before it enters the painting system. After painting, the panes are taken to the coating system to increase their scratch resistance. Once the coating has been thermally cured, a protective film is applied to each pane to protect the surface during the subsequent 5-axis CNC machining.

For components that can manage without a scratch-resistant coating, digital printers with a print area of up to 3,000 x 2,500 mm are also available. The complete absence of colour makes it possible to customise each individual item or to add consecutive numbers. Logo panels made of PC are a typical product. These simple-looking panels are complex to produce. Anika Kirsch describes the process:

Two employees remove a finished milled component from the workpiece holder of the CNC machining centre.



Pre-formed components are given the desired colour design in the paint booth.

"We apply the lettering and logo from the back using digital printing. We spray the large surfaces in the spray booth to achieve a metallic effect, and the front of the panel receives a scratch-resistant coating. Thanks to the different processes that we combine, we can offer our customers a truly wide range of design and finishing options."

Before the components leave the Ebersbach production site for the customer, they all undergo quality control. Under special cold and warm white light, employees carefully examine the surfaces to detect any defects.

With 50 employees, Kirsch generated a turnover of around 10 million euros in 2024. While the competition relies on high volumes in automated coating lines, Kirsch, as a specialist, serves its customers from a volume of one. Anika Kirsch sums it up: "We are large enough to meet industrial standards, but small enough to develop individual solutions for our customers. Our company is on the threshold between a boutique manufactory and an industrial firm. This enables us to handle constant component changes. That is our niche – and we are strong in it." ■

www.kirsch-kunststofftechnik.de

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Leading and trusting the team

New managers are often initially (generally) distrusted by their own team. There are often doubts as to whether they have the necessary skills for the new position. This phenomenon can be observed in different contexts and at different levels, for example when a new mayor takes over a position as head of an administration, when a new officer assumes responsibility for a military unit or when a new manager joins a company.

The secret of success is to first of all place trust in the existing, long-standing team. In general, each team member has the ability to perform his or her task and contributes to the functioning of the overall apparatus without the need to demonstrate the superiority of each individual's knowledge of certain issues.



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

The (new) conductor of an orchestra can initially assume that the members of the orchestra have mastered their instruments. The team is certainly capable of playing previously rehearsed pieces together. When rehearsing a new piece, the orchestra members first learn their individual parts. This is followed by rehearsing the ensemble playing, for example the strings or wind instruments. Only when this works

can the entire orchestra begin practicing and perfecting the piece as a whole. The conductor refines the piece through his special focus and interpretation so that it can ultimately be performed as a complete work of art. The conductor's overarching leadership task also consists of shaping and perfecting the team after the familiarization phase by replacing or promoting individual members in order to optimize the orchestra's performance.

Interim managers in particular must master this art of leadership like a conductor, but without a long training period in the respective position if they want to be successful in a company. As a rule, they are brought in when a gap has arisen in a company that needs to be bridged at short notice or a new area of expertise needs to be developed.

The ideal is that suppliers, customers and the rest of the organization are unaware of the interim manager's activities. He or she must gain an overview in the shortest possible time in order to determine where intensive and where less intensive support is required. A good team can work effectively without leadership for a limited period of time, but possibly not in the same way, or the important areas do not work together because the coordinator is missing. (Note: Similar to a failed beat in an orchestra, where the interaction between the instruments is impaired, the flow of information can also be disrupted in organizations). These findings are independent of the management level or organizational structure and always apply in their essence. ■

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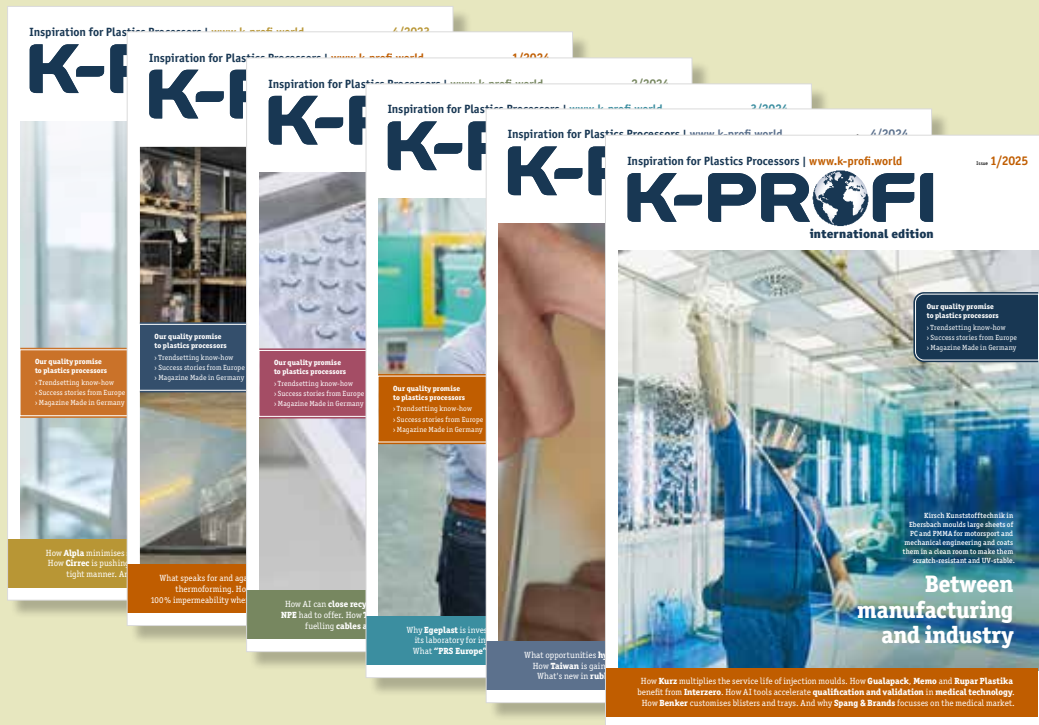
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