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international edition

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From H₂, LSR and rubber, recycling, thermoforming and smart colouring

Dear reader,

a gloomy economic mood, Taiwan's plastics industry is thinking big: a broader export of equipment remains a goal. This was once again clearly evident at its "TaipeiPlas" trade fair: page 5. Hydrogen should accelerate the energy transition. Which supplier parts are needed to expand the H₂ value chain? What opportunities do plastics processors have? Dr Kai Fischer and Marie Hadenfeldt from the "Hydrogen Business and Technology Forum" of the IKV at RWTH Aachen University provide answers: page 8.

Mack Kunststofftechnik focuses on the "special cases of thermoforming" for racing cars, snow groomers, buses, medical technology and art objects. The family-run company produces transparent, glossy or refined components: page 14. Despite the ongoing economic downturn, there was no complaining at the German Rubber Conference (DKT) in Nuremberg. The transformations in the energy industry and mobility offer rubber machinery manufacturers new opportunities. Together with service providers, they are countering the crisis with many new ideas for elastomer processing: page 19. Ansgar Thees-Ovelgönne is developing recycling concepts with plastics processors and disposal companies – stationary in his company, mobile at the processor's site, as a closed loop or with further utilisation: page 24.

At Trelleborg Sealing Solutions, the Stein am Rhein site is regarded as a centre of excellence for the processing of LSR. The Swiss company relies on in-house developed hot runner, cold runner, dosing and injection technologies as well as partnerships with Arburg, Elmet and Wacker, among others, to produce extremely high-quality parts: page 28. True-to-original car, truck and aircraft models are the speciality



of Herpa. The injection moulding production in Dietenhofen is currently converting the colouring of PS, ABS, MABS and LDPE from colour powder to masterbatch. The challenge: high dosing accuracy with very low shot weights. Insights from on site from page 34.

We wish you a pleasant end to the year and a good start to a successful 2025!

Markus Lüling, Editor-in-Chief
lueling@k-profi.de

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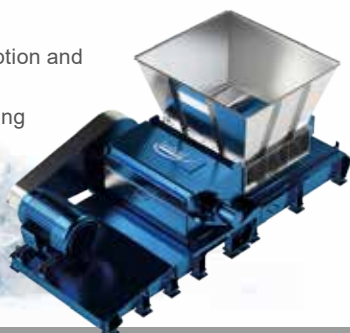
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Taiwan: plastics industry with big goals

Why the country's importance is growing beyond Asia and what role exports play in this

The first "TaipeiPlas" was launched in 1997 and the trade fair now takes place every two years. It attracts numerous visitors, especially from Asia. Despite the tense global political situation, the sword of Damocles of Chinese military intervention in Taiwan and a gloomy economic mood, over 16,000 visitors attended this year's fair, most of them from Asia, as was to be expected.

Text: Gabriele Rzepka and Gero Trinkaus, Team K-PROFI

International guests from Korea, India, Vietnam, Thailand and Pakistan dominated the visitor picture, so that the trade fair visit confirmed the impression of greater interest within Asia. The reasons for visiting were varied. Mirawati Wu from Indonesia and Saiful Bahri from Malaysia, both from Pacific Medan Industri, reported: "We are at the trade fair because we are looking for injection molding and blow molding machines for our sites. We want to find out about the latest developments and see what innovations are available."

Almost 500 exhibitors from 16 countries presented their products. The focus was on plastics machinery, which accounted for 40 % of exhibitors, auxiliary equipment and robots, which represented 14 % of exhibitors, and raw and composite materials, which also accounted for 14 %. The Director of the Taiwan Trade Center in Düsseldorf, Danny Liao, was satisfied: "Around 80 percent of the exhibitors came from our country, but we also had 20 percent international exhibitors at the trade fair." Many of them came from Europe, the USA, Japan, Turkey and, of course, neighboring Asian countries such as China, South Korea, Malaysia and India.

The relatively new presence of raw material manufacturers attracted Manmohan Sublok and Shivani Sablok from the raw material trader Golden Arch Marketing, India, to Taiwan, for example: "We visit our suppliers here and look for other trading partners. We also travel to Germany for K every three years, because we have very important suppliers in Spain and would also like to import raw materials from Germany to Asia."

Mirawati Wu (right) from Indonesia and Saiful Bahri from Malaysia were at TaipeiPlas for their employer Pacific Medan Industri: "We are looking for injection molding and blow molding machines for our sites."



Photo: K-PROFI



Photo: K-PROFI



Photo: Taitra

James Huang, CEO of the Taiwan External Trade Development Council (Taitra), opened the trade fair in the capital Taipei.

Good mood among the exhibitors

A total of around 2,500 international visitors from 98 countries attended. The focus was on the topics of "Innovative materials", "Modern production technologies" and "Circular economy". The exhibitors were happy to address these topics. Kings Solution, Taiwan, has developed a return machine for PET bottles, metal cans and batteries. Customers are companies that set up the machines in their buildings or in public areas so that employees and passers-by can dispose of their containers here. "We don't have a deposit system in Taiwan. To motivate people to use the machines, we have developed an app that connects to the machine and counts the bottles, cans and batteries returned. The user can then take part in a competition," says Jeremy Hu, Kings Solution. Companies can display their logo or advertising on the display of the reverse vending machine.

Some companies also had something to show when it came to material innovations. Georg Wang from Ta Haw Enterprise presented the new black masterbatch and perfumed masterbatches: "Rose fragrance is doing very well in Dubai, for example, where the masterbatch is used for packaging. We also take our products to the K. Our headquarters are in Taiwan, but we produce in China." At Great Eastern Resins Industrial from Taiwan, an important focus was on the product Isothane, a PIR TPU. Allen Huang explained: "Our material is very light and can be recycled. This allows us to offer a lightweight material with very good mechanical properties and different degrees of transparency."

Manmohan Sublok and Shivani Sablok from Indian raw materials trader Golden Arch Marketing: "We visit our suppliers here and look for other trading partners."



Patrick Tong from Trexel explains the interaction between the SA-160 injection molding machine from FCS and its physical foaming process.



The machine produced safety goggles live at the trade fair.

With its SA-160 injection molding machine, FCS demonstrated the production of safety goggles. The closed-loop servo injection system can precisely control the speed of each shot, the injection time stability is 99.9 % and the mold product weight remains stable. Jude Tsai explained some features of the machine: "The mold opening stroke is increased by 16 percent, making the machine suitable for producing products with great depth. The clamping force is applied directly to the center of the moving platen, which ensures that the mold is loaded evenly, thus reducing waste." During the show, FCS produced temples for safety glasses using the Mucell process. While FCS

is represented worldwide with its machines, the situation is different for the blow molding machine manufacturer Fong Kee, Taiwan. Joey Hsieh made it clear: "In the Asian region, we play in the top league with our systems, but internationally we cannot keep up with the top level." At the trade fair, the system produced canisters from PE, which are then shredded and returned to the machine. Tenso, Taiwan, was also an eye-catcher with its linear handling system. Ivan Chen proudly explained: "A weight of five kilograms is constantly suspended from the robot, and it sorts balls at the same time. Despite the load, the system always hits the center of a target with the laser pointer. This clearly demonstrates the precision of the system."

For the first time this year, the organizer presented awards for innovations in the categories of materials, products and machines as well as the three excellence categories of aesthetics, intelligent machines and sustainability.

"We are becoming more competitive internationally"

After declining visitor numbers due to the coronavirus pandemic in 2022 as a result of significant travel restrictions and disrupted supply chains, exhibitor and visitor numbers recovered significantly in 2024. Danny Liao is satisfied with the development of TaipeiPlas and also has concrete visions for future developments: "In the future, we plan to attract an even broader range of exhibitors and make TaipeiPlas an all-in-one trade fair. It should reflect the latest developments in the global plastics and rubber industry – from materials to products, including solutions for a circular economy."

Danny Liao's hopes are based on very concrete figures, as the plastics and rubber industry in his home country is becoming increasingly important. The island state has 400 plastics and rubber machinery manufacturers alone, three quarters of which are members of the Taiwan Association of Machinery Industry (TAMI). According to Bush Hsieh, Chairman of the TAMI Committee for Plastics and

One of the winners of the innovation competition in the material category was Ever Light from Taiwan. Ching-Yu Lin explains: "We have developed a foamed product that protects against yellowing even when exposed to strong UV radiation."

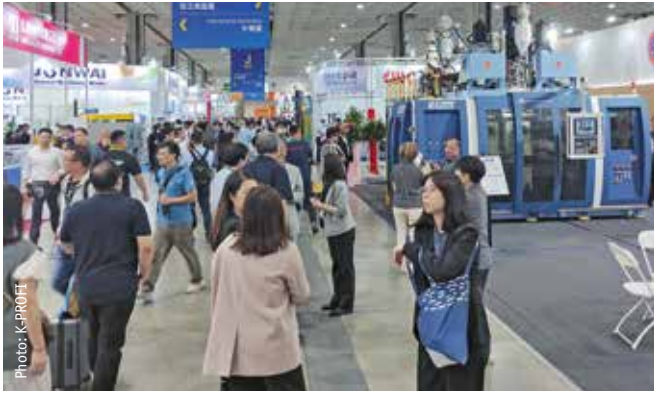


The Taiwanese company Kings Solution has developed an automatic return machine for PET bottles, metal cans and batteries. "Our customers install the machines in their buildings so that employees can dispose of their containers here," says Jeremy Hu, giving an insight.



Georg Wang from Ta Haw Enterprise shows a new black masterbatch and perfumed masterbatches: "Rose fragrance is doing very well in Dubai, for example. The masterbatch is used there for packaging."





Visitor interest in TaipeiPlas has grown again. The next edition of the trade fair will take place in fall 2026.



The linear handling system from Tenso, Taiwan, was an eye-catcher. Ivan Chen proudly explained: "A weight of five kilograms is constantly suspended from the robot, while at the same time it sorts the balls very precisely."

Rubber Machinery, machine manufacturers are becoming increasingly competitive compared to their international rivals: "In recent years, they have introduced intelligent manufacturing technologies and invested in the development and integration of technologies such as the Internet of Things (IoT), automated control systems and data analysis. This has improved the accuracy and efficiency of the machines, making them more competitive internationally."

The topics of CO₂ footprint and sustainability were not only a topic at the trade fair. "Many companies are launching machines on the market that consume less energy," confirms Bush Hsieh. The manufacturers source the components for their machines mainly from China, Japan and Germany.

Exports dominate the business

The lion's share of machines from Taiwan is exported – around 90 %. No wonder, as the country is small and companies have long since found their markets outside their own borders. Half of this goes to the Asian market, primarily China, Vietnam, India, Thailand and Indonesia. The other half goes to the USA, Germany, Poland, Russia and Brazil. Over the past ten years, the export share of the Taiwanese rubber and plastics machinery industry has remained stable at an average of around USD 1 to 1.1 billion per year – even during the coronavirus pandemic. The trade war between China and the USA is impacting the global supply chain, which is also affecting manufacturers in Taiwan. Tommy Hsu, President of TAMI, reports: "Some US and European companies have decided to avoid the Chinese market and turn to other sources of supply. Taiwan's technology and our geographical advantage has made our

manufacturers one of the alternatives for these companies." This is driving the growth of exports.

In 2023 and 2024, however, the slowdown in the global economy, high raw material prices, rising inflation and thus falling demand for plastics and rubber machinery will have the opposite effect. On balance, the effects of the exchange rate policy led to a decline in Taiwanese exports of plastics and rubber machinery by almost 20 % to USD 0.8 billion in 2023. Looking to Europe, Tommy Hsu is realistic: "In the European market, our competition comes from Germany, Austria, China and Japan. In terms of prices and exchange rates, we still have to work hard to gain a foothold in Europe."

In addition to the machine manufacturers, Taiwan also has a considerable number of plastics and rubber processors. Bush Hsieh illustrates: "There are between 3,000 and 4,000 companies, mainly in the industrial

clusters in the central and southern regions of the country." The companies manufacture products for the automotive industry, electronics, construction and consumer goods. Packaging, cable and wire sheathing, display and housing components and medical technology products also play an important role. The industry's turnover amounted to USD 26 billion in 2022, but also fell by 20 % to USD 20 billion in 2023 due to the global economic situation. The export share of plastic and rubber products fluctuates between 60 % and 70 %. The most important markets include China, Southeast Asia, the USA and Europe. Taiwan also exports to Japan, which accounts for 5 % of total exports, and to the Middle East, Africa and Latin America, which each account for 2 to 3 % of total exports.

The next, then 20th edition of TaipeiPlas will take place from September 15 to 19, 2026. 

www.taitra.org.tw

During the summit, numerous companies provided insights into their sustainability and climate protection activities. The first session was addressed by (from left to right) Catherine Huang (Chief Sustainable Officer of Victor Taichung), Carson Hui (Senior Sales Manager Taiwan at Arburg) and David Chen (General Manager Wittmann Battenfeld Taiwan). The moderator was Bush Hsieh, Chairman of the Plastics and Rubber Machinery Committee at TAMI.



Photo: K-PROFI

“High level of material control”

How plastics processors can benefit from the hydrogen boom

The production of hydrogen (H₂) as an energy source is intended to accelerate the energy transition. Obtained electrolytically using green electricity, “green” hydrogen is to cover parts of the energy demand of industry and transport in a climate-friendly way. To this end, a new nationwide core network is being planned. The plants for producing H₂, the transport infrastructure and the systems for converting H₂ into energy have so far been individual projects and are only manufactured in small quantities. Which vendor parts are needed to expand the hydrogen value chain, what can the materials industry contribute, and what opportunities arise for plastics processors?

At the end of 2022, the Institute for Plastics Processing in Industry and Crafts (IKV) at RWTH Aachen University and 20 partners from industry completed the market and technology study “Plastics in the Hydrogen

Economy”. This has given rise to a “Hydrogen Business and Technology Forum”. K-PROFI spoke with Dr.-Ing. Kai Fischer, who as Scientific Director at IKV is responsible for the hydrogen-economy topic area and chairs the

forum, and with Marie Hadenfeldt, M. Sc., who as a research associate coordinates the forum’s activities and supervises technical projects and issues.

At the “Hydrogen Business and Technology Forum”, representatives of the hydrogen economy and the plastics industry work together. Regular events promote the exchange between the players.



Photo: IKV

K-PROFI: What are the main results and findings of the market and technology study?

Kai Fischer: When it comes to hydrogen, one quickly thinks of very harsh operating conditions and that a lot of things have to be reinvented. We started the hydrogen study to find out which applications and markets hydrogen technology touches – quite independently of plastics. We found that the plastics industry can use the hydrogen industry, and the hydrogen industry also needs plastics when it comes to scaling up to economic viability.

Who do you count as part of the hydrogen industry?

Marie Hadenfeldt: These are companies that manufacture materials, technical components, processes or plant technology for the production, distribution, storage or use of hydrogen, such as the manufacturers of electrolyzers and their suppliers.

Can you briefly summarise the study's findings?

Kai Fischer: The first result of the study is the comprehensive documentation of 41 markets that we have analysed with regard to major growth drivers – and that initially completely independently of the material. From these interesting markets, we virtually disassembled 50 technology and system configurations into exploded-view drawings and described what the requirements for the components are and how they could be solved using plastics. The hydrogen application industry has so far thought very much in terms of process engineering plants made of stainless steel, and many players are unaware of the functionally integrated solutions available with plastic or how they could design their systems and components to be plastic-friendly.

The second result of the study for us was to bring together hydrogen experts with a number of partners from the plastics value chain and to promote the exchange of ideas on what the requirements of such systems and applications are and how they can be better and more economically realised in plastic.

Marie Hadenfeldt: The information was not only compiled in a literature search, but also identified in workshops with companies from the plastics and hydrogen industries.

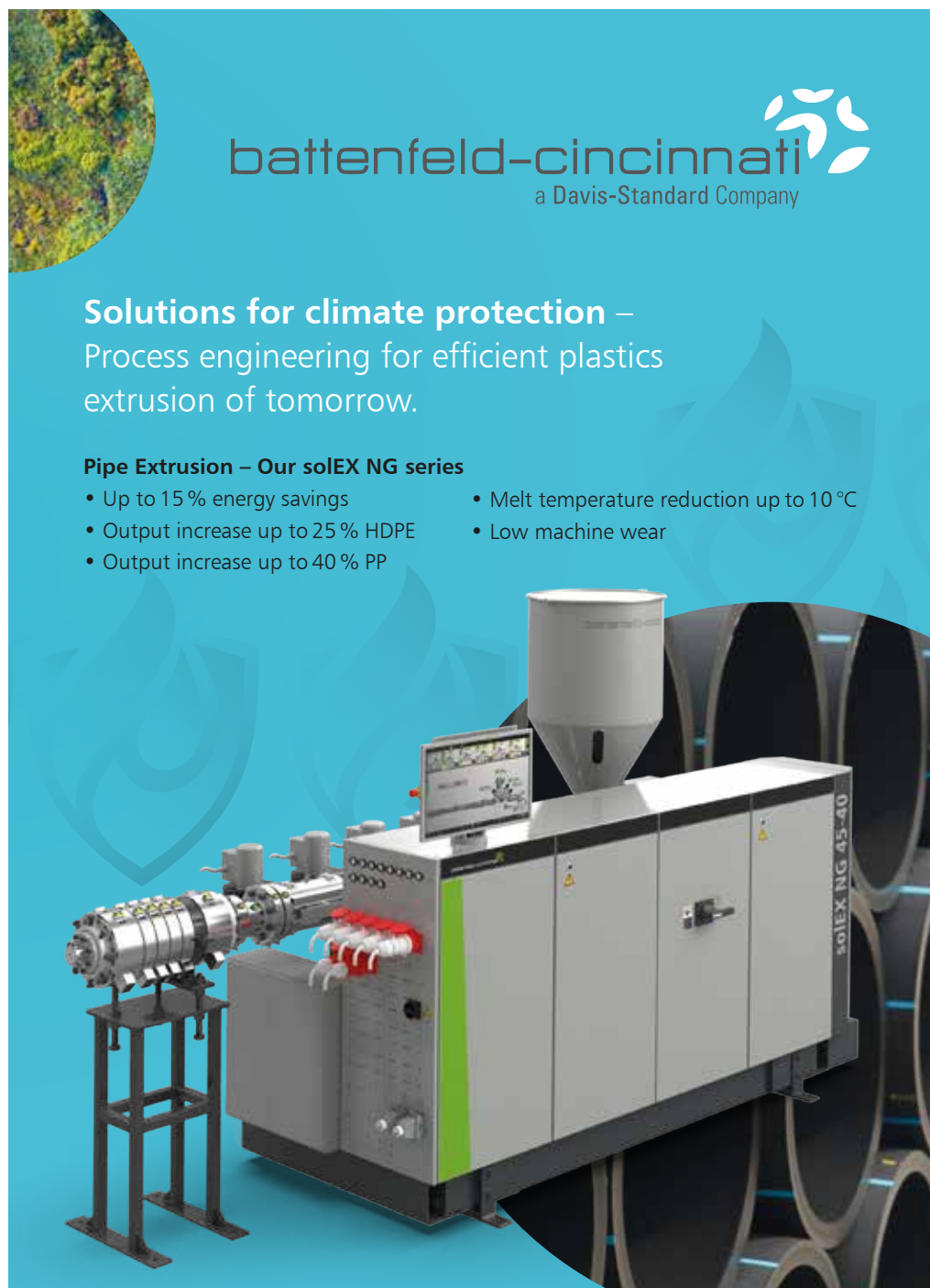
The study therefore also offers first-hand information and applications that cannot be found in an online search.

In the process, a group of active companies emerged that have a long-term interest in working on the identified tasks.

Kai Fischer: We didn't do the study just for the sake of it, but to explore the topic area for IKV, to identify meaningful development topics and to get answers to questions such as: on which topics do

we need to initiate research and development? Who are the stakeholders in the value chains that we can network and integrate?

We have indeed achieved this goal. We have identified a wide range of topics that can be developed very quickly with relatively simple developments, and we have found longer-term topics that require more research in order to achieve levels of use for plastics that are now standard in automotive engineering or medical technology, for example.



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Which product or application range has turned out to be interesting?

Marie Hadenfeldt: We have developed various scenarios for how plastics can be used in the hydrogen industry to make the components technologically better, but also cheaper to mass produce. One example is replacing steel pipes in electrolyzers with a fibre composite solution. In a publicly funded project launched in 2023, we are working with around 50 companies to research how these pipes can be manufactured and, in particular, how they can be connected in a leak-proof and practical way without the need for specially trained personnel.

Kai Fischer: Electrolyzers often come as decentralised solutions in containers. These contain piping systems of a manageable length that are made of stainless steel but can become very complex. Stainless steel is expensive and must be processed in a costly manner. Depending on the system, pipes and fittings have to withstand operating temperature ranges of up to 100° C and pressures of up to 50 bar. In hydrogen systems, it is not always the plastic that comes into contact



Dr.-Ing. Kai Fischer is responsible at IKV for the hydrogen economy and chairs the "Hydrogen Business and Technology Forum".

with hydrogen; many other process media are also involved – ionised water, oxygen, but also glycol, for example. The requirements for plastics are not only that they must be compatible with hydrogen. There are already manufacturers of plastic components for hydrogen systems. If you look at their parts, you can't tell at first glance whether they are assemblies for hydrogen technology or for more conventional applications. Plastic cannot replace stainless steel in the very hot components of hydrogen technology, but it can in many other applications.

What are the barriers to entry into hydrogen applications or their production?

Marie Hadenfeldt: Formal hurdles often arise from the fact that the requirements for components for conventional construction, i.e. for steel-based systems, are defined. Therefore, plastic-specific requirements must be formulated, for example with regard to the ageing of the plastic. Hydrogen does not damage the plastic in the sense of "embrittlement", but the storage of hydrogen in the cavity between

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the molecular chains of the plastic can lead to changes in the material behaviour that must be understood and controlled.

On the other hand, the plastic can also cause problems in the H_2 systems with certain ingredients and additives. This means that it flushes various ingredients into the hydrogen or water cycle, for example “ion leaching”. This ion leaching can damage the proton exchange membranes, for example. Since the testing and analysis of plastics in the hydrogen sector is a key factor for the success of plastics in the H_2 sector, we have identified the most important properties and developed roadmaps up to standardisation in a series of workshops initiated together with Freudenberg. There was also an exchange with DIN on standardisation via their H_2 standardisation roadmap.

Despite the application-specific challenges, none of these are showstoppers. There are unproblematic formulations, but there are also plastics that are not suitable for use in certain applications. That is why we are working on construction methods, barrier technologies, test stands and more transparency to reduce reservations. We want to propose functional and convincing system solutions and not be asked: Can you recreate this metal component in plastic?

Is there anything to be aware of in the design and mould construction that goes beyond the usual plastic-specific design rules?

Marie Hadenfeldt: The requirements due to a lack of knowledge are often relatively high, higher than they need to be. Overly ambitious requirements are always costly. To make the best possible use of the cost reduction potential, requirements based on the principle of “as good as necessary” are important.

Kai Fischer: There are solutions that can be drawn on if all the requirements are known. The plastic must not only have a suitable barrier to prevent hydrogen from diffusing through, but it must also be compatible with the hydrogen processes so that it does not damage the system. And then there are detailed issues such as the influence of the media, swelling, ageing, etc. This requires a very high level of material control.

In other words, the damage mechanisms have not yet been clearly identified and it is not yet possible to draw conclusions about which ingredients are acceptable?

Marie Hadenfeldt: Yes, at least they are not yet sufficiently known in their entirety. If we stick with the example of ion leaching, there is currently no consensus on which ions cause damage. In the forum, we discuss what is already known about which ions are harmful, how damage potentials can be quantified and which limit values must therefore be adhered to.

Kai Fischer: Ion leaching is a material-specific problem. With steel, there is little or no leaching. That is why many users do not worry about which plastic-specific ions in which concentrations can damage the proton exchange membrane, for example. There are also studies and posts from members in the forum on this topic.

This concerns the polymer itself and all additives, fillers and reinforcements that are compounded into it.

Kai Fischer: Exactly. Nowadays, PPS or PPA are used, for example, which produce less ion leaching. There are also compounds that produce more. Overall, materials are selected today according to the principle: the purer the materials, the less complexity. However, you have to consider the mechanics, permeation, temperature resistance, media resistance, contamination potential and processing properties. Limiting yourself to the simplest material wastes potential. That’s why guidelines for material selection are essential. We want to make a contribution here as well.

Accordingly, all processing methods have opportunities – extrusion, fibre composite technology, injection moulding, blow moulding...

Kai Fischer: Exactly, in addition to the manufacturing processes, all the downstream processes in joining technology, barrier formation or surface finishing. There will be interfaces – on the one hand with stainless steel and other standard metal components, and on the other hand within the plastic components. Highly integrated, injection-moulded components may need to be welded or sealed. If, for example, laser transmission welding is necessary, this places demands on the application and processing technology for the addition of the polymers and on the long-term behaviour of the welded joint.

Do you see parallels between hydrogen technology or special affinities to other applications or customer industries?

Kai Fischer: We see interest across all user industries, particularly in infrastructure elements. Automotive engineering is not one of the top target groups for the hydrogen economy because cars can be operated much more efficiently in terms of electrical efficiency using battery power. However, when it comes to possible parallels between hydrogen technology and other application industries, I see the automotive industry as a good example: the proportion of plastics has grown steadily there. We have combined different materials, integrated functions and, in a mass application, helped to increase efficiency and reduce costs.

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Marie Hadenfeldt, M. Sc. coordinates the activities of the forum and supervises technical projects.



Marie Hadenfeldt: We see a bit of a chicken-and-egg problem. The hydrogen industry needs to scale up. Today, the systems are only required in small quantities, which is why construction methods are chosen that work well as individual pieces. At some point, high volumes are needed for highly integrated components. So initially there will be drop-in solutions like the plastic piping in the electrolyser. These will demonstrate functionality and also generate confidence in plastics technology.

Am I wrong in thinking that you are mainly dealing with technical parts in your activities?

Kai Fischer: Innovation clearly comes from the many technical parts in which we see great innovation potential. That's where our focus lies.

What are the hydrogen economy and the plastics industry working on together in the "Hydrogen Business and Technology Forum"?

What are the hydrogen economy and the plastics industry working on together in the "Hydrogen Business and Technology Forum"?

Do your partners in the forum all focus on similar parts, similar applications or similar technologies?

Marie Hadenfeldt: The companies have very different products in mind and quite different interests. Some are still looking for applications for their products and expertise. In the forum, we invite at least half of the speakers from the hydrogen industry to our events. There are also many material manufacturers among our members who are very interested in the development of testing technology that can be used to compare their materials for customers or to prove that they meet certain requirements. Ideally, these developments will ultimately lead to standardisation.

Kai Fischer: A practical technical example: at the forum, a processing company presented how contamination changes depending on what was previously processed on the machine. Because if someone manufactures components with the purest polymer but has previously processed highly filled material on the same machine, then they will end up with unsuitable parts because they have introduced contamination from their previous production into the current batch.

The first movers of the hydrogen systems often have little interest in revealing their supposedly unique know-how. By contrast, the first and second followers are extremely open, present detailed requirements for individual components and specifications for some systems, and even share their lessons learned. It is precisely these partners

who provide the most valuable input, so that there is now a good network of companies that act very openly.

So the forum brings together the entire supply chain for the production, distribution and use of hydrogen.

Marie Hadenfeldt: The forum brings together companies from the entire value chain. At the semi-annual meetings, we also integrate guests who can and want to contribute to technological development. These are companies that have been active in the hydrogen economy for a long time or those from the plastics industry that want to tap into the H₂ market for themselves. All of them are already part of the hydrogen value chain or want to be in the future.

It is still possible to participate in the forum. Is access very formal or rather low-threshold?

Kai Fischer: In terms of administration and money, it is very low-threshold. The duration is always two years, and you benefit from a network event with lectures and workshops at least every six months. Every three months, we distribute a market and technology monitoring report curated by our team of experts with information that contributes to the market expansion of plastics in the hydrogen economy. To do this, we analyse the countless press releases, studies, funding programmes and publications related to hydrogen and prepare the most interesting information for our partners. Companies currently invest an annual fee of € 3,500 for this package.

Would you like to give the plastics processors one more message?

Kai Fischer: The plastics industry is the enabler for the hydrogen industry to be capable of mastering the necessary scale-up at some point. For this to happen, components and systems must be designed for plastic. To ensure this, a bidirectional exchange is necessary. The plastics industry, which has built up valuable know-how in functional integration over decades, can support the hydrogen industry in becoming more cost-efficient, more powerful and more suitable for series production through optimised and scalable designs and systems.

Ms Hadenfeldt, Dr Fischer, thank you very much for this conversation.

The interview was conducted by Markus Lüling, Editor-in-Chief of K-PROFI.

Contact for the Hydrogen Business and Technology Forum: H2@ikv.rwth-aachen.de

www.ikv-aachen.de

Trade Fair Calendar

Trade fairs related to plastics processing in 2025

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

ArabPlast	Dubai, UAE	07.01. – 09.01.2025	www.arabplast.info
Afroplast	Cairo, Egypt	16.01. – 19.01.2025	www.afroplast.com
Warsaw Plast Expo	Warsaw, Poland	04.02. – 06.02.2025	www.warsawplastexpo.com
Plast Alger	Algier, Algeria	24.02. – 26.02.2025	www.plastalger.com
KPA	Ulm, Germany	25.02. – 26.02.2025	www.kpa-messe.de
JEC World	Paris, France	04.03. – 06.03.2025	www.jec-world.events
MECSPE	Bologna, Italy	05.03. – 07.03.2025	www.mecspe.com
ICE Europe	Munich, Germany	11.03. – 13.03.2025	www.ice-x.com/europe
Plast Imagen	Mexico City, Mexico	11.03. – 14.03.2025	www.plastimagen.com.mx/en
Circular Valley Convention	Dusseldorf, Germany	12.03. – 13.03.2025	www.cvc-duesseldorf.com
Plastics Technology Expo	Rosemont IL/USA	18.03. – 20.03.2025	www.plasticstechnologyexpo.com
Plastics & Rubber Vietnam	Ho Chi Minh City, Vietnam	18.03. – 20.03.2025	www.plasticsvietnam.com
Plastico Brasil	Sao Paulo, Brasil	24.03. – 28.03.2025	www.plasticobrasil.com.br
Plastpackprint Nigeria	Lagos, Nigeria	25.03. – 27.03.2025	www.ppp-nigeria.com
Hannover Messe	Hanover, Germany	31.03. – 04.04.2025	www.hannovermesse.com
Plastics Recycling Show	Amsterdam, The Netherlands	01.04. – 02.04.2025	www.prseventeuropa.com
Plastics Live	Coventry, UK	02.04. – 03.04.2025	www.plasticslive.co.uk
Chinaplas	Shenzhen, China	15.04. – 18.04.2025	www.chinaplasonline.com
Control	Stuttgart, Germany	06.05. – 09.05.2025	www.control-messe.de
Moulding Expo	Stuttgart, Germany	06.05. – 09.05.2025	www.moulding-expo.com
Plasttechnik Nordic	Malmö, Sweden	07.05. – 08.05.2025	www.plasttechniknordic.com
Cirplex	Klagenfurt, Austria	13.05. – 15.05.2025	www.kaerntnermessen.at
KPA/Kuteno	Bad Salzungen, Germany	13.05. – 15.05.2025	www.kpa-messe.de/www.kuteno.de
Compounding World Expo	Mumbai, India	14.05. – 15.05.2025	www.compoundingexpoindia.com
Plastics & Rubber Thailand	Bangkok, Thailand	14.05. – 17.05.2025	www.plasticsrubberthailand.com
Plastpol	Kielce, Poland	20.05. – 23.05.2025	www.targikielce.pl/en/plastpol
Greenplast	Milan, Italy	27.05. – 30.05.2025	www.greenplast.org
HanoiPlas	Hanoi, Vietnam	04.06. – 07.06.2025	www.chanchao.com.tw/hanoiplus
Plastec East	New York, USA	10.06. – 12.06.2025	www.imengineeringeast.com
Central Asia Plast World	Almaty, Kazakhstan	25.06. – 27.06.2025	www.plastworld.kz
Kunststoffenbeurs	's-Hertogenbosch, The Netherl.	17.09. – 18.09.2025	www.kunststoffenbeurs.nl
Vietnamplas	Ho Chi Minh City, Vietnam	17.09. – 20.09.2025	www.chanchao.com.tw/vietnamplas
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K 2025	Dusseldorf, Germany	08.10. – 15.10.2025	www.k-online.de
Injection Molding & Design Expo	Cleveland OH/USA	12.11. – 13.11.2025	www.injectionmoldingexpo.com
Compamed	Dusseldorf, Germany	17.11. – 20.11.2025	www.compamed.de
Formnext	Frankfurt/Main, Germany	18.11. – 21.11.2025	www.formnext.de
Plast Eurasia	Istanbul, Turkey	18.11. – 22.11.2025	www.plasteurasia.com

Specialities – not mass-produced goods

How Mack focuses on the special cases of thermoforming



Components for racing cars, PistenBully snow groomers, disaster response vehicles, buses, medical technology or even works of art – at Mack Kunststofftechnik GmbH & Co. KG in Ulm, it is often a case of relatively small batch sizes and something “special”. The thermoforming specialist produces many transparent components, those with high-gloss surfaces, with a piano lacquer look, as well as a variety of components in a chrome look. Many products are made of transparent polycarbonate or PMMA and receive a hard coat after the thermoforming process to ensure high scratch resistance, UV and chemical resistance, as well as shatter protection. The company has the ECE R43 safety glass approval for motor vehicles. Elmar Mack, managing partner, says in retrospect of the coronavirus pandemic: “Thanks to the ECE approval in collaboration with our partner companies, production has literally exploded during this period, because we have been manufacturing all the separating windows needed for buses to protect drivers from infection. When the rest of the economy was in decline, we achieved very good sales with PC windows.”

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

“My primary goal is not sales growth. I want organic growth and to continue to work successfully, but I also want to enjoy my work,” says Elmar Mack, describing his company philosophy.

“Nothing must go wrong”

However, the large batch sizes from this period tend to be the exception. As a rule, delivery call-offs are for quantities between 10 and 100. Currently being produced in the halls is a panel for a measuring device used in medical technology. It has a piano-black finish and a viewing window made of a transparent, 400 x 400 x 3 mm PC semi-finished product, screen-printed on the back in multiple colours using a distortion printing technique. The aluminium mould is tempered and has a folding mechanism that helps to remove the component from the undercuts. The demands on the moulding process are high. Even the smallest particle on the mould or semi-finished product would be visible on the surface. The temperature window must be accurate to $\pm 2^\circ\text{C}$ so that the surface does not become uneven. This requires highly qualified personnel. Mack makes it unmistakably clear: “For the thermoforming of transparent or chrome-plated parts, I need reliable top people. The material is extremely expensive, so nothing must go wrong.” That is why the Ulm-based company’s production team mainly consists of highly trained, long-standing specialists. Staff turnover is very low. “We do everything we can to retain our employees. It pays off,” Mack affirms.

The moulds are not normally temperature-controlled. The four new Geiss T10 and Ts1 thermoforming machines and the Illig systems have temperature-controlled base plates. Since the batch sizes are small,

the company is less concerned with fast cycle times and more with ensuring careful processing of the expensive materials. “Process reliability and perfect reproducibility are essential for cost-effectiveness when batch sizes are small,” Mack explains. The headlamp lenses for a racing car, which are currently waiting at the CNC machining centres, are also made of PC. Before milling, the moulded headlamp lenses were coated with a hard coat. The clamping edges often remain on the components after the moulding process because coatings are baked on at very high temperatures. Without the clamping edge, the component would lose its stability during the coating process. This category of components also includes the element of a backlit bumper for an electric vehicle, which is moulded from transparent PC and pre-painted. The challenge here was to mould the painted semi-finished products in such a way that after the thermoforming process, the triangles that are later backlit appear evenly in the component.



Headlight lens made of PC with a hard-coat layer for a racing car.



Bezel for an ART measuring device made of ABS: negatively drawn with a high-gloss surface and absolutely consistent radii before milling ...

... and afterwards.



From a black-lacquered PC sheet, the company forms the component with a viewing window for a medical measuring device in a piano-black finish. The mould has a folding mechanism to allow the undercuts to be demoulded.



To avoid damaging the delicate surface, an employee covers the components with a film. After the subsequent hardcoat coating, the surface is scratch-resistant.



Mack forms the exterior moulding for a bus from a semi-finished product in a chrome look. The surface is so shiny that you can see your reflection in it.



The film-formed upper shell for an orthodontic appliance is made of PMMA.



Here the same component after milling, together with its counterpart – the lower shell made of ABS-PMMA.



The employees are equipping the T10 with the 2-cavity mould for the wheel arch of the sports car.

Chrome-look components, such as the exterior trims of a bus that are currently being developed, also receive a coating after the moulding process. Mack describes the process steps: "We receive the chrome-look coated semi-finished product from Epsotech. After thermoforming, our partner company Kirsch Kunststofftechnik applies the coating, which ensures the necessary surface strength. Only then does the component go into the milling machine."

A portfolio full of eye-catchers

Care is also required for an orthodontic device used to create 3D images of teeth. The top shell is made of translucent PMMA, while the back wall is made of ABS-PMMA. The semi-finished product is provided with a film for the moulding process to protect the surface. "This would not be possible with polycarbonate, because the mould temperature is between 190 and 200 °C. Even the smallest grain of dust in the film would become visible in the component," explains Mack.

The wheel arches for a sports car are not transparent, but they are still impressive. The impressive components with complex geometry are produced from a 2,000 x 1,000 x 4 mm PP-EPDM semi-finished product in a two-cavity mould. To demould the T10 blows pressure into the component. The entire process takes about 6 minutes. Next to it, a machine is producing negatively shaped roof linings made of ABS for a city bus, a few steps further trays are being made of translucent white PMMA with 78 % light transmission for hand scanners, and a little further on, the company is producing elements for an Adlatus cleaning robot made of ABS-PMMA.

From individual parts to the big picture

The Ulm-based company works with a total of four 5-axis CNC machining centres from HG Grimme and Geiss, as well as a 3-axis milling machine. In addition to the four Geiss thermoforming systems, there are two UA 100-4g from Illig in the production halls. Assembly is also an important step in the value chain, as the customer receives ready-to-install components. During the visit, Mack shows us how the fender flares for the "Ineos Grenadiers" disaster response vehicle are made. The prototype of the vehicle has two wheel-bases, and each fender flare consists of six

different ASA thermoformed parts. In total, the employees assemble 36 individual parts to create the final fender flares. Mack is enjoying the project: "We are partners with Letech, who are building the portal axles for this Grenadier. The vehicle has a like a Unimog, but is significantly cheaper. We are initially producing the fender flares for 100 vehicles, but we hope that after the prototypes, we will be able to start a small series." The first vehicles will be delivered at the end of the year.

The air duct for a PistenBully is also no easy task. The two ABS shells must be glued together airtight. In addition, the employees insert six air vents and seven air outlet grilles into the duct. All elements are joined using a 1K PU adhesive that hardens with the help of humidity. The glued components remain in the gluing devices for about three hours; the actual assembly time is about 20 minutes.

Numerous setups every day

The components that are produced in the halls of the Ulm-based thermoforming company suggest that this is not about huge quantities. Mack gets to the heart of the matter: "We specialise in producing these small quantities economically and to a very high quality." The company only ever produces the quantity that the customer orders. The machine operators also set up the thermoforming machines for ten parts. The set-up times per day are correspondingly high, because each of the six machines has three to four different moulds every day. Mack puts it in figures: "We have around 1,500 moulds that are in constant use. Our semi-finished product warehouse is always full so that we can start immediately after the customer's order. We manufacture specialities here, not mass-produced goods."

The machine blows compressed air into the mould to demould the PP-EPDM component.



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The company produces around 150 new parts per year and sends out about 4,500 delivery notes in the same period. Most of the material comes from Röchling, Senoplast, Epsotech and Isokon. Since the semi-finished products are often stored for long periods, industrial ovens are available for drying and tempering.

A look back at the history

The dynamic managing director has been solely responsible for his company since 2005. The company was founded in 1997 by his father Johannes Mack. He was responsible for the thermoforming department at Römer Motorradhelme und Schutzausrüstung, which was taken over from Bullard in the US in 1995. However, business did not go as expected and Johannes Mack was able to buy the plastics processing division out of the company in 1997. At the time, there were delivery obligations from current contracts with PistenBully and Kässbohrer, which the newly founded company Mack Kunststofftechnik continued to fulfil. The father and son took over the company together.

This is what the fully assembled fender flares look like with all the insert nuts and components ...



Photo: K-PROFI/Arvio München

Elmar Mack looks back: "In the beginning, my father was responsible for production and I took care of the commercial side. However, since my father had the vision from the outset that I should take over the business, I quickly got involved in production too." Ten years after its foundation, the junior was then solely responsible and from 2006 he brought a breath of fresh air into the company. One year after taking sole responsibility, he moved the company location from Neu-Ulm to Ulm with a new building on a greenfield site. CNC machining centres were installed, followed by further production expansions in 2015 and 2023. "We used to do everything manually. I invested a lot, bought the new thermoforming machines with automatic plate loading from Geiss, purchased the CNCs." Last year, the family business had a production area of 2,500 m² and 25 employees generated a turnover of 5 million euros.

Beauty and design

Beauty and design are not uncommon topics at Mack Kunststofftechnik. High-quality surfaces, racing car components and chic casings are part of the business model. This suits Elmar Mack. During the coronavirus pandemic, he founded the start-up Cyrrevo together with Söhngen-Design and other partners, which offers sim racing simulators embedded in high-quality designer furniture

from Rolf Benz. At the push of a button, the simulator disappears, leaving behind a luxurious living room interior.

During the coronavirus pandemic, Elmar Mack has also devoted himself to designing and building his own sports car made of GRP components. Every now and then, the thermoforming machines also shape art objects. For example, the company produced ABS/PC elements for a 2,500 m² façade for the Berlin-based architectural duo Elegant Embellishments. There are two elements: X and I, which can be joined together to form an endless organic shape. Each element consists of a front and back, which are riveted and screwed together. The elements were coated with silver titanium dioxide and serve as facade cladding to provide shade for a hospital in Mexico City. Thanks to the TiO₂ coating, they also filter NO_x, VOC and SO₂ from the air.

All these projects are close to the dedicated owner's heart: "My primary goal is not sales growth. I want to continue to work successfully and the company should stand on solid, independent foundations, of course! But work should also be fun. And our product portfolio guarantees that." ■

www.mack-kunststoff.com

www.cyrrevo.com

www.kirsch-kunststofftechnik.com

www.geiss-ttt.com

... and this is the finished vehicle.



Photo: Leitech

Big and small ideas for rubber processing

How machine manufacturers and service providers see crises and transformations as opportunities

The ongoing economic downturn is not making life easy for machine manufacturers, especially if they serve the elastomer processing niche. But there was no complaining at the German Rubber Conference (DKT). The industry has always been inventive, and the transformations in energy and mobility offer new opportunities. The companies are pursuing a variety of paths – be it new technologies, strategies, application markets, services or sometimes just a small but important piece of equipment. K-PROFI looked around and listened at the DKT trade fair in Nuremberg.

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

Under the motto “Partnering for Transformation”, the machine manufacturer Desma Elastomertechnik presented itself with a new corporate design and an inviting, open stand concept. “This year, we want to document our orientation towards turnkey systems for component production for energy distribution systems, mainly for regeneratively generated forms of energy, which has been in place for years,” explained CTO Dr Michael Zaun.

The head of technology and sales manager Harald Schmid are convinced: “Even though the automotive market still plays a very important role at our locations in China and India, this business will not return to the level of 2017/18 in Germany in the foreseeable future.” That is why the Fridingen-based company has recently stepped up its involvement in the energy sector, where it not only sees great potential but can also already draw on decades of experience. “We have been involved in this sector since the switch from porcelain to elastomer isolators a good 25 years ago,” emphasises Schmid.

“We now generate a large share of our sales at the local site in the energy sector,” says Zaun, adding: “This is not simply a case of switching to a different industry; this path is lined with challenges.” For many customers, infrastructure products for the generation, transmission and distribution of renewable energy are uncharted territory. These also include established companies looking for new business ideas. “We support this by not waiting for a customer to come to us with an item,” explains the CTO, “but by developing new production processes with the customer and offering the relevant expertise.” To this end, the mechanical engineering

company employs, among other things, special scouts who thoroughly explore the necessary knowledge.

Another consequence: “Customers expect complete solutions,” says the sales manager. “We hardly do any standard machine business anymore; instead, we do a lot of specialities.” With its broad machine portfolio, mould construction with extensive expertise in cold runner technology, and in-house automation department, Desma sees itself well positioned for this.

As a highlight, Desma presented the Sealmaster 300+ horizontal machine in Nuremberg, featuring a brushing system, Flow-Control cold runner and a dummy mould that illustrated all possible mould sizes with the respective specific usable area. The machine has a service-friendly overall design, offers precise positioning accuracy

and particularly high travel speeds. Harald Schmid is convinced: “This is the fastest injection moulding machine for rubber processing.” An additional special feature: depending on the requirements, it can be equipped with either a servo-hydraulic or an asynchronous drive. “Since both can have advantages and disadvantages, this makes it possible to choose the best option for each specific case,” the sales manager points out.

Also on display at the exhibition stand was a vertical 968.560 Z0 benchmark with 6,300 kN clamping force, 6,600 cm³ FIFO-A injection unit and silicone tamping unit, an all-rounder from Desma. The machine offers high ergonomics for the operators thanks to the Benchmark clamping system and the demoulding table, as well as good accessibility for handling systems, robots and other automation systems.

Highly automated cell replaces two machines

Compared to previous years, when machine manufacturer LWB-Steinl demonstrated its expertise in automation with complex production lines, including everything from complete post-processing to a new multi-station concept, this year’s DKT exhibit appeared rather small at first glance. Managing Director Dr Clemens Behmenburg confirms: “We transported this machine in one piece to the trade fair.” But the C-frame rotary table machine VCERS1000 not only stands out because of its new design, it also has a lot to offer.

“The trend is towards highly automated cells,” says Behmenburg. And so, the designers have integrated everything, including the automation and temperature control, and fully enclosed it. “The machine shown here is cleaner, more compact and more modern than previous ones and will serve as a



Desma CTO Dr Michael Zaun (left) and Sales Manager Harald Schmid at the versatile 968.560 Z0 Benchmark.

All photos: K-PROFI



Proud of their new machine: LWB Managing Directors (from left) Peter Steinl, Dr Clemens Behmenburg and Martin Schürmann.

technology platform for further new developments," emphasises the managing director. "Although it is a special-purpose machine, which is our standard, it is so modular that the concept can be transferred to other machines."

The demonstration machine, which is equipped with an 85-cm³ RS elastomer injection unit and has a clamping force of 1,000 kN, produced two different bottle openers in a mould from M. Huber I.T.Σ. at the DKT. This has two cavities of different sizes and is equipped with a cold runner with a needle valve that is controlled by the cavity pressure and whose control is integrated into the LWB machine control system.

The integrated 6-axis robot loads the front lower half of the mould on the turntable with metallic inserts. After rotating by 180°, these are overmoulded and vulcanised in the mould. During this time, the robot removes the finished parts from the other lower mould half, transfers them to a cooling station, from where they are discharged from the production cell after falling below a pre-set temperature, and then the mould is reloaded. This handling and the heating time are precisely coordinated so that there is no delay in the cycle time. "The machine thus replaces two machines," says Clemens Behmenburg.

LWB has developed a special app to combine its wide-ranging technical expertise in a single tool and make it available for comprehensive customer advice. Managing Director Martin Schürmann explains: "If you enter initial data such as component type and size, material, heating and cycle times and annual quantities in this app, you will immediately receive suggestions for a suitable machine type including clamping force, as well as an estimate of the number of operators required, the space and energy requirements and the investment costs." This makes it possible to go through various scenarios in a direct discussion and quickly find the right solution.

Complete range from a single source

In addition to revising its injection moulding machine series, the Austrian machine manufacturer Maplan has committed itself to becoming a full-service provider by expanding its portfolio in recent years. At the last DKT two years ago, important steps in this direction were presented with the MAP.Autocell production cell and the user-friendly one-for-all control MAP.commander, as well as an extensive range of cold runner systems.

"With the acquisition and integration of the automation specialist WEAsystec and the mould maker rt-formtec, we now offer 360-degree system solutions for the semi- and fully automatic production of rubber and silicone products from a single source," says Maplan CEO Wolfgang Meyer proudly. "With our high level of vertical integration at our main site in Kottlingbrunn, we are ideally positioned to meet the current challenges."

Together under the Maplan roof (from left): Maplan Managing Director Wolfgang Meyer, WEAsystec Managing Directors Marko Menke and Matthias Tanzer, rt-formtec Managing Directors.



According to Maplan, the company has been slightly affected by the current economic downturn in the standard machine business but has been able to more than compensate for this decline with additional segments and products. Nevertheless, the Austrians see "many question marks in Europe" and are increasingly turning their attention to Asia. "We see China and India as interesting markets," emphasises Meyer. "That's why we have now opened another site on the Indian sub-continent in addition to our Chinese site."

Maplan brought a fully automatic production cell based on a horizontal Ergo+ 280 with 2,800 kN clamping force to Nuremberg to demonstrate its expertise. Parts with different volumes were produced in four cavities using a needle valve nozzle cold runner mould. A removal system with pneumatically controlled grippers ensured fully automatic handling.

Expertise in thermoplastic injection moulding for elastomer processing

Engel underscored its expertise in elastomers with two practical applications. "This segment is relatively stable," said Armin Mattes, Sales Manager Elastomers at the Austrian machine manufacturer. "We don't have much standard business in this area but are in demand for complex projects with 2K parts and automation." In addition to medical technology, important areas of application include E+E, in particular electric mobility.

The fact that Engel is well positioned for this with its tie-bar-less technology and extensive automation expertise was demonstrated



Dietmar Waizenauer (left), Technical Director at Nexus, and Engel-Elast Sales Manager Armin Mattes at the fully electric e-mac 465/130.



Matthias Fuchs (left) from Arburg and Götz Scheibe from ACH Solution in front of the Allrounder 570 A with Turnmix dosing unit.

by the production of an NBR star screen in a fully automatic production cell. The compact design of the victory 460/120 tech injection moulding machine used enables efficient use of the production space. The single-cavity mould from EFI Formenbau is equipped with a mould cavity pressure measurement system and a special surface coating to prevent contamination. "The tie-bar-less design of the machine allows the robot to operate without difficulty. It first removes the sprue and overflow, then removes the sieve star and places it on a conveyor belt without the need for rework," explains Mattes. "The force divider ensures that platen parallelism is maintained throughout the entire cycle, even without tie-bars."

The digital assistant iQ weight control, which can detect and compensate for fluctuations in ambient conditions or in the raw material in the same shot, thus preventing rejects, is also used here. "This is already established in thermoplastics injection moulding and we now want to consciously introduce it into the elastomer sector," says Mattes.

Engel demonstrated how the challenges of LSR processing can be overcome by manufacturing a high-precision infusion valve on an all-electric e-mac 465/130 injection moulding machine. The precision of the electric machine is supported by the Nexus Servomix X20 metering system, which ensures air-free metering of the liquid silicone. The valve, which weighs just 0.42 g, is manufactured by Psilkon in Motten. It is produced in a 32-cavity mould by Nexus in a cycle time of 27 seconds. "A particular highlight here is the inline slitting that is carried out during the process while the parts are still in

the mould," emphasises Mattes. "This eliminates the need for subsequent slitting of the parts, which significantly reduces the manufacturing effort." To do this, the cores on which the LSR parts sit after the mould has been opened are retracted, the valves are slit with knives and then ejected from the centre plate. To ensure that the slits are maintained, a non-self-healing LSR is required, which in this application comes from ShinEtsu.

Energy efficiency and precision for silicone processing

Arburg likes to demonstrate its elastomer expertise at trade fairs with liquid silicone or TPE applications. This year at the DKT, the company showed live that it is also at home in the processing of solid silicone. The machine manufacturer brought an electric Allrounder 570 A with a clamping force of 2,000 kN to Nuremberg for this purpose, since electric injection moulding machines with their energy efficiency and precision as well as quiet operation also offer advantages in silicone processing.

A bottle opener made of Elastosil R plus 4001/70 from Wacker was produced at the trade fair. The machine was equipped with an ACH Turnmix high-pressure metering system from Austrian partner ACH Solution to ensure continuous feeding of the silicone compound. "This system ensures virtually bubble-free and constant-pressure material feeding, and liquid and paste-like additives can be metered in at any time during the inline process," explained Götz Scheibe from the sales team at ACH Solution. "The ACH Turnmix processes silicone mixtures with a Shore A hardness range of 20 to

90 and is designed as a stand-alone system that can communicate with various controllers via existing interfaces." The four available sizes enable throughputs between 110 and 2,000 cm³/min. "Depending on the material properties and viscosity, however, this can also be significantly more," says Scheibe.

Four bottle openers were produced in a cycle time of around 60 seconds at a cross-linking temperature of 200 °C with one shot. The four mould cavities were injected directly via a cold runner system without any gate marks at an injection temperature of 30 °C to 40 °C. The size 400 injection unit used for the trade fair application features special screw geometry, cylinder temperature control and nozzle technology as part of the Arburg silicone equipment package. With its portfolio of injection moulding machines and wide range of automation options, Arburg offers customised solutions right up to complete turnkey systems for processing liquid and solid silicone, also in combination with multi-component applications.

Full service for rolling mills

In addition to modern rolling mills, the machine manufacturer Deguma not only offers technical overhauls of a wide range of old rubber processing machines but has also increasingly developed into a full-service provider for rolling mills in recent years. "Buying a rolling mill is not the end of the story," says managing partner Viktoria Schütz. "Once a processor has a machine in operation, further services are required over the entire life cycle of the systems. We don't just develop these out of our own resources, but we also orient ourselves to the challenges of our customers."



Deguma Managing Director Viktoria Schütz and Key Account Manager Sebastian Bein at the neo rolling mill.

These include operator instruction and various service and maintenance packages for all requirements, but also safety consultations, retrofits and training. In fact, safety is a top priority. "Rolling mills are among the most dangerous machines in industry," emphasises the managing director. "That is why we are actively involved in developing new safety standards." For example, in the EN 1417 standard, which has been in force since March this year, the permissible overrun distance of rollers in the event of an emergency stop has been reduced from 60° to 45°. "This significantly reduces the risk of injury," says Viktoria Schütz, "but there is still a considerable risk of injury in an emergency. That's why our machines are equipped with a braking angle of 10°. This makes it practically impossible to be pulled into the roller gap." Just in case, Deguma also has an emergency box with important tools and aids on offer.

The fact that it doesn't always have to be the big solutions made of steel and iron was demonstrated by the machine manufacturer in Nuremberg with a newly introduced ergonomic roller blade. "The lightweight walnut handle makes it comfortable to hold. In addition, the blade with radius grinding makes it possible to cut rubber compounds on the roller with little effort," explains the managing director. Another advantage: it is gentle on the roller surface.

Gerlach Managing Director Jens Möckel at the UHF module 201.



The new gamification feature implemented in the control system is more than just a gimmick. "It allows operators to work with the machine sustainably and with few errors – i.e. without overloading or emergency stops – just as they do in computer games to complete certain levels. This is accumulated over several shifts and when a certain level is reached, there may be a reward from the company, for example," says Key Account Manager Sebastian Bein, explaining the idea behind it. "We have developed a beta version and are now looking forward to customer feedback."

Another new feature is the option of mixing rubber compounds on a pay-per-use basis on rolling mills at the Deguma plant in Geisa in the event of production bottlenecks or for testing.

Targeted vulcanisation with focused microwaves

Microwave vulcanisation has the advantage over hot-air, infrared or salt bath vulcanisation that the cross-linking occurs uniformly over the entire cross-section, for example of a profile. It is therefore particularly suitable for thick-walled articles. "However, the less non-polar a mixture is, the less effective the microwaves are," says Jens Möckel, managing director of Gerlach Maschinenbau. The specialist in continuous vulcanisation systems has therefore developed the "guided wave" technology. "In this process, the microwaves are bundled and concentrated by mirror systems," explains Möckel. "This means that even weakly polar mixtures that do not react to conventional microwave systems can be excited."

The guided wave can be regulated continuously. "This makes it possible to regulate the energy input into the product via target temperatures, which are recorded by a thermal imaging camera," emphasises the managing director. "In contrast to hot air, a change has an immediate effect here."

Thanks to the compact and modular design of the microwave units, these can be combined with each other in any way, just like the hot air modules from Gerlach, to create vulcanisation lines and thus adapted to the respective production-specific requirements. The UHF Box 205 with two independent UHF units offers a particularly high degree of flexibility. "These are offset against each other and mounted so that they can be rotated, thus enabling 360° coverage of critical areas in profiles," explains Möckel. "Even areas that are in the shadow of metal girders or products with compounds of different polarities can be heated in a targeted manner." An additional advantage is that the UHF Box 205 is designed as a mobile unit. It can be easily moved with a forklift or pallet truck, which means that its position within a vulcanisation line is variable. "This makes it easy for a processor to find out whether a microwave has to be at the beginning of the process or whether it might be more efficient to place it for some products in the middle of the line or near the end," the managing director makes the advantage clear.

Easier simulation with the elastomer database

"Generating material data for elastomer compounds is very resource-intensive, as measuring a data set is costly," explains Nick Flossbach, Technical Sales Manager at simulation software provider



Nick Flossbach, Technical Sales Manager at Sigma Engineering, explains the advantages of the new elastomer database.

These include the type of rubber, heat capacity and conductivity, density, flowability, and T90 time and temperature. A data set for the simulation is created from this data by comparison with stored compound data. At present, a few laboratory-determined data sets are already included. If the experimental results match the simulation results based on the generated data, the corresponding mixture can be stored so that the database grows over time. "At the moment, we are gaining initial experience with the new tool," reports Flossbach, "and we are very satisfied with the results."

Sigma Engineering. As a result, experimental data for a formulation is rarely available for simulation. "With our generic elastomer database Sigma Rubber Designer, which is integrated in the new version of Sigmasoft Virtual Molding, we want to make simulation possible with a few parameters that can be determined for practically any compound."

Christiane Rach from Cold Jet demonstrates the effectiveness of dry ice cleaning.



Clean moulds with dry ice

Cold Jet, a company that offers dry ice technologies for the efficient and environmentally friendly cleaning of moulds, had its premiere at the DKT. "In elastomer processing in particular, cured material and release agents quickly build up in the moulds, which then leads to unevenness, burrs and defects in the parts produced," explains marketing manager Christiane Rach.

Traditional cleaning methods require the press or injection moulding machine to be switched off and are very time-consuming. "Our cleaning technologies using dry ice offer an effective alternative," says Rach confidently. Dry ice particles are blasted at high speed onto the surface to be cleaned, resulting in fast and residue-free cleaning.

The advantage of this is that the moulds remain in the machine and the cleaning can be carried out at operating temperature, which significantly reduces downtime. The marketing manager also emphasises: "The process is non-abrasive. Therefore, all mould surfaces up to A1 and structured surfaces can be cleaned without damage." In contrast to water- or chemical-based methods, no additional waste is produced because the cleaning agent dry ice simply sublimates without leaving any residue. ■

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What exactly is 360-degree recycling?

How Thees Kunststoffverarbeitung serves many customers with mobile and permanently installed recycling plants



Photo: Sebastian Heun

Matthias Wagner (left), Head of Technology and Organisation, and Ansgar Thees-Ovelgönne examine the ground material samples from production before these are delivered to the customer.

“The future belongs to recycling,” says Ansgar Thees-Ovelgönne with conviction. This conviction recently motivated the managing director of a recycling company in the Oldenburg Münsterland region to invest millions and build a new office and production building. It is this belief that motivates him – together with more than 60 colleagues – every day to develop recycling concepts with plastics processors and disposal companies, whether at his own plant or on-site at the customer’s premises, and whether closed-loop or with a further recycling concept. His conviction motivates him to expand his own business as sustainably as possible, from electric forklift trucks and photovoltaic systems to sediment separators under the site. K-PROFI found out more about Thees Kunststoffverarbeitung, mobile recycling, projects and future visions during an on-site visit to Dinklage.

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

“We want to be the first point of contact for comprehensive plastics recycling,” is the vision of Managing Director Ansgar Thees-Ovelgönne, who runs the two companies Thees Kunststoffverarbeitung and Thees Mobile together with his wife Diana. The family business has been operating in the Oldenburg Münsterland region since 1976. “When my father-in-law and company founder started recycling almost 50 years ago – at that time, he was recycling bread boxes – he was one of the pioneers, and a lot of things were quite different in the world of recycling back then.”

Recycling was not on everyone’s lips and was certainly not a political issue. The reasons for recycling were usually economic; sustainability considerations only came later. Recyclers rarely had to buy input streams, and certainly didn’t have to fight for them, because there were “hardly any real recyclers, but plastic-containing waste was often pressed into bales and shipped to the

Lasse Dettmer, Head of Purchasing and Sales, is part of the four-person sales team that is always in contact with customers and suppliers.



Photo: Thees Kunststoffverarbeitung

Far East. Today, such exports are restricted or prohibited by law, and the incineration of residues quickly costs between 100 and 200 euros per tonne,” says Ansgar Thees-Ovelgönne. CO₂ balances are playing an increasingly important role, making incineration the simplest, but not the best option.

Sales of output streams are heavily influenced by virgin prices: “If virgin prices are low, as they are at the moment, it is difficult to sell recycled goods.” These are not always easy times for Thees: “In the long term, I am not worried about us processors. By 2030 at the latest, when the Green Deal takes effect and 55 per cent fewer greenhouse gases may be emitted than in 1990, secondary raw materials will have to be given preference over virgin materials.” And until then, the managing director, who has been with the company since 2005, wants to continue to focus on healthy growth with his ambitious team and position the company on an even broader footing. At the same time, he is striving not only to fulfil numerous standards and certifications for the company, such as EU Cert plast, Recy Class and as a specialised waste management company, but also to expand them.

Investment in a new location

One milestone on the way to achieving their goals was the construction of a new building for the Thees-Ovelgönne couple right next to the A1 motorway exit Lohne/Dinklage. “In addition to the new, modern and representative office building, we have also built two new halls here that offer sufficient space for technical expansions,” reports the managing director, thinking in particular of the expansion of his activities in the direction of post-consumer waste. Currently, Thees recycles a large proportion of post-industrial waste (PIR). Last year, 60 employees processed 40,000 tonnes of plastic waste at one of four locations in the district or on the road throughout the world, turning it into reusable materials, mostly in the form of regrind. Of the total volume, 35 % was processed by mobile recycling plants and 65 % by stationary plants.

Thees handles the logistics for the stationary processing of PIR. “We have our own fleet of vehicles and pick up our suppliers’ recyclables within a radius of around 200 km.” Destinations further afield are handled by external logistics companies, some of which have been working with the company for decades

and are therefore “an important cornerstone of flexibility and reliability.” The processor provides its customers with all types of collection vessels such as containers, mesh boxes or boxes for collecting leftovers. “We offer the all-round carefree package. This is a fundamental part of our claim to provide 360-degree recycling,” the managing director continues. By this he means that the raw materials and recycling experts provide their suppliers with comprehensive advice, draw up a recycling concept with them, take over logistics and collection, and document everything accordingly, which, for example, is becoming increasingly important for the CO₂ balance of every company.

Specialised in mechanical separation processes

The processing begins once the production waste and secondary raw materials have been collected from the customer. “Simple, uncontaminated residues are our bread and butter, while multi-component, contaminated or dirty waste is the icing on the cake,” says Ansgar Thees-Ovelgönne. In one of the granulators from Amis Zerma, Dreher or Herbold Meckesheim, the non-contaminated plastic scraps are turned into a ground material that Thees aims to produce so that it can be fed directly back into the customer’s production process without further treatment. “For post-consumer waste, specialists are developing mechanical separation processes, among other things, to remove contamination or foreign inclusions.” Thees, for example, is well versed in density manipulation and uses this to separate different materials from each other. “We collect the different density media and reuse them over and over again,” says the managing director, underpinning his own claim of acting sustainably. The Dinklage plant processes mainly HDPE scrap for injection moulding and extrusion applications, accounting for around 50 % of the total volume, 30 % PP scrap, 5 % LDPE and 15 % technical plastics such as PA, PS, POM and ABS. The finished regrind is delivered to one of over 100 regular and long-standing customers in big bags or in silo vehicles, again using the company’s own fleet and/or regular carriers. Sometimes the supplier and customer are one and the same company, sometimes in combination with “mobile colleagues”. “We have already implemented closed-loop solutions with a double-digit number of companies – and not only with plastics processors, but also with brand owners, for example.”

Increasing total volume and regranulate output

The investments in the new building include a Vecoplan shredder and an Erema repelletising line, both designed as a multi-purpose solution. “With the new systems, we are already preparing today to process more post-consumer waste in the future – and always with optimal energy efficiency.” To this end, the Vecoplan shredder can not only take large parts, but can also be fed with bale goods. With the regranulation line installed around two years ago, Thees expanded its portfolio of ground materials to include regranulates, which already account for 10 % of the output goods. A further increase is definitely on the cards. “Overall, we are planning to double our recycling capacity from 40,000 to 50,000 tonnes per year to 100,000 tonnes per year in the long term, which will also mean up to 40 new jobs,” says Ansgar Thees-Ovelgönne, looking ahead.

The Erema plant is equipped with a cutter/compactor so that as many different input streams as possible can be processed in the

future, enabling nonwovens, flexible packaging plastics and dusts to be dosed in addition to hard plastics. The purchase of further plants is planned as the processing capacity increases. “In the long term, we may even want to be able to clean post-consumer waste ourselves in order to be even more flexible, but that’s still a long way off.”

Mobile grinding is often more sustainable

Once the regrind or regranulate has been produced for the customer, it has to be stored. For this purpose, Thees provides its customers with a total hall storage capacity

of more than 3,000 tonnes. It is often easier and more sustainable not to have to bring the recyclables to the processing plant in Dinklage at all, but to be able to grind them on site at the customer’s premises.

This is where Thees Mobile comes into play. “We are the European market leader in the mobile processing of large-volume plastic streams and their by-products,” says Ansgar Thees-Ovelgönne. The mobile recycling specialists achieve an output of 15,000 tonnes annually with their mobile services. Automotive supplier parts such as bumpers, load carriers, reusable transport boxes, beverage crates, but also PET bottles are processed.

Grinding bottle crates at the point of waste generation is a particularly sustainable option. If five trucks are needed for a defined quantity of bottle crates, the resulting ground material can be transported by one truck.



Photo: Thees Mobile

Ansgar Thees-Ovelgönne discusses the production process for the next day with machine operator Ludger Sieveke.



Photo: Sebastian Heun



The mobile team of experts has everything they need with them: a soundproof container with the mill, pallets, big bags, outlet pipes and an electric forklift truck.

The reason for the smart mobile solution is clear: CO₂ emissions. "We let the air out of the leftovers," says the managing director, who is referring to the fact that on-site shredding reduces the volume by up to 1:5. In other words, five trucks are needed to transport 24 tonnes of beverage crates, but only one to transport the same amount of ground material from place to place. Ideally, the ground material stays at the grinding site or is taken directly to the crate manufacturer. In other cases, the ground material is taken to alternative plastic processors or to the warehouse in Dinklage.

Everything is customised and based on individual ideas

"Mobile grinding is more difficult to plan than stationary grinding," reports Ansgar Thees-Ovelgönne based on his experience with many spontaneous orders. This requires logistics that the four-person planning and organisation team from mobile grinding has mastered very well. "Fortunately, our employees are all-rounders." They use the machine solutions specially designed for Thees Mobile, which are mounted on special trailers that may not exceed 40 tonnes. "The mobile processing units are all designed so that they can manage with their own power generator, a forklift truck can drive in and sound insulation is provided." The latter is always particularly important when the sources are located in urban and/or residential areas.

The company has seven mobile shredding systems, two mobile PET briquetting presses, a mobile PET baling press and a mobile density separation system, as well as numerous adaptable and modular conveyor peripherals. Each system can work completely independently and, depending on the job, can also consist of several systems. Thees also relies on machine builders such as Amis, Herbold and Dreher for its mobile systems.

"Our aim of offering 360-degree recycling often means thinking outside the box," the managing director continues. By this he means, for example, that he and his team have also ground old PVC window

profiles at the point of waste generation and that he has also been active in Romania, northern Sweden and Spain. "It can even make sense to ship a mobile grinding plant to Africa, but then it should be a large-scale project of several thousand tonnes – that does happen," he explains. These ideas are also part of the 360-degree recycling approach. "We want to be the first point of contact for our customers when it comes to the processing of plastic waste – regardless of what it is and where it is." Thees' managing director summarises the company's mission as follows: "We are driven by the desire to have examined all options for economical and sustainable recycling before we consign a material for chemical recycling, thermal recycling or export." ■

www.thees.com

During the tour of the plant, Ansgar Thees-Ovelgönne shows the cleanliness and fineness of the HDPE regrind produced, which can be fed directly back into the production process of a plastics processor.



Photo: Sebastian Heun

LSR specialist for the Extreme und Excellent

Discover how Trelleborg Stein on the Rhein
masters liquid silicone processing

Recognized as a Center of Excellence for the processing of liquid silicone, Trelleborg Sealing Solutions in Stein am Rhein, Switzerland, takes pride in its core competence of high-precision toolmaking. According to General Manager Jarno Burkhardt, the challenge lies in injection molding of the liquid material, with the goal of producing extreme-quality parts. The Swiss-based center banks on proprietary technologies for hot runner, cold runner, dosing, and injection, along with development partnerships with companies like Arburg, Elmet, and Wacker.

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



Jarno Burkhardt, as General Manager Trelleborg Sealing Solutions Switzerland, is responsible for the Stein am Rhein production site, among others, with its associated toolmaking business.



Injection molded LSR products for various industries; Applications with multicomponent technology are growing fastest in Stein am Rhein.

Trelleborg Group, located in Sweden, operates in about 40 countries around the world and generates an annual revenue of approximately 34 billion SEK or about three billion euros. Starting April 1, 2024, they established a new business area: Trelleborg Medical Solutions. This unit focuses on the rapidly expanding healthcare and medical activities and complements the established business areas of Industrial Solutions and Sealing Solutions.

The Stein am Rhein location in Switzerland, with its 160 employees, is part of Trelleborg Sealing Solutions and services Trelleborg Medical Solutions. As per Jarno Burkhardt, the site garners over 40 percent of its revenue from the medical industry. "Until recently, the Trelleborg Medical Solutions business was integrated into the Trelleborg Sealing Solutions business area. However, we continue to work very closely together," emphasizes Carolin Grandt, Global Product Line

Director at Stein am Rhein. The site functions as a lead center for Trelleborg in processing liquid silicone.

In 2011, the plant – originally established as Silcotech AG in 1984 – became part of Trelleborg Sealing Solutions. LSR (Liquid Silicon Rubber) has only been available as an industrial material since the late 1970s. "Nowadays, the Stein am Rhein operates as an exceptionally advanced LSR specialist in single and multicomponent injection molding," says Ursula Nollenberger, who also served as Global Product Line Director in the past at the Stein am Rhein site. Historically, already the founder of the site had the confidence to work with this demanding material early on and realized a first tool with a neighbouring mould maker and then set up his own business with a focus on liquid silicone injection moulding. The General Manager reports: "A material that is as liquid as water when injected requires extreme

tool and surface precision. The Swiss region offers the necessary precision engineering skills thanks to its long tradition of luxury watchmaking. As a result, we developed our site into a technologically outstanding LSR specialist, in both single and multi-component injection molding."

Seed cell for medical technology

Trelleborg itself entered liquid silicone processing through growth: "With taking over Stein am Rhein we were able to tap into a true technology leader," recalls Ursula Nollenberger. "The idea was to build on a leading liquid silicone processor with a footprint in the medical field," adds Jarno Burkhardt. This also marked the beginning of a "gradual journey into medical technology," reports Manuel Funk, Technical Manager Medical Device Solutions Europe, who has been familiar with the site since the start his works for Trelleborg in 2008: "After the acquisition, Trelleborg and the Healthcare & Medical segment grew also through further acquisitions with the aim of increasingly focusing on the medical market, striving to one day becoming an independent business area. A lot of new sites for medical technology solutions are located in the United States of America. Almost all of them also process silicone, either as liquid or solid silicone. It is the gold standard in medical technology."

During the on-site interview, another acquisition by Trelleborg Medical Solutions was announced: Trelleborg is growing through integrating the Baron Group, which

As LSR specialist, Trelleborg manufactures technically complex and geometrically fine parts that not everyone is capable to produce – in clean rooms and beyond.





From left to right: Ursula Nollenberger and Manuel Funk represent Trelleborg Medical Solutions; As Product Line Director, Carolin Grandt is responsible for Stein am Rhein.

specializes in medical technology solutions, with its headquarters and two production facilities in Australia, as well as two additional locations in China. "The medical technology industry is very specialized. It ranges from harmless industry-oriented applications to the highest risk classes, including long-term implants," explains Manuel Funk. "This brings with it special demands in terms of regulatory aspects, quality systems, and specialized personnel, and was one of the reasons for spinning off Trelleborg Medical Solutions as a separate business unit."

High-precision toolmaking is an essential Trelleborg capability for reliable processing of liquid silicone. Tolerances in the thousandth of a millimeter range are part of everyday life.

Lead Center for liquid silicone

As a LSR manufacturing center, the Trelleborg site in Stein am Rhein is of strategic importance for the entire Trelleborg Group. "Our two production sections, the technical production and cleanroom production, are characterized by a very high degree of automation, high quantities, and extremely high technical complexity. We conduct both tool and process developments and actively distribute LSR expertise to our sister sites worldwide," explains Carolin Grandt. This includes the Trelleborg Sealing Solutions site in Pernik near the Bulgarian capital Sofia with flexible, semi-automated processes, a Trelleborg Sealing Solutions site in Shanghai for serving the local Chinese market, and the Trelleborg Sealing Solutions site in Weobley, England, which complements the silicone portfolio with solid silicone but also has

LSR capacities in the cleanroom for small to medium quantities. This set-up allows Trelleborg to leverage their global network and offer customers the manufacturing concept that suits their application. "However, from the perspective of tool complexity, we serve customers from the Stein am Rhein site," says Carolin Grandt.

Even though the medical and pharmaceutical industries are important growth markets for the Trelleborg Stein am Rhein site, it operates independently of the market as a Center of Excellence and is positioned broadly. The expertise lies in complex liquid silicone components and meets a high demand for a variety of applications, especially when it comes to sealing. "The second largest and massively growing sector in recent years in Stein am Rhein is the automotive industry," says Jarno Burkhardt. Typical applications come from multicomponent injection molding and include sensor holders and sensor protection systems, for example, for adaptive speed and distance control, emergency braking, and airbag systems. Here, as in the healthcare sector, absolute particle-free conditions are a must. Even a slight burr that comes loose poses a problem. "Especially with liquid silicone, a correspondingly process-secure tool and processing technology is essential. Through our special tool design, we offer massive advantages for our customers," adds Jarno.

The really subtle difference

Trelleborg designs and builds all its tools in-house. Developing its own tool-making competencies in Stein am Rhein was part of the strategy from the very beginning: "Our true core capability is high-precision tool-making," emphasizes the General Manager.

With highly automated manufacturing cells, Trelleborg ensures economical production of technically complex, burr-free liquid silicone components in large quantities.



Photo: Trelleborg



Photo: Trelleborg

Stein am Rhein itself covers 20 percent of the toolmaking capacity at Trelleborg. The rest is handled by three other own toolmaking sites within a 25-kilometer radius – all partners and suppliers we have been able to acquire in recent years to grow our in-house manufacturing capabilities. “We manage the capacities centrally in Stein am Rhein and supply them through our design. The final touch is then done again in Stein am Rhein. For the final correction of each tool, we use a diamond paste in a manual finishing process with a microscope. No matter how advanced the machining equipment in our modern toolmaking is, it requires a person who, with their expertise and experience, precisely adjusts the tool with the diamond paste. This is what makes the difference between a slight burr or minor flow defects and a burr-free, perfect part with extremely high surface accuracy.” Compared to conventional plastic injection molding, LSR specialists speak of a ten to hundred times higher precision requirement for the tool. Tolerances in the thousandth of a millimeter range are commonplace. “We consider ourselves one of the most impressive capacities worldwide in terms of high-precision toolmaking,” explains Jarno Burkhardt convincingly.

Perfectionists with technologies developed in-house

However, the precision of the tool alone is not enough for the process-secure processing of LSR. According to Jarno Burkhardt, the combination of the precision offered with a specially developed micro-needle injection technology, proprietary hot and cold runner design, and engineering is the key to success. Trelleborg doesn't reveal more details about the ingredients of their in-house developments, only this much: “The combination of highly efficient closure times even with 128-cavity tools and detailed solutions like pressure testing integrated into the cavity using sensors or pneumatics makes the difference. Through differential pressure measurement in the tool, we can, for example, check during the injection molding process whether the adhesive bond in multi-component parts has been well realized. Additionally, we always design a tool from scratch around the component, so we can do without design-related standards like parting lines.” It is crucial to be involved in the part development from the very start to exclude critical surfaces or parting planes.

The huge raw material warehouse for its 80 injection molding machines, Trelleborg turns around within two months. Mostly commission goods with different shore hardness grades and properties in terms of temperature and tear resistance, surfaces and flammability.



Photo: K-PROFI

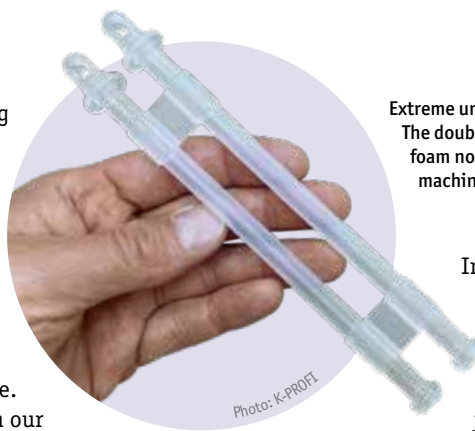


Photo: K-PROFI

Extreme undercuts, long cores, three sliders: The double tube with finely dimensioned foam nozzle for a fully automatic coffee machine is created in one shot.

In its development expertise and work with customers, Trelleborg Stein am Rhein is considered as a leading engineering service provider with liquid silicone injection molding capabilities, distin-

guished particularly by its tool technology. It sets the course for process-secure manufacturing right from the feasibility assessment. How can geometry, injection points, or flow paths be altered to not only improve process security but also increase the number of cavities? Or: How can raw materials be adapted to the application to ensure their process-secure handling even in mass production? In close collaboration with the raw material manufacturer – Wacker Chemie AG being an important supplier – simulations, filling studies, and finite element analyses are conducted. “We offer extensive expertise in coatings, optimizations, or altering surface properties of elastomers,” says Jarno Burkhardt.

Benefitting through development partnerships with customers and suppliers

The site is generally geared towards extremes: “Very large, very small, very wide, very thin – definitely away from the standard,” states the General Manager, citing as an example a 20 mg lightweight sealing cap for a microswitch. Trelleborg manufactures this micro-injection molded part with a shot weight of 1.45 g in a 64-cavity tool. “Precisely controlling the volume flows at this incredibly small shot weight and so many cavities doesn't work with standard equipment. For the repeat-accurate production of such micro parts, we also use self-developed dosing technology. When we receive the dosing pump from Elmet, we rely on our own technology from the fitting onwards. In combination with the mentioned micro-needle injection, we achieve the precision.” For many years, there has been a development partnership with the LSR dosing system specialist from Oftring, Austria. Among other things, Trelleborg tests new LSR dosing systems

The LSR metering systems dock outside the clean room and ensure highly precise preparation of the two silicone base polymers into silicone components.



Photo: K-PROFI

under real production conditions before their market launch, such as the LSR dosing system Top 700 before its presentation at the NPE in May 2024, and supports fine-tuning. Conversely, Trelleborg benefits from the close collaboration when fine dosing, volume flow, or the accuracy of existing systems need to be adjusted for special components.

A similar situation applies to the “excellent cooperation” that has existed for decades with the injection molding machine manufacturer Arburg in Loßburg, according to Burkhardt: “A win-win situation. We are allowed to test components in advance with a view to the further development of LSR machines and incorporate feedback as a processor. At the same time, we gain access to specification details that we would not normally have, enabling us to realize special components.” Trelleborg also uses Arburg’s highly customized ALS host computer system as a production management tool. “We map the entire manufacturing process, the complete value chain including tempering processes and surface treatment, not just injection molding.”

80 machines process LSR in single and multi-component injection molding

At Stein am Rhein, Trelleborg operates nearly 80 injection molding machines. In the Bulgarian plant in Pernik, an additional 50 injection molding machines complement the production network for liquid silicone processing. Due to the low viscosity of LSR, the machine size is determined not by the clamping force but by the tie-bar spacing. “Regarding clamping force, our machines are usually oversized. We downgrade by opting for the smallest screw and unit sizes in the optional accessories,” reports Jarno Burkhardt. More than 500 active tools with up to 128 cavities are in use. For large, high-cavity tools, tie-bar spacings of up to 720 x 720 mm are available.

The Trelleborg production in Stein am Rhein is divided into two areas: one is the technical production with over 50 injection molding machines for single and two-component injection molding of parts for automotive, sanitary, industrial, household appliances, as well as health and baby care applications. The other is the cleanroom production with more than 20 injection molding machines for the medical and pharmaceutical industries, as well as sensitive applications in the automotive, electronics, and lighting sectors. “Currently, we operate four independently



The trend is moving towards temperature-free LSR parts, but not for all applications. In addition to complete networking, the annealing process in the clean room at 200 °C also ensures germ-free nature.



Trelleborg uses the variant of LSR metering directly in the newly established fourth clean room at the site, primarily for a blood glucose measurement application. Here at the validation run of the plant.



There has been a development partnership with the LSR metering system specialist Elmet for many years, from which both sides benefit.

operable cleanrooms, each with its own monoblock filter system. Depending on the application, we achieve particle cleanliness according to ISO classes 8, 7, and even 6. The latter is achieved with a high level of automation, thereby minimizing contamination by humans,” explains Jarno Burkhardt.

Continuous growth in clean room capacities

The largest share within the medical portfolio consists of parts for inhalers, which Trelleborg produces for German pharmaceutical companies. “Respiratory diseases do

not tolerate particle or bacterial contamination. Therefore, we follow a meticulous protocol. Before stepping into the cleanroom, personnel change clothes twice. Monthly, doctors conduct saliva and blood tests on our employees and update their medical certificates. The killer for a medical product is bacteria-forming germs, and bacterial contamination is not considered in the ISO standard,” explains the General Manager. “We produce 24 hours a day in 51 weeks a year with a very low manual component, achieving a very high quality in terms of particle and bacterial contamination, which we monitor and document around the clock.”

After integrating the Swiss plant, Trelleborg quadrupled its cleanroom capacities. “Since 2012, we have invested a multi-million amount in this,” says Burkhardt. “Two years ago, we completed the fourth cleanroom for a blood glucose measurement application.” The Swiss LSR specialists emphasize that they are not limited to a specific production spectrum. “Every item is custom-specific. The common denominator is technical complexity. These are parts that not everyone can manufacture,” says Manuel Funk. He lists examples: large undercuts, 0.1 mm thin membranes, multifunctional overmolded components for artificial feeding tubes, thermoplastic rings overmolded with a fine liquid silicone antenna as a high-precision control element in a breast pump, microsensors for continuous blood glucose diagnostics, etc.

LSR overmoulding open the doors to further growth

Trelleborg is also involved in multicomponent technology with rather unconventional combinations of LSR with engineering thermoplastics, as well as with high-performance thermoplastics. “Generally, liquid silicone and thermoplastic materials do not have a high adhesion affinity. However, with our good material knowledge, processing, and tooling expertise, we can create an adhesive bond with LSR that surpasses any comparable materials like thermoplastic elastomers,” Carolin Grandt. “In the composite, the elastomer usually represents the most critical component of the application. It is therefore logical that we, as LSR specialists, offer multi-component technology. It is

Innovation iCast

Pushing the boundaries of LSR processing with AI and 3D printing – Why Trelleborg is bringing injection moulding and additive manufacturing together: Interview with Jarno Burkhardt in K-PROFI international issue 2/2024, directly available at www.k-profi.world/issue/240231.

the fastest-growing application in Stein am Rhein,” notes Manuel Funk. Jarno Burkhardt adds, “The trend is towards system components. Multi-component parts with LSR mean less assembly effort. We even inject micro parts using multi-component technology.”

Stein am Rhein production continues to grow

Where is the journey heading? “The increasing use of sensors and the rising electrification, regardless of the base industry, has significantly boosted our site in recent years. Additionally, there is the continuous growth in the medical sector. To accommodate this growth at the site, we are currently expanding through additional production space, which is a good ten percent of the original space” reports Jarno Burkhardt. Addressing the stereotype that Switzerland is particularly expensive, the General Manager notes, “Significantly higher working hours and fewer public holidays and vacation days result in a lower hourly wage than in southern Germany. Nevertheless, Switzerland is a high-wage region. With our triad of high automation,

engineering expertise, and highly specialized toolmaking, we can more than compensate for this challenge.” Unlike the situation in Germany, he does not see the profession of toolmaker currently at risk and attests to the region’s excellent infrastructure in this regard: “The profession still holds a very high value and recognition among the younger generation. In Switzerland, it is a four-year apprenticeship. We are currently training four young people, one apprentice for each year of training.” The expertise and experience remains within the company.

Focusing solely on cost-efficient volume production is not the future plan: “We aim at an even higher degree of extremity,” announces Jarno Burkhardt. Additionally, Trelleborg already supports its customers with a new process for cost-effective, fast, and flexible small-series production of complex LSR components. “iCast enables the economical production of small pre-series from the series material, for example, for validation and verification, because we don’t have to invest in a tool. It is a hybrid of 3D printing and injection molding and is based on an AI-supported feasibility study. A tool insert costs in the double-digit euro range and is created within three days, so the customer receives parts with the gating and parting line like in the series within two or three weeks. With the five-step iCast process, we have achieved a technological breakthrough in LSR processing after six years of development. We produce for the medical and pharmaceutical industries as well as the automotive industry,” Jarno Burkhardt is pleased to report. ■

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The LSR production in Stein am Rhein includes technical production with over 50 injection molding machines for the single and multi-component injection molding of components for automotive, sanitary, industrial, household appliance-, as well as healthcare and baby care applications.

For the automation of individual injection molding plants, Trelleborg relies on the user-friendly and easily programmable handling components from Wittmann.



From powder to masterbatch

How the model vehicle manufacturer Herpa changes the colouring process for very low shot weights

Herpa Miniaturmodelle GmbH specialises in true-to-the-original, sophisticated models of cars, trucks and aeroplanes. In 1:87, 1:200 or 1:500 scale, they are as popular with collectors as they are with companies for advertising and merchandising. More than 1,500 models of modern and historical prototypes are available in the 75th year of the company's existence. In its injection moulding production at the Dietenhofen headquarters, Herpa is currently converting the colouring of the important materials PS, ABS, MABS and LDPE from colour powder to masterbatch. The challenge here is to achieve high dosing accuracy at very low shot weights.

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

Photo: Herpa Miniaturmodelle

More than 1,500 models, mostly in 1:87 scale, are available from Herpa, which celebrates its 75th anniversary this year.



Holger Maier, Tobias Röck and Johannes Kraus (from left), here in the Herpa Museum, have significantly increased production quality and efficiency by switching from powder to masterbatch colouring.

Herpa models usually consist of around 30 individual parts and are essentially put together by the hobbyists – assemblies by welding or gluing are unusual. Shift foreman Holger Maier: "We process batches from around 80 to 40,000 pieces. Larger quantities concern carry-over parts between model series, such as truck tyres, which we sometimes produce for half-yearly or yearly demand and stockpile. But if customers order individually or even custom-decorated models, we can quickly reach typical quantities of 200 trucks in red, yellow or green." Herpa produces almost its entire product range from four types of plastic: natural PS, crystal-clear PS, ABS, MABS and LDPE. Almost all parts are model-specific; only non-visible chassis or supporting structure parts, as well as wheels for commercial vehicles, are used in model series of different brands.



Holger Maier shows a modularised injection moulding tool with exchangeable inserts.



Herpa keeps thousands of interchangeable inserts in close proximity to the injection moulding production.



Herpa uses interchangeable inserts to limit the frequency of changeovers and ensure efficient injection moulding production.

Herpa operates a total of 21 injection moulding machines with clamping forces ranging from 100 to 1,100 kN and with standard screws with diameters of 18 to 35 mm. The annual throughput is only 40 to 45 tonnes of plastic, but the production volume is around 2 million assembled items. Of these, 70 % are for the company's own products, and around 30 % are for resale. With around 30 individual parts per item, the volume adds up to 30 to 50 million plastic parts annually. The product life cycles of the models are usually two to four years. Only structural and non-visible elements of individual models outlast a vehicle generation.

Almost all model parts are drop parts. Only those that can easily be scratched are produced by Herpa "staffed" – that is, with an employee at the machine. "Crystal-clear parts are labour-intensive," notes Johannes Kraus, a member of the management board: "We have tried many automation concepts, but with our small batch sizes and the many different parts, no one has really been able to help us yet." The only products that are not exclusively assembled by hand at Herpa are truck and tractor tyres, because the quantities for some wheel set variants are large enough to be assembled automatically.

Herpa produces in three shifts with a small night shift. The plastic used is only dried in a central drying hopper in exceptional cases; the small quantities of material required are filled manually into the hoppers of the machines. The experts plan the production

sequence with the aim of keeping the number of changes of colour, mould inserts or complete tools to a minimum, but always with the necessary end date in mind. Holger Maier: "We try to keep the colours as constant as possible and not to make any major changes." As few colour changes as possible – this strategy also results in very little waste. "We change the complete tools two to three times per shift and the colour another two to three times, which makes five to six set-up processes per shift. In addition, there are the intermediate changes of the mould inserts."

Modularity and mould inserts extend the colour change

The tools are modularised according to a sophisticated system developed by Herpa itself. They can carry several contour-defining inserts, which can be exchanged and filled on the machine via a rotatable sprue bushing. Herpa has recently changed its strategy in toolmaking: its own capacities are concentrated in the area adjacent to the injection moulding production for maintenance and servicing, while the construction of new moulds is being outsourced.

"Our moulds are highly polished, especially for the car bodies. The parts get their shine from the mould and the crystal-clear polystyrene," explains Johannes Kraus. Individual parts of the models, such as windows, roof elements and headlights, are transparent, while all others are dyed through. Achieving uniform colours for all individual parts



Plastics in 350 standard colours, as a mixture of granules and powder, are stored next to the production area.

of the models, which are injection-moulded from different materials, requires a considerable amount of effort. Holger Maier: "Some model manufacturers use a very expensive method if they don't get the colour right: they paint their parts afterwards."

At Herpa, painting is not used except for effect painting. "If someone really wants silver metallic, black metallic or red metallic, then you can't do without painting." Colouring with silver is not sufficient for the highest standards: "Unfortunately, no one has yet come up with a solution for how to get this under control," regrets Johannes Kraus. The models are given a visual "finishing touch" at Herpa, primarily through hot foil stamping, pad printing, digital printing or screen printing.



Photo: K-PROFI

The MDS Balance gravimetric dosing unit in the injection moulding machine's housing adds the masterbatch to the material flow.

Johannes Kraus (left) and Tobias Röck exchange experiences with masterbatch dosing in injection moulding production.



Photo: K-PROFI

Changing several hundred colours to the masterbatch

Herpa has around 350 standard colours for models by mixing granules and powder. Johannes Kraus: "Colour continuity is very important for collectable products. The red fire engine should always come in the same fire engine red." With the small quantities and amounts used, Herpa has always had to pay higher and higher minimum quantity surcharges for powder colours. Until now, employees have mixed the plastic granulate with the powder colours manually or dyed it using a stationary mixer. "Our challenge is to achieve a high degree of dosing accuracy with very low shot weights – while also maintaining good flexibility when changing."

Herpa is currently converting the colouring process from powder to masterbatch on an ongoing basis. Holger Maier: "During the changeover, we are working with Grafe, who are providing us with excellent support in continuously converting all powder colours into masterbatch and also in sampling the new colours." Outgoing powder colours are thus gradually being replaced by masterbatch so as not to waste any finished batches. Johannes Kraus: "We are taking a two-pronged approach and are initially trying to convert as many colours as possible and to follow up the conversion mechanically so as not to cause a bottleneck anywhere."

"We tried everything possible before we came to the decision to switch from powder to masterbatch," reports Johannes Kraus. "The idea was anything but new, but we never approached it consistently, partly because of our close ties with the powder supplier." In addition to the material costs, there are also practical reasons for the changeover. "The powder colours are difficult to clean from the cylinder, and the colours are changed frequently due to the small-scale production and low shot weights," reports Holger Maier. For some colours, the cleaning effort was disproportionate to the production quantity: "We used three kilograms of material for an order of 500 parts and another ten or 15 kilograms to clean the cylinder." Another economic hurdle was that for some parts, the shot weight was distributed as follows: 2 % product and 98 % sprue. With the switch to masterbatch, the screw and cylinder are now cleaned more quickly.

Gravimetry brings precision to colouring

"In 2023, during the orientation phase for alternatives to powder, Labotek provided us with a Movacolor MDS Balance gravimetric dosing device for four weeks for testing purposes. After that, a competitor offered us their own model." Labotek regularly offers customers the opportunity to test such devices free of charge for a period of three to four weeks. "They can do anything with it, just don't break it," grins Tobias Röck, Labotek's sales representative for southern Germany and a master industrial technician for plastics and rubber himself: "Many customers use this time to test the device thoroughly."

Labotek has been a specialist in the fields of drying, dosing, conveying, storing and crystallising plastics for over 80 years. The company places a high value on energy and cost-efficient solutions, maintains a cooperative partnership with its customers and offers customised solutions to optimally support individual production processes. Labotek is an official distributor of Movacolor. "It is important to us to enable our customers to test and experience innovative and demand-oriented technologies. When renting equipment, we take care of on-site commissioning, offer training and, together with Movacolor, support the optimisation of processes. Throughout the entire test phase, we are on hand to help our customers with any questions or challenges they may have – a real learning-by-doing experience," says Tobias Röck.



Herpa stores all models ever produced with sample parts for an indefinite period of time.

After the test phase, Herpa quickly purchased two MDS Balance gravimetric dosing units from Movacolor from Labotek and put them into operation on two standard injection moulding machines. The modular units are equipped with a weighing cell and can achieve throughputs of 70 g/h or more. Unlike volumetric units, they do not feed the masterbatch using a screw, but with a weighing cell. In conjunction with the control software, it achieves a dosing accuracy of only

0.05 % deviation. On older machines, the dosing device can be operated as a stand-alone solution, while on modern machines it can be integrated into the machine control system via interfaces. Alarm settings indicate a lack of material on the manually loaded machines or other faults, thus protecting machines, hot runners and moulds. Up to 1,000 colour formulations can be stored in the MDS Balance control system – enough for the approximately 350 recipes at Herpa. “Step by step, we are now equipping one machine after the other with gravimetry,” announces Johannes Kraus. With add-on parts, Labotek and Movacolor support the adaptation to injection moulding machines of various brands, specifically to a Boy XS.

Herpa uses a small amount of sprues or start-up lumps in non-critical components such as black base plates, interior or chassis parts. Otherwise, the injection moulding company separates by type of plastic, but not by colour. The polystyrene recyclables go to a manufacturer of coat hangers, the remaining quantities to specialised dealers.

Fewer downtimes increase flexibility

How many parts will be needed in the near future? When will it be worth setting up and injecting again? Planning the production sequence, warehousing and batch sizes is difficult. The importance of improved flexibility in injection moulding is particularly evident in the run-up to Christmas: “Seasonal business often causes us a bit of a headache – especially when a retailer miscalculates or an industrial customer has forgotten their promotional gifts or business gifts before the holidays,” reports Johannes Kraus, “so it’s all the more important to have more flexibility in our processes.”

www.herpa.de
www.labotek.com/de
www.movacolor.com

A Boy XS injection moulding machine will also be equipped with a Movacolor dosing unit in the near future.

The MDS Balance is controlled via an 8" touch screen.

The polystyrene scraps are separated by type of plastic, but not by colour, and sent to a manufacturer of coat hangers.



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“This is not intended by the system” ...

... or “The tail wags the dog”

By now, everyone is probably familiar with the saying “the system’ wasn’t designed to do that”. We should not forget that SAP, Workday and other systems were developed to simplify business processes, create more transparency and speed up procedures. Some points may still need to be optimised.

Systems such as Workday, for example, provide every manager with comprehensive transparency about their team. This includes information on length of service, remuneration, career history and planned personnel development. This is a positive development that can help to provide a better overview of all issues relating to the team.

new candidates in order to comply with the “workflow” and complete a process in the first place. In the past, after a less successful interview, it was sufficient to inform the HR department that the candidate was not suitable and to ask for a rejection. However, depending on how internal processes are organised, this is no longer sufficient. Numerous other details must be provided before the process can be processed further.

In the past, a highly competent assistant helped to optimise workflows for managers and teams. This left sufficient time to take care of central tasks. These functions have been largely rationalised, so that managers now have to deal with coordinating appointments via Outlook, preparing for and following up on meetings and writing minutes, among other things. Only for top managers is it still an option to afford an assistant. Taking headcount reductions into account, this approach only appears to make sense on the surface. If you look at the output that managers and teams achieve today in the time they have left, there is “room for improvement”.

It is important to fulfil your own role successfully, whether as a manager who leads employees or as a specialist who uses their specific knowledge to advance areas. Systems and apps should be seen as tools that enable you to carry out your own tasks more effectively. They should not degenerate into instruments of prevention. **■**



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The digitisation of personnel files and other important information has the great advantage that all data is stored securely and can be accessed at any time, even if there is a change in the company. In larger companies, this example system proves to be very helpful due to its scope and services. However, I would like to point out that there is room for improvement in practice.

It can be observed that in some companies, processes that used to be the responsibility and help of internal service providers are now being shifted to line managers. This includes, for example, filling out personnel request forms or maintaining the “system” after interviews with

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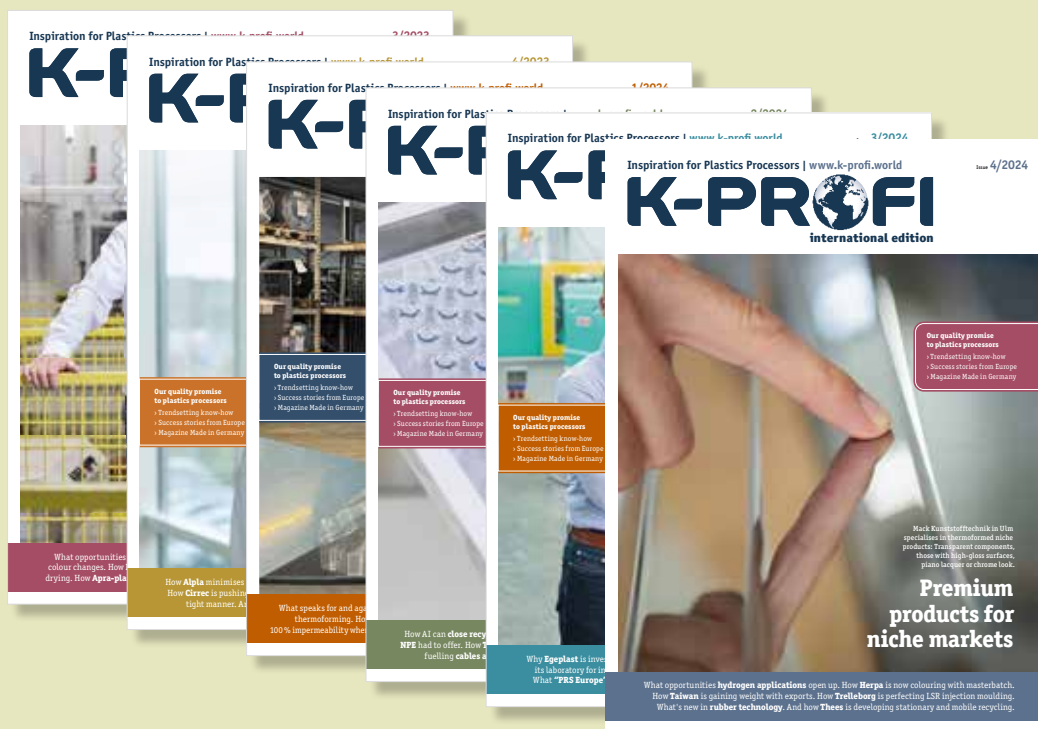
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