

K-PROFI

international edition



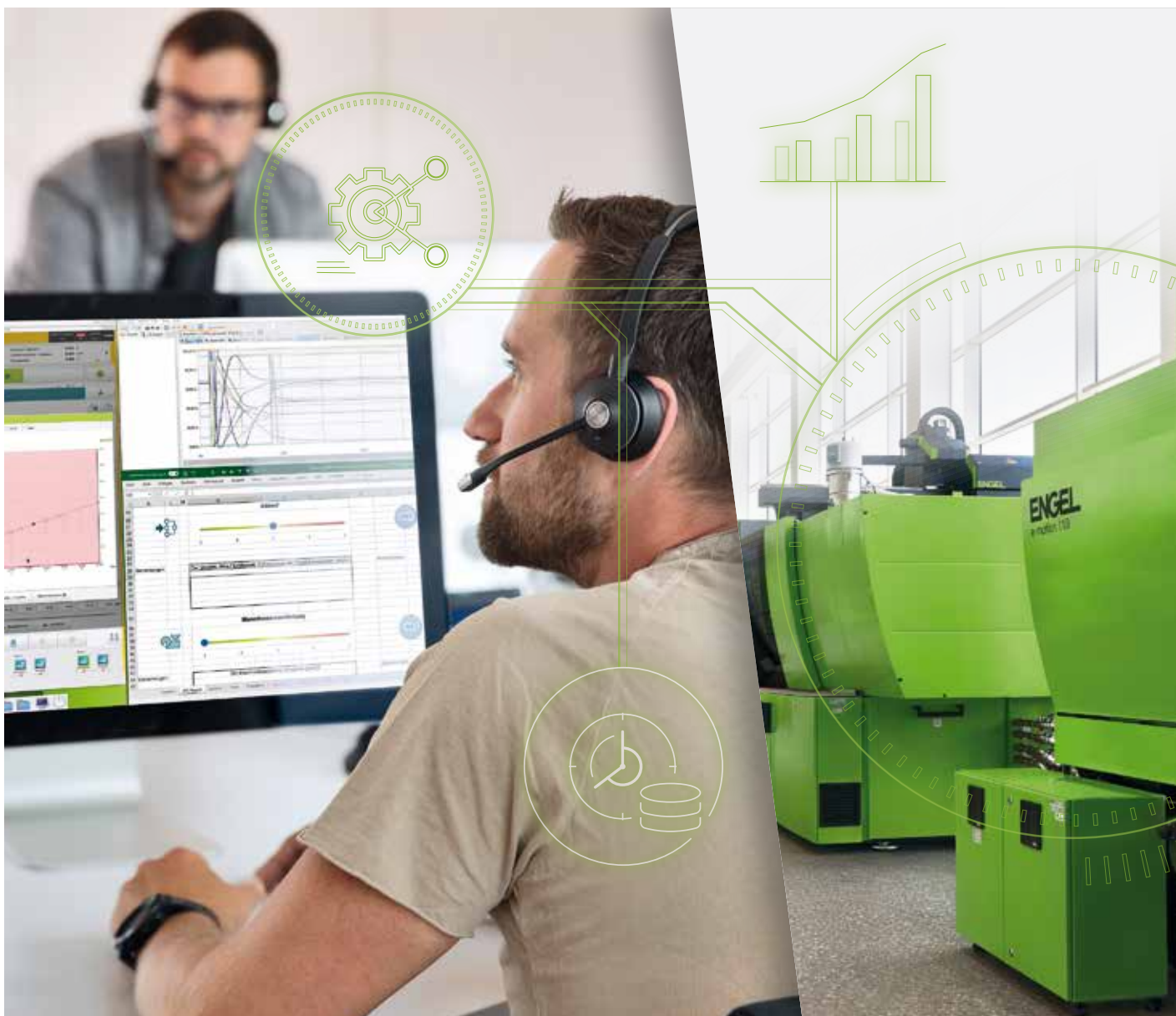
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A look behind the scenes of plastics processing

Dear Reader

Tesafilm and Tesakrepp are world-famous. When it comes to the adhesive masses for them, homogenisation is the key. Thomas Erfurth reveals the preferred processing unit at Tesa on page 6. Feneberg brings minced meat to its supermarkets in mono-tubular bags with a barrier. Joanna Herbst from Schur Flexibles explains what speaks for the alternative to trays and soaker pads (page 10).

For the second time since 2010, Jürgen Mangold had to lead the toolmaker and injection moulder Horst Hähl through an insolvency. How he mastered them is shown on page 14. Calculating the CO₂ footprint of a product is not trivial. Why it is important for every plastics processor, from page 21. The thousands of years old ceramic materials allow substitution only in niches: page 26. Hot gas welding proves to be an alternative to screwing, clipping or gluing, e.g. for complex vehicle parts made of polyamide. Pöppelmann's experience with the non-contact and particle-free process: page 30.

Verpa-Folie creates its own closed material cycles with its customers. The goal: more recycled material, less new material. How this works starts on page 36. Leather has largely become obsolete as a material for luggage, car interiors and footballs. Where and why plastics are replacing leather today, from page 40. PKT optimises its efficiency and saves 1 GWh of energy per year in the process. How the precision and micro injection moulding expert sets benchmarks, from page 48.



Used machines find a second life via direct sales, online exchanges and industrial auctions. Current insights into the market for the sought-after second-hand treasures from page 58. MAM Health & Innovation offers the world's lightest all-silicone dummy. Starlim injects it - in a 2K process from a hard and a soft silicone component (page 66). Currently, increased M&A activities can be observed.

Please register to receive 'K-PROFI international' free of charge and without obligation by direct mailing: www.k-profi.world. The next issue will be published in September, 2021.

Markus Lüling

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Today, the company produces its classic Tesakrepp at its largest location by volume in Offenburg.

Homogenisation is key when it comes to adhesives

Why Tesa and other adhesive manufacturers rely on the planetary roller extruder process principle

Tesa: A brand that probably everyone knows. Adhesive tape: the product that almost everyone also knows and associates with the brand. But hardly anyone knows how these everyday aids are manufactured. Hardly anyone knows how difficult it is to process adhesive compounds so that they do their job safely. K-PROFI learned from Thomas Erfurth, head of the Tesa SE Technology Centre at the Norderstedt site, why the planetary roller extruder is just the right processing unit.

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

Apart from Tesafilm, one of the best-known Tesa products is certainly Tesakrepp, a masking tape that is indispensable for wallpapering and painting work, for example, and has been used since 1941. To produce masking tape, raw paper is first soaked and dried, whereby the fibres shrink and the typical crepe structure is created. The prepared paper is then coated with an adhesive compound made from a mixture of rubber and various additives. This produces giant rolls about 2,000 mm

wide, which are then cut into the 30 or 50 mm wide rolls available in home improvement stores.

Several planetary roller extruders

To ensure that the adhesive mass can reliably fulfil its task in the subsequent application, it must be plasticised very homogeneously. And it is precisely for this purpose that the planetary roller extruder (PWE) from Entex Rust und Mitschke GmbH

in Bochum is used. "Tesa has been working with Entex for over 25 years," reports Thomas Erfurth. The seemingly indestructible systems from Bochum run in several of Tesa's 14 production plants, which employ a total of 5,000 people and produce 7,000 different products. "One of our systems has been in use at Tesa since the beginning of the cooperation and is still running," explains Dr Thomas Birr, Head of Process Engineering Development at Entex.

Tesa also uses PWE laboratory equipment. "Here in our Technology Centre in Norderstedt, we further develop process technologies, produce prototypes of new adhesive masses or product designs, and also manufacture initial small batches," says Thomas Erfurth, introducing his department, in which around 50 employees and about the same number of small plants work to ensure

that the adhesive specialist can launch up to 100 new developments on the market each year. Solvent-free systems have been one of the focal points in recent years. "We have already been converting our adhesive masses to water-based systems, among others, for many years for ecological reasons," Thomas Er-furth emphasises.

Reliable partner

Tesa can rely on Entex in the development of new adhesive systems. "The cooperation with Entex is based on partnership. On the one hand, the technical centre in Bochum is very helpful for us, where we can carry out tests and draw on Entex's process know-how. On the other hand, we appreciate Entex's implementation strength when it comes to new or revised system parts and spare parts. Thanks to the high vertical range of manufacture, we receive fast and uncomplicated support," explains Thomas Er-furth. "We know that the PWE is not a simple machine, which is why we support our customers both with process development here at our company and with the appropriate advice when problems arise on site," confirms Dr Thomas Birr. The support can be provided via remote maintenance, which proved its worth especially during the Corona pandemic, but also through technicians who travel to the customer's site if necessary.

In the production of adhesive masses, the planetary roller extruder demonstrates its advantages to the max, which is confirmed by nine other manufacturers of adhesive masses in addition to Tesa. They use PWEs in many applications for the production of hot melts, plastisols, PUR-based adhesives, silicones and epoxy- or acrylate-based adhesives. After all, the

Little anecdote

The success story of Tesa (company's preferred spelling: tesa) goes back to the unsuccessful development of a sticking plaster. Pharmacist Paul C. Beiersdorf was working on this when Dr Oscar Troplowitz took over the company founder's laboratory in 1890. The plaster stuck extremely well but irritated the skin. Troplowitz made a virtue of necessity and in 1896 launched the first technical adhesive tape for patching bicycle tyres, the Cito sports patch. The company's classic, Tesafilm, has been around since 1941, and painter's masking tape since 1946.



Photo: Tesa

Tesakrepp painter's masking tape is available in a wide variety of versions, e.g. for outdoor use with UV stability or in a particularly thin version for indoor use.

"In principle, our PWE is a series configuration of several extruders, but in one machine," explains Dr Thomas Birr. The special processing unit works, on the one hand, with several planetary spindles that give it its name and ensure a high dispersion and homogenisation performance as well as high exchange surfaces and, on the other hand, with a kind of chamber principle. The individual process tasks such as melting, mixing, homogenising and degassing are separated from each other in the processing unit by dispersion rings so that targeted process control is ensured.

Precise temperature control

"Targeted process control is also very important with regard to the temperatures of adhesive masses," knows Dr Thomas Birr. Resins and waxes in particular can sometimes become very low in viscosity or even liquid at the usual processing temperatures of adhesive masses between 150 and 200 °C. This is why it is so important to control the temperature precisely. If such a liquid compound is to be mixed into a highly viscous base polymer, sliding rather than mixing occurs, which must be avoided. After all, homogeneous mixing is very important for the subsequent application so that no defects occur on the surface of, for example, the painter's masking tape, which could lead to the tape adhering



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too strongly or too little in one place. "The PWE is all about precise process temperature control, which can also vary along the processing unit thanks to the chamber principle," continues the Head of Process Development. This is also confirmed by Thomas Erfurth from Tesa: "With the PWE, we achieve ideal homogenisation with optimal temperature control – and over a short process length."

Adhesive performance is what counts

Compared to alternative mixing units that work in batches, such as internal mixers or agitated vessels, which tend to be used for specialities due to their limited volume of around 250 l, the continuously operating PWE with its high output of up to 1 t/h is used for Tesa's long-running products. In addition to Tesafilm and painter's masking tape, the company produces many different adhesive masses – especially for the 7,000 different products that many people use but often don't know about, let alone see.

Every car and every mobile phone contains adhesive compounds that affix small components and have to be very durable and temperature-stable. Typical adhesive tapes, for example, must not lose performance in a temperature range of -50 to +70°C. But the

requirements for adhesive tapes are much more far-reaching and vary depending on the customer and the area of application. Especially in the application fields of automotive, e-mobility and mobile telephony, the trend is towards adhesive bonding. Here, not only the performance must be right, but also the dimensions must fit. "Especially for small components, a thin but high-performance adhesive tape is more likely to be required, which we offer in pre-cut strips," explains Thomas Erfurth from Tesa.

In order to be able to respond to customer requirements, the Technology Centre has numerous process engineering equipment at its disposal. Here, real-life conditions are recreated and exactly the right adhesive strip for the customer is produced through iterative trials. "For our industrial customers, customised adhesive tape solutions and a professional delivery process are crucial in terms of a robust quality and delivery accuracy. This is where Tesa has proven in its more than 130 years of company history that we are dependable," concludes Thomas Erfurth. ■

www.tesa.com
www.entex.de

Photo: Tesa



Since April 2021, there have been two new environmentally friendly packaging tapes with the Eco logo: Tesapack Bio & Strong and Tesapack Paper Standard, with which Tesa has once again expanded its product line.

Photo: Entex



Whether a component is needed for a production plant or a laboratory PWE, Entex can react and deliver quickly thanks to its high vertical range of manufacture.

Photo: Tesa



Thomas Erfurth, Head of the Technology Centre: "The very good homogenisation performance of the PWE is very beneficial, especially for our adhesive masses."

Fairs are due to start in autumn

All over the world, plans are crystallising

In the middle of 2021, the plans for trade fairs in-person are taking shape. After almost all major events had been cancelled by the summer, a whole series of trade fairs and conferences are on the agenda for the autumn. Here is the current overview through the end of 2022.



Trade Fair	Location, Country	Fair runtime	Homepage
Plastec West 2021	Anaheim CA, USA	10.08. - 12.08.2021	www.plastecwest.com
Indoplas 2021	Jakarta, Indonesia	13.10. - 16.10.2021	www.indoprintpackplas.com
Kuteno 2021	Rheda-Wiedenbrück, Germany	07.09. - 09.09.2021	www.kuteno.de
Equiplast 2021	Barcelona, Spain	14.09. - 18.09.2021	www.equiplast.com
Kunststoffen 2021	's-Hertogenbosch, The Netherlands	15.09. - 16.09.2021	www.kunststoffenbeurs.nl
Interplas 2021	Birmingham, UK	28.09. - 30.09.2021	www.interplasuk.com
Compounding World Expo	Essen, Germany	29.09. - 30.09.2021	www.compoundingworldexpo.com
Plastics Extrusion World Expo	Essen, Germany	29.09. - 30.09.2021	www.extrusionworldexpo.com
Plastics Recycling World Expo	Essen, Germany	29.09. - 30.09.2021	www.recyclingworldexpo.com
Taipei Plas 2021	Taipeh, Taiwan	28.09. - 02.10.2021	www.taipeiplas.com.tw
Fakuma 2021	Friedrichshafen, Germany	12.10. - 16.10.2021	www.fakuma-messe.de
Vietnamplas 2021	Ho Chi Minh City, Vietnam	13.10. - 16.10.2021	www.chanchao.com.tw/vietnamplas
InterPlas Thailand 2021	Bangkok, Thailand	01.11. - 04.11.2021	www.interplasthailand.com
Plastics Recycling Show Europe	Amsterdam, The Netherlands	04.11. - 05.11.2021	www.prseventeurope.com
ArabPlast 2021	Dubai, UAE	15.11. - 18.11.2021	www.arabplast.info
Formnext 2021	Frankfurt/Main, Germany	16.11. - 19.11.2021	www.formnext.de
JEC Forum DACH	Frankfurt/Main, Germany	23.11. - 24.11.2021	www.jec-dach.events
Plast Eurasia 2021	Istanbul, Turkey	01.12. - 04.12.2021	www.plasteurasia.com
Interplastica 2022	Moscow, Russia	25.01. - 28.01.2022	www.interplastica.de
T-Plas 2021	Bangkok, Thailand	09.02. - 12.02.2022	www.tplas.com
Plast India 2022	New-Delhi, India	17.02. - 21.02.2022	www.plastindia.org
JEC World 2022	Paris, France	08.03. - 10.03.2022	www.jec-world.events
Plastimagen 2022	Mexico City, Mexico	08.03. - 11.03.2022	plastimagen.com.mx
ICE/CCE/InPrint	Munich, Germany	15.03. - 17.03.2022	www.ice-x.com
Swiss Plastics Expo 2022	Lucerne, Switzerland	15.03. - 17.03.2022	www.swissplastics-expo.ch
HanoiPlas	Hanoi, Vietman	15.03. - 18.03.2022	www.chanchao.com.tw/hanoiplas
Plast Expo Nordic 2022	Helsinki, Finland	16.03. - 17.03.2022	pfsptec.messukeskus.com
France Innovation Plasturgie	Lyon, France	05.04. - 08.04.2022	www.f-i-p.com
Chinaplas	Shanghai, China	25.04. - 28.04.2022	www.chinaplasonline.com
Argenplas	Buenos Aires, Argentina	06.06. - 09.06.2022	www.argenplas.com.ar
Colombiaplas	Bogota, Colombia	26.09. - 30.09.2022	www.colombiaplast.org
K2022	Dusseldorf, Germany	16.10. - 23.10.2022	www.k-online.com



With flowpack packaging instead of trays with absorbent pads, not only can up to 70 % of the material be saved, but the new packaging also offers other advantages.

Mono tubular bag with barrier

Why Schur Flexibles offers its customers an alternative to conventional tray packaging

“Our customer Feneberg saves 35.7 tonnes of plastic by using tubular bags instead of trays and absorbent pads,” says Joanna Herbst, naming one of the main advantages of the new resource-saving packaging concept for fresh minced meat, a very sensitive packaged good. In some countries, such as Switzerland and France, the packaging concept is already being used, but in Germany and other EU countries, it is only now hitting the supermarket shelves. Together with her colleague Tobias Wegmann, also Commercial Product Manager Converting at Schur Flexibles GmbH from Wiener Neudorf in Austria, she explains what else speaks for the tubular bag and how she assesses its potential.

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

“There is no substitute for plastic when it comes to packaging minced meat safely,” Tobias Wegmann reports. Plastic is light, transparent, flexible and – thanks to the barrier – gas-tight, so that the necessary gassing is possible and does not escape. Packaging in this case means the type that ensures that the product remains fresh, germ-free and appetising for several days and does not discolour at the self-service counter in the supermarket. Up to now, trays with a lidding film and an absorbent pad for the leaking meat juice have usually been used for this purpose. Since this packaging solution is a rigid packaging that not only requires a relatively high material input but also consists of different raw materials and is thus almost worthless for meaningful material recycling, there is growing

interest in replacing it. And to do so without compromising protection, freshness, minimum shelf life and transportability. “We have succeeded not only in developing the sustainable packaging concept but also in launching it commercially on the market,” Joanna Herbst emphasises.

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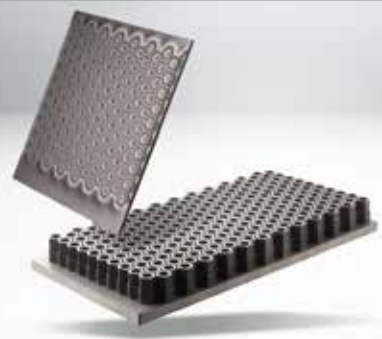
The main entity responsible for the new sustainable packaging solution is, first of all, the department that was set up at Schur Flexibles a few years ago to deal with the issue of sustainability. This team of experts is very familiar with the different recycling infrastructures, national legislation and disposal fees and coordinates closely with the development departments. Since the topic has many aspects, it is indispensable to look at the packaging from all directions together with the customer as part of the “re-Think Initiative” and thus find the best possible solution. After all, the conversion of a packaging concept often entails a multitude of adaptation processes. For example, when switching from tray to tubular bags, the customer needs a vertical form fill seal machine, which he might not have. “But especially if a customer needs to make a replacement investment, we think he should definitely think about switching from tray to flow wrapping. In most cases, the initial costs for a horizontal flow wrapper are even slightly lower than for a traysealer. In addition, the flow wrapper requires a little less floor space,” says Tobias Wegmann, citing further reasons for switching.



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Flexible packaging meets requirements

For Feneberg, a family-run supermarket chain from the Allgäu region of Germany, Schur Flexibles uses MonoFlow PXC film, which won the Packaging Award in the Sustainability category in 2020 and the WorldStar Award in the Packaging Materials and Components category this year.

Specifically, the novel mono-pack for fresh minced meat is a 60 µm thin PP film with a high barrier, as required for MAP packaging, combined with a PP-based sealing layer. "With the MonoFlow PXC film, we not only achieve the required performance for packaging fresh meat but also stay below the magic 5 per cent limit for foreign materials in a mono solution," Joanna Herbst summarises. With a PP content of over 95 %, the packaging is considered recyclable and thus supports the legal requirements for compliance with recycling quotas in many countries. "The recyclability has already been confirmed by an independent institute," adds the product manager, highlighting the Europe-wide positioning of the Schur Flexibles Group, which employs a total of 1,900 people in 23 plants in Germany, Finland, Denmark, Sweden, the Netherlands, Poland, Slovakia, Greece, France, Italy, the UK and Russia.

Additional logistical advantages

Depending on the size and weight of the previously used tray with absorbent pad, the new type of tubular bag packaging made of mono-PP can save between 60 and 80 % of raw material. Tobias Wegmann knows that the new packaging has been very well received by consumers: "Sales of minced meat at Feneberg have even increased slightly since the new packaging was introduced. Obviously, consumers have quickly grown accustomed to the new look."

The main advantage, the weight saving, is accompanied by further benefits in terms of logistics. Here, too, the savings are enormous, Tobias Wegmann continues: "With one pallet of film rolls, up to 84,000 sales units can be packaged, whereas with one pallet of plastic trays it was only 5,400." This is, of course, positively reflected in the storage space required. In terms of the number of delivering trucks, it corresponds to a reduction of 90 %. In addition, the flowpacks are slightly smaller than the trays, which means further advantages in terms of transport and shelf space. ■

www.schurflexibles.com

Especially for replacement or new investments, it is worth considering investing directly in a horizontal flow wrapper, which is usually cheaper than a tray sealer and requires less floor space.





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“Once through hell, but in the end, the sun shines”

How the automotive supplier Horst Hähl mastered its second insolvency and grew from it

When Jürgen Mangold, with foresight and an eye on the company's succession in the medium term, initiated the process of finding investors at the beginning of 2018, he had no idea how many stumbling blocks would be put in his way. In 2020, the Managing Partner first had to guide Horst Hähl Kunststoffspritzguss & Werkzeugbau GmbH from Dußlingen, Germany through its second insolvency. Not because of, but in the middle of the pandemic. K-PROFI spoke to Managing Partner Jürgen Mangold and Ralf Stokar, one of the new investors, about the reasons and the way out of the crisis, the advantages and disadvantages of insolvency proceedings in self-administration and the fact that insolvency does not have to mean the end.

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

K-PROFI: Mr. Mangold, what was Hähl's situation before the insolvency?

Jürgen Mangold: To understand, I have to look back a few years. When I took over Hähl after the first insolvency in 2010, we had to update the company, which was in need of restructuring. We invested primarily in new, also large injection moulding machines. An extremely large number of enquiries followed, and we achieved an average growth

of 15 per cent over the last four years – I am intentionally excluding 2019/2020. But growth needs to be financed. This requires not only machines but also buildings, structures, processes and employees. We have more than doubled the workforce to 135 employees. What we made went immediately into the further development of the company. Additional capital was needed for further growth. This aspect and my plan to no longer have to shoulder the responsibility alone by my 60th birthday at the latest led me to contact an M&A (Merger & Acquisitions) advisor at the beginning of 2018 to look for an investor. A year later, one of the potential investors joined the company operationally as an advisor to get to know the company for a few months. Unfortunately, it was exactly from this time on that some massive problems came our way.

What happened specifically?

Jürgen Mangold: Point 1: Due to the turmoil in the automotive industry, several customers postponed major projects. This caused huge problems, because the tool pre-financing associated with the projects continued, of course, without us being able to complete the projects. Point 2: Unfortunately, there were additional customers who didn't pay us for three or four months even in series delivery and literally used us

as a bank. Personally, I had underestimated the third point: we experienced a gradual but relatively strong price increase in 2019: wages and salaries, energy costs, the first force majeure cases with effects on material costs and at the same time increasing demands from the automotive industry for further price reductions. In sum, this has led to an increasingly difficult cash situation. We factored in a few weeks for the project postponements but did not expect several months. Of course, this also led to a loss of confidence on the part of the bank.

How did the potential investors and your bank respond?

Jürgen Mangold: After the orders from the carmakers also collapsed by up to 60 per cent in some cases in autumn 2019, both investors and the bank demanded an IDW S6 expert opinion, a standard procedure in this situation. As a result, this restructuring expert opinion confirmed at the beginning of November what we already knew: Hähl needed fresh capital because the high financing burdens were contrasted with a sales volume that was too low at that time, which led to an imbalance between receivables and liabilities. After the insolvency was established, the so-called monitoring period began. But unfortunately, the drama worsened during these four weeks: Sales continued to fall, forecasts were poor because customers were also ordering poorly for 2020. A few days before Christmas, the potential investor therefore turned us down, so that the bank finally called in the credit lines on 20 December 2019. I had no choice but to go to court.

You then applied for insolvency proceedings in self-administration. What are the requirements for this?

Jürgen Mangold: The court only approves self-administration of insolvency proceedings if the company is capable of restructuring. This is where the IDW-S6 expert opinion that had already been prepared paid off. It included a strategy for the future and showed the company's ability to be restructured. This



Photo: K-PROFI/Susanne Gnamn

Managing Director Jürgen Mangold:
“The IDW-S6 expert opinion certified a positive continuance prognosis, always on the premise that money would be put in.”

preliminary work proved to be very valuable. The IDW-S6 expert opinion certified a positive continuance prognosis, always on the premise that money would be put in. Therefore, the Tübingen District Court followed the application very quickly, so that I was able to plan the next steps with the court-appointed officers and trustees just three days later.

What are the advantages and disadvantages of self-administration?

Ralf Stokar: Insolvency in self-administration is designed to ensure that the company remains in the possession of its shareholders and to create opportunities to restructure and reorganise. From the business owner's perspective, self-administration is much more complex than regular insolvency. For the business owner, it means a physical as well as a psychological double burden to simultaneously manage the business operations and be the insolvency administrator; he is the first point of contact for creditors, customers and employees. But there is the clear advantage that you remain the master of the whole process.

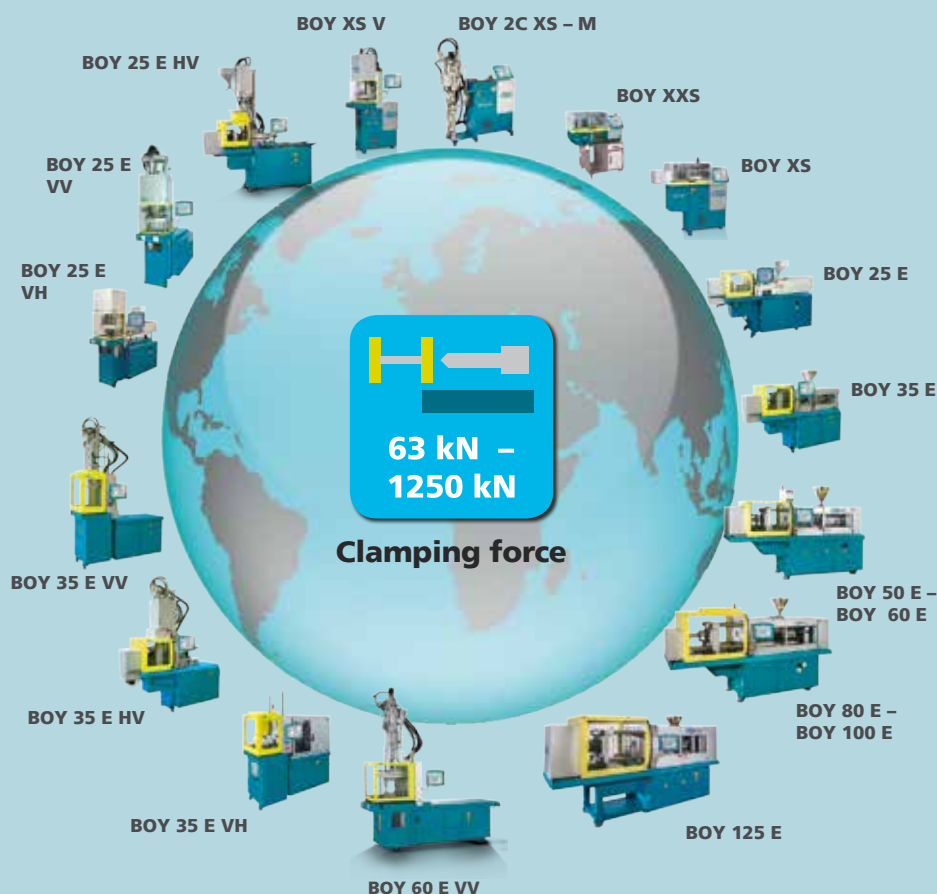
Jürgen Mangold: This leeway to discuss decisions and help determine the course is the big advantage. In fact, it was an ordeal and extreme pressure for all of us. Without the excellent team, which was highly motivated despite the situation, starting with my assistant, we would not have managed it.

How did you communicate with your employees and business partners?



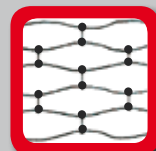
Investor Ralf Stokar: "The main focus of the restructuring and reorganisation was the optimisation of the fixed costs, which had mainly resulted from the financing of growth."

Jürgen Mangold: Communication plays a big role, of course. We had already informed the staff about the tight financial situation at a staff meeting the end of October 2019 and presented the results of the restructuring report at this meeting. When I had to break the sad news to the employees one day before Christmas, the shock was great. However, the positive continuation report had a great effect. We were able to use it to show the staff a way forward and encourage them: Let's fight for it together. We also got various large clients on board early on, even before the insolvency, and informed them so that they



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Photo: K-PROFI/Susanne Gnaamm

Jürgen Mangold on the shop floor:
 “Basically, we have matured as a team and
 as a company in the face of insolvency.”

could pay for their projects and bring money into the coffers. The assurance of these clients that we are system-relevant and the clear wish that they want to continue working with the existing team in this capacity was also one of the reasons why we applied for self-administration. We spent the Christmas holidays writing letters and informing our business partners about the insolvency and that operations would continue.

Ralf Stokar: The open and early communication was a clear confidence-building measure. In combination with the self-administration procedure, which was geared towards continuation from the beginning, the customers and suppliers were able to anticipate with a high degree of probability that no liquidation or break-up was to take place here. They have been very supportive and carried the company through the insolvency.

What specific changes did you make during the restructuring process to ensure the company's long-term success?

Ralf Stokar: First of all: With Hähl it was not about an operative restructuring, the business model, the products or the markets. From my point of view, it was a rather simple restructuring, because it was financial. The main focus of the restructuring and reorganisation was the optimisation of the fixed costs, which had mainly resulted from the financing of growth. After the first insolvency, Hähl had brought its machinery up to state-of-the-art standards, expanded its production range, invested in technology, both in terms of production and products. The company had also aligned itself with the automotive industry through certifications and its project management, thus gaining recognition as a preferred supplier. However, Hähl now had to cut costs, and that's where insolvency proceedings create the opportunity to renegotiate financing, to adjust it to today's interest rate, or to get out of other obligations such as existing leasing contracts or supply contracts that have turned into money-losing deals over the years.

Jürgen Mangold: In addition to adjusting the leasing contracts and bank financing to the conditions of 2020, which was actually only possible in the context of insolvency, we also parted with customers or product

groups that initially served to cover fixed costs, but with which we now no longer generated any or sufficient profit margins. The keyword here is income and loss source analysis. We also adjusted the rules of the game for some contracts: With higher minimum order quantities for a higher average revenue per order as well as material control surcharges. This is also an advantage in insolvency: I can invoke the principle of the higher authority, such as my administrator, and terminate contracts because I am not allowed to continue operating at a loss due to creditor protection. You can manoeuvre freely, so to speak, without having to fear disadvantages such as a penalty, which you cannot afford in an already financially strained situation. Then we also benefited from the fact that during the insolvency period various machines that were being financed were paid off. And we received fresh capital through various investors.

You filed for insolvency shortly before the onset of the pandemic. To what extent did this influence the restructuring process?

Jürgen Mangold: Filing for insolvency on December 20th, shortly before the turn of the year 2019/2020 was the worst possible time for an investor search process. It started with a standstill over the holidays, so that we could only start preparing the investor search process at the beginning of January. Fortunately, we were able to extend the three-month preliminary process until April 1st. But when we were about to start approaching the market, Corona's first lockdown and the reorientation of business to online rather than face-to-face meetings caused a significant timing delay. I had to show potential investors the company virtually via a tour with a smartphone and headset.

In general, the combination of “predominantly automotive plus Corona” was a difficult situation, to begin with. Hähl, with its strong project management and toolmaking, also depends on new projects. But there were a lot of question marks: When will major new orders from the automotive industry arrive in Corona times? The uncertainty lasted for many months. We had to prepare new sales plans every 14 days. If the Corona



Photo: K-PROFI/Susanne Gnaamm

Major automotive customers certified Hähl's systemic relevance and supported the company during the insolvency process.



Photo: K-PROFI/Susanne Gnammm

Encouraging employees: On the basis of the positive going concern opinion, the restructuring process could be shown to them.

How did you finally get the fresh capital you needed?

Jürgen Mangold: After all external investors declined, I gathered people from my immediate circle around me. Eight people, including four employees who formed an investor group, bought shares, which shows confidence in one's own ability. You can hardly get a stronger commitment than the personal commitment of your own employees.

In 2010 you bought the company, which had become insolvent in the course of a financial crisis, from the family that owned it at the time. What was different about the current crisis?

Jürgen Mangold: The two crises are not comparable; the initial situations are completely different. In the last ten years, we have created unique selling points, structured the organisation according to lean principles, invested in modern machinery with a wide range of products and competent and motivated employees. In comparison, we are no longer so easily replaceable today. During the crisis at that time, customers withdrew projects. This time, customers were loyal to us, but we phased out orders where necessary.

After twelve months, the insolvency was lifted at the end of 2020. Looking back, what would you do differently today?

measures were relaxed a little, the automotive industry immediately stepped on the gas again. A constant up and down. This ping-pong effect only cemented the restlessness and worries among potential investors, and while they did not turn down the company, they did turn down this uncertain future. And even with the best and most loyal customers, patience wears thin after months. At some point, every risk manager wants to have clarity.

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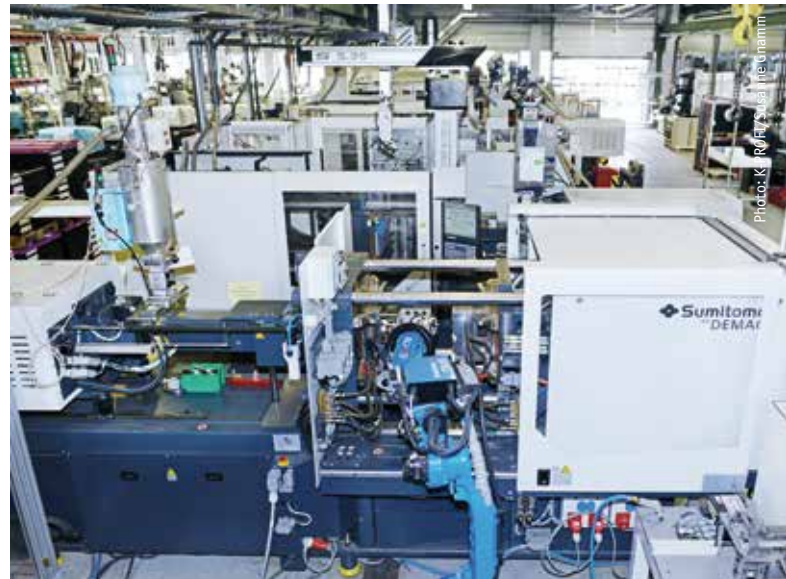
Jürgen Mangold: I would try to prevent the insolvency. Because every insolvency is extremely stressful for everyone. I could have considered my employees, who have now taken over shares, for a shareholding much earlier. But I simply didn't have that idea. Insolvency is always accompanied by loss of reputation and unnecessary friction.

Ralf Stokar: Unfortunately, we don't have a lived insolvency culture in Germany, there is always a certain stigma attached to it. Nevertheless, it is clear that Hähl would have had to struggle for many years to achieve the current financial situation the conventional way. My advice: file for insolvency early and seek self-administration proceedings with the aim of staying on board. Insolvency does not necessarily mean the end. Hähl is a successful example that even in a difficult environment like plastic injection moulding in the automotive industry and in times of a pandemic, you have a chance to sustainably reorganise a company and position it in the market.

What advice do you have in general for other affected companies?

Jürgen Mangold: Staying true to yourself is important. And if you are sure you are on the right track, don't suddenly change direction. Just one example: Of course, we could have parted with simulation software and CAD systems, which would have had a short-term effect. However, an important branch of the company would have been cut. The current investors support the strategy wholeheartedly. We have openly discussed our path in the management and shareholder circles and also put our finger in the wound. This brought us even closer together but also convinced us to stay on our chosen path and not to fundamentally change our business model. Nevertheless, the process of finding investors was valuable. With every potential investor you get a mirror held up to you: where are you good, where is there still potential, which procedures need to be reconsidered. This led us to put our processes to the test and fine-tune them.

Ralf Stokar: Hähl already had the right and appropriate strategy, which was further reinforced by the restructuring and reorganisation process. However, in one place or another, the performance



Since the takeover from insolvency in 2010, Jürgen Mangold had invested in new, also large injection moulding machines and automation.

had to be readjusted. You have to clearly reflect on what the company is capable of and make its path plausible. In this process, you need reliable and trusted partners from your personal and from an adviser environment with whom you can discuss and agree on your concept. In fact, you also acquire a high degree of transparency and broad expertise in an insolvency. Administrators, general representatives, advisors, but also potential investors prepare business assessments, question processes and approaches and bring in new perspectives.

What needs to be considered when restarting after insolvency?

Jürgen Mangold: You have to communicate very quickly and very widely to customers, suppliers and business partners that you have emerged stronger from the insolvency. For customers, the goal is



Plant manager Andreas Rempfer (left) and Jürgen Mangold face the transition process in the automotive industry.

Findings

- › Solving liquidity problems should not be delayed.
- › Insolvency can greatly help to implement previously neglected or not enforced restructuring measures under pressure.
- › Continuous and honest dialogue with employees, customers and suppliers can produce solutions that would otherwise have seemed almost impossible.
- › Insolvency in self-administration is only approved if there is a clear concept of how the company will continue to operate economically. A "business as usual" is not accepted. The causes of the insolvency must be understood and eliminated.

... wrote K-PROFI columnist Dr Arno Rogalla in issue 4/2019.

to get out of risk management and secure the ability to deliver, and into future projects and development orders. With suppliers, the goal is to switch from cash in advance to payment on time. With credit insurers and credit checkers, it is a matter of creating trust again. Getting back into the normal work rhythm of 'business as usual' with new projects as quickly as possible is also important for the confidence of the employees.

What have you personally learned from the crisis?

Jürgen Mangold: I had not expected at all how the staff and the customers were behind the company. I had expected much more reluctance from this direction. Throughout the entire process, our partners have shown a high level of trust in us. Even suppliers, who also lost money, encouraged us in the creditors' committee meetings. This spirit of optimism was really great, a strong sign of respect. Basically, we have matured as a team and as a company in the face of insolvency. We have a clearer focus, we can market our advantages more confidently, and we look

Hähl restructured in self-administration

In contrast to regular insolvency proceedings, the operational responsibility remains in the hands of the Managing Director, who controls the reorganisation himself. The competent district court does not appoint an insolvency receiver, but a so-called administrator. The administrator supervises the proceedings and represents the interests of the creditors. For the self-administration proceedings of H. Horst Hähle Kunststoffspritzguss & Werkzeugbau GmbH and the real estate company HM Management & TechnoConsult GmbH, the district court of Tübingen appointed the Stuttgart lawyer Dr. Holger Leichtle of Schultze & Braun as administrator. Managing Director Jürgen Mangold was supported in the reorganisation and restructuring process in self-administration by lawyer Dr. Philipp Grub and his team from the law firm Grub Brugger, Stuttgart, as general representatives. The contribution of fresh capital via five investors made it possible to pay out a quota of 10% to the insolvency creditors. Jürgen Mangold remained a co-partner of the company. The insolvency was terminated on December 31, 2020. The core staff, the service portfolio and the complete machinery remained unchanged. Around 100 of the former 130-plus jobs were saved.

more closely at our earnings. Our revenue is about 30 per cent lower, but we are in a better position than before in terms of gross profit. In our circle of shareholders, we regularly exchange views on important issues. This has

broadened our expertise considerably. I already had the vision a few years ago that other partners would continue to run the company beyond my eventual retirement. I have now found these people.



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Based on your experience, how do you view the fact that the obligation to file for insolvency is currently suspended?

Jürgen Mangold: There is a danger that affected companies will find themselves in a certain degree of lethargy, also because of the additional funding. At the same time, we have to face the transition process in the automotive industry, adapt to other products and procedures. We have therefore deliberately used periods in 2020 when we did not have a lot to do for new developments. The entire automotive industry is taking giant steps in a new direction. This requires investments and, if necessary, changes in the product portfolio. There is a lack of financial resources for this when loans have to be repaid after the crisis. That makes the situation worse.

Ralf Stokar: With the obligation to file for insolvency suspended, companies scramble from month to month with aid loans, use up equity capital, draw on their reserves. If investments then decrease because of the loans to be repaid, this will have an effect in the mid to long term. They are still facing these difficult times as the one Hähl went through in 2020. Hähl went through hell once at the most difficult time, used the insolvency opportunities and is now in a strong and stable position. Hähl can take off directly after the pandemic, the possibilities for the future are tremendous. ■

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Photo: K-PROFI/Susanne Gnam

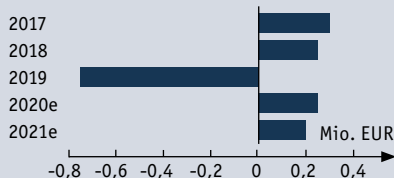
Plant Manager Andreas Rempfer and three other employees form one of the five investor groups.



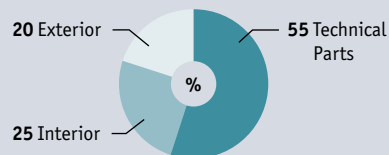
History

- 2010 Takeover of the company by Jürgen Mangold
- 2012 Development of new project management and international tool procurement
- 2014 Expansion of real estate and investment in large machines
- 2021 Entry of new investors

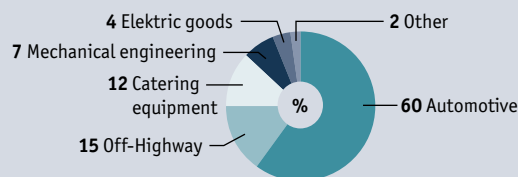
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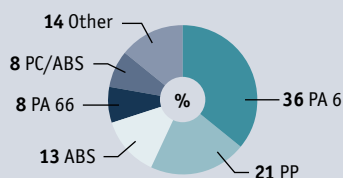
Portfolio



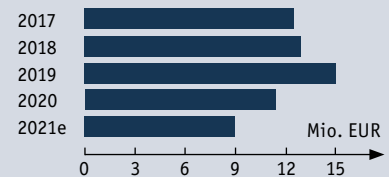
Main customer industries



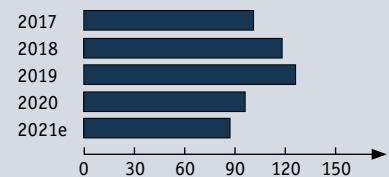
Processed plastics



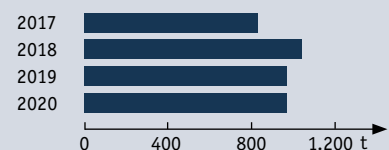
Turnover



Employees



Processing quantity



Source: Hähl; Graph: K-PROFI

The long road to climate neutrality

Why the carbon footprint is becoming important and how difficult it is to be determined

Everyone is already talking about the CO2 footprint, but it is still often an abstract concept. Why it will soon become of direct importance for every single plastics processor, that its determination for a product is not trivial and that recycling is not a cure-all for sustainable business became clear at the forum "CO2 footprint and sustainability in the plastics and rubber industry", which TPE manufacturer Allod recently organised together with PlasticsEurope, the VCI and the German Rubber Society.

Text: Dipl.-Chem. Toralf Gabler, Editor K-PROFI

"We came across this topic by way of our customers in the automotive industry," says Allod Managing Director Kurt Gebert. "Our contacts there increasingly want information not only on material properties and prices but also on the carbon footprint of the TPEs they purchase." For Kurt Gebert, who is known and appreciated for his dynamic networking, the industry-wide importance

of the topic was the reason to give it a wide scope in the professional circles through an online forum.

Misconceptions in politics and the public

"We need more and more raw materials, so we have to source and use them efficiently," says Prof. Mario Schmidt, head of the Institute for

Industrial Ecology (INEC) at Pforzheim University. All too often, however, the discussion is narrowed to the scarcity of raw materials. "We are more likely to reach our limits with environmental media before raw materials become scarce," the industrial ecologist is convinced. Therefore, he says, the impact of raw material use on water, soil, atmosphere and climate must always be taken into account. "Recycling can play a part in this, but it will never be possible to completely close raw material cycles," he says, putting the damper on the euphoria for the circular economy that is currently being pushed.

Experts estimate that global material resourcing per capita and year will increase from 12 t in 2018 to 18 t by 2060, and still

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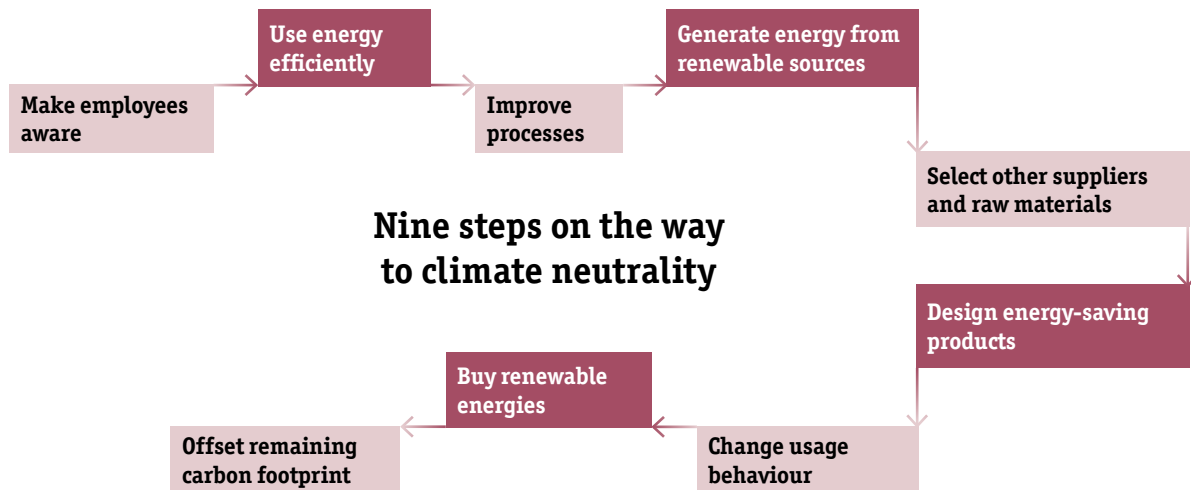
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to about 14 t with strict sustainability measures. “This increasing demand can only be covered to a small extent by recycling because it is only possible to recycle what is already available as material in the technosphere,” explains Prof. Schmidt. “There are some very wrong perceptions about this in politics and among the public.”

At the moment, it is propagated that the ideal goal is to close cycles. “But physics alone does not allow for such closed cycles,” says physicist Mario Schmidt. “At the very least, energy has to be put into it, the generation of which always causes environmental pollution.” Extensive studies by INEC in the field of metal recycling showed, for example, that this is not per se better than primary extraction, both from a monetary point of view and taking CO₂ emissions into account. Therefore, one must always consider the relationship between the costs of recycling and primary extraction. “This results in a marginal benefit range for recycling. And this is typically not 100% recycling,” says Prof. Schmidt.

Sources of information on the carbon footprint

DIN CEN ISO/TS 14067 provides a general framework for determining the carbon footprint.

At PlasticsEurope, eco-profiles on various plastics can be found at www.plasticseurope.org/de/resources/eco-profiles.

There is also Ecoinvent, a comprehensive database that originated from a semi-governmental initiative in Switzerland, the commercial database GaBi from the US company Sphera, and the free database Probas from the German Federal Environment Agency, which contains a collection of data from various past projects without further quality control or updates.

CO₂ offsetting as the last measure

Climate neutrality – another buzzword of our time and an aspirational goal in the EU’s Green Deal – is very difficult to achieve, according to Mario Schmidt. “At least not in a few years,” he is convinced. But we have to start, nevertheless. The institute director, who advises both politicians and well-known companies on environmental issues and the carbon footprint, mentions possible approaches, such as the use of energy-efficient processes and self-generated renewable energy, changing raw materials and suppliers, designing energy-saving products or purchasing renewable energy. “Only at the end of all these measures should one think about offsetting the remaining carbon footprint,” emphasises Prof. Schmidt, who takes a rather critical view of such offsetting. “If you pay for your CO₂ emissions so that emissions are avoided elsewhere in the world, this must result in steps that have not yet been taken or will be taken in the foreseeable future. But if climate protection becomes an increasing issue in all countries, there are fewer and fewer of those opportunities that can legitimately be used for this purpose.” He is also sceptical about compensation through CO₂ sequestration, for example by planting trees. “Who can guarantee that these forests will actually remain standing in the long term and will not burn down after ten years or be cut down after a change of ownership?”, he points out.

CO₂ footprint becomes an important parameter

Dr. Tina Buchholz of PlasticsEurope explained that in future the CO₂ footprint will also be increasingly requested in the value chain of plastics and rubber processors. “The EU’s Green Deal, which aims to achieve greenhouse gas neutrality by 2050, is creating greater pressure on the manufacturing industry in this direction,” she is convinced. “In this context, the carbon footprint is a tool to show quantitatively where a product or technology stands in the context of this pursuit.”

But it will also become an important parameter for compensatory measures to ensure competitiveness vis-à-vis companies outside the EU borders by offsetting the burden of the EU’s internal CO₂ pricing.

The amount of the proposed border compensation is then to be calculated from the CO₂ footprint of the respective products. The extent to which this will benefit the plastics and rubber processing industry has not yet been determined, however, since the laws for this are only just being drafted, explained Dr. Buchholz.

“But the CO₂ footprint is also an important realisation tool for the financing of envisioned transformation measures within the framework of the Green Deal”, says Dr. Buchholz and mentions, among other things, the calculation of the amount of a climate surcharge for end consumers, the calculation of the “recycled” CO₂ content for the recognition of “carbon capture and use” products in EU emissions trading or the evaluation of CO₂ costs of new technologies.

Comparability of data problematic

Inka Fynn at the German Institute for Rubber Technology in Hannover has been working on the determination of the actual carbon footprint of products for several years. “In the product carbon footprint, the greenhouse gases emitted and removed by a product in the course of its product life cycle are accounted for,” she explains. A distinction is made between three sub-scopes. Scope 1 includes the CO₂ released directly by the company, Scope 2 the indirect emissions, e.g. through purchased electricity. It is much more difficult to determine the indirect emissions outside the company that are included in Scope 3, e.g. through the purchase of goods and services. The latter in particular is highly relevant in the industry, where they account for a share of more than 75%.

“The reliability of the results depends strongly on the input data used,” emphasises Inka Fynn. The effort required to combine data from many different sources is very high. And because of the use of different databases, supplier specifications, system boundaries and functional units, the comparability of data for different products is often not given. For more precise results, a lot of data from the industry is still needed. The scientist used the example of natural rubber as a raw material to illustrate the obstacles that can be encountered. Since the storage of CO₂ in the rubber trees also plays a role here, the CO₂ footprint of the latex produced varies considerably depending on the age of the rubber plantation. When transporting goods, it should be taken into account whether they are travelling alone or as a co-load. And the mass of transport equipment and packaging also has an influence on the CO₂ footprint. The emissions caused by the use and subsequent disposal of the product are no longer within the producer’s control and can therefore at best be estimated.

Inka Fynn views further challenges, among other things, in the allocation of the company’s activity data to different products if they are manufactured in parallel. The expert’s conclusion: “No carbon footprint study is perfect.” Nevertheless, she says, one has to start now and keep improving the data and processes in an iterative process.

Kurt Gebert, too, thinks there is still a long way to go and suggests that the three organising associations jointly set about further developing this important topic. ■

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Bush Hsieh, TAMI's chairman of the plastics and rubber machinery committee

New times call for new solutions

How the Corona pandemic is affecting the market for the Taiwanese plastics machinery industry

The effects of the Corona pandemic are being felt by industries worldwide. Taiwan's plastics and rubber machinery industry can also tell a tale or two here. From \$1 billion in 2019, export volume slumped 20 per cent to \$0.8 billion in 2020, according to the Taiwan Industry Association TAMI. Still, TAMI's chairman of the plastics and rubber machinery committee, Bush Hsieh, shows optimism, saying, "In China, our market share has grown significantly despite the pandemic, and the same is true for the U.S. The losses stem mainly from markets in Japan, Indonesia, India and Vietnam."

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

Contrary to the general trend, not all machine manufacturers from Taiwan have suffered sales declines. Polystar, a supplier of recycling machines, is even highly satisfied with the year 2020: "Last year, despite Corona, we achieved the best sales figures since 1988," says marketing manager David Lo. The company manufactures machines primarily for recycling HDPE, LDPE, LLDPE



Tony Wu, Sales Manager at Chumpower



Hank Wu, Sales Manager at FCS



David Lo, Marketing Manager at Polystar

and PP film packaging. Chumpower builds stretch blow moulding machines and was able to keep sales steady in 2020 compared to the previous year. Sales Manager Tony Wu sees several reasons for this: "On the one hand, this pleasing result is certainly due to our numerous existing customers who remain loyal to us. In addition, supplying people with bottled clean water during the pandemic was and is essential in many parts of the world. We may have benefited from that as well." Injection moulding machine maker FCS, on the other hand, lost sales in 2020. But this year, business is booming, raves sales manager Hank Wu: "Our sales hit a record high in the first quarter of 2021. The Corona Valley is behind us."

Online formats replace trade fairs

Customer interactions are the nuts and bolts for any salesperson. One of the most important tools – international trade shows – has been down for months. Before Corona, TAMI participated in 50 international trade shows. Bush Hsieh sums it up: "Without a doubt, trade shows are extremely important for our industry. In my opinion, this is still the best platform for our members. But these times demand new solutions. We are focusing on digital formats and designing new models of customer communication."

Clever digital solutions are gaining more and more acceptance in the market. Hank Wu also observes this: "When all trade shows were gradually cancelled after the pandemic began, we were initially very concerned. But in fact, our customers have quickly adapted to the new online formats. Online trade shows, webinars, virtual conferences – all of these have been well received by customers in our experience." TAITRA, the Taiwan Trade Center, supports companies with online marketing. Via press conferences, virtual company tours or conferences, it provides the platform on which the Taiwanese industry can present its new developments and trends. In Tony Wu's view however, a real trade show cannot be replaced by all this: "Virtual formats cannot replace direct physical customer contact. Some things are best discussed face to face."

Return to normality

The great longing worldwide is called a return to normality. It is difficult to predict when this wish will become reality. Bush Hsieh is certain: "The market will recover

step by step. We think that in two to three years we will be back where we were before the pandemic." It is important to use the time until then. Working on innovations, better technological solutions and new markets are the focus for the Taiwanese machine manufacturers. These include, for example, the semiconductor industry and medical technology. Hank Wu is looking forward to the "analogue" trade show business starting 2022: "I think from then on, the trade shows will take place again, but will remain rather local." The global situation is

still volatile due to the pandemic. New mutations and the lack of vaccination coverage in large parts of the world make predictions for the global market problematic. David Lo explains, "we expect the situation to improve in the long term when most people worldwide are vaccinated. But virtual online communication will certainly remain a model for customer exchange and collaboration in the future, usefully complementing physical contacts." ■

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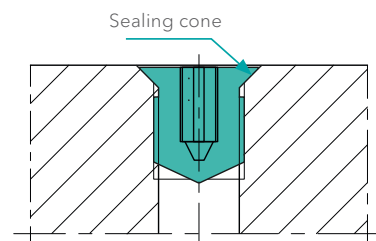


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In niche applications, plastics
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The success story of plastics began 100 years ago. On the occasion of this anniversary, K-PROFI takes a look at plastics in competition with other materials. Part three focuses on the competition with ceramics. Ceramic materials were already used for containers several thousand years ago. Today they are also used in technology, construction, plumbing and medicine. With their strength, abrasion, temperature and chemical resistance, they have so far only permitted substitution by plastics in niches. Here, however, plastics, sometimes in combination with ceramics, can have some advantages.

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

For a long time, it was customary to use ceramics and stone for the interior finishing of residential and commercial buildings, hotels and holiday homes – especially when it came to high-quality décor. This has changed. Plastic products have become respectable. First, let's take a look at the floor coverings: In addition to conventional tiles and wood, there are now many plastic flooring variants, such as

linoleum, PVC and, in more recent years, so-called Luxury Vinyl Tiles (LVT). The advantage of plastic floors is the ease with which they can be installed and cleaned, their robustness, their attractive appearance, which ranges from natural wood to noble stone design in any colour, a certain foot warmth and impact sound insulation. These are all advantages that have led to plastic flooring becoming commonplace even in modern living areas with high-quality interiors.

The situation is somewhat different in the bathroom. Even though LVT is sometimes used as flooring here because of its suitability for damp rooms, many of the sanitary objects, such as toilet bowls and washbasins, are made of ceramic. Only in hotels, mobile toilets or in caravans and mobile homes can these be found made of plastic. Shower enclosures are also usually made of deep-drawn polystyrene panels.

Sturdy composite material for the bathroom

An example of the combination of the two materials plastic and stone/ceramic are new, high-quality shower trays and bathtubs made of Solique. "The composite material made of dolomite, resin

The iSENSI bathtub made of sanitary acrylic won the German Design Award 2021.

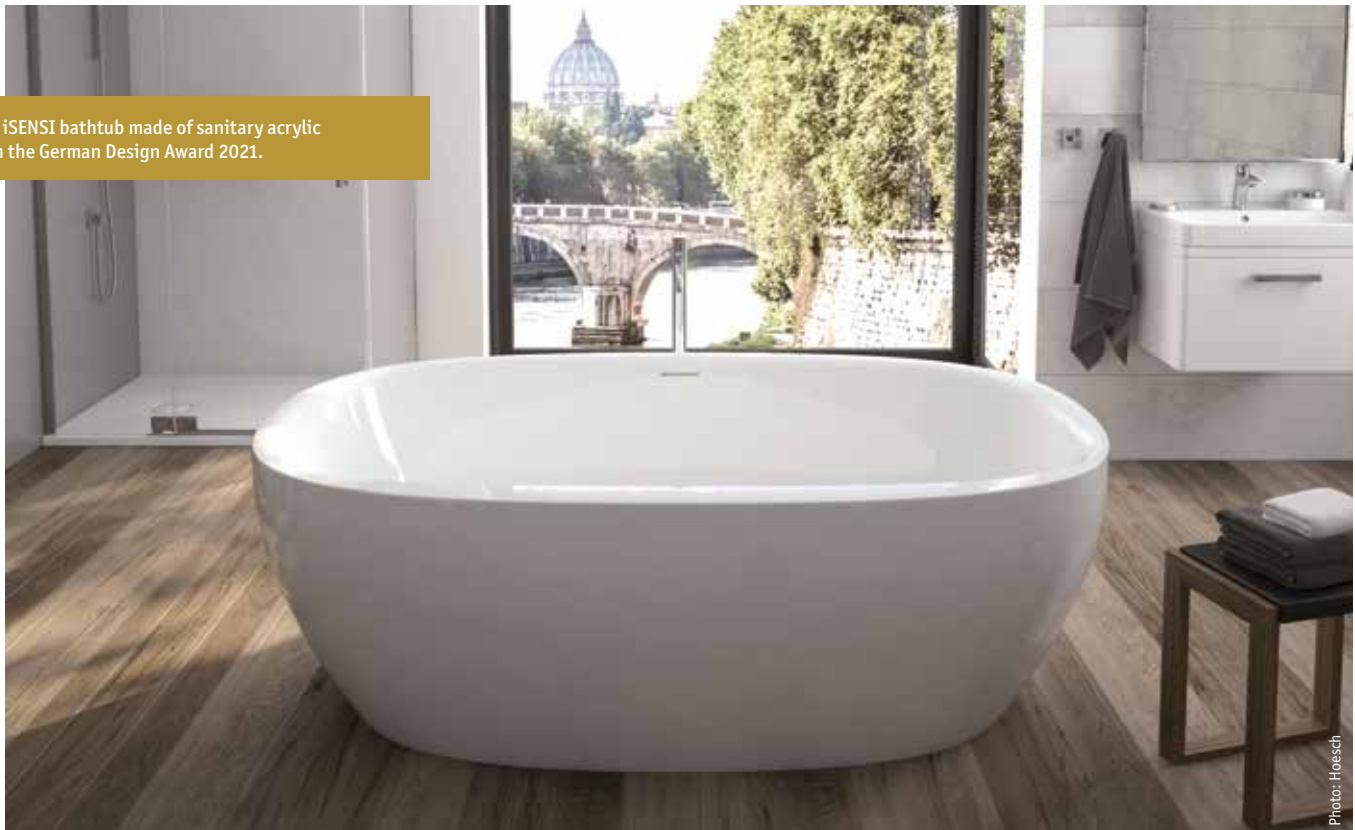


Photo: Hoesch



The composite material Solique makes the MUNA S shower tray extremely sturdy.

and hardener, is extremely hard and sturdy,” explains Karina Baran, Assistant Sales Manager & Public Relations at Hoesch Design GmbH from Kreuzau. An additional gelcoat layer consisting of synthetic resin, mostly based on unsaturated polyester or epoxy resins, not only ensures a perfect look but also resistance to abrasion and wear. “We offer our customers a two-component repair kit with which small scratches or dents, should they occur, can be repaired on their own,” Karina Baran continues. With the new series, Hoesch is expanding its product range, which continues to include acrylic shower trays and bathtubs that are well established in the industry.

Coexistence and cooperation in tribology

“In tribological applications, i.e. whenever components in motion interact directly with each other and mass production of complex components with a high degree of functional integration is required, plastic is an ideal material,” describes Dominik Schubert, Research Associate at the University of Erlangen’s Department of Plastics Technology (LKT). Today, for instance, many actuators in cars are made of plastic, for example in the seat adjustment, in the power-adjustable exterior mirror or in the controls for the air supply and air conditioning. Numerous tribological plastic components can also be found in the field of household electronics. A few examples are the gears in fans for the oscillation function, plastic sliding elements in furniture construction or mechanical components for optical drives in CD, DVD or BluRay players and game consoles. Due to their good gliding properties, these components are also manufactured from plastic without the addition of lubricants and the possibility of cost-effective mass production via injection moulding.

However, when abrasion is a particularly crucial factor and brittle material characteristics are unproblematic in the application, there is no way around ceramics. “Ceramics are unbeatable when it comes to high wear resistance,” explains Dominik Schubert, giving the mixing cartridge in the water faucet as a prominent example. In a single-lever faucet, the ratio of hot and cold water is regulated by two ceramic discs that are moved against each other when the lever is operated. Abrasion must be prevented, as it would end up in the drinking water. In the textile industry, too, the thread guides in systems for spinning yarns are always made of ceramic because of the high wear resistance.

Dominik Schubert emphasises “that the property profiles of ceramics and plastics are so different that substituting ceramics with plastics and vice versa in tribological applications often does not make sense.” He sees the two materials, which differ in hardness, ductility and abrasion resistance by several powers, less as competitors than as complements. After all, in addition to the side-by-side, there is also a coexistence in the different applications. The best examples of this are grinding wheels made of ceramic-filled plastics or ceramic

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injection moulding. Here, ceramic powder with a volume share of more than 60 % is compounded with wax and low-melting polyolefins, e.g. PE, and injection moulded into the desired shape. The result after firing and sintering is a ceramic moulded part with a complex geometry that could never be produced without the injection moulding step. This is how, for example, ceramic grinders for pepper mills are produced. In medical technology, too, ceramic injection moulding has long proved its worth for complex parts used in pumps, valves, or endoscopic equipment.

Light and unbreakable

Plastic tableware has a bad reputation among the public. Rightly so when it comes to low-quality disposable articles. But if high-quality and high-priced plastics are increasingly being used for this purpose, there must be worthwhile advantages over ceramic tableware. "These are above all the significantly lower weight, transparency and unbreakability," explains Georg Grässel, a specialist for household and catering applications in Global Business Development Ultrason, BASF's brand for polyarylethersulfones. In terms of other important properties, the plastics polysulphone (PSU), polyethersulphone (PESU) and polyphenylenesulphone (PPSU), which belong to this class of polymers, are at least equal to those of ceramics. For example, they are taste-neutral, can be steam sterilised in up to 2,000 cycles, are permeable to microwaves and resistant in a wide temperature range from around -100 °C to 200 °C and do not become discoloured by foods such as curry or ketchup. "This and the possible processing by injection moulding, injection stretch blow moulding and extrusion predestine these plastics for applications in the household and catering sectors," says the BASF expert.

PPSU replaces melamine as a ceramic substitute

"In Asia, food bowls made of melamine resin have replaced those made of ceramic in many areas due to their weight advantages and stability," Georg Grässel knows. They are easier to handle in restaurants and also reduce the risk of injury from shards, for example in schools and kindergartens. Their disadvantage: in hot steam heaters,



which are being used more and more, the thermoset material is not very durable. "This opens up a large market for PPSU," Grässel is convinced. "Japan is currently a pioneer here and we expect other countries to follow soon with South Korea and China." However, PPSU also has a disadvantage due to its low scratch resistance. This is not a problem when using traditional wooden chopsticks for eating, but plastic and metal chopsticks are increasingly being used. Therefore, such bowls are now also produced by 2K injection moulding: PPSU brings the necessary toughness and polyethylene naphthalate (PEN) provides a highly transparent, scratch-resistant surface that protects the separately applied decoration.

In hospitals and nursing homes, too, porcelain plates and bowls are now largely replaced by those made of PESU or PPSU because of the handling advantages. "Even for outer packaging, which ensures that the centrally prepared food does not get cold when it is distributed, PESU can be used because it can be foamed," explains Grässel. "If everything is made of one material, recycling it later requires less effort."

Freezing and heating in one container

The mechanical durability of PPSU and PESU over a wide temperature range pays off in fast-food restaurants, among others. Pre-cooked



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food can be frozen in the same container in which it is later reheated in the microwave or convection oven. An advantage that is equally useful in private households. Lids made of transparent PPSU or PESU even allow the food to be monitored during heating. “Several well-known manufacturers of such kitchen containers for the home are very fond of using these polymers,” Georg Grässel knows.

“Due to their low weight compared to ceramics, polyarylethersulphones not only offer advantages in handling but can also contribute to jet fuel savings for aircraft,” Grässel explains. Currently, some airlines use catering dishes made of PESU in economy class. Here, catering dishes made of PESU replace as a reusable solution the less sustainable disposable containers made of aluminium and wax-coated cardboard, composites that cannot be easily recycled. “In the course of the eco-discussions and the targeted CO2 reduction, sooner or later this will also prevail in the business class, where ceramic tableware is still predominant,” Georg Grässel is sure. With their inherent flame retardancy, polyarylethersulphones are particularly well suited for use in aircraft. This eliminates the need for harmful flame retardants, which is helpful in meeting food safety requirements.

Faster tooth filling with plastic

Today's dentistry cannot do without plastics. Plastic dentures, plastic fillings and, above all, plastic adhesives are part of everyday business in every dental practice. Plastic adhesives are also needed when a patient decides to have a ceramic filling placed in his or her decayed tooth. Speaking of fillings: which is better, more durable, more expensive – the plastic or the ceramic filling? K-PROFI now talked about this with Sascia Eckstein, dentist in Hückelhoven. “Plastic fillings have a significant advantage over ceramic fillings: They can be inserted immediately, whereas a ceramic filling must first be created by the dental technician after an impression has been taken, and then fitted in a second session.” A distinction is made between inlays, which are inserted with a precise fit, onlays, which cover a larger area, and overlays, which are bonded over a defective tooth area. The latter is useful when there is enough healthy tooth structure so that a crown is not yet necessary.

Regardless of which form is required, the advantages of ceramic are clearly its enormous hardness and longevity. The exact colour accuracy, which the dental technician can adapt to the individual tooth colour of the patient, is also a plus point. The disadvantages are the significantly higher costs compared to a plastic filling and the longer treatment, both of which many patients shy away from.

But not all plastic fillings are the same. And they are not only made of plastic. They are composites with varying amounts of glass or ceramic fillers and colour additives. To provide a tooth with a plastic filling, the cavity must first be prepared by drilling. Then comes the drying, which is the most important part. “Our light-curing acrylics do not tolerate any water, but of course we work in a moist environment,” Sascia Eckstein reports. For the resin to adhere to the tooth at all, its surface is roughened, a bonding agent is applied, and only then is the actual filling placed. This is applied layer by layer, and the composite is cured with UV light. Polishing – done.

“The disadvantage of plastic fillings was always the shrinking of the plastic, which could lead to the development of minimal gaps, in which caries can then form again. Fortunately, filling materials are constantly



Fig.: dentalmedia.de

Plastic fillings can be fitted on the spot, saving the patient several sessions.

being developed further, so that this disadvantage is hardly a factor today,” the dentist reports. In her practice, she uses plastic fillings much more often than ceramic ones. She is sure that this will continue to be the case in the future because of the advantages mentioned. ■

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View of the two half-shells and the finished welded oil guide. The complex geometry can be realised by hot gas welding

Solid connection under a special atmosphere

How low-particle, non-contact welding of technical to high-performance plastics works

In niche applications, hot-gas welding is proving to be an alternative to other welding processes, to mechanical joining techniques or to adhesive bonding - for example, for 3D geometries that were previously impossible to produce using welding technology. Primarily used for polyamide parts for the automotive industry, it is also suitable for joining high-performance plastics and for particle-free joining in medical technology.

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

Polyamides of all kinds are part of the basic components under the bonnet - they can be found in charge air pumps, oil or brake fluid reservoirs, oil guide tubes, suction modules, filter elements and much more. In recent years, the components have become smaller and smaller, the geometries more and more complex. Whereas 20 years ago a coolant pump was as big as a football, today it can be held with one hand. "In recent years, more and more technology had to fit into the same installation space, which naturally led to restricted space conditions," illustrates Michael Dultmeyer, Key Account Manager Automotive at Pöppelmann K-Tech, Lohne. Above all, the downsizing associated with this made the components more

vulnerable to contamination. Even a few particles in the system can lead to deposits in media-carrying assemblies and thus to failures. The calls from the automotive industry for low-particle joining processes, which at the same time yield high strength and resistance, have become louder and louder. "Classic polyamide welding methods such as infrared, vibration or hot plate welding often cannot keep up with these requirements," explains Dultmeyer. For more than ten years, the alternative at K-Tech has been hot gas welding. A niche process that is increasingly gaining in popularity.

"Hot gas welding has opened up completely new 3D geometries for us that were previously not possible at all. The increasingly smaller installation space in the vehicle dictates ever tighter corners, which we can often only realise with the help of hot gas welding," Dultmeyer outlines the challenges. Hot gas welding is the process of choice for media-carrying components with demanding geometries that must have both high strength and a high level of technical cleanliness. Dultmeyer ranks the technology: "Hot gas welding is not the one process for polyamides that is better at everything. If I have palm-sized components, I achieve very good strength, good technical cleanliness and good cycle times with ultrasonic welding.

Our analyses have shown that laser welding is just as clean as hot gas welding and that comparable strengths are possible with radial laser welding. It always depends on the size of the component, the complexity of the contour and the material, which process is the most economical and leads to the desired goal." If, for example, a double contour – I.e. an outer and inner body – is to be welded or welded on two levels, hot gas welding is often the only option. Hot-gas welding also often scores points with large components.

On the other hand, there are highly complex tools that cannot be used flexibly and require long set-up times. A hot gas tool only works for the one specific component. And: the process has a relatively high energy consumption and requires nitrogen as a process medium.

Approximately 95 % of K-Tech's customers for hot gas welding come from the automotive industry. According to Dultmeyer, numerous OEMs and Tier 1s use the know-how of the experts from Lohne: "We mainly serve the premium segment. We have quantities ranging from 5,000 components per year for special vehicles to 800,000 for series production vehicles." The company has access to numerous hot gas welding systems from KVT Bielefeld GmbH. The very high quantities are partly produced by a fully automated manufacturing cell. The half-shells of a coolant line are removed from the injection moulding machine in a fully automated process and completed with O-rings, bushings and screws. The robot then transfers the two elements to the welding system, removes them after the joining process and transfers them to the leak test. "We have two fully automated manufacturing cells, one for hot gas welding and the other for laser welding. With these two cells, we are currently manufacturing five different products at high cycle rates," Dultmeyer illustrates.



"Hot-gas welding has opened up completely new 3D geometries that were previously impossible to realise," Michael Dultmeyer illustrates the benefits for K-Tech.

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Photo: Wegner



View of the nozzle structure during coaxial hot gas welding.

The processes at a glance

VAB Wegner/Bielomatik

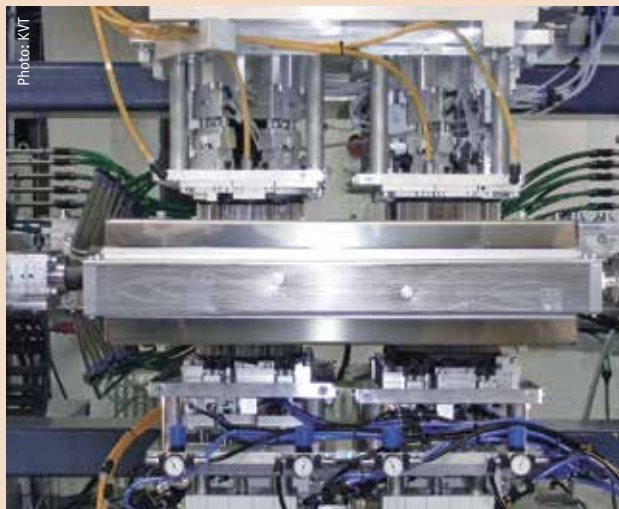
A cartridge heat exchanger system with separate cartridges per heating zone heats the nitrogen. This allows the temperature and volume flow to be individually controlled in each segment of the hot gas mould. The 3D-printed nozzle consists of a porous structure enclosed in sidewalls that follows the welding contour all the way around. This surface emitter avoids energy hotspots and uses the maximum energy during the heating phase. With different distances of the nozzle to the component, adapted nitrogen volume flows as well as individually controllable temperature ranges, the process can be precisely adapted to the respective component for different thicknesses, angles and geometries. Welding angles of 95° can be achieved all around.

The welding system records all the settings and changes that have been made, which can then be read out for each specific component. For prototypes, a nozzle geometry is selected that allows the gas to escape over a wide area. For series production, the gas opening is optimised for N₂ consumption. Due to the low pro-

Photo: KVT



Photo: KVT



Welding machine in working position with a 1-cavity mould.

duction costs of nozzles in 3D printing, it is more economical to change a nozzle than to manually readjust a nozzle bore. In order to produce a homogeneous melt, it is important that the N₂ volume flow is evenly distributed. Simulations during the development of the nozzle ensure this. After melting, the component fixtures move together and join by displacement or by force. In the first case, the machine moves to a defined position in the melt area, where the melt solidifies with low pressure. In the second case, the melt is pressed together until a defined counterpressure is built up. Depending on the material, either the one or the other method leads to higher weld seam strength. In the series machines, constant flow and pressure monitoring can be integrated as well as an infrared camera that records and monitors the quality of the weld seam.

KVT Bielefeld

The process is based on the further development of hot plate welding. A heating element in the centre of the system provides the energy supply, which heats the nitrogen via a heat exchanger. The hot gas tool consists of a pipe system that follows the welding contour and is equipped with closely spaced small tubes. The hot gas flow emerges from the tubes and melts the plastic along the joining zone. Welding angles of 65° are possible. The distance between the tubes and the component can be adjusted individually. After the required melting heat has been applied, the heating element moves from the processing position to the parking position. Now the two feed units close with the workpiece holders so that the plasticised welding geometries move into each other in a defined manner. The pre-set joining path is monitored, thus ensuring the correct final dimension of the welded parts. During the cooling time, the joining pressure is maintained.

View of a part of the HGW tool: Part of the HGW nozzle attachment plate with the round nozzles. An additional row of nozzles is visible on the inside at a different height because something is still being welded into the part on the inside.

Niche process with potential

But where does hot-gas welding actually come from? In the search for a welding process for highly filled polyamide components with complex shapes and high material thicknesses, KVT Bielefeld developed hot gas welding from hot plate welding in the early 2000s. In 2005, the company brought the new patented process into the market. KVT Managing Director Dirk Kortmann remembers: "It was not easy to enter the market at that time. We came up with a new process that nobody knew and of whose advantages we first had to convince our customers." But in its niche, the new technology gradually won over more and more plastics processors.

With the development of coaxial hot gas welding by VAB Wegner from Minden, an extension of the process is now available. In coaxial hot gas welding, the plastic melts inside a pipeline. The nozzle is coaxial to the surface to be welded. This process makes it possible to realise welds that are almost orthogonal to the joining direction. The path to his technology was paved with process engineering challenges, recalls inventor Ewald Wegner: "Six years ago, I had a welding task that I could not reproduce with any of the existing processes. This led to coaxial hot gas welding, which I had only used for prototypes for many years. Now it's a matter of convincing the market of the process." Due to the different technological approaches, Wegner's process does not infringe upon KVT Bielefeld's patent rights. Thanks to the cooperation with Bielo-matik since last year, Wegner's process has also found its way into series application.



Dirk Kortmann describes the design freedom "It is possible to weld areas on a component where I can't even reach with infrared or vibration welding."

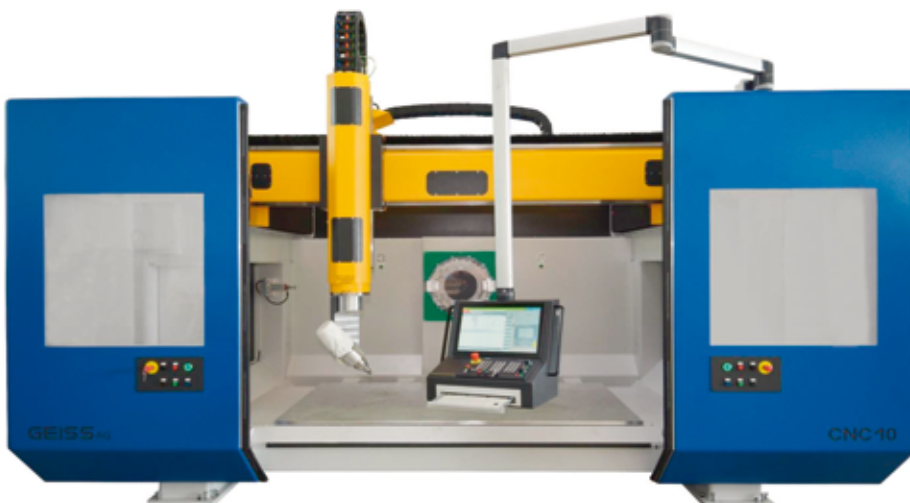
High design freedom

Hot gas welding is always used when a non-contact, low-particle process is required, thermal degradation or oxidation of the material is unacceptable, weld seams have to have high mechanical strength and very high welding angles have to be realised. These are plus points



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Inspiration from a research project

In a joint research project, Esslingen University of Applied Sciences and GMB Kunststoffteile GmbH, Pleidelsheim, took a close look at the hot gas welding parameters of the established process used by KVT Bielefeld. Johannes Schmid, Research Associate at the Laboratory for Plastics Technology at Esslingen University of Applied Sciences, explains: "Hot gas welding is becoming increasingly important for the automotive industry. We have found that only limited basic scientific knowledge has been available to date. The understanding of the process is predominantly based on users' empirical values, not on scientific investigations. We wanted to change that." According to Schmid, the focus was on the process from KVT Bielefeld, because: "In mid-2019, when the research project started, it was the only series process for hot gas welding available on the market." The research partners looked at the process medium, the hot gas tool temperature, the heating times, the flow rates and the flow profile of the nitrogen stream exiting the small tubes.

Schmid describes: "At the beginning of the welding process, the tubes are at a smaller distance from the joining zone; after 15 seconds, for example, the distance is increased. This ensures a more homogeneous heat input." The nozzles create a jet impingement, which results in heat loss and thus longer heating times. The reason: the gas flows away sideways after hitting the joining zone. As a result, the researchers have tinkered with a new nozzle that can be attached to the tubes. The plastic component protrudes about 0.5 mm into the nozzle so that the nozzle surrounds the joining zone. The process gas can no longer bounce off, and the plastic melts evenly in a controlled manner. A clear advantage, confirms Schmid: "With the new attachment nozzle, the same weld seam strengths can be achieved at lower temperatures and with shorter cycle times. For example, we were able to reduce the cycle times by up to 60 % when welding plates. This lowers energy requirements and process costs."



Photo: Hochschule Esslingen



Photo: Wegner

Ewald Wegner in front of his system for coaxial hot gas welding.

that no other plastic welding process has. The process gets its appeal from the use of nitrogen. This serves as a heat transfer medium and is also a shielding gas. Heating elements with heat exchangers heat the nitrogen, which transfers the energy by convection via a pipe and nozzle system to the zones of the component to be plasticised and heats them up to the melting point. Oxidation processes are prevented by the absence of atmospheric oxygen, and ashing with the resulting particles does not take place. In contrast to mechanical processes such as vibration welding, which is well established in polyamide processing, the nitrogen flow ensures a non-contact process in which no particles are produced.

Another plus point is the high degree of design freedom that the process offers. Kortmann specifies: "It is possible to weld areas on a component where I cannot reach at all with infrared or vibration welding". Wegner adds: "For example, I can weld several connections from different directions to a valve block in a very high packing density. The only alternatives are a mechanical connection or adhesive bonding." Hot gas welding also scores points when it comes to integrating sensitive electronic components. This is because the heat flow can be adjusted so precisely that it does not even thermally stress electronic components located directly next to the weld seam.

"There is only limited basic scientific knowledge about hot gas welding. That's why the research project came about and from it the new attachment nozzle," explains Johannes Schmid.

From prototype to series production

The centrepiece of hot-gas welding is the hot-gas tool. Nozzle geometry, volume flows, gas guidance and distribution, spacing of the nozzles or tubes are individually designed for each component. With prototypes and in subsequent preliminary tests together with the customers, the hot gas specialists of both suppliers work out the final welding parameters for the series process. Multiple moulds with different cavities are also possible, with which successive joining steps can be realised. The cycle times in series production for polyamide are – depending on component size, geometry, filling level and weld thickness – between 20 s for small and around 45 s for large components. In the realm of prototypes, things don't go quite so fast. "Due to the discontinuous process, we need up to a quarter of the heating time to bring the nozzle to the right temperature. But in a stable series process, of course, that doesn't matter," Wegner elaborates.

The nitrogen that is indispensable for the process usually comes from processed compressed air. This is available everywhere and is the cheapest way to produce the process medium. When asked about the weld seam design, Kortmann and Wegner confirm in unison: "The design is no different from that of other welding processes. Since there is no relative movement in hot gas welding and the scope for inclination angles is much greater than in other processes, the engineer even has more freedom in the design."

With this process, several connections from different directions can be welded to a valve block in a very high packing density.

The automotive industry is without a doubt the main addressee and driver of hot gas welding. But manufacturers from the medical technology sector have also already discovered the process for themselves – for example, for cleaning stages in dialysis or drug delivery systems in veterinary medicine. Furthermore, hot gas welding is suitable for joining high-performance plastics such as PPS, PPA, PEI or PEEK. 

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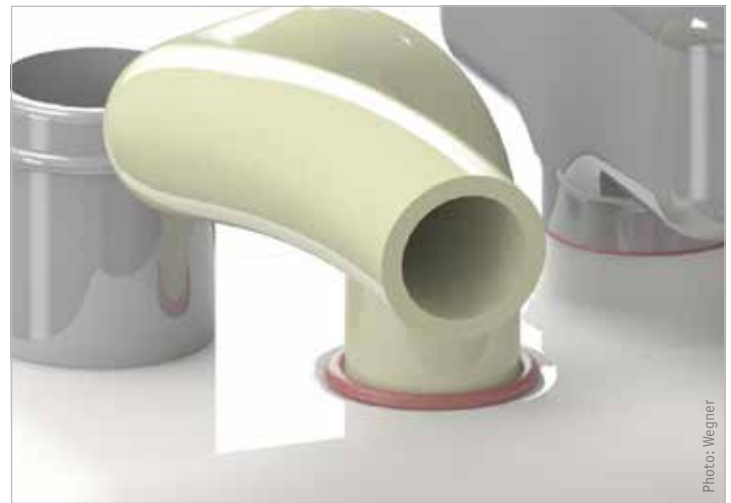


Photo: Wegner



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Plastics and ecology are not opposites

How Verpa-Folie is focusing more on the sustainability of packaging films

“The environmental aspect has always been an area of interest for us,” explains Olaf Hegen, Head of Development and Member of the Executive Board. By reducing the thickness of its films alone, Verpa Folie Weidhausen GmbH from Upper Franconia, Germany has saved more than 40,000 tonnes of raw material in recent years. Now, the future-oriented company is establishing its own material cycles with its customers to promote the use of recycled goods while further reducing the use of virgin materials. “It is the future of all of us that we have to think about,” Olaf Hegen is certain, and in an interview with K-PROFI he explains what other positive effects are associated with closed material cycles.

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

Shortly after starting out as a trading company for packaging materials, it was clear to founder Joachim Baumann that the plastic films had to be produced in-house. So, in 1988 Verpa started with the purchase of its own blown film lines and the production of packaging films. It was also clear that all films had to be thickness-optimised in order to be sustainable. For this purpose, a new material was developed and the Verpalin brand was born. The company's own production waste was collected and recycled from the very beginning. Today, the film manufacturer operates a total of 36 blown film lines from Hosokawa Alpine and Windmöller & Hölscher, among others, at its two German production sites in Weidhausen and Gunzenhausen, and at its Polish site in Wrocław.

“More than half of our blown film lines are coextrusion lines, mostly for three layers, but also one for five layers,” says Olaf Hegen, outlining the machinery, which in addition to the extrusion lines also includes printing machines for up to ten colours and a wide range of packaging lines. In total, the Verpa group of companies now employs 550 people, who produce films of different thicknesses with lay-flat widths from 35 to 3,600 mm from 60,000 tonnes of polyethylene annually. “We have a very broad product spectrum and produce films for almost all industries,” emphasises the Head of Development, naming a few customer industries such as the automotive,

furniture, food, beverage, construction and pharmaceutical sectors. In addition to classic packaging films, shrink wraps and liners, Verpa also produces technical films such as corrosion protection films.

A brand-new addition to the film manufacturer's product range is medical masks, which are made from non-woven sheeting. “During the Corona crisis, we made a conscious decision to invest in a modern, automated line for the non-contact production of surgical masks, and we consider this a clear investment for the future,” Olaf Hegen is certain. The new plant produces up to 500,000 masks per day, which are certified according to medical CE standards.

Award for sustainability received

In addition to its diverse production facilities, Verpa also operates several recycling plants, including a new regranulation plant from Erema, which was optimised according to its own specifications. For Olaf Hegen it is a nuisance that the plastics industry, and here especially PE film manufacturers, are under so much fire. Not only that plastics today make a major contribution to ensuring that less food spoils, but goods are also not damaged or can be transported safely over long distances – many companies in the industry have done their homework a long time ago.

“Sustainability has always been a matter of course for us,” Olaf Hegen summarises and differentiates: “Through intensive research and development work, we have been able to consistently and steadily further reduce film thicknesses – while maintaining the same or even better performance. Today, some of our films are only 7 µm thick, which corresponds to about one-tenth of a human hair. In-house recycling is



Verpa provides interested customers with a baler for film remnants in order to be able to recycle the valuable raw materials.

a matter of course, and external recycling circuits are currently being established.” It is not for nothing that his company was chosen by the independent rating agency EcoVadis as one of the best 1 per cent of the companies considered and evaluated in the plastics industry in 2021 for its societal commitment. The evaluation criterion is a company’s sustainability performance, which includes the categories of environment, labour and human rights, ethics and sustainable procurement.

In-house fleet provides flexibility

Verpa-ReLease-System is the name given by the film manufacturer to its new activities in an effort to establish closed-loop systems with customers as much as possible. “We provide customers with a baler so that they can collect and press their film remnants. We collect the pressed bales again, reprocess the plastic waste and return it to film production, if possible, for the same customer,” the development manager explains one possible approach. “Fortunately, we have our own fleet of vehicles and can react flexibly to customer needs for both delivery and collection.”

A typical instance where such a cycle works very well is in factory transports. Some goods, including automotive parts, are wrapped in a protective film for transport from one factory to the next. Unpacking produces clean and single-variety waste that can be easily recycled again. “We mix up to 100 per cent recycled material into our products,” reports Olaf Hegen. The amount of recycled material depends on many factors: the required mechanical properties, the film thickness and customer requirements such as sealability.

Closed-loop systems secure raw material procurement

So far, ten of Verpa’s customers have opted for the closed-loop collection solution, but Olaf Hegen is sure that more will follow. In terms of company size and collection volume, the development manager foresees few limits due to the company’s own high processing volumes and flexible vehicle fleet. For his company, the material cycles

A total of 36 blown film lines, many of them for 3-layer or 5-layer films, are in operation at Verpa locations.



mean ensuring its own input goods. For it is precisely the availability of raw materials that has become difficult in the recent past.

Besides the ecological aspect and the securing of input material flows, the establishment of closed-loop systems also has an economic aspect. As soon as the plastic tax on non-recycled plastic packaging which the EU has already decided to impose on 1 January this year is implemented, packaging made of 100 % virgin material could become significantly more expensive.



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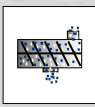




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Depending on the product, the film specialist operates its PE blown film lines in short-neck (photo) or long-neck mode.

Olaf Hegen answers the question of whether “green products” sell better in the meantime: “Our customers specifically ask for sustainable products, among others with recycled content. It is well known that the effort required for high-quality recycling is enormous. Fortunately, the sales price is no longer the only decisive criterion.”

Future ideas and other green products

At Verpa Folie, sustainability is currently based on three pillars. First, there are the thickness-optimised standard blown films Verpalin, which have been providing for reduced material consumption

Verpa’s machinery also includes several converting lines, on which the blown films can be processed directly.



for years. Secondly, under Verpalin Green Life, the film specialist combines all products that are made from bio-based or recycled raw materials. Here the company pursues different approaches. It uses both regranulates from post-industrial and post-consumer applications and purchases biopolymers and also pyrolysis materials. Plastics made from renewable raw materials such as sugar cane or tall oil, a waste product from wood processing, also come into the equation. "Depending on the application, raw materials filled with chalk or talc can also be used, which reduces the amount of plastic needed," says Olaf Hegen, explaining another of the many possibilities Verpa uses. Pillar number three is the recycling system already described, the Verpa ReLease system.

Olaf Hegen is certain that closed-loop systems are generally a sensible approach for the entire plastics industry. Functioning systems, such as in the beverage industry, have proven that raw material use and landfill waste can be reduced. "Used plastics must finally be recognised as valuable materials and not declared as waste," is his clear

message. The idea for the future is a targeted recycling system, also for food packaging. For this, however, the industry would have to make some optimisations, according to his assessment: "First of all, further take-back systems would have to be set up or the existing ones optimised and expanded since this is the basic prerequisite for good recycling. Mechanical recycling must be further optimised, both in terms of plant and process technology."

Due to the high-quality requirements for food packaging, Olaf Hegen believes that only chemical recycling such as pyrolysis can be an option in this area. Here, too, there is a need for development. In order to operate such energy-intensive recycling processes ecologically, renewable energy sources should be used. Again, his company wants to be a role model and is currently investing in a photovoltaic system. Finally, Olaf Hegen is counting on certifications that are granted especially for recycling systems, such as the Blue Angel or the new ISCC plus certification. The consumer must be made aware of these through effective education because only transparency creates trust



For Olaf Hegen, sustainability in film production is a matter of course and can be achieved in various ways.

and thus the cooperation of the consumer, which is indispensable for well-functioning closed-loop systems. 

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Photo: adidas

The “Uniforia” is on the hunt for goals at the European Football Championship.

Hard-sided suitcases go down well with travellers: they are light and robust and easy to move around with four wheels.



Photo: Travelite

Material for football and travelling world champions

Where and why synthetic materials have replaced leather today

Summer 2021 means: finally travelling again and – with a year’s delay – the European Football Championship. Luggage, car interiors and footballs have one thing in common: leather has largely had its day as a material. Instead, plastics offer many advantages in these very different areas of application. In part four of our series on the occasion of the anniversary “100 years of plastics”, the K-PROFI editorial team takes a closer look at the substitution of the very old natural material.

Text: Dipl.-Ing. (FH) Karin Regel, Dipl.-Ing. (FH) Sabine Rahner and Dipl.-Chem. Toralf Gabler, Editors K-PROFI

Everything – well, almost everything – revolves around the round leather these days. However, the legendary sports equipment has long since ceased to be made of tanned animal skins. Fully synthetic footballs made of several layers of plastic have now replaced the traditional leather ball.

When the football was not yet round

When Helmut Rahn scored the DFB team’s first World Cup title from the back in 1954, sending Germany into a frenzy of joy, the match ball was still made of elongated leather strips sewn together. Therefore, even if world champion coach Sepp Herberger claimed otherwise, it was not really round. This did not change until 1966, when the ball did not land behind the German goal line in the final at London’s Wembley Stadium but was still counted as such, which went down in history as the “Wembley Goal” and sealed the end of Germany’s World Cup dreams in the motherland of football.

Four years later, a visually completely different World Cup ball rolled across the field in Mexico. The Telstar – for the first time from Adidas – was made up of black and white pentagons and hexagons, making it much rounder than before. But the material of the ball with which Gerd Müller was crowned top scorer was still leather. The winning goal

for Germany's second World Cup victory by Müller on the 7th of July 1974 in Munich's Olympic Stadium was, however, the last goal in a World Cup that was scored with a pure leather ball.

PUR layer protects against rain

Although the base material of the 1978 World Cup ball Tango in Argentina was still leather, a polyurethane layer on the surface protected it better against moisture and the resulting increase in weight. The reason for this further development was probably less the experience from the water battle in Frankfurt four years earlier than the anticipated rain in the South American host country. In Cordoba, even the Austrians coped better with the new ball than the defending champions, while the Argentines, of course, were the ones who mastered the Tango best.

Waterproof seams were supposed to protect the Tango España even better from the rain at the 1982 World Cup. This new innovation was hardly put to the test in the Spanish summer. And player sweat posed no danger to the ball either – at least not in the preliminary round match between Germany and Austria. But just like this uninspiring ball passing in Gijón, the round leather was no longer regarded as world championship material.

Football becomes synthetic

In Mexico 1986, a fully synthetic football was played for the first time at a World Cup. On the one hand, this was to prevent the once again feared water absorption in the rain, but on the other hand, it was also to cope with the conditions of hard soils, humid climates and high altitudes. The Azteca ball passed its baptism of fire or water in the match between South Korea and Bulgaria, which at times resembled a water polo match at an altitude of over 2,000 metres. And the Argentine ball artist Diego Maradona showed in the quarter-final against England that the plastic ball was not only excellent for kicking but also for handpassing into the goal. From then on, the ball designers in Herzogenaurach – Adidas has been producing the World Cup football without interruption since 1970 – reached further into the diverse box of plastic materials.

Foam layers improve ball control

An additional inner layer of polyurethane foam made the Etrusco Unico, with which Germany became world champions for the third time in 1990, completely water-repellent. After the water problem

was finally solved, plastics were used to improve further ball properties. For the 1994 World Cup in the USA, for example, the Questa was given a layer of PE foam to absorb and return kinetic energy more dynamically, which was intended to improve ball control and increase shooting speeds. The energy return was further improved by a newly developed PUR foam layer for the 1998 Tricolore in France. The syntactic foam consisted of a dense, regularly arranged matrix of gas-filled, individually sealed micro-bubbles. Both of these features probably suited the more technically adept footballers in particular. The team under national coach Berti Vogts only made it as far as the quarterfinals.

With a further improved syntactic foam layer and a three-layer polymer fabric, the Fevertova was to have an even more precise and predictable trajectory for the World Cup in Japan and South Korea. In the final, the German goalkeeper Olli Kahn, who had been excellent up to that point, miscalculated the trajectory or the bounce of an incoming ball, so that it was "only" enough for the runner-up spot against the Brazilians.

Finally, round...

For the unfinished 2006 summer fairy tale in Germany, the developers had continued to work on the flight characteristics. This time, they came up with a completely new basic geometric design: instead of hexagons and pentagons – the usual pattern since 1970 – the Teamgeist ball now consisted of 14 panels in the shape of propellers and turbines glued together almost seamlessly using a special technology. The connecting lines were thus shortened by 15% compared to the earlier models, which significantly reduced the deviation from the ideal ball shape.

The panels consisted of several layers: A fabric made of cotton and polyester fibres was used as the textile carrier material. An adhesive coat of PU glue bonded these to the overlying syntactic PUR foam. The thickness of the layer was increased from 0.9 to 1.1 mm compared to the previous model, which further increased the restoring forces and improved the flight characteristics. The next intermediate layer of a PU dispersion protected the ball from external influences and gave it a high elasticity. A final PU topcoat prevented abrasion of the printed surface. Tests in the Adidas test laboratory at the time showed that the scatter range of the trajectories of reproducibly kicked balls was one third smaller than with earlier models.

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...and also, a bit organic

In the following years, many details of the material and geometry were modified. For the 2010 World Cup in South Africa, TPU and EVA were added to the material mix. The Jabulani now consisted of eight three-dimensionally shaped panels. Grooves in the surface were also intended to improve aerodynamics. After 40 years, a German Müller – this time Thomas – became the top scorer with this ball again. The Brazuca for the 2014 World Cup in Brazil was composed of only six panels in the shape of four-winged propellers. This made the ball even rounder and Germany became world champions for the fourth time. The Telstar 18 for the last World Cup in Russia in 2018 was given a sponge rubber layer made of bio-based EPDM rubber lying directly under the outer skin. This elastic padding should once again improve the bounce of the ball during play – however, the defending champions did not do so well with it and were eliminated in the preliminary round.

Incidentally, the inside of the football is no longer an animal product. Instead of the pig's bladder used in the past, butyl rubber now ensures that the football never runs out of air.

Luxurious playing, sitting and driving experiences

Which player will have to spend most of his time on the bench during the 2020 European Football Championship has not yet been decided at the time of going to press in June 2021, but there will be no lack of comfort. Whether players, coaches or physiotherapists, those who will be on the side-lines can at least look forward to comfortable seating. One brand, in particular, stands out and has stood for ergonomic seating on coaches' and players' benches in stadiums since 1994: Recaro. Since the Fritz Walter Stadium on the Betzenberg was equipped for 1. FC Kaiserslautern 27 years ago, more than 150 top clubs worldwide now enjoy the brand seats, from Eintracht Frankfurt to Real Madrid.

The body-contoured stadium seats are based on car seat models and originate from Recaro Automotive, since January 2020 a business unit of Raven Acquisition, LLC, which uses the Recaro brand under licence



In 1906, the master saddler Wilhelm Reutter founded the Stuttgart Carosserie- u. Radfabrik, from which the seat specialist Recaro emerged in 1963.

from Recaro Holding. The roots of Recaro Automotive Seating, based in Kirchheim/Teck, go back to the Stuttgart Carosserie- u. Radfabrik, founded in 1906 by master saddler Wilhelm Reutter, from which the seat specialist Recaro (Reutter Carosserie) emerged in 1963. Recaro Automotive Seating develops, produces and sells premium vehicle seats for the original equipping and aftermarket. In addition to the body-hugging, supportive seat structure, the supportive side bolsters, individual adjustment options as well as seat heating and air conditioning, the seat covers also contribute to the individual driving experience.

"For many customers, leather is an integral part of high-quality seats," informs Romi Diana Doser, Senior Manager Marketing & Communications at Recaro. "Look, feel, smell are still decisive purchasing criteria for high-quality leathers. Beautiful patina only happens with this natural material." Thus, the use of leather as an upholstery material depends on the customer group. Vehicles from the premium or luxury segment use the more expensive and elaborately surface-finished material leather more than mid-range vehicles, some of which offer leather as an option or in combination with synthetic textiles. Acceptance by the end consumer is the main limit for the use of synthetic covers, says Recaro.

Recycled content in textiles is increasing

The requirements for seat covers in terms of lightfastness, abrasion, dry/wet abrasion resistance and flame retardancy are high. Natural materials such as leather are subject to natural influences. Mosquito bites, for example, can affect the quality of a leather material. "Compared to natural materials, synthetic materials always offer the same quality due to their defined production process," Romi Diana Doser explains an important advantage of synthetic materials. Recaro has been using these since the late 1960s or early 1970s. Compared to the textile alternative wool, which did not meet the optical quality requirements due to pilling, they promised better quality and longer durability. The spectrum of today's synthetic upholstery fabrics is broad and testifies to the fulfilment of individual requirements.

Recaro developed the Cross Sportster CS seat especially for comfortable entry and exit in SUVs and off-road vehicles; here with Dinamica microfibre for the centre panels and artificial leather for the side bolsters.



The best known is certainly Alcantara from the eponymous Alcantara S.p.A. The microfibre fabric made of polyester and polyurethane, originally developed in Japan in 1970 and now produced in Italy, has a suede look and a velvety surface, is breathable, light, wear-resistant and easy to clean. The microfibre material Dinamica by the manufacturer Miko srl also comes from Italy. This also resembles suede in look and feel but is made of 45% recycled polyester, which comes from textiles and PET bottles, for example. Both fabrics, as well as the hard-wearing 100% polyester fabric Artista, are used as breathable covers for the seat centre panels and combined with side bolsters made of leather, imitation leather or the fabric Nardo (70% polyester, 19% PUR, 11% PA). As a high-quality, easy-to-clean and hard-wearing alternative to leather, Recaro uses a material combination of 67 % soft PVC (PVC-P-FR-ADCA), 22 % PUR-PET and a textile backing layer (11 %) of PET+NF35 (cotton fibre) for its artificial leather. Another robust and easy-care fabric is perlon velour, which consists of 65% PET and 35% cotton and is used primarily as an upholstery option for the lightweight CFRP bucket seat Recaro Podium and for the racing shells for motorsports.

The interior has a sustainable approach to leather

Leather stands for luxury, especially when it comes to car interiors. For many years, this statement was unreservedly valid. But in the course of a new critical consciousness of consumers – keywords 'zero emissions' and 'zero animal products' – a trend towards natural fibres, e.g., for vegan leather, is emerging, as Recaro observes. "PET bottles, apple scraps, fishing nets and co.: even car seats are slowly becoming sustainable," was also the headline of the industry magazine Automobilwoche in December 2020.

Of course, the automotive industry cannot ignore the trend towards more sustainability and resource conservation. "Many major brands in the car industry now offer environmentally friendly vegan interiors for which not a single animal had to suffer, for example, made of apple or grape leather," says the animal rights organisation PETA. According to their research, all Smart and Ford models have a vegan interior as standard, at Tesla, this applies to the Model 3, and there is an option for the Model S and X, to name just a few examples. Especially with electric

vehicles, a shift is taking place. Volkswagen does not offer leather upholstery for its electric ID models. Porsche's Taycan does come with a partial leather interior as standard, but for the first time, the sports car manufacturer is also offering a completely leather-free equipment variant in its e-vehicle. This uses a microfibre material (Race-Tex) made partly from recycled polyester fibres, the production of which, according to Porsche, causes 80% less CO2 emissions than the production of conventional materials. The aforementioned fishing nets are found in the floor covering made from the recycled fibre Econyl.

"The concept of luxury is changing in the wake of e-mobility. Sustainability is the focus. It's about incorporating materials that are already available and gradually increasing the recycled content," affirms Christine Maier, responsible for textile development in Audi's Design Color & Trim department. While in the top-of-the-line Audi A8 model the installation rate of leather upholstery is 100 %, for the Audi E-Tron GT they have completely rethought the materials and developed a leather-free interior. One of the two main players is the fabric Kaskade, which is reminiscent of wool and consists

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With e-mobility, the concept of luxury is changing: for the first time, Porsche also offers a completely leather-free equipment variant in the Taycan.

...and mobile

In order to be able to travel as comfortably as possible, suitcases with four wheels have become popular in addition to the L size, which is around 75 cm high. These are light and can be pushed without effort, unlike the 2-wheel solutions that were common in the past. "Two wheels are at best still common for cabin luggage, although here, too, many size S (55 cm) suitcases are already equipped with four wheels," Kirsten Haardt continues. Size M, she says, is the size that enjoyed a certain popularity even during the Corona pandemic, because on the one hand some business trips are still undertaken and on the other hand it is more likely to be a short trip in one's own country, for example, to visit family members. "Due to the Corona pandemic, the travel industry and thus our business have experienced significant cuts. We are now hoping for a quick recovery," Kirsten Haardt names the understandable impact of the Corona crisis on the company's business.

Convenience when travelling logically goes hand in hand with the weight of the luggage. "A typical L-size suitcase weighs between 4.2 and 5 kg, which is about half the weight of a comparable leather suitcase." An aluminium suitcase as an alternative to a plastic suitcase is heavier than the latter, but still significantly lighter than a leather suitcase. Aluminium cases are more of a niche product, but still popular and they are also part of Travelite's product range.

of 15 % textile remnants such as selvages, 35 % PET bottles and half polyester virgin material. Fishing nets and industrial waste are made into carpet and floor mats.

Plastic suitcases light...

The Olympic motto "faster, higher, further" could be transferred one-to-one to travel until the global pandemic began. More and more business trips, more and more private holiday trips, to ever more distant countries. Always with them: the luggage. Over the last thirty years, plastic solutions have become the absolute standard for luggage, both hard and soft cases, says Kirsten Haardt, who works in product development at Travelite GmbH + Co KG in Hamburg. According to her experience, leather has completely fallen by the wayside as a material for these products. Although leather is still common for high-quality purses, handbags and briefcases, in the luggage sector there are almost only plastic solutions. The two main reasons for this are: Weight and cost.

Other advantages of plastic solutions are the diverse design and surface options and their durability. Hard cases made of PC, ABS or PP have become established, especially for air travel. "These will last between 20 and 25 years even for frequent flyers and, in contrast to a leather suitcase, offer significantly more protection for the product because they can hardly be dented," the product developer explains further. Basically, customers want to be able to take their luggage with them on every trip, whether by car, train or plane, and that's why hard-sided suitcases also have the edge over the soft-sided luggage. Travelite produces around 60% hard luggage cases and 40% soft luggage, combining the two brands Travelite and Titan.

A leather-free interior was developed for the Audi E-Tron GT. The fabric Kaskade consists only half of polyester virgin material.



The many design options are among the obvious advantages of plastic suitcases, as are lightness and durability.



Photo: Travelite

Sustainable due to long-lasting durability

The plastic used by Travelite is mainly PC, as this has the best weight/property performance. While PC and ABS shells are deep-drawn, the shells for a PP case are injection moulded. The disadvantage of PP is the higher weight resulting from the greater wall thicknesses compared to ABS and PC cases. "However, in recent years we have succeeded in further reducing the weight of PP suitcases," emphasises Kirsten Haardt and thus comes to the topic of environmental friendliness: "Of course, sustainability and recycling are at the top of our company's list of interests." Due to the long durability of a plastic case, it is a sustainable product per se. The basic recyclability of the materials is also a given, as they are thermoplastics, but there are no closed-loop solutions in this respect so far. "We are consistently working on new solutions, and I firmly expect that there will also be a suitcase recycling project in a few years," says Kirsten Haardt, who is also very interested in other environmentally friendly material solutions. For soft luggage cases and travel bags, the use of recycled material is already standard today. Fibres made of r-PET are durable and do not differ from those made of virgin material in their properties. "Consumers who don't fly that often really appreciate our soft luggage because it is also robust, but can also be squeezed into a gap easily," says the developer, who is very concerned that "plastic has a rather bad image in the public perception. Plastic is a fantastic material with which we can produce durable and sustainable luggage solutions." 

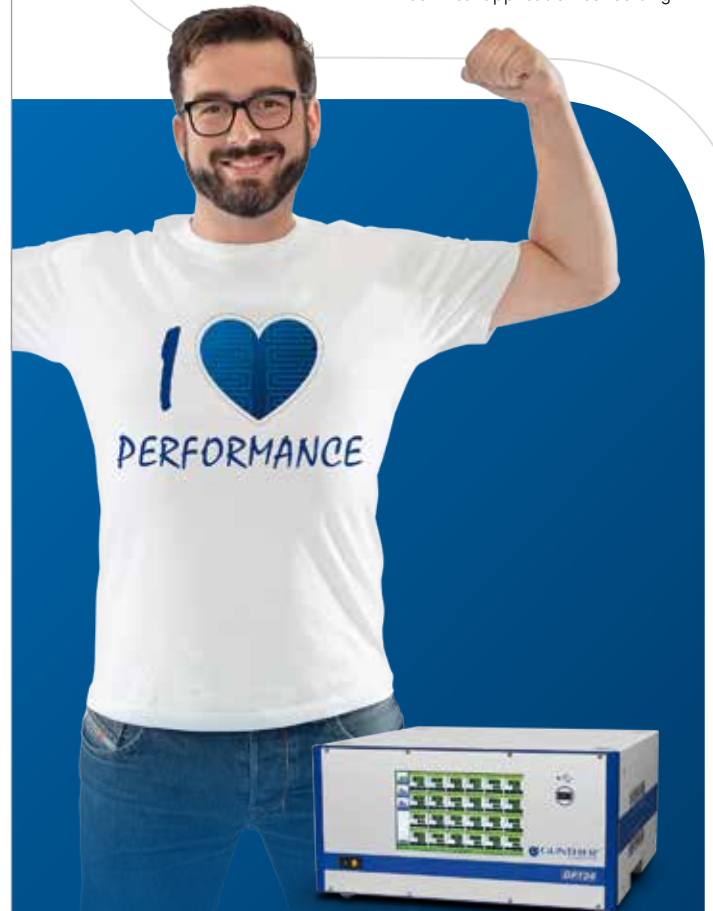
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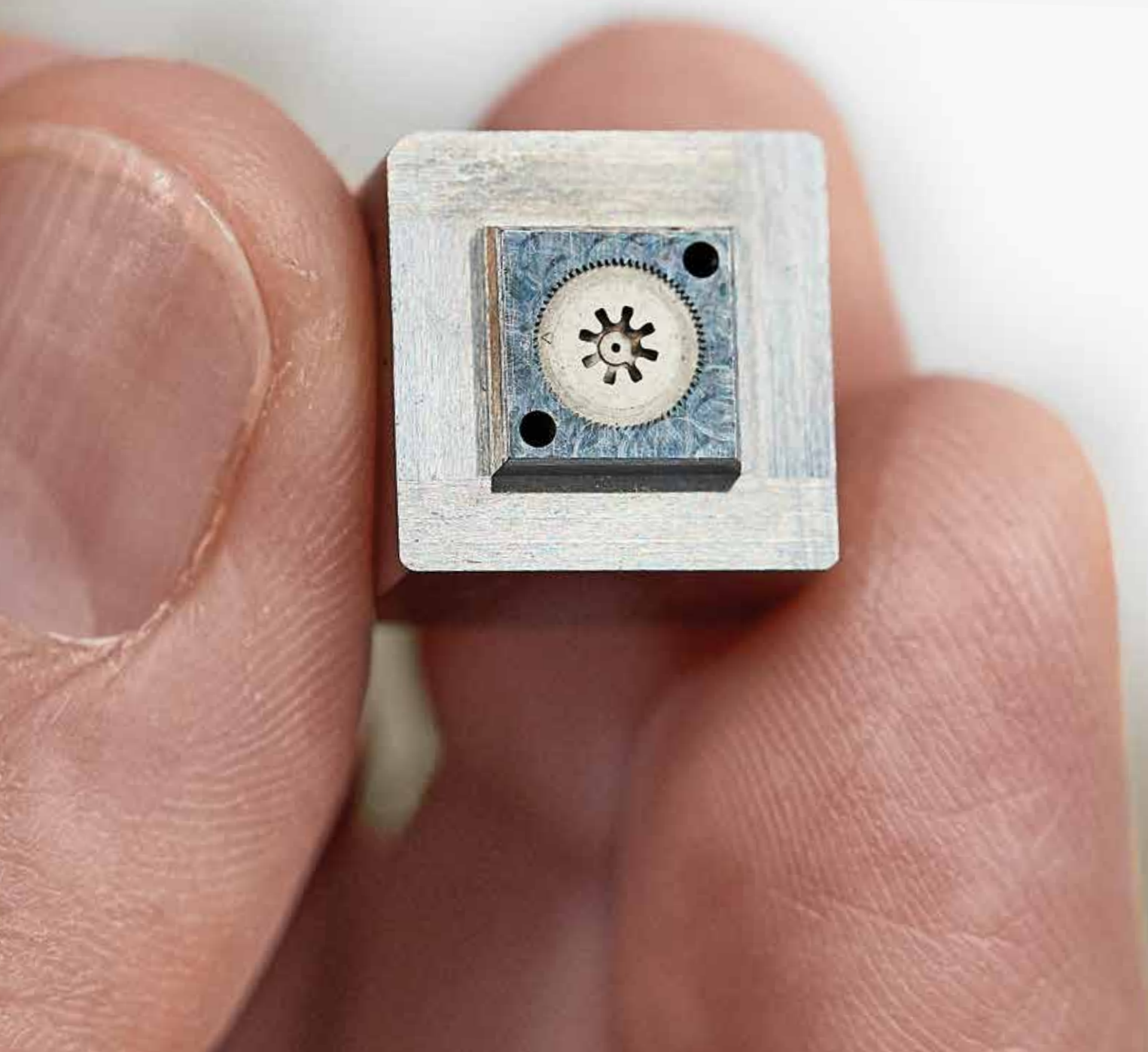
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The filigree structures of this mould insert for micro gears can only be made out under a magnifying glass.

Photo: PKT



Setting benchmarks with precision

How PKT optimises and secures its efficiency and value chain with targeted investments

PKT Präzisions-Kunststoff-Teile GmbH, Tiefenbronn, saves a gigantic 1,000,000,000 watt-hours (1 GWh) per year and thus about one fifth of its previous energy consumption. The family-owned company recently received an award for its holistic approach to implementing the many energy-saving measures. Managing Director Peter Rapp and Operations Manager Thomas Kaupp report on how the precision and micro injection moulding expert, an energy-intensive company based in Germany, is holding its own globally and is currently preparing for the digital transformation after its transition from a quasi-manufacturer for the watch industry to a sector-neutral industrial company.

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

Tiefenbronn is located just a few kilometres from the city of Pforzheim. For a long time, the "Gold City" was considered the heart of the German watchmaking industry and today is known for precision engineering instead of jewellery. It was here in 1969 that Walter Spielmann laid the foundation stone for his company, which specialises in high-precision plastic parts and is still family-owned today. PKT's history was also largely shaped by the watch industry until well into the 2000s. Precision and filigree structures are therefore deeply rooted at PKT and represent its core competence. Peter Rapp, who joined the company in 2009, explains: "That was a lucrative but also very dependent phase. At times, we generated almost half of our sales with a cult brand." The financial crisis twelve years ago slowed down not only watchmakers, but also PKT. The company was in the red for the first and only time since it was established. Learning from the crisis meant diversification, i.e. broadening the technological skills acquired from the precision and watchmaking industries.

With precision parts for a fertility injection pen, PKT succeeded in 2010 by entering medical technology, which is still the most important industry in terms of sales. "We were able to capitalise on the trend towards miniaturisation in medical technology, the keywords being minimally invasive and endoscopic interventions," says Peter Rapp. Even for the packaging industry, which does not seem the obvious choice at first glance, PKT develops highly sophisticated precision solutions, such as the pressure relief valve for a shaving foam can made of plastic. Here, it is a matter of permanently stressed parts for a working valve that continuously generates the airflow between the pressure accumulator and the media container inside and thus allows the use of plastic instead of aluminium in the first place. In precision engineering, on the other hand, PKT is active with precise plastic parts in linear guide systems and in electrical engineering with miniature ball bearing cages for dental drilling systems. "No matter



Photo: K-PROFI

Spot check: The micro-precision components require quality control under the microscope.

which user industry the customer comes from, we are open to all requirements that fit our core competencies: Precision and micro injection moulding, thin-wall injection moulding and hybrid parts. This allows us to clearly set ourselves apart from competitors." Very small, very light and finely structured - the special feature of many articles can only be seen through a microscope.

With the transformation of knowledge from the watch industry into new industries, PKT has been able to record double-digit annual



Managing Director Peter Rapp: "Through targeted investments, we ensure our value chain is stable for demanding precision and micro injection moulding."



Operations Manager Thomas Kaupp: "Without the many measures, we would consume about 1 GWh more energy today, which is a 20 per cent saving per year."

growth rates. But growth has to be managed. "We realised that this growth, both in terms of breadth, i.e. in volume, and in terms of depth with new industries and technologies, was a real challenge for our

organisation. That's why we put acquisition on the back burner, started consolidating more in 2013, streamlined processes and structured ourselves." PKT focused on management systems and gradually worked its way through various certifications. Starting with the existing quality management system (DIN ISO 9001), environmental management (DIN ISO 14001), occupational health and safety (DIN ISO 45001) and energy management (DIN ISO 50001) were introduced. By 2022, the medical technology standard DIN ISO 13485 is to follow as a customer-oriented certification.

Preparing staff for digital transformation

These steps and targeted measures in personnel development, as well as IT infrastructure, should create the basis for the next big milestone, the digital transformation, which Peter Rapp has his sights firmly set on. Updating the IT hardware and server landscape, networking, as well as remote access for working from home, were just the foundations, which have already paid off in the pandemic. "Starting from this, we have integrated further areas into digitalisation along the value chain. From Moldflow simulation to DoE software and CAD to CT analysis, we have digitised the processes from

product creation to quality. We are currently installing the Arburg master computer system to control the data flow bidirectionally between MES and ERP. After that, our digitalisation roadmap will move in the direction of PLM, or Product Lifecycle Management. Especially in medical technology, where a lot of documentation is required, we still work with too much paper. Here we want to digitalise a considerable part of the workflow and document management. These are our focal points for the next two to three years."

Every customer, every industry ticks differently - precisely because PKT is industry-neutral, the employees have to face a broad spectrum of requirements every day. Peter Rapp sees great potential here in the context of digitalisation to make it even easier for staff to work error-free in the future. "It is still a vision for us, for example, to disseminate work instructions via messenger services or to map maintenance schedules in head-mounted displays, but we already want to lay the foundations for this." In general, the Managing Director considers the digital transformation in connection with human resources development to be the biggest challenge of the next few years, because "for a smart factory we also need smart people". Not everyone is enthusiastic about operational data becoming transparent and machine and performance data being analysed. "We have to train, alleviate fears, carry out pilot rollouts



Rarity: This high-precision micro EDM machine from Sarix enables repeat accuracies below 1 µm and surface finishing with Ra values below 0.1 µm.



Photos: PKT

Base plate for exhaust gas purification system: PKT operates sector-neutrally within its core competence of precision and micro injection moulding.



Photo: K-PROFI

Assembly of an injection mould: Toolmaking is the foundation at PKT and generates over 10 % of the turnover.



Photo: K-PROFI

Concentrated know-how: The toolmaking department employs 30 of the 140 staff and builds all precision and microinjection moulds themselves.

and adapt the processes to our employees in such a way that we don't overtax them. It's going in rapid steps towards Industry 4.0."

This is not only associated with higher demands on staff skills. At the same time, this situation is currently encountering a real shortage of skilled workers and young people who are ready for vocational training as process mechanics, mechatronics or tool mechanics. Nevertheless, Peter Rapp appreciates Germany as a business location: "We basically have a good infrastructure and reliable government-political structures. Even if the growing bureaucracy and

constantly new levies or taxes do not always make it easy for us, international involvement would also entail additional costs. Supporting regional providers is sustainable and pays off in the end. We deliberately want to be noticed as one of the leading names for precision and micro injection moulding in Germany."

Precision standards score points in global competition

And this is exactly where PKT positions itself. The entire value chain is geared towards the smallest precision parts. It starts

with the CAD: "We work with 10-6 resolution, whereas the usual is 10-3." Only a few partner companies are set up for this. In the already highly specialised toolmaking sector, PKT set another benchmark and three years ago invested in a Sarix SX 100 HPM Pulsar high-precision micro-eroding machine from Switzerland. "By means of the so-called micro-erosion milling process, in which a rotating rod electrode, similar to a milling tool, is guided along the workpiece in paths and removes material by spark erosion, corner radii as small as 3 µm can be produced on the workpiece. The repeat accuracy of the positioning is less than 1 µm.





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The material removal is in the ten-thousandth range. There is only a handful of this machine in Germany, it is fundamentally important for us." Without this machine tool, some of PKT's products would not be feasible at all, explains Peter Rapp.

These include micro components for a new medical technology application in diabetes monitoring. A highly demanding project that PKT was able to secure for itself in the face of global competition. In fact, the American client spent months researching worldwide for a supplier and was only able to select from among three. In the end, PKT was able to prevail over the two competitors from Asia and the USA because of its competence in high-cavity applications: "Our competitors were only confident of a maximum of eight-cavity moulds for this critical part, we entered the race with 32-cavity moulds and are currently building a 64-cavity mould," Peter Rapp reports, not without pride. Often the limits of what is feasible are pushed to the limit, which makes good feasibility analyses as well as the experience and know-how to recognise when things get critical all the more important, he says. "We operate in this balance every day."

Toolmaking know-how is the foundation

PKT builds all its own tools. Toolmaking, with its 30 employees – about a fifth of the workforce – generates around 2.5 million euros, well over 10 % of annual revenue.

The micro-precision components are cavity-sorted and placed in these packaging tubes already in the injection moulding machine.



Peter Rapp shows inserts produced by micro-erosion: "In the high-end sector, the last μ is crucial. That can only be done economically in-house."

The essential department is already almost fully booked for 2021. In the high-end sector, "it all comes down to the last μ ", as Peter Rapp emphasises. It is difficult to find market partners who can support PKT and absorb order peaks. Except for the occasional machining of large mould plates, all work steps are done in-house. Peter Rapp sees almost only advantages in this: "If we are involved in the entire production process, we also benefit from the 'lessons learned'. The



Process Manager Lucas Heuchele at the micro injection moulding machine from Arburg, which is used for smaller series when high-cavity moulds are not profitable

knowledge gained is reflected in our digital design manual. That is our capital. Injection moulds for the production of such demanding components cannot be economically reproduced externally." In addition, the short-term availability of spare parts is an important argument: "We can directly access existing milling and eroding programmes and react to malfunctions within a very short time," adds Operations Manager Thomas Kaupp.

The precision requirement is just as clearly reflected in the injection moulding machine park. Over 70 injection moulding machines cover the clamping force range from 150 to 2,000 kN. "We don't need the larger machines because of the clamping forces, but to be able to install our high-cavity moulds," says Thomas Kaupp, referring to the range of injection units that are very small compared to the clamping surface. Products from Netstal and Sumitomo Demag, including one all-electric injection moulding machine each, make up a quarter of the machines. The majority are from Arburg, and the trend is upwards, with two more to follow this year. Since PKT invested in the first hybrid Allrounder A machine twelve years ago, the Tiefenbronn-based company has remained loyal. "Arburg has done a great job with the Alldrive. It comes close to the all-electric ones, in certain areas it even surpasses them," Thomas Kaupp is convinced. PKT can now look back on



16 years of experience with electric drives in injection moulding technology. Thomas Kaupp needs only a few words to make the comparison with fully hydraulic machines: "Much more precise, much quieter, much less energy consumption, definitely less wear, therefore less maintenance-intensive. In all these years, across all Arburg machines, we've had to replace just one spindle and one toggle lever."

Systematically to the benchmark in energy efficiency

Injection moulding production, including peripherals, consumes around 30 % of the total energy required by PKT. "This is our third largest cost item. As an injection moulder, we are an energy-intensive company," Peter Rapp notes. Investing in energy-efficient injection moulding machines is therefore only one of many savings measures at PKT. Electricity prices have been rising steadily for many years. For PKT, this is reason enough to deal intensively with the topic of energy efficiency for economic reasons alone. Since 2014, the Tiefenbronn-based company has been doing this with the same precision and systematic approach that it applies to the manufacture of its products. Initially, Energy Manager Thomas Kaupp started taking individual measurements in production to record the largest consumers. "We did that with a simple measuring device from Fluke. Then we switched to Econ, a classic web-based energy monitoring system based on a database, in order to be able to specifically identify and evaluate all consumers," says Thomas Kaupp.



The fully automated production cells with Yaskawa six-axis robots are designed to work also in ghost shifts.

PKT identified the outdated cooling system as the peak consumer. "Our new cooling system from Combitherm was the biggest throw, but also the biggest investment. We put it into operation in 2017 and carefully optimised it further." The result: the original annual consumption of 320,000 kWh for the cooling system was massively reduced by more than 75 % to 70,000 kWh.

There was also great potential in the lighting. In the warehouse, production, tool shop, corridors, offices, etc., around 900 fluorescent tubes were replaced with LED



Six-axis robot with gripper plate for removing micro-injection moulded parts from the high-cavity mould.

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lamps. The energy-saving is about 50 %, in absolute terms 90,000 to 100,000 kWh per year. The significantly better room illumination is an additional effect of this measure.

In the compressed air supply, speed-controlled compressors are now replacing the old constant compressors. Leakages have been sealed and the compressed air level optimised. “Basically, a compressor is of course an energy-destroying machine, so the energy savings are limited. But we were able to connect the compression to the heat recovery and thus achieve further effects.”

Keyword building heating: in order to be able to recover and store the compressor waste heat, two 1,000-litre water storage tanks were installed. “Heat recovery was one of our first actions. Two years ago, we also installed an energy-saving module. From the original 22,000 litres of oil, we’re now down to about 8,000 to 9,000 litres, which is a good 230,000 kWh saved every year.”

Air conditioning, which is essential for high-precision toolmaking, is also one of the top consumers. Recently, free coolers have been supporting the chillers. “We just got through the first winter with this and are already at 55,000 kWh savings. That equates to about 10,000 euros, and the



Photo: K-PROFI

investment of 24,000 euros in the free coolers with frequency-controlled drives quickly pays for itself.”

Almost every granule processed at PKT goes through a drying process. In the case of a Koch drying system with 18 bins, which was

Largest single investment: the cooling water system from Combitherm consumes only just over 20 % of the energy of its ageing predecessor.

newly purchased in the course of the expansion, the dryer is equipped with a speed-controlled fan drive. “That makes a big difference in terms of energy,” Thomas Kaupp knows. Three existing dryer systems were therefore additionally converted to speed-controlled drives. In addition, the engineers reflected on the regeneration process of the drying basins: “Up to now, the changeover was time-controlled. We had Koch-Technik install a temperature sensor in the desiccant tanks. As long as there is moisture, the temperature does not rise above 100 degrees Celsius. When the drying process is finished, the temperature rises. Therefore, we now switch off the regeneration when it reaches 140 degrees Celsius. This way we could halve the regeneration time to one hour. With six dryers and regeneration twice a day, we save quite a bit.”

Quantitative and qualitative energy monitoring

Energy Manager Thomas Kaupp is convinced: “If we hadn’t invested in all these individual measures, we would be using about one



Photo: K-PROFI

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gigawatt-hour more energy per year today.” However, Managing Director Peter Rapp makes it clear that it is no longer just a matter of bare figures: “Our very own motivation as a company was, of course, economic efficiency, followed by conservation of resources and the environment. Energy management makes sense at all levels. Employee identification and awareness of energy efficiency have risen sharply. It’s almost a perpetual motion machine. We dedicate ourselves to the topic with an above-average commitment. This is paying off.”

The energy monitoring system is still in use, with a hundred measuring points in the meantime. In addition to 70 measuring points for power and energy consumption, temperatures, humidity, volume flows or even oil consumption are recorded. These values can be used to create key figures for monitoring. The monitoring provides up-to-date data every minute. Peter Rapp is pleased: “The monitoring also has a qualitative character. We immediately recognise any deviations from the normal process situation, for example, if a machine draws an above-average amount of energy or possibly no more.”



Photo: K-PROFI

What is the next step planned? The installation of photovoltaics? “That is indeed both of our passion,” Peter Rapp and

During the day shift, PKT works with a full staff, during the late shift with half the staff, and during the night shift largely without staff.

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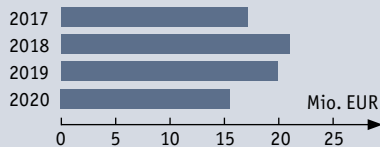
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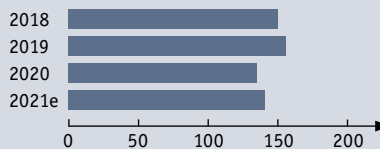
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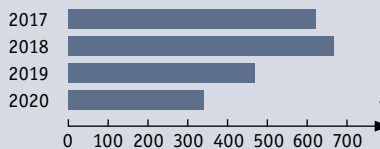
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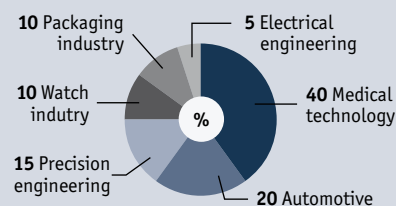
Employees



Processing quantity



Main customer industries



Thomas Kaupp confess, “but unfortunately our building infrastructure is not designed for it in terms of load-bearing capacity.” So it’s a project for the distant future. Nevertheless, the next optimisation step will take place in the near future: “At the end of the year, we will install an electrical low-pass filter. This is a kind of energy-saving system on the scale of a transformer house. It filters out harmonics and feeds this energy back into the grid,” explains Thomas Kaupp. He assumes energy savings of at least 10 %, which is realistic in our injection moulding operation with about 75 % inductive-capacitive load share. “Adjusted for corona, we consume about 4 GWh of electricity per year, which is just under 700,000 euros in electricity costs. Being able to save ten per cent or more here in the long term, even more so if energy prices continue to rise, pays off.” With a net investment, i.e. after deduction of the subsidy, of about 200,000 euros after only three years.

All the measures of the last five years add up to an investment of about 2.5 million euros. “We see the efficiency measures as positive and sensible investments in the future. As a family business, we don’t have to show a huge return on investment after just twelve months. It is important to me to make provisions in good times so that things will also work well in bad times,” Peter Rapp emphasises. This has now proven itself in the Corona year 2020: “Our revenue dropped from almost 20 million euros in the previous year to 15.4 million euros, and yet we have not slipped into the red.

Almost all materials pass through the drying process. PKT operates speed-controlled dry-air dryers with 56 bins.

PKT has had existing dryers converted to speed-controlled fan drives for dry air generation.

Since the end of last year, we have been running at maximum load again. March 2021 was the best month since the company was founded. We are ready for an efficient take-off.”

www.pkt-gmbh.de
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The web-based Econ energy monitoring system reports measured values every minute and detects deviations from the normal process situation.



Foto: K-PROFI



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When Makutec buys a used Arburg injection moulding machine, it is completely overhauled, repaired and tested in a trial run for several days so that the buyer receives a functional guarantee for his used machine.



Precious second-hand treasures

How second-hand machinery finds a second life via direct sales, online exchanges and industrial auctions

The automobile and housing market as well as the second-hand machinery market certainly exhibit parallels. Increasingly, contacts are being made in the virtual sphere. Sellers want to get the best price for their “good piece” and buyers want to be sure they are buying something good. The significant difference: while real estate is usually sold regionally and vehicles can be transferred from A to B without any problems, it is much more complicated in the case of second-hand machinery for the plastics processing industry, especially if national borders have to be crossed or sea routes have to be travelled. How can processors sell decommissioned treasures in the best possible way or find a suitable machine to expand capacity in a timely manner? What role do manufacturers play? Which marketing channels do the market participants trust? K-PROFI asked the players.

A compilation by Toralf Gabler, Sabine Rahner, Karin Regel, Gabriele Rzepka and Markus Lüling, editors K-PROFI

“From my point of view, the argument for buying a second-hand machine is often about time. A used machine is sometimes available much faster than a new one” explains Karlheinz Herbold. Herbold Meckesheim GmbH from Meckesheim/Germany, which specialises in machines and plants for plastics recycling, generates about 5 to 10 % of its sales with used machines. “We buy back machines for shredding, fine grinding, shredding, washing, separating, drying and agglomerating from our company off the market. During the reconditioning, we bring in our expertise, can advise the customer optimally and thus significantly minimise the risk for the buyer of hidden defects,” says Managing Director Karlheinz Herbold, formulating an advantage for his customers. His company usually buys second-hand

machines when it sells a new plant to a customer. “We take the old machine in as part payment,” says Karlheinz Herbold, drawing a comparison to the purchase of a car.

“Often the biggest motivator for our customers to decide in favour of a used machine is the very fast availability. Of course, the price also plays a role,” reports Stefan Herzinger, Managing Director of Wickert Maschinenbau GmbH from Landau/Germany. The used machines are not advertised specifically; current offers can be viewed on the homepage. “Most of our used machines are sold through the normal sales channel, i.e., we receive an enquiry and then realise together with the customers that a used machine is the best approach here.”

Used machines back to the manufacturer?

The Austrian injection moulding machine manufacturer Engel established its own company for used machines at the end of 2020. In addition to injection moulding machines, Engel Used Machinery s.r.o., based in Prague/Czech Republic, also buys back used robots from the Engel series, reconditions the products and offers them on the market again. “In some cases, only a second-hand production system can be considered. For this requirement, too, we want to offer our customers a high-quality solution with Engel’s usual consulting expertise and excellent service,” says Dr Christoph Steger, CSO of the Engel Group, explaining this strategic decision. The repurchased injection moulding machines and robots will be reconditioned in-house. Engel has created the necessary capacities for this at its production plants in Austria and the Czech Republic. “Eastern Europe is the largest and fastest-growing market for used injection moulding machines,” says Leopold Praher, who has taken over the management of Engel Used Machinery.

But buying back used machines and trading in second-hand equipment is still rather the exception among machine manufacturers. “We usually arrange for the contact to partners who handle the business,” informs Andreas Schramm, Managing Director of Wittmann Battenfeld Germany. The specification of the machine is key: the more individually the machine is specified, the more difficult it is to find a match. Larger companies, in particular, are more likely to pass on highly specified used machines within their group. In addition, the following aspect is important: used machinery is subject to the Machinery Directive with the corresponding CE marking obligation if it is being imported into the EU economic area for the first time or if it has been substantially modified during a conversion and is thus to be regarded as a new machine. Therefore, it must always be checked whether it is a case of placing it on the market from a CE point of view – with all the consequences to be derived from this for risk assessment and product liability.

“If you as a manufacturer put machines directly back into the market, they would have to be brought up to the latest technical safety standard in each case. In order to be able to cover the area of warranty, a thorough overhaul is also necessary, which is only really worthwhile for relatively new machines,” confirms Harald Schmid, Sales Manager at Desma Elastomertechnik. Basically, the market is straightforward. The few used injection moulding machines for elastomers on the market are mostly resold directly by the customers or passed on to subsidiaries or partners. “In some cases, we take back used machines in the course of a new machine procurement, but mostly we mediate between potential interested parties and sellers and take over the installation and, if necessary, retrofits or overhauls. The used machines are most often older than 15 years.”

Complete overhaul at the dealer with function guarantee

Although Arburg is aware of the intrinsic value of its machines and even older machines are in great demand, the sale of used machines is hardly an issue for Arburg. “Our customers sell their Allrounders on their own due to the high market value,” reports Gerhard Böhm, Managing Director Sales and Service at Arburg. “From our point of view, when buying a machine on the general used machine market, it is important to look at it

on site, test it during operation and look at the general state of care, the status of the wear parts, compliance with the maintenance intervals and, of course, the number of operating hours. Experience shows that the advantages of the used Allrounders are so convincing that their operators often buy new machines from us later on.”

Business with used Arburg machines has been the daily bread of Makutec GmbH, Straßenhäus, for decades. “We are recommended by Arburg agents worldwide and have earned a very good reputation here,” says Sabine

Lenau-Weilberg, who runs the company with her father, happily. After initial preliminary information about the maintenance and condition of a potential machine candidate, it is inspected at the seller’s premises: “Thanks to our more than 30 years of experience with Arburg machines, we know exactly what to look for during the inspection and quickly recognise what costs we will be facing during the overhaul. Machines with more than 100,000 operating hours are no longer an option. When we buy a machine, we overhaul it completely, repair it, replace defective parts and do an alignment.” After that, the machine is

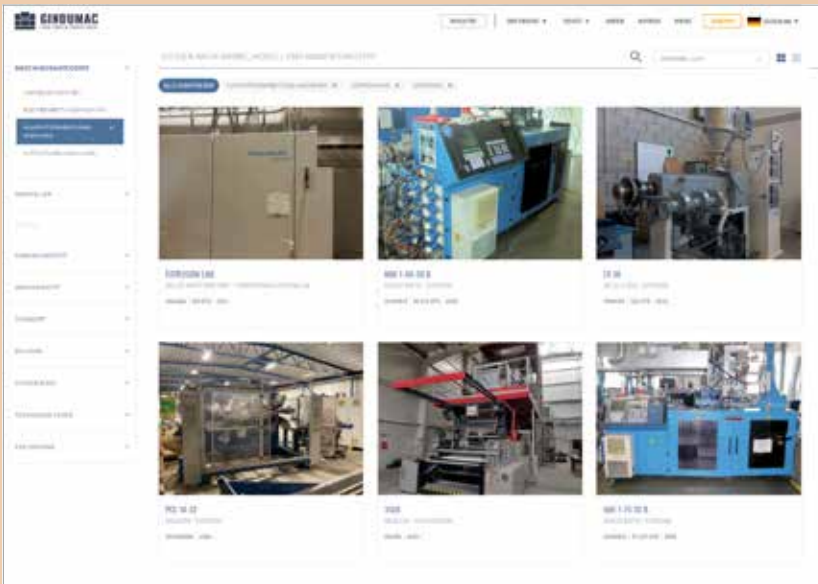


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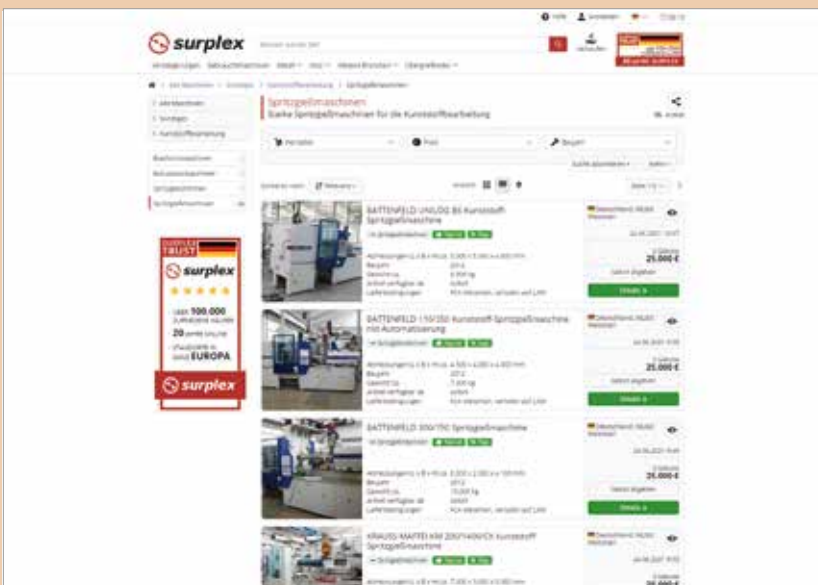
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“basically like new”, so Makutec gives a functional guarantee on delivery. The complaint rate is almost zero because the machines are tested for two to three days after the overhaul. This is why customers keep coming back to Makutec. “At the moment, hardly any machines are given up, you really have to search to get a used machine. Because of this scarcity, we, therefore, supply the German market almost exclusively at the moment and export very little, although we also receive enquiries from abroad.”

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Reach and visibility count in brokerage

But how do sellers and buyers come together? Whether professional traders like Makutec or plastics processors: anyone who wants to sell a machine usually advertises on virtual marketplaces that are funded by monthly fees or sales commissions. Interested parties thus have worldwide access to the offer and can sometimes even compare prices online. These independent machinery exchanges that concentrate solely on brokerage include maschinensucher.de, resale.de or plasticker.de, which is specifically for the plastics industry. The Trade Association of the Wholesale Trade in Machines and Tools (FDM) also focuses on brokerage with its specialist group for used machines. At www.machine-stock.com, FDM has been operating a portal with offers of second-hand machinery from its member companies for six years.

Digitalisation is changing the trade in used machinery. For Surplex GmbH, which has been operating on the market since 1999, online auctions have become the most important sales channel. More than 500 online auctions are conducted on surplex.com every year, with more than 55,000 machines and operating equipment from various industrial sectors changing hands – also in the context of insolvencies, restructurings, plant or

site closures. The platform is available in 16 languages and has more than 50 million page views per year. According to the company, it is the only industrial auction house in the whole of Europe that offers all transaction processing services from a single source, including dismantling, loading and customs clearance. To this end, Surplex employs 200 people in offices spread across 13 European countries. “In the past, SMEs had to rely on non-transparent and regionally limited trading structures to sell surplus machines. Today, they can lucratively auction off decommissioned machines on the world market,” Surplex says.

Global trading platform for metal, sheet metal and plastics processing

Local trade is declining, global online trade is growing – this is the observation of Gindumac GmbH, Kaiserslautern. The group of companies with national subsidiaries in Germany, Spain and India has been operating an online platform for global trade in used machinery from the metal, sheet metal and plastics processing sectors since 2017. In addition to the two founders and managing directors, Janek Andre and Benedikt Ruf, the shareholders include Leis Holding, since October 2020



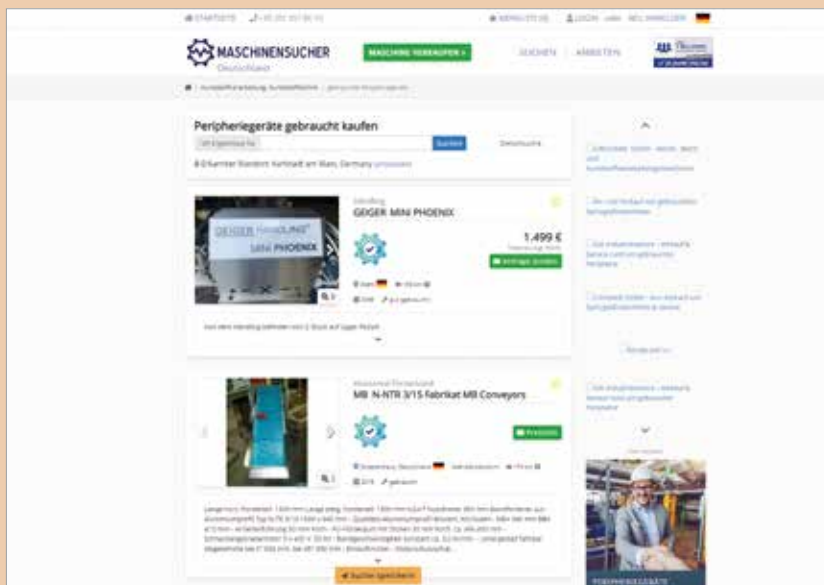
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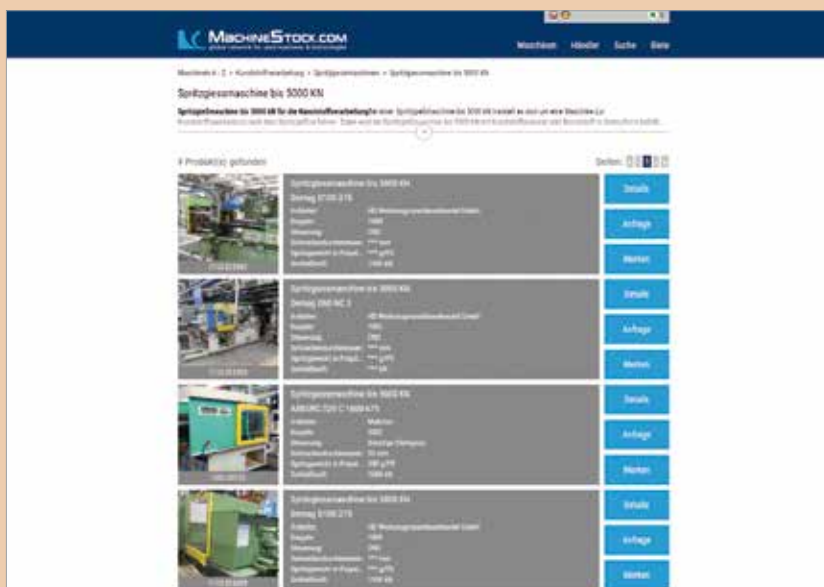
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Schuhe24 as majority shareholder and already since 2018 Krauss-Maffei Technologies GmbH. The company has repeatedly reported expansions in the scope of its services and offerings, most recently including the brokering of the largest used injection moulding machine to date with a clamping force of 54,000 kN from Germany to India.

Specialised in the plastics and beverage industry

Second-hand machinery dealers bridge numerous obstacles for sellers and buyers. MachinePoint Group from Valladolid/Spain, an internationally active company in the plastics, packaging, food and beverage industries, has been doing this since 1997. The MachinePoint Used Machinery division brokers used machinery of all makes between buyers and sellers and is the preferred reseller of Husky used equipment. The database of what the company claims is the largest used machinery dealer in the industry now holds 350,000 contacts, with 40 employees facilitating the change of ownership for around 200 machines per year. When asked why a seller does not sell directly to the buyer, CEO César Rodríguez Gabilondo answers that this is not so easy: "We are very familiar with the transport options, we know how to securely fix a machine so that it is not damaged during transport, we know the customs regulations and which accompanying documents are necessary so that the transfer goes smoothly." This is particularly important when customers have to finance the used machine. After all, it means time and money if a machine has to stay in port for several weeks or even months because papers are missing.

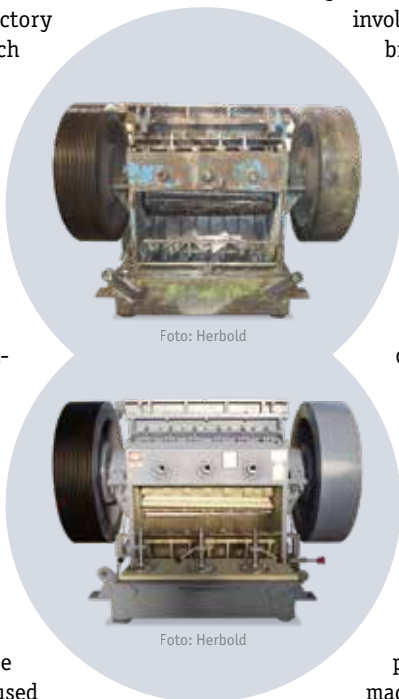
The ideal age is in the middle

However, MachinePoint does not broker every machine. "We buy neither very young nor very old machines," says Marco Marchiello, Sales Director Plastics Division. On the one hand, machines that are too young are still too expensive, so that it is almost not worthwhile for the buyer to forego the guarantee of a new machine. MachinePoint does not buy completely newly developed machines because the technology is not yet sufficiently well-known and established to be able to recommend them with a clear conscience. A machine that is too old may be cheap, but the buyer may not get anything out of it for any length of time. The specialists say that the typical age of injection moulding machines is about seven to

ten years, while extrusion lines for the production of sheet and film can easily be ten to 20 years old. Printing presses and extrusion lines have fewer moving and wear-prone components than, for example, bag sealing machines or injection moulding lines. The latter work in cycles and usually with high pressures, pneumatics or hydraulics and therefore have a shorter lifespan. There are no restrictions on the clientele: however, experience has shown that younger and thus more expensive machines tend to go to large companies, while older and thus less expensive machines are of interest to new and small companies.

MachinePoint only rarely buys machines to store them. In 95 % of cases, the sale takes place from factory to factory. There is no such thing as a typical sales sequence. Both buyers and sellers approach the used machinery dealer and ask for assistance. In order to be able to assess the condition of a second-hand machine that is for sale, it is inspected by an expert "in normal times". "In Corona times, we carry out a virtual inspection, which we do well because of our now 20 years of experience," emphasises César Rodríguez Gabilondo. Speaking of Corona: the pandemic has given the used machinery dealer a sales peak. "Especially lines for the production of flexible packaging films and bottles for disinfectants were in great demand," he says, "lines for the production of beverage bottles also boomed, as much more was being consumed at home and less in restaurants or hotels." However, he expects the market to calm down and, due to the many restrictions in the tourism industry, many plastics processors will have lower production numbers and accordingly need fewer machines – whether new or used.

As a manufacturer of shredding systems, Herbold is also active in the used machine business. An in-house department overhauls mills both from the company's own production and from other manufacturers. The photos show a mill before and after the overhaul.



Even used machines have their price

The buyer can save about 50 % if he decides to buy a second-hand machine. In addition to information about the condition of the machine, transport options and requirements, customers are sometimes also assisted with financing. At MachinePoint, the seller is already paid before dismantling, even if the purchase price has to be financed by the buyer. Another reason why sales are rarely made directly from seller to buyer. "Used machines also usually have very high investment volumes. As a rule, we finance all transactions with our own financial resources, but we also have good contacts to various banks as well as private financiers in order to set up financing that is manageable for all parties involved," César Rodríguez Gabilondo presents one advantage of his company.

He does not consider exclusive trade fairs for used machines to be useful: "The buyer comes from a very specific industry, for example, the film industry, and does not want to find out about used machines in general but wants to find out about the machine market in his segment. That is why it is so important for us to be present at the K, so that the visitor can compare: New machine or used machine?" So far, he says, his company has seen a drop in demand for used machines just before one of the big trade fairs such as K, NPE or Chinaplas and a significant increase afterwards. For him, this is proof that a potential buyer first informs himself and then compares before making a decision. Generally, he sees an increasing demand for second-hand machines in the plastics and beverage industry in recent years, which has ultimately also contributed to the success of his company. ■

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Code: Produkt: Produzenten Standorte

Auswahl

Produkte

Monomere

Polymere

Standard-Kunststoffe

Polyolefine

PE (Polyethylen)

PP (Polypropylen)

Styrol-Kunststoffe

PET (Polyethylenterephthalat)

PVC (Polyvinylchlorid)

Technische Kunststoffe

Polyamide

Styrol-Copolymere

PBT (Polybutylenterephthalat)

PC (Polycarbonat)

PMMA (Polymethylmethacrylat) Formmassen

POH (Polyacetat, Polyoxyethylen)

Hochleistungskunststoffe

Polyurethane

Biopolymere (biobasiert und -abbaubar)

Regionen

Chart

Map

Forecast

Region

Kapazität (Jahre)

Anteil (%)

Asien

11.609.000

18.1

Nordamerika

8.409.000

11.8

Südamerika

3.224.000

4.5

Afrika

960.000

1.3

Australien/Ozeanien

300.000

0.4

Welt

72.211.000

100.0

Land (Welt)

Chart

Map

Forecast

Land

Kapazität (Jahre)

Anteil (%)

China

25.020.000

25.8

USA

7.899.000

10.9

Saudi-Arabien

5.230.000

7.4

Indien

4.480.000

6.3

Südkorea

4.150.000

5.8

Japan

2.733.000

3.8

Deutschland

2.505.000

3.3

Russland

2.140.000

2.9

Kapazitäten

Ausblick

Produzenten: PP (Polypropylen), Welt

Chart

Forecast

Produzent

1 Sinopec

2 LyondellBasell (LLB)

3 Braskem

4 PetroChina

5 Borealis

6 Sabic

7 Total

8 Reliance

9 ExxonMobil Chemical

10 Formosa Plastics

11 Ineos

12 Lott

13 Sumitomo

14 IFF

15 Shenhua Group

16 Sinopec

17 Sibur

18 Beaulieu (Polydan / Pimade)

19 Mitsui Chemicals

20 Mitsubishi

21 Oil Refineries (Came)

22 Indian Oil (IOC)

23 Yanchang Petroleum

24 Tasnee (Cristal)

Anlagen: PP (Polypropylen), Welt

Map

Forecast

Produzent

Total Petrochemicals & Refining USA Inc

ExxonMobil Chemical USA

Reliance Industries Ltd - (RIL)

Saudi Polyolefins Co - (SPC)

Equistar Chemicals

HMC Polymers

Braskem

Petro Rabigh

The Polyolefin Company (Singapore) (TPC)

Formosa Plastics USA Corp

Equistar Chemicals

PetroChina Dushanzi

Zhejiang Shaoxing Sanyuan Petrochemical Co

Sinopec Beijing Yanhan Petrochemical (BYPC)

Dattang International Power

ExxonMobil Chemical Asia Pacific

Honam Petrochemical (HPC)

Honam Petrochemical (HPC)

Bn Zahr Saudi European Petrochemical Company

Shenhua Ningmei (Shenhua)

Tobolsk Polymer LLC

Borsuige (Abu Dhabi Polymers)

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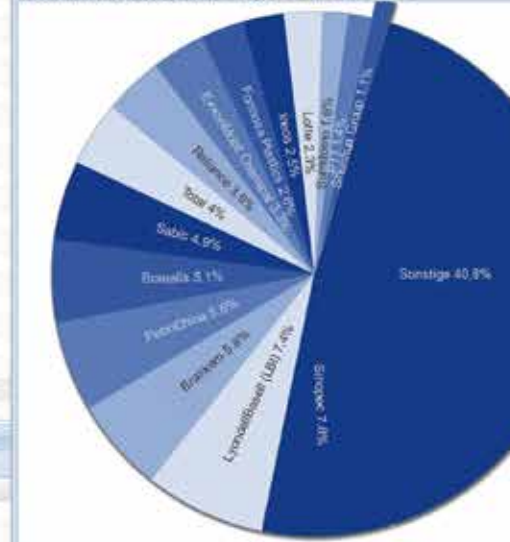
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Produzenten: PP (Polypropylen), Welt - Top 15 - Total 72,211,000 Jähr



Kreis-Chart * Optionen... Refresh

PP (Polypropylen)

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The result of the latest joint project between MAM and Starlim: the lightest all-silicone dummy for premature babies.



Silicone products for demanding mouths

Why the combination of experience and simulation is so important for dummy manufacturer MAM

The baby cries, it gets a dummy and calms down. Behind this everyday action lies a great deal of development work and know-how. After all, a baby can cry but not speak. "Our customer is first and foremost the baby, i.e. the user," says Harald Schermann, Head of Technical Product Management & Strategic Purchasing Research and Development at MAM Health & Innovation GmbH from Siegendorf in Austria, explaining the special situation. "And in order to understand and satisfy our customers, we are in constant dialogue with parents and international medical experts." The latest result of this intensive and special development work is the world's lightest all-silicone dummy, which is created by 2K injection moulding from a hard and a soft silicone component.

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

MAM sells many millions of soothers every year and is considered the market leader in some countries. But the company not only produces dummies for soothing but also teats as attachments for drinking bottles, the drinking bottles themselves and much more. To be exact, there are about 140 different products. Around 150 items for babies and parents are sold every minute, manufactured at three of the company's own locations as well as by partner companies worldwide. Obviously, MAM knows what babies want. After all, the

company has grown by 240% in the last ten years and now employs around 1,000 people. They are proud of the fact that about 90 % of all product components are manufactured in Austria. There are further production sites in Hungary and Thailand.

One of the partner companies is Starlim Spritzguss GmbH from Marchtrenk, also in Austria. "We have been cooperating with Starlim for over 40 years," emphasises Harald Schermann: "We can rely one hundred percent on Starlim's expertise in processing liquid silicone. Together we have already brought many new and further developments to the market." Starlim is not only a development partner but also one of several companies that manufacture product components for MAM. "Due to our above-average growth, we work with various partner companies worldwide," the manager explains further. The growth continues despite the global Corona pandemic, he adds.

The latest new development, which was created together with Starlim, is the 2K all-silicone dummy, which is also well suited for premature babies. Typically, dummies for babies consist of the actual soothing part and a solid shield that rests outside the mouth and ensures that the dummy does not go completely into the mouth. The soother part satisfies the baby's need to suck and is made of either latex or silicone. The shield is made of a thermoplastic, usually PP.

The liquid silicone specialist Starlim produces around 14 billion silicone parts a year on a total of 250 injection moulding machines.

“Several steps are necessary to produce the well-known dummies, because after the two parts have been injection moulded independently of each other, they have to be joined together via a snap-in or snap-on connection, alternatively via ultrasonic welding.” All-latex or all-silicone dummies already exist, but none so light that they are suitable for even the smallest babies. “We are very proud that we have developed the world’s lightest all-silicone dummy and have already launched it on the market,” emphasises Thomas Rohaczek, Head of Product Design and Development.

But from the very beginning: “In order to be able to precisely assess the needs of our customer, i.e. the baby, we first talk to many experts such as midwives, doctors and paediatric nurses.” When developing a dummy, he says, it is also important to communicate with orthodontists, as dummies that are too large exert too much pressure on the jaw arches and can cause deformities later on. Once the developers at MAM knew what the product should look like, Starlim came into play. “Together we have now developed the perfect dummy design in several iteration steps,” Thomas Rohaczek continues, “and virtually.”

This is precisely the particular strength of Starlim, which on the one hand has enormous expertise in processing liquid silicone and on the other has state-of-the-art simulation software to calculate adjustments to tools and process. “In the simulation, we have to include all the important parameters such as mould, temperature, viscosity and pressure in order to arrive at the most perfect process possible,” explains the Head of Product Development at Starlim, Leopold Pühringer. “Thanks to the combination of many years of experience from liquid silicone processing and simulation, we not only do this very well but also quite quickly.” For all parties involved, this is an economical approach that does not require step-by-step mould production and no production costs or material waste.

The complex manufacturing process now looks like this: In the first injection moulding machine, the shield is created from a silicone with a high Shore A hardness, which a robot carefully transfers to the mould of the second injection moulding machine. Here,



Photo: Starlim

the soothing part is injected from a silicone that is as soft as possible and joined to the shield while hot. “The second mould closing poses a challenge since a change in the shape of the first component can occur here, which of course is not allowed to happen,” says Leopold Pühringer, describing a challenge that was, however, overcome.

The advantages of the new 2K all-silicone dummy result from the material combination. Newborns have very sensitive skin that could be irritated by the conventional hard thermoplastic shield. Another advantage is the size of the new dummy. The dummy is much smaller than previous ones and therefore lighter. This means that it causes fewer pressure points and is easy for the baby to hold in its mouth. Of course, it meets all requirements in terms of long-term stability and temperature resistance, so it can be regularly sterilised for hygienic reasons.

Speaking of requirements: These are of course particularly high for dummies. In addition to hygiene, it’s about food safety and security. That’s why every dummy must pass the so-called template test. To do this, it is placed on a template from both the front and the

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back and subjected to a defined weight of 1 kg. The template stands for the mouth opening of the baby and the weight for the suction power. "During the test, the dummy must remain in contact with the template in any direction and must not slip," explains Thomas Rohaczek from MAM. "Today, we can also perform this test by simulation, which is a significant relief."

In addition to the lightest all-silicone dummy, an anti-colic bottle is also one of the special products from MAM. Drinking from such a bottle is modelled after drinking from the mother's breast. Thanks

to the special design, the baby does not suck in so much air when drinking and gastrointestinal colic is less likely to occur. The bottle consists of a total of six parts and can be completely disassembled for easy cleaning. Part 1 is the bottle body, which is open at the top and bottom. The detachable bottom of the bottle has two parts – a ring with holes and a silicone seal that allows the bottle to "breathe". Parts 4 and 5 are the top ring that holds the bottle teat, and finally, part 6 is the cap to protect the teat when the bottle is to be taken away. "With this bottle, the infant can drink in a completely relaxed manner and at its own pace," is how Thomas Rohaczek formulates the decisive advantage of the bottle, which also includes a "self-sterilising" function and is available in different sizes. 

www.mambaby.com

www.starlim.com

Left: The special base design with a silicone seal ensures that the baby hardly sucks in any air when drinking from the anti-colic bottle.

Below: With the virtual template test, a new dummy design can be checked quickly and inexpensively.

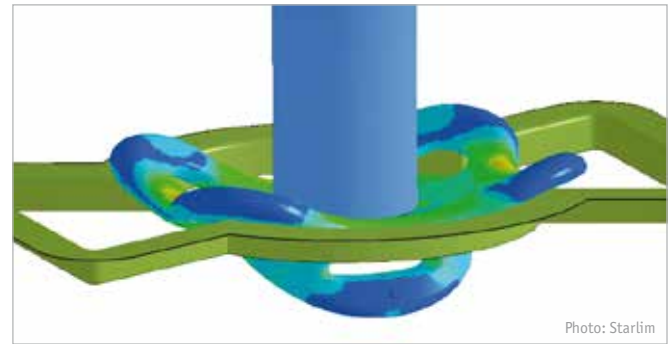
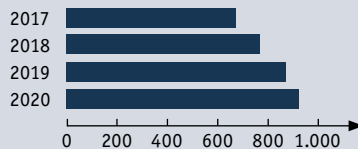


Photo: Starlim

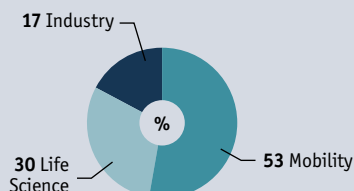


Source: Starlim; Graph: K-PROFI

Employees



Markets



Management



Ing. Thomas Bründl
CEO

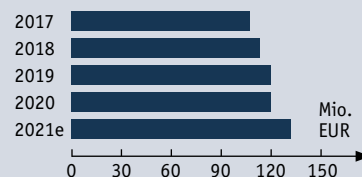


Ing. Karl Großalber
Vice President Marketing & Sales

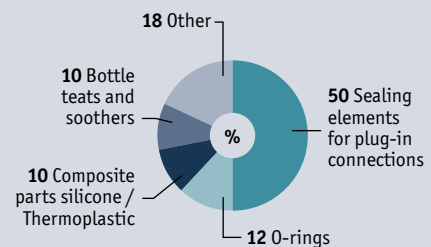


Markus Köttstorfer MBA
Sales Director

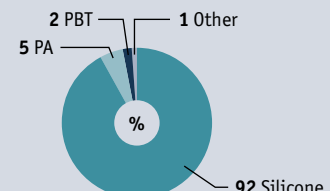
Turnover

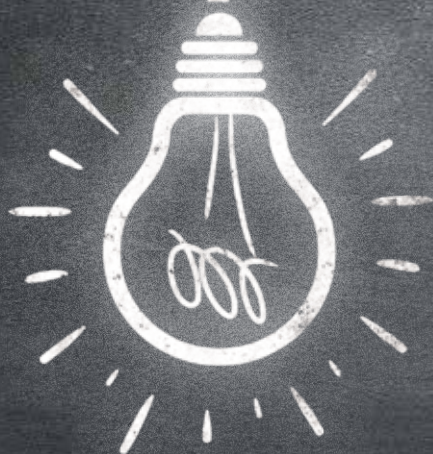


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Sensor sorting technology



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“Why don’t you find me a company”

Why M&A projects for SMEs are a matter of absolute trust and take their time

We are currently experiencing a lot of movement and change in the plastics processing industry. Well-managed M&A processes are a real opportunity for buyers and sellers. Success should not be left to chance.

In recent weeks I have had several very different enquiries about mergers & acquisitions (M&A). On the one hand, there are



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those consultant colleagues who know a businessman who is simply looking for a location in a new region, for example, and who simply want to present him with a company as a bonus to their actual assignment. These colleagues then randomly call acquaintances from whom they hope to receive tips that may then with little possibility lead to success. The tipsters usually come away empty-handed in these deals and are later annoyed at their own stupidity. The consultant is happy about a nice dinner with the business owner and hopefully more business in his core area. And the businessman is initially pleased to have achieved a strategic goal that is important to him so easily by chance.

The consultants of a second category that I have met are – in themselves – systematic, but terribly annoying to all parties. They buy databases and analyse them, which is perfectly legitimate. Then they contact potential target companies and offer their service to sell a business without being asked. Conversely, they offer companies to sell

businesses to them that are actually not for sale at all. If you only play this game long enough, you will eventually actually bring two partners together, but before that, you have simply annoyed a great many parties. This is irritating for all those who had no interest in a deal in the first place.

The royal road in this business is the most arduous, and it has its price: A company owner has the clearly formulated goal of entering into a partnership in order to leverage synergies, or he wants to buy a company. He decides to have a systematic search carried out. Ideally, he commissions an M&A consultant who has a dedicated network in the specific industry and one who he personally trusts. Once the criteria have been established, the search process begins, which may in fact take some time. A good result is when the business owner can then choose from several takeover candidates or potential partners and there is a real win-win situation for seller and buyer, e.g. also the settlement of an uncertain age succession.

The consultant is paid for his services and additionally receives a previously agreed commission after the successful completion of the transaction. It is precisely at this point that it is extremely important for the business owner and for the M&A consultant to have a clear understanding beforehand. Unfortunately, in the course of the process, the buying business owners often get irritated due to the lack of patience that they pay for the services even if they have not yet successfully been “matched”. However, a good consultant must be seen as a truffle pig. His service is to find the right company. That is what he gets paid for in the first place. The daily or hourly rates of lawyers and analysts in the follow-up process of due diligence and contract negotiations are often many times higher. On closer inspection, however, these services are rather standard and “easy to pay for”.

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